

A R T U Ü L I K O O L I
TOIMETISED

ACTA ET COMMENTATIONES UNIVERSITATIS TARTUENSIS

969

PROBLEMS IN CONTEMPORARY
SURGERY

(Dedicated to Ulrich Karell's 100-th anniversary)

TARTU  1994

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Alustatud 1893. a. VIHIK 969

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Editor Ennu Sepp

Arh.
12992

Tartu Ülikooli toimetised. Vihik 969
PROBLEMS IN CONTEMPORARY SURGERY
Tartu Ülikool
EE2400 Tartu, Ülikooli 18
Vastutav toimetaja E. Sepp
T.99. 9,5. 9,88. 400
TÜ trükkikoda. EE2400 Tartu, Tiigi 78



ULRICH KARELL

1892—1983

PROFESSOR ULRICH KARELL

H.Kelk

**Department of Traumatology and Orthopedic,
University of Tartu**

Ulrich Aleksander Karell was born on May 24th, 1892 into the family of the teacher Karl Karell and his wife Miina. In 1912 he finished the Aleksander Gymnasium of Tallinn and entered the Medical Faculty of Tartu University.

After the outbreak of World War I he was called up and his studies at the university were interrupted. He could resume his studies after the Estonian War of Independence.

In 1919 he married Vera Feodoroff in Voronezh (Russia) and the young family returned to Tartu.

In 1921 U.A.Karell graduated from Tartu University the Medical faculty of and started work as an assistant to Prof. K.Konik in the First Surgical Hospital of Tartu University on Toomemägi, where he had worked already in his student days. The Karells resided in the Hospital for 10 years. Son Mark was born in 1923 and daughter Eva in 1926.

In 1925, U.A.Karell went to Germany and Austria for further studies in the field of surgery, orthopaedics and roentgenology under such world-famous scientists as Prof. Schmieden, Prof. Hohlfelder (Frankfurt), Prof. Perthes, Prof. Jungling (Tübingen), Prof. Enderlen (Heidelberg), Prof. Sauerbruch (Munich), Prof. Eiselsberg and Prof. Breitner (Vienna).

On May 16th, 1928 U.A.Karell successfully defended his doctoral dissertation. In 1928 he participated in an international congress of radiologists in Stockholm. He was active in making a law concerning health protection of roentgenologists in Estonia.

When U.A.Karell had become a Privat-docent of Tartu University he went abroad to study and to research first under Prof. Kutner in Breslau and then under Prof. Eiselsberg in Vienna. He delivered a report on cardiospasm at a congress of German Surgeons.

In 1932, Dr. U.A.Karell became a Docent of Surgery of the Medical Faculty of Tartu University and head of the First Surgical

Hospital to succeed Prof. K.Konik. In 1935 he was elected Professor Extraordinary of Surgery and in 1937 Head of the Second Surgical Hospital of Maarjamõisa.

From 1935 Dr. U.A.Karell represented Estonian medicine in the I International Anti-Cancer Union and was on the editorial board of the "Acta Unions Internationalis Contra Cancrum". In 1936 he became Vice-Chairman of the Anti-Cancer Society of Estonia and a corresponding member of the society "Duodecim" of Finnish physicians.

His next home was in J.Hurt Street, where the family rented the first floor in a house belonging to Grünthal. In 1939 the marriage of Ulrich Aleksander and Vera Karell was dissolved and U.A.Karell settled in the house situated between Tiigi and Õpetaja Streets. The house and Karell's library perished in World War II. Vera Karell and the children moved to Tallinn.

During the years of German occupation Dr. U.A.Karell rented rooms in the house belonging to Horn next to the Eye Hospital. He married Miss Maimu Usin and the Karells moved into a detached house in Lembitu Street where they lived until they left Estonia in 1944.

In Germany, Dr. U.A.Karell worked as a surgeon of the town hospital of Kempten. Between 1945 and 1948 he headed the rural hospital of Sindelfingen. He performed many orthopaedic and plastic operations. He also treated Estonians who had been wounded in the defensive battles at Sinimäe in the North-East of Estonia.

In November 1949 Ulrich and Maimu Karell and their daughters Mari and Tiia left for the USA. Their family stayed in New York for some time. To obtain a licence to practice as a physician in the U.S.A. years of permanent residence were required and so U.Karell accepted an offer to practise as a surgeon on the tropical island of St. Croix (the Virgin Islands), a 6-hour flight from New York.

The Karells built themselves a house on the Island of St. Croix. U.Karell turned out to be a talented carver and sculptor and in his free time he made wooden sculptures and boat models. The sculptures are still to be seen on the island and they have become well-known local sights. Being a well-known surgeon he was repeatedly offered good jobs in other places but he turned all these offers down. He thought that he belonged to the island and its people who badly needed his skilled help.

U.Karell's colleagues on the Island of St. Croix remember him as an extremely popular and respected surgeon, a competent and skilful orthopaedist, a personality of a great working.

His colleague Dr. Roy Anduze has said that U.Karell was an

unforgettable man, quiet and taciturn. When presiding over the meetings of surgeons, he seldom added anything to the reports of his colleagues, but when he did so, it was something very important. Dr. R. Anduze remembers cases when Dr. Karell was summoned to his patient in the middle of a theatrical performance. Dr. Karell always placed his patients' interests before his own. He practised surgery, orthopaedics. No wonder that he did a lot of overtime work.

Dr. Randell James, another colleague speaks about Dr. Karell's excellent orthopaedic practice. He concludes, "With him next to us we all were happy and confident. He was a pillar of strength to those around him." U. Karell's charm and fitness, friendly attitude won him everybody's respect and love.

In 1912 U.A. Karell joined the Estonian Students' Society (EÜS) and was involved in the movement for independent Estonia. His fellow-student Karl Kook writes that U.A. Karell, an attractive personality, was an embodiment of the highly educated and cultured pre-war Estonian intellectual. While living abroad U.A. Karell continued to contribute to the work of the society as much as his strenuous work allowed him to.

When in 1975 the Rotary Club of St. Croix marked his 83rd birthday the organisation thanked Dr. Karell for his long and devoted work in the organisation (U.A. Karell had joined the Rotary Club in Tartu) and they underlined Dr. Karell's great service to the benefit of St. Croix and its people, both as a medical man and sculptor of great popularity.

Attending the 2nd Estonian World Festival "Esto" in Baltimore, USA, Dr. Karell, aged 84, got injured in a traffic accident. The fracture of femoral neck confined him to the wheelchair till the end of his days.

He died at the age of 91 on St. Croix on July 16th, 1983. His funeral ceremony in the local church was conducted by clergymen of different confessions.

Dr. U.A. Karell was cremated and buried at the Woodlaron Park Cemetery in Miami on July 25, 1983.

Dr. U.A. Karell, an excellent surgeon and renown theoretician led a full life, devoted to his profession. He was a man of generous character, wide knowledge (he could speak seven languages) and high moral standards. His students at Tartu University could learn very much from him.

Prof. U.A. Karell made a great contribution to the development of medical science in Estonia.

PROFESSOR U.KARELL, HEAD OF TARTU UNIVERSITY HOSPITAL OF SURGERY 1931-1944

L.Roostar

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In May 1992, Tartu University and all medical men of Estonia marked the birth centenary of Professor U.Karell with a festive jubilee conference attended among others by U.Karell's second wife and his children and grandchildren. Professor Karell's work has left its imprint on medical research in Estonia. A man of many interests U.Karell did much to promote medicine and win international acclaim to Estonian medical research.

U.Karell played a great role in surgery when he headed the Tartu University Hospital of Surgery. As U.Karell had had a lot of practice in field surgery in the years of World War I his University tutor Professor K.Konik gladly recommended him for the post of junior assistant at the First Hospital of Surgery. K.Konik knew U.Karell as a brilliant student and he promoted U.Karell's rapid development into a promising medical researcher.

Having passed the ten examinations for the Doctor's academic degree in 1924 U.Karell went abroad to work and study in distinguished centres of surgery in Germany and Austria. Returning to Estonia, U.Karell took up intensive research and published three papers. In 1928 he obtained his Doctor of Medicine Degree for his work "The Treatment of Tuberculous Lymphomata by X-Rays and the Prognostic Value of Some Blood Changes Herewith". The paper of 247 pages successfully proved that

1. tuberculous lymphomata could be treated with X-rays,
2. treatment with X-rays called for the hospitalization of the patient when inoperative tumour radiation therapy was combined with diathermial surgery.

In 1930 U.Karell became Privat-docent of Surgery. He made a brilliant lecture on X-ray diagnosis of chronical appendicitis at his 'venia legendi'.

Having spent eight months in the best hospitals of Germany, France and Helvetia, U.Karell started reading a regular surgery course of five hours a week for fourth-year students of Tartu University.

In 1931 Professor K.Konik was elected Head of the Second Hospital of Surgery and U.Karell, author of 19 papers, was elected to succeed him and act as Head of the First Hospital of Surgery.

The year of 1932 marked a new stage in U.Karell's life. U.Karell, a university teacher, medical researcher and surgeon was elected Head of the First Hospital of Surgery for the term of three years.

Docent U.Karell worked very hard, combining his work in the hospital with that in a number of medical research institutions. In 1935 the Board of Research Expertise of the Medical Faculty nominated U.Karell as a good candidate for extraordinary professorship. The decision of the Board of April 27, 1935 reads: "Although U.Karell's casuistic papers fail to testify to his research potential, they do demonstrate the chosen subjects and theoretical zeal of the author. As to Docent U.Karell's surgical practice it can be stated with full confidence that U.Karell has achieved the professor's level of qualification. His three-year teaching experience fully recommends him for the professorship".

Professor K.Konik died in 1936 and U.Karell succeeded him as the Head of the Second Hospital of Surgery. As it was too much work for one person to head two hospitals, U.Karell applied to be freed from the responsibilities in the First Hospital of Surgery and recommended Docent A.Linkberg to replace him as Head of the First Hospital of Surgery.

As can be seen in the book "Criticism of the Scientific Work of the Candidates for the Vacant Professorships of Surgery at Tartu University" published in 1938. Professor U.Karell took his work in the capacity of the official reviewer of scientific papers of the Medical Faculty very seriously. There were three candidates: A.Rosenfeld, C.Prima and Docent A.Linkberg. Criticising the work of A.Rosenfeld U.Karell wrote: "Paper No. 7. Treatment of Pleural Empyema. Published in 1928. Three quarters of the paper is a translation of a paper by F.Landvis without any reference to the original author. A.Rosenfeld suggests that good results can be obtained total empyema if open drainage is given up and in the management of the wound is allowed to close by granulating process". The talk is about the five description of management of thoracostomies. U.Karell concluded saying that the method could not be recommended as it was not sufficiently safe. He did

not recommend A. Rosenfeld for the post as the latter had not published any papers that would reflect his abilities as a practising doctor and independent researcher of medicine. While writing about the activities of A. Linkberg Professor U. Karell wrote: "As I know Docent A. Linkberg in his everyday work as an energetic and enthusiastic doctor who has dedicated himself to his work, I must point out how conscientious and experienced he is both in hospital and lecture-room".

I knew Professor A. Linkberg personally and I can assure you that Professor U. Karell's opinion of people and their work was objective and well-grounded. Professor U. Karell was good both in practising medicine and teaching it. Every summer he went to practise in the best surgical hospitals of Western Europe. He delivered a number of talks on Estonian medicine and treatment of cancer there.

In 1937, at the meeting of the Tartu Society of Estonian Physicians dedicated to Ernst von Bergmann's birth centenary U. Karell made an extremely thorough report on Bergmann's scientific legacy.

Professor U. Karell was active in the work of many scientific institutions (e.g. Tartu Society of Estonian Physicians, Anti-Cancer Society of Estonia, International Society of Surgery, International Anti-Cancer Union, Finnish Society of Physicians "Duodemica"). He also belonged to a number of academic and public organisations.

In 1940 U. Karell became Ordinary Professor of Surgery. On February 15, 1940 president K. Päts signed his nomination.

Professor U. Karell continued his work at the Second Hospital of Surgery after Estonia was occupied by the Soviet troops. The last entry to his personal file, kept since March 1, 1921, was made on July 21, 1941, which stated that U. Karell had been appointed Commandant of the Maarjamõisa Hospitals of Tartu University. U. Karell headed the Hospital of Surgery during the German occupation till 1944, when he left Estonia.

Professor U. Karell published 31 papers, 27 in Tartu. His best publications are still of interest for modern surgeons.

Professor U. Karell's life and work at the head of the Surgical Hospitals of Tartu University is a good example for all of us to follow.

PROFESSOR ULRICH KARELL'S SCIENTIFIC PAPERS ON ABDOMINAL SURGERY. SURVEY

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Publications on abdominal surgery make up the major part of prof. U. Karell's scientific papers. They were published mainly in the journal *Eesti Arst* (Estonian Physician) in the years 1925-1937 and written according to the model accepted at that time. The introduction provide a shorter or longer but always an adequate review of the world literature on the problem that is being dealt with, followed by an account of his own material, and finally, as a short summary, the essential points that the author feels to be deserving attention from the point of view of better diagnosing or more successful management.

Professor Karell's works reveal his great interest in rare cases of disease. He says in his article "Situs inversus in totalis regularis" [1], written in 1925: "Although everything connected with situs inversus may seem trivially simple to every thinker or examinee, in real-life situations this rare and bold trick of nature presents, even for the best of diagnosticians, curiosities that can only be solved by the clairvoyant X-ray". From the analysis of an individual case (a 19-year old patient was operated on a left-side appendix) he draws the conclusion that the location of the diaphragmas on X-ray pictures allows one to predict indirectly the localization of the organs in the abdominal cavity. If the diaphragm on the left lies higher than that on the right, situs inversus should be suspected. For a more exact diagnosis, prof. Karell suggests pneumoperitoneum should be created, and pyelography.

In 1930 U. Karell published "Volvulus caeci" [2]. His data show the disease that is rare in Western Europe (about 4%) to be much more frequent in Estonia: in the 1920s and 1930s, volvulus caeci was present in 16 (20%) out of 80 intestinal occlusion cases. An interesting fact is that, according to the literature, the problem was first described by Zeuge von Manteuffel in 1898. The author also discusses the ethiological factors that in Estonia at that time included poor food and

problems of diet, but also the differences in the specific weight of different parts of the intestine, meteorism, traumata, and excessive motility of the intestine in the abdomen. He pointed out two ways to overcome the condition the detorisation of the intestine together with fixation, or else, in the case of intestinal gangrene, its resection together with ileostomy or with ileotransversostomy.

Prof. Karell's "Diagnosis of mesenterium commune intra vitam" [3] was published in the same year. This is a further study into the causes of volvulus: in most cases its underlying principle is a congenital anomaly of the intestinal mesentery. His opinion is that the diagnosis of caecum mobile only by palpation, as was recommended by Hausmann in 1913, is not possible in all cases, and he suggests that palpation should be combined with an X-ray examination in different body positions, i.e. also tilting down the head part of the body while making the X-ray.

The same kind of combined methods of examination U. Karell described already in his earlier article entitled "X-ray diagnosis of chronic appendicitis" [4]. He showed that it was possible to diagnose chronic appendicitis by changing the body position during X-ray and by observing the filling and emptying of the appendix during irrigoscopy. It is also essential to note the presence of Döhner's symptom: inserting air into the large intestine via the rectum will bring on pain in the region of the appendix. The important conclusion made by prof. Karell is that combined examinations help avoid unnecessary operations, and especially unscientific laparotomy for exploration.

1931 brought the article "Congenital cystic dilation of the common bile duct" [5] The material for studying the rare disease (3 cases) was obtained from the Breslau Clinic, from prof. Küttner. The article describes the pathogenesis of the disease: unproportional embryonic development of the hepatic and the common bile duct epithelium, inflammations, spasms of the Odd sphincter. The four characteristic symptoms of the condition are icterus, pain in the epigastrium, tumor in the region of the liver, and a growing abdominal circumference. The results of treatment were poor: the lethality in conservative and surgical treatment cases was, respectively, 100% and 71%.

During his studies at Breslau Clinic in 1931 prof. Karell also wrote an analysis of the perspective results of cardiospasm treatment [6, 7]. He studied the 16 cases of the disease that were treated in Breslau Clinic in the previous 30 years and reached the conclusion that the conservative treatment of cardiospasm failed to give successful long-term results. In

order to estimate the perspective results of the operated (mainly by Heller) patients, he analysed both the subjective symptoms and complaints as well as the objective ones: the results of fluorography examinations of the esophagus. The classification he worked out for estimating the perspective results of treatment shows that there may be a divergence between the subjective and objective signs.

Professor Karell's studies of the intestinal tract lead to his report on the Estonian Second Congress of Physicians in 1932: "On the surgery of the colon". He analysed the results of the 127 operations made in the previous 10 years and felt that it was important for all the Estonian medical profession to become aware of the problems. Since the event was dedicated to fight against cancer, prof. Karell's paper was the main report on the congress. Besides other issues related to colonic diseases, he studied also the postoperative mortality of cancer cases and showed that it was very high in comparison with other countries. Also he pointed out that mortality could not be lowered only by using more superior surgical techniques; it was essential to achieve early diagnosis and surgery of cancer through educating people about the possible symptoms of the disease. Each patient with the slightest suspicion of cancer should be referred to a specialist for a precise diagnosis. In 1934, on an international congress in Belgium, U. Karell read a report on the epidemiology of cancer diseases in Estonia. Cancer prevalence here was high among the railway workers, also there were high rates of female sexual organs cancers. Poor hygiene and cramped social conditions accounted for the latter, he said. In Estonia women developed cancer averagely 10 years earlier than men. The greatest problem here was early diagnosis. On the example of Belgium (he called Belgium the motherland of cancer treatment) where there were special foundations for fighting cancer, he organized such a foundation in Estonia as well. A prompt support followed by President of Estonia K. Päts who donated 1000 kroons for prophylactic screening of suspected cancer patients.

In 1934 prof. Karell published the article "On the treatment of inoperable malignant growths" [8]. He claimed that the number of malignancies showed a trend towards increase and that it was necessary to operate on the patients at an early stage. His study reveals that it frequently happened that already before the surgeon's examination the case was classified as inoperable. Whether a case is operable or not has to be decided by the surgeon, says prof. Karell. He also suggests possibilities for the management of inoperable cancers by combining irradiation and toxin therapy.

The years 1935-1937 see three major articles, one on the surgery of the bile ducts [9], and two on gastric surgery [10, 11]. "Electrosurgical removal of the gall bladder" [9], published in 1935, is a thorough survey of the problems connected with the surgery of the gall bladder: anesthesia in gall bladder operations, its removal, drainage of the subhepatic region following the removal, and postoperative mortality. Prof. Karell's results concerning mucoclasia of the gall bladder by electrocoagulation are of much importance: his experimental results in corpses and his knowledge of electrochemistry and physics lead to a thorough discussion of electrocoagulation.

To achieve better therapeutic results, both the physician and the patient must be convinced that an early operation contributes much to a faster and smoother recovery in gall bladder diseases. The surgeon must be exacting towards himself, he must keep improving his surgical techniques, the operation has to be radical while being minimally traumatic. Both pre- and post-operative therapy are of great importance, with a special attention to infusion therapy. Coagulation resection makes it possible to avoid the use of draining that in turn leads to fewer postoperative complications.

Today we are confronted with much the same problems that were discussed by U. Karell nearly 60 years ago. The transfer from open surgery to endoscopic techniques sets out electrocoagulation as the main method for freeing the gall bladder from its adhesions and the liver. The draining of the subhepatic region following endoscopic operations is very rare.

U. Karell's works on gastric surgery form a major and a most fundamental part of Estonian surgical literature. When we look back today, we see that half of the 110-year history of gastric surgery was gone through by 1937. In peptic ulcer surgery the method of choice at that time was gastric resection. In his article "Gastric resection technique in Tartu University 1st Surgical Clinic" [10]. U. Karell describes the technique in detail. Since the operations were performed with local anesthesia, it was essential that the surgery should be fast and well coordinated. For that reason detailed instructions for each assistant and surgical nurse are given in his article. The special instruments designed by U. Karell that were made by the company U. Saks for freeing the stomach are still used today in Tartu University Surgical Clinic.

It has to be said that U. Karell's technique for gastric resection, and his surgical technique in general, is very much what is still employed at University Surgical Clinic today. That is also the technique has been

taught to surgeons studying and training here. Thus, U. Karell can justly be considered one of the founders of Estonian gastric surgery and its school.

U. Karell's next article "Results in gastric surgery and the importance of jejunal alimentation in such cases" [11] discusses the possibilities for improving the results of gastric surgery. His opinion is that in severe, advanced cases jejunal alimentation, i.e. jejunostomy should be used and that should be the way for feeding such patients. The first in the world to introduce jejunostomy was P. Gould in London, in 1885. According to U. Karell, in Estonia it was first used in 1931. His study proves that jejunostomy has widened the indications for surgical treatment and decreased postoperative mortality by 9,4%. The conclusion is that jejunostomy should be practiced more widely. In the summary U. Karell says that Estonian gastric surgery is still lagging behind when compared to the well-known centers of the world.

It is now 56 years since the last works in the field of gastric surgery were published by prof. Karell. During that time in peptic ulcer surgery there has been a development from gastric resecting methods to gastric preserving methods.

It is a pleasure to observe that U. Karell's school has been consistent and developing. That is certainly one of the underlying factors that make our today's results in Tartu University Surgical Clinics well comparable to those of the advanced countries.

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ENDOSCOPIC FINDINGS IN UPPER GASTROINTESTINAL TRACT HEMORRHAGE IN TARTU UNIVERSITY SURGICAL CLINIC: COMPARISON OF TWO PERIODS, 1979-81 AND 1989-91.

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The incidence of upper gastrointestinal hemorrhage (UGIH) is 50-160 per 100 000 inhabitants [1, 2, 3].

Peptic ulcer, gastritis, esophageal varices and Mallory-Weiss syndrome are responsible for 64-80% of UGIH [4, 5, 6].

Though elective ulcer surgery has dramatically declined in the past 15 years [7, 8], the admission rate [9, 10] and emergency surgery [7, 11] for peptic ulcer bleeding has not decreased.

Non-steroidal anti-inflammatory drugs (NSAID) are often considered to be responsible for hemorrhagic gastritis and ulcer formation [12, 13]. People using these drugs are put to a higher risk of gastrointestinal bleeding [14, 15]. Consumption of NSAID is increasing in the whole world, especially in the elderly [16, 17] and probably due to this there has been a major change in the age structure of UGIH. The percentage of the elderly has significantly risen in hemorrhage patients [1, 18].

Mortality rate of UGIH ranges from 3,7 to 11,8% [19, 20].

These data show that UGIH remains a challenging problem for surgical departments.

During more than two decades of development and extensive spread, endoscopy has shown its exactness and usefulness in diagnosing and treating UGIH. It is essential for the accurate diagnosis of the cause of hemorrhage and its localisation.

The main causes of hemorrhage according to esophagogastroduodenoscopy are depicted in Table 1.

Table 1

Causes of UGIH according to endoscopy.

%	Villar et al. 1977	Pectsalu A. et al. 1987	Allum W.H. et al. 1990
Duodenal ulcer	26,0	24,9	34,6
Gastric ulcer	10,4	27,0	18,7
Gastritis	18,2	15,7	
Esophageal varices	15,1	6,3	6,3
Mallory - Weiss s.	7,8	5,8	5,0
Esophagitis	3,6		9,1
Gastric tumor	3,6	8,1	2,7
Miscellaneous	7,8	5,5	14,1
No diagnose	7,3	6,8	9,5

The aim of our study was to assess the possible alterations of UGIH in the light of the epidemiological changes in the world, enhanced NSAID consumption and changes in the Estonian society during the last years.

PATIENTS AND METHODS

Esophagogastroduodenoscopic investigation of UGIH in Tartu University Clinic began in 1978. Since then all patients with UGIH (excluding a small number of those with very poor general condition, patients operated urgently after admission due to severe bleeding and those refusing endoscopy) were examined endoscopically. Majority of the investigations were performed within 12 hours after the admission, all within 48 hours.

Fiberoptic instruments that have been used are the following: GIF-D3, TYF-2D, GIF-K, ACMI, PUTSCHOK.

Every result of endoscopy is recorded on a special card.

We analysed all the cards of two separate periods - 1979-81 (I period) and 1989-91 (II period) in order to study the cause, sex and age distribution of UGIH and changes in these variables.

206 patients (148 male and 58 female) were investigated in I period and 401 (273 male and 127 female) in II period.

In the study of the causes of UGIH all pyloric and prepyloric ulcers were classified into the duodenal ulcer group. Erosions, acute ulcerations and intramucosal bleeding spots of stomach were classified as gastropathy according to Z. Maratka et al. The group "miscellaneous" consists of the causes of bleeding with less than 2% occurrence (duodenopathy, stomal peptic ulcer, esophageal cancer, gastric heman-gioma, duodenal tumors, chemical corrosion of esophagus, pancreatic cancer infiltrating duodenal wall etc.). In some cases endoscopy didn't reveal a lesion responsible for the bleeding - classified as "no diagnose".

As the study includes all the endoscopic records of UGIH patients, not only of those coming from Tartu and Tartu region, but also of other parts of southern Estonia, it doesn't reveal the incidence .

RESULTS

During I period (1979-81) 206 patients and during II period (1989-91) 401 patients with UGIH were examined endoscopically.

Figure 1 depicts the causal distribution of UGIH in both periods.

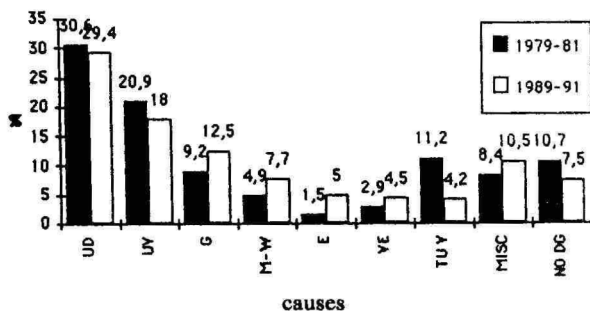


Fig.1. Causes of bleeding according to endoscopy (UD - duodenal ulcer, UV - gastric ulcer, G - gastropathy, M-W - Mallory-Weiss syndrome, E - esophagitis, VE - esophageal varices, TU V - gastric tumor, MISC - miscellaneous, NO DG - no diagnose)

Duodenal ulcer, gastric ulcer and gastropathy are responsible respectively for approximately 30, 20 and 10% of all the bleedings. I and II period don't differ significantly in any of the causes of hemorrhage. The rate of miscellaneous causes and "no diagnose" group hasn't changed either.

Figure 2 compares UGIH sex rates.

The overall sex rates indicate a nearly 2:1 relation, with 71,8% men and 28,2% women in I period and 68,2% versus 31,8% in II period. There is no significant difference between the two periods (Fig. 2a.).

In the duodenal ulcer hemorrhage group the percentage of male patients has decreased from 77,8% to 65,3% and there is a respective increase of female patients from 22,2% to 34,7% (Fig. 2b.). However, the change is not statistically significant. There is an analogical situation in the gastric ulcer hemorrhage group (Fig. 2c.). In both these groups the male to female ratio is approximately 2:1 in II period.

In gastropathy patients the male to female ratio is 3:1 with no remarkable change.

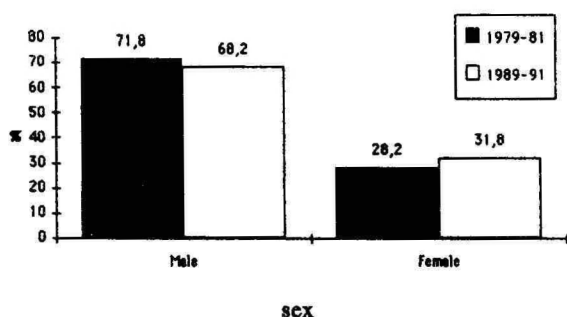


Fig. 2a. Total sex ratio in UGIH patients

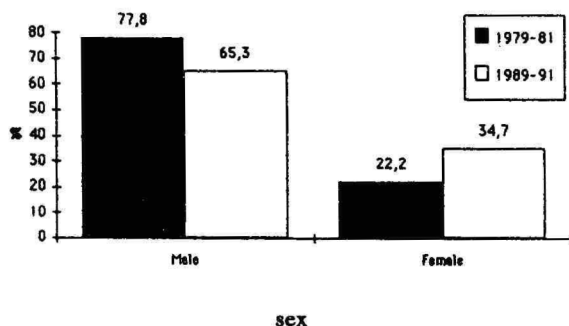


Fig. 2b. Sex ratio in duodenal ulcer hemorrhage patients

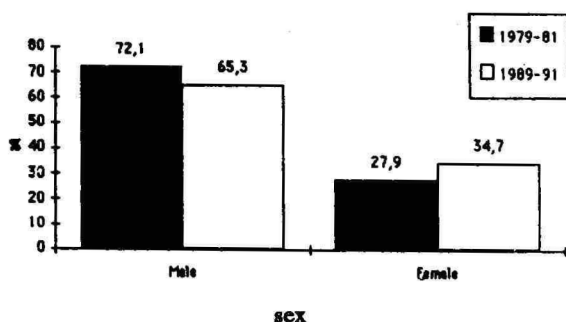


Fig. 2c. Sex ratio in gastric ulcer hemorrhage patients

The sex rates of the "no diagnose" group don't differ significantly through the two periods. The same can be said about bleeding from gastric malignancies, the male:female ratio being 1:1 in II period.

Male patients predominate in Mallory - Weiss tear group. The relation 9:1 has not changed during the ten years.

The age structure of the three main causes of UGIH during the two periods is represented in Figure 3.

Duodenal ulcer occurrence is relatively equal through the age groups in I period. In II period there is a rise in the age group 50-69 years (42% of all the bleedings) (Fig. 3a.). Comparing the two periods shows no significant changes in the occurrence rates of different ages.

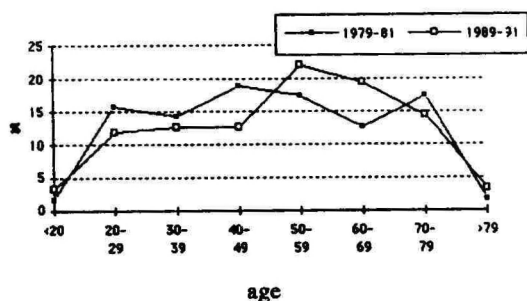


Fig. 3a. Age and duodenal ulcer hemorrhage

The incidence of gastric ulcer hemorrhage rises with the age in both periods. Patients over 60 years constitute 51% of all the cases in I period and 58% in II period (Fig. 3b.).

Gastropathy as a cause of bleeding prevails in the 40-69 years old in both periods, 69% in I period and 74% in II period belong to this group.

Collation of the three main causes of UGIH shows that gastric ulcer patients are significantly older than those with duodenal ulcer or gastropathy.

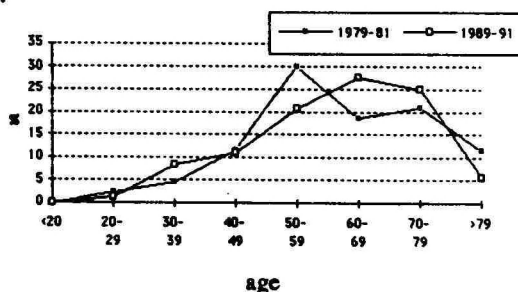


Fig. 3b. Age and gastric ulcer hemorrhage

DISCUSSION

The absolute number of UGIH patients examined endoscopically has increased twofold in a decade in Tartu University Surgical Clinic. A remarkable rise in the incidence of UGIH could be suspected, but this research is not a geographically defined area study and so does not provide the exact data for incidence changes.

The diagnostic yield of endoscopy was 89,3% in I period and 92,5% in II period (no significant difference). Most centres report of results close to 90% or exceeding it [1, 21, 22]. It is known that the shorter the time from admission to endoscopy, the bigger the information [23].

Certain changes have been noted in the causal distribution of UGIH. Kurata reports of a remarkable increase of the rate of gastric ulcer and a decrease of duodenal ulcer in USA [24]. At the same time the overall rates of hemorrhage have not changed in the United Kingdom [25] and a Finland study shows a decrease of gastric ulcer and increase of duodenal ulcer hemorrhage [26]. These variations are suspected to be related to geographical and life-style determined differences [18]. However in most works peptic ulcer is claimed to be the reason of UGIH in about 50% of the cases [3, 9, 19].

Our analysis shows also that duodenal ulcer and gastric ulcer have been the main causes of UGIH in southern Estonia through the last decade, with no remarkable change. They contribute respectively 30 and 20% so altogether a half of all the bleedings. These two lesions together with gastropathy and esophageal varices (up to 15% of all cases) seem to be predominating in the world. In our study esophageal varices are the source of bleeding in less than 5% of cases.

There is a 7% decline in the rate of gastric malignancies. That may be due to diagnosing of earlier stages of tumors the last years. The rate of gastric cancer bleeding is yet somewhat higher than found by others [2, 26, 22].

The sex distribution of UGIH patients didn't change significantly neither in the overall rates nor in the rates of the main causes of UGIH. Various rates of male predominance are seen in every cause of UGIH. The overall male to female ratio is 2:1.

In peptic ulcer hemorrhage there is a trend, yet not significant, of changing sex proportions towards the increase of female rate, especially in duodenal ulcer, where the male to female ratio changed from 3,5:1 to 2:1 in ten years. In gastric ulcer the change is from 2,5:1 to 2:1. Works on peptic ulcer show that in uncomplicated cases the ratio is similar [18, 25] to the one found by us in II period. A Norwegian study shows a reversed male:female ratio - 0,7:1 [27]. Maybe, the character of the disease is changing, the social roles of sexes are changing, women are consuming more NSAID etc. This may have a certain impact on peptic ulcer hemorrhage sex ratio.

In hemorrhagic gastropathy the male to female ratio had an insignificant change - a decrease of male rate by 5%. Mallory - Weiss tear is generally related to previous alcohol consumption, so mostly men are in risk here. There is no change in this group in our material with a ratio 9:1.

The proportion of the age groups is changing in the world the last years. The percentage of the elderly, admitted due to peptic ulcer or gastritis hemorrhage has significantly increased in both sexes [18, 25]. This is evidently related to changing patterns of NSAID use. And not that the gastrointestinal mucosa of the elderly is more prone to the damage caused by NSAID [13], but the elderly are consuming these drugs remarkably more than years ago.

Our study shows that the over 60 years age group has increased by 5% (from 32% to 37%) in duodenal ulcer and 7% (from 51% to 58%) in gastric ulcer patients during 10 years. However, the change is not

significant. No change has occurred in gastropathy, where the >60 patients made up 37% in 1979-81 and 38% in 1989-91. It is evident that gastric ulcer hemorrhage occurs relatively more often in the older age than duodenal ulcer or gastropathy bleeding.

As a conclusion we can say, that there has been no major change in the cause, sex and age distribution of UGIH patients in Tartu University Surgical Clinic during the past 10 years, but certain minor changes show the similar trends as described in the world literature.

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LONG-TERM RESULTS OF PROXIMAL VAGOTOMY AND DUODENOPLASTY IN THE TREATMENT OF DUODENAL OBSTRUCTION

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Proximal vagotomy (PV) is widely used in the treatment of duodenal ulcer disease, in recent years also in complicated cases.

A difficult and controversial problem is the choice of method of the operation in complicated duodenal ulcers (penetration, stenosis), localized either in the distal part of the bulbous or the postbulbar area. Often falsely described as "pyloric stenosis", it is in fact duodenal stenosis, (bulbar or postbulbar) located at least 1-2 cm beyond the pyloric ring [11].

There are different surgical approaches to this pathology: gastric resection, vagotomy with Jaboulay gastroenterostomy, dilatation either digitally or with Hegar dilators through gastrotomy or duodenoplasty.

The aim of our study was to present long-term results from patients with bulbar or postbulbar stenosis who underwent PV with form-and-function preserving duodenoplasty (DP) with ulcer excision according to Holle.

MATERIAL AND METHODS

Between 1978-1985 43 patients underwent PV with DP in II Department of Surgery of Tartu University. 39 patients were male and 4 were female. The patients ranged in age from 22 to 65 years, with a mean age of 41 years. All patients had a previous history of duodenal ulcer disease, with an average duration of 9 years.

The diagnosis was verified on endoscopic examination and finally established at the operation. In 23 cases the site of ulcer was in the distal part of the bulbous and in 20 cases in the postbulbar area. In 29 patients there was 1 ulcer and in 14 two or more. All 43 patients had duodenal

stenosis that was combined with penetration in 14 cases and with hemorrhage in 11 cases.

We used a standardized PV technique and form and function preserving duodenoplasty with ulcer excision according to Holle (9.). We think that the most important moments in using this technique are an adequate mobilization of the duodenum by a Kocher manoeuvre, excision of the ulcer(s) and the surrounding deformation, and the preserving of the pyloric ring. We did not use intraoperative test of the completeness of vagotomy.

The follow-up was accomplished 5-11 (mean 7.7) years after the operation in 39 patients (1 patient died 1 year after the operation of myocardial infarction and 3 were lost to follow-up for unknown reasons). The examination of the patients included a standardized questionnaire with 18 questions (39 cases) and an endoscopic examination (32 cases). During the conventional endoscopic examination we estimated the function of the pyloric ring and the completeness of vagotomy by the endoscopic Congo Red test (ECRT) according to Duonahue et al (3.). Long-term results were graded according to the modified Visick scale (5.).

RESULTS

There were no postoperative deaths attributable to the operation. 2 intraoperative splenic injuries occurred requiring splenectomy. Immediate postoperative complications occurred in 3 (7%) patients (1 pancreatitis, 1 wound infection, 1 peripheral thrombophlebitis).

In the long term period, i.e. 5-11 years after the operation (mean 7.7 years), 35 patients were classified as Visick I or II (89.7%) (table 1). In 4 cases a mild dumping syndrome (10.5%) and in 6 cases mild and occasional diarrhoea (15%) occurred. All these were easily corrected by diet and classified as Visick II. Unsatisfactory results - recurrent ulcers in four cases - were classified as Visick IV (10.3%).

All four recurrences were diagnosed endoscopically. In 3 cases the ulcer was localised in the duodenal bulb and in 1 case in the corpus of the stomach. Recurrences develop during the 3th, 5th, 6th and 8th year after the operation, giving a mean interval to recurrence of 5.5 years.

In 23 cases the completeness of vagotomy was estimated by ECRT and the results are given in table 2. The number of ECRT-positives

(74%) is surprisingly high, even in the light of our earlier data that vagotomy is incomplete more often after PV than after truncal vagotomy (56% and 34%, respectively) (14.). The incomplete vagotomy areas were localized twice more often in the upper part of the gastric corpus mucosa. Probably it is in connection with performing vagotomy on the distal part of oesophagus, in the cardiac and fundic regions.

Table 1.

Clinical results 5-11 years after operation.

Visick grade	N ^o -of patients	Percentage
I	19	
II	16	89,7
III	-	-
IV	4	10,3
Total	39	100,0

Table 2.

Results of ECRT in 23 cases after surgery

ECRT	N ^o	Percentage
Negative	6	26
Positive	17	74
Positive areas in gastric	lower part -	3
corpus mucosa	lower and upper -	4
	upper -	10

} 41
} 82

All recurrent ulcer patients were ECRT positive. By endoscopy we estimated also the pyloric function (defined as the rhythmical opening and closing of the pylorus). It was considered to be normal in 31 and defective in 1 case.

DISCUSSION

Our data show that PV with form- and function preserving DP in the treatment of complicated distal duodenal ulcers is a safe operation with no mortality, low number of complications, mild side effects and an acceptable recurrence rate in the long-term period. It has been confirmed in many series that PV is a safe operation with low operative mortality (16.). In our series of complicated duodenal ulcer disease cases there were no operative deaths following DP with excision of the ulcer and the surrounding deformation.

As an intraoperative complication, only splenic injury requiring splenectomy occurred in 4.6% of cases in our material; that is in good consent with the results by Nylamo 5% (13.). In 1 case postoperative pancreatitis following the excision of the ulcer was most likely in connection with the surgery (resulted most likely from the excision of the ulcer).

Long-term results after PV with DP are difficult to compare because in the literature there are few reports about this type of operation, the technique of DP varies and follow-up periods are relatively short (1.). Our mean follow-up time was 7.7 years. In our long-term follow-up about 90% of the cases were classified as excellent (Visick I) or good (Visick II). Available literature presents similar results (80-100%), though for shorter follow-up periods (1, 11.)

Side-effects as the dumping syndrome and diarrhoea occur significantly less frequently after PV than after resection, truncal, selective or proximal vasotomy with drainage (13, 16.). In our study the dumping syndrome was present in 10.5% and diarrhoea in 15% of the patients, values higher than reported by Bowden (1.). But all these cases were mild, easily corrected by diet and with no effect on life quality. All these cases were classified as Visick II.

The relatively high rate of ulcer recurrence after PV is the main argument against this procedure. According to literature, there are recurrent ulcers averagely in 10% of the cases 5 years and even in 20% of the cases 10 years after PV (6.), and in 0-8% of the cases after PV with DP (1, 11.). Our opinion is, that today the only objective method for detecting recurrent ulcers is endoscopy, since it can reveal also asymptomatic ulcers (4.). On endoscopic examinations we found 4 recurrent ulcers, i.e. 12.5% of the cases examined endoscopically. All recurrences were symptomatic. Up to two thirds of the recurrences

occurred within 5 years after the surgery, but the ulcer recurrence rate continued to rise with time (4, 7.). This confirms our results: -recurrences develop during the 3th, 5th, 6th and 8th year after the operation.

Incomplete vagotomy is clearly the leading cause of ulcer recurrence after all forms of operation involving vagotomy (16.). To estimate the completeness of vagotomy we used ECRT that makes it possible to ascertain the location and the size of the incomplete vagotomy areas. Of the patients who underwent ECRT 74% had a positive test result. This percentage is high, but according to our earlier data out of all cases of incomplete vagotomy detected by ECRT, recurrent ulcer patients only account for 13% (14.). In this study all recurrent ulcer patients were ECRT positive.

We observed that incomplete vagotomy areas were twice more often localized in the upper part of the gastric corpus mucosa.

One reason for incomplete vagotomy can be technical errors. The performing of vagotomy in the lower part of the oesophagus, cardiac and fundic areas is a difficult procedure, which explains why areas of incomplete vagotomy occur more frequently in the upper parts of the gastric corpus. The possibility that vagal fibres could be present intramurally should also be taken into account (12.).

Areas of incomplete vagotomy in the lower parts of gastric corpus could be brought about by a too cautious or imprecise dissection of "crow's foot" while trying not to damage the function of the antral pump and pyloric ring. Another cause for incomplete vagotomy can be the vagal reinnervation of fundic glands in a long-term period (10.)

All recurrent ulcers analysed in this study were successfully treated with drugs only. According to many authors' observations, the nature of ulcer disease changes after PV, the course of recurrent ulcers becoming more benign (2,8.). Frequently they respond well to medical treatment and do not tend to recur any further (15.). An advantage of PV with DP is the preservation of the function of the pylorus. Of 32 endoscopic examinations we considered the pyloric function normal in 31 patients and defective in 1 case. The preserved function of the pylorus was confirmed by the observation that only in 4 cases there was a visually detectable bile reflux into the stomach and in 1 case visual changes of the gastric mucosa.

Endoscopic examination with ECRT is an objective method for discovering recurrent ulcers, allowing an easy and reliable evaluation of the completeness of vagotomy. The high rate of ECRT-positiveness

indicates that the follow-up period need be extended in order to monitor the possible development of recurrent ulcers.

We conclude that for patients with a distal obstruction of the duodenum in combination with other complications of ulcer disease, PV with ulcer excision and duodenoplasty preserving the pyloric ring is a good option and offers a possibility to select a more individual method of operation.

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CYTOLOGIC ANALYSIS CONCERNING THE INFLUENCE OF EXOGENOUS PROSTAGLANDINS (PGE₂) AND VAGOTOMY ON SOME ORGANS OF THE GASTROINTESTINAL TRACT

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The present material is based upon ten years of experiments concerning the effect of vagotomy and PGE₂ on the gastric and duodenal mucosa. The objective was to determine the efficiency of these methods in the treatment of the above mentioned organs and to clarify the action mechanisms. The processes in the human gastric and duodenal mucosa are very similar to those in rats as was endorsed by the parallel clinical experiments [5, 9, 23, 24].

Subsequently we would like to present the data gained while applying histological and histochemical methods. These data serve as the basis for the present biochemical and radioimmunoassays.

The experiments were carried out with 500 white grown-up rats. Because of the peculiarities of the method the rats were divided into following groups:

- Group 1. The control-group. No procedures were carried out on these animals.
- Group 2. Indomethacin was administered intragastrically in an amount of 50-40 mg/kg within 1-6 days. As it is known, Indomethacin and its analogues do harm to the gastrointestinal mucosa and possibly the big glands of the abdominal cavity. For this reason Indomethacin was used to evoke pathology in these organs.
- Group 3. PGE₂ was administered intraperitoneally in doses of 25-500 µg/kg within 1-6 days.
- Group 4. Vagotomy was performed to these rats. The duration of the experiments was 1-180 days.

- Group 5.** In addition on the intraperitoneally administered PGE₂, Indomethacin was administered intragastrically in an amount of 25-500 µg/kg and 5-40 mg/kg during 1-6 days.
- Group 6.** Vagotomy was performed to these rats and Indomethacin administered intragastrically. The duration of the experiments was 1-6 days.
- Group 7.** These rats were vagotomized and PGE₂ was administered intraperitoneally within 1-6 days.

The following cells were explored with the help of histological and histochemical methods:

- the gastric and duodenal surface epithelium and epithelial germinal cells
- the cellular composition of the gastric germine glands (mucocytes, parietal cells)
- the amount of the tissue basophiles was explored, especially their functional activity on the basis of degranulation. Liver and pancreas were explored in some animals
- the functional activity of the connective tissue macrophages in gastroduodenal mucosa, as well as in the liver and the pancreas by applying a vital colouring technique (necrosine, lithium-carmin)
- the amount and distribution of lymphocytes was generally estimated in the organs under observation.

The tissue pieces were fixed for the microscopic studies in the 10 % formalin and Carnoy solution. The material was inserted into paraffin. The tissue slices were coloured by hemalaun, eosine, alcian blue and neutral red, and a periodate-Schiff reaction was performed. The colouring with hemalaun only was used, when investigating the material coloured during the rats' life-time. Quantitative assessment (counting the cells) of preparates and statistic analysis were used as much as possible.

Considerable changes in duodenal and gastric mucosa were already seen in 1-2 days after the intragastric administration of Indomethacin. In the surface epithelium the deformation of epithelial cells, focal cell desquamation and necrosis were observed. These cells (the gastric surface epithelium, mucocytes, enterocytes calciformis) excreted mucus that could be coloured with alcian blue and at periodate-Schiff reaction. The accumulation of the new mucus into these cells was slow if compared with the control group. A noticeable rise in the mitotic activity of the germinal epithelial cells (in the collum of the gastric glands and in the intestinal crypts) was observed. It is probably a defence reaction but not sufficient for the termination of the destructive effect of

Indomethacin (Fig.1-a). A strong hyperemia was present in the mucosa. All the blood-vessels had been filled with erythrocytes, there was a lot of extravasations round the small blood-vessels and the number of lymphocytes was increased in the mucosa. These cells were located diffusely. Extravasations resulted in inflammation with a moderate macrophageal phase.

The cellular relationship of the germine gastric glands didn't change considerably. The difference as compared with the control-group can be functional: the mucocytes emptied, especially in the outer part of the gland neck.

Following the administration of Indomethacin there was no difference in the amount of tissue basophiles, but the degranulation rate (Fig.1-c) increased considerably and did not depend on duration of the experiment (1-6 days). By using conventional histochemical tests it is possible to determine what kind of bioactive substances are excreted into intracellular space. Histamine - the regulator of the gastric function, PGE_2 and other substances can be taken into account.

Intralobular enlargement of the connective tissue round the central veins was observed in the liver. In the interstitial connective tissue the amount of tissue basophiles had increased as well. No difference as compared with the control-group was found in the pancreas.

We can find evidence in literature that Indomethacin decreases the local blood-supply, inhibits the effect of the prostaglandins, leads to necrosis in the mucosa and destructs the protective barrier of the mucus [2, 8, 10, 17]. Our histological studies confirmed the facts mentioned above.

After the intraperitoneal administering of PGE_2 the mitotic activity of the epithelial germinal cells had increased minimally, the influence on the blood-supply was not observed. The amount of the tissue basophiles had increased to some extent, but their degranulation remained the same as in the control-group. The macrophageal reaction didn't differ from that of the control-group. The protection ability of the mucocyte mucus in the gastric germine glands had increased minimally.

One can read in literature that PGE_2 increases the production of the mucus considerably, improves blood-supply and defence potential, inhibits acid secretion, activates the germinal cells and diminishes the effect of histamine on the parietal cells [1, 4, 8, 11, 15, 16, 17, 18, 19]. In our experiments such a big contrast as compared with the control-group was not observed.

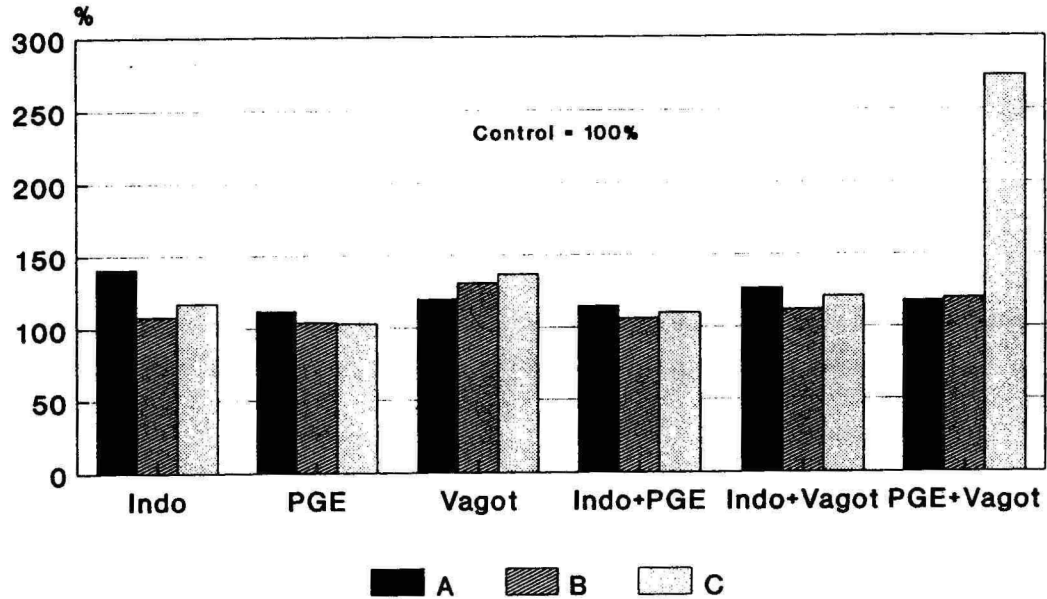


Fig. 1. A - mitotic coefficient,
B - phagocytic activity of macrophages,
C - mast cells degranulation

The changes in the gastric and duodenal mucosa were already observed in the first postoperative days after vagotomy and disappeared within 4-5 weeks. As a rule the rise in the mitotic activity of the epithelial germinal cells increased the mucus secretion in the stomach and duodenum, a considerable rise in the phagocytic activity of the connective tissue macrophages (and the Kupffer cells in liver) and a slight to moderate hyperemia were observed. A relative decrease of the parietal cells in the gastric germine glands was found, merely due to the increase of the mucocytes. A permanent and considerable rise of the tissue basophiles in the duodenal and gastric mucosa (in liver as well) and rapid degranulation of these cells were an important difference as compared with the control-group (Fig.1-a). Such changes have been described in literature as well. It is also affirmed that vagotomy causes mucosal atrophy, but it did not come out in our experiments [3, 7, 12, 13, 14, 19].

The amount of the lymphocytes in the gastric mucosa after vagotomy had increased most of all in the experiments of 1-3 days of duration. That could have been due to an operation trauma, too.

The destructive effect of Indomethacin on the gastric and duodenal mucosa was considerably diminished, when Indomethacin and PGE₂ were administered together. Necrotic changes were practically absent, the mucosa was covered by a regular surface epithelium, the mitotic activity of the germinal cells showed a relatively small increase as compared with the control-group (Fig.1-a). Only smaller mucosal blood-vessels had been filled with erythrocytes, no extravasations were observed. A permanently increased production of the mucus was found. The mucus coloured with alcian blue and at periodate-Schiff reaction was found on the surface of the mucous membrane, in the lumen of the gastric germine glands and in the mucus producing cells (mucocytes, enterocytes caliciformis). The degranulation rate of the tissue basophiles had minimally increased as compared with the control-group (Fig.1-c).

The protective effect of PGE₂ on the gastric and duodenal mucosa is evident in the histological studies of that animal group. The stimulation of the reparative and physiologic regeneration, strengthening of the protective mucous membrane, stabilizing of the blood-supply - this is the mechanism of the process that is confirmed by our experiments. The results correspond to those of literature [1, 4, 6, 9, 17, 18]. No difference in the cellular composition of the gastric germine glands was found in that rat group, yet the increase in the functional activity of the mucocytes was observed as compared with the control-

group. Evidence can be found in literature that the mucocytes are the ones most sensitive to PGE_2 [20].

When combining Indomethacin and vagotomy, the results to a certain extent depended upon the time of administering Indomethacin after vagotomy. In the first case the destructive effect of Indomethacin was minimum (a slight degeneration of the epithelium, a few extravasations). In the second case the effects of operation (vagotomy) were predominating (the rise in the amount of the lymphocytes, the macrophage activation) and extensive destruction of the surface epithelium occurred when Indomethacin administration had been directly after the operation. The destructive effect of Indomethacin (a slight degeneration of the epithelium, a few extravasations) was observed, When there had been a little delay in the administration of Indomethacin after vagotomy. The mitotic activity of the epithelial germinal cells, the degranulation of the tissue basophiles (Fig.1-c) and the macrophageal phagocytic activity (Fig.1-b) had considerably increased as compared with the control-group (Fig.1-a). The cellular composition of the gastric germine glands was the same as that the rats that had only been vagotomized. Thus the effect of vagotomy prevails when using the above-mentioned Indomethacin doses.

The effect of the two factors in the gastrointestinal mucosa coincides, when using PGE_2 together with the vagotomy. An enormous degeneration of the tissue basophiles was observed (Fig.1-c). In literature evidence can be found about the inhibition of endogenous prostaglandin synthesis after vagotomy [8, 12]. Taking into account the variety of bioactive substances produced by the tissue basophiles, it is impossible to determine the agents excreted by the degranulating cell. Still by using radioimmunoassay we have got preliminary data confirming the rise of the tissue basophile degranulation and PGE_2 containing rate the gastric mucosa after vagotomy or vagotomy combined with the administration of exogenous PG [14, 22, 23, 25].

In conclusion we can say that by applying the histological and histochemical methods it is possible to determine the protective effect of vagotomy or exogenous PG administration on the gastric and duodenal mucosa. On both occasions the ability of reparative and physiologic regeneration will be improved, the blood-supply will remain more or less normal (especially after using exogenous PG), the protective mucous membrane of mucosa will become stronger and the cellular immune system will activate (especially after vagotomy).

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DIAGNOSTIC CRITERIA FOR LACTOSE LOADING TEST AFTER GASTRIC SURGERY

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Hypolactasia i.e. decrease in activity of the small intestine enzyme lactase after the suckling period is one of the most frequent causes of milk intolerance after gastric surgery among the population in general. Hypolactasia is suspected in case of lactose intolerance when abdominal symptoms and diarrhoea occur 30-60 minutes following the ingestion of milk or milk products. Confirmation of hypolactasia then depends on utilisation of various laboratory techniques. Lactose loading test (LLT) is one of the most common indirect methods for diagnosing hypolactasia. This test consists of giving a standard dose - 50 g of lactose to the fasting subject and capillary blood glucose determining at 0, 20, 40 and 60 minutes. A rise in blood glucose over the fasting level of less than 1,1 mmol/l is defined as an evidence of hypolactasia. There are a few reports published about a higher rise of blood glucose level as a diagnostic criteria of hypolactasia for patients having undergone gastric surgery.

The purpose of this study was to specify the diagnostic criteria for LLT after gastric surgery. LLT are performed on the same patients before and after different gastric operations and changes in their blood glucose curves are examined. We proceeded from the point of view - ulcer surgery could not affect small intestine lactase activity, consequently could not cause hypolactasia - postulated by E. Gudmand-Hoyer (1969) and J. Jussila et al (1972). We combined the 50 g lactose load test (LLT) with the 25 g glucose and 25 g galactose load test (GGLT) to examine the lactose absorption rates and to diagnose hypolactasia. Before the operation the criteria for establishing the diagnosis of hypolactasia was a rise in blood glucose level of less than 1,1 mmol/l. Significant hypolactasia was proved in all single cases with ratio between the maximum increase in blood glucose in a lactose load (Δ LLT) and in a glucose - galactose load (Δ GGLT). This ratio in cases of hypolactasia could not exceed 0,40 (Δ LLT/ Δ GGLT < 0,40) /E. Gudmand - Hoyer

1969; T.Pirk et al 1973/. This relationship reflects the differences in absorption rates of mono- and disaccharides.

For this study 203 patients with peptic ulcer, having been treated successfully in the Second Department of Surgery of Tartu University Hospital were selected and examined before and one year after gastric surgery. The test group consisted of 169 men and 34 women aged from 20 to 72. 176 patients were suffering from duodenal and 27 from gastric ulcer. The anamnesis lasted from 2 to 45 years. Ulcer was diagnosed endoscopically in all cases. The diagnosis was verified during operations. The operations performed were proximal vagotomy without pyloroplasty in 57 patients, proximal vagotomy with pyloroplasty and ulcer excision in 75 patients, truncal vagotomy with pyloroplasty and ulcer excision in 36 patients and antrumectomy or partial gastrectomy by Billroth I in 35 patients. Hypolactasia was discovered in 62 patients with peptic ulcer preoperatively by diagnostic criteria of LLT and GGLT generally recommended and described above. Repeated LLT were performed on the same patients one year after gastric surgery. Comparisons between the blood glucose arising gradients in time of LLT and GGLT before and after different gastric operations were carried out. For statistical evaluation even Student t-test and discriminant analysis were used.

Maximum rises in blood glucose concentration in time of LLT and GGLT did not alter after proximal vagotomy without pyloroplasty. But blood glucose increase taking place during LLT and GGLT was significantly higher with patients had undergone proximal or truncal vagotomy with pyloroplasty and antrumectomy or partial gastrectomy. It has been explained with normal gastric emptying after proximal vagotomy without pyloroplasty and with rapid gastric emptying after pyloroplasty or gastrectomy.

The ratio between the maximum increase of blood glucose in a LLT and in a GGLT established before operation did not change after ulcer surgery in all cases. In cases of normal lactose absorption it was over 0,40 ($\Delta LLT/\Delta GGLT > 0,40$). In cases of hypolactasia it was below 0,40 ($\Delta LLT/\Delta GGLT < 0,40$).

The results of this study (in Table) allow to diagnose hypolactasia in patients with peptic ulcer and after proximal vagotomy without pyloroplasty is when the blood glucose level rise in a LLT is less than 1,1 mmol/l. The rise of blood glucose level in a LLT less than 1,7 mmol/l after pyloroplasty and less than 2,2 mmol/l after antrumectomy or partial gastrectomy enables to diagnose hypolactasia. In case of low

Table 1

**Diagnostic criteria with a 50 g lactose loading test for peptic ulcer patients
before and after gastric surgery**

Patients groups	maximum increase of blood	glucose over the fasting level
	diagnosis: lactose malabsorption among this hypolactasia	diagnosis: normal lactose absorption
peptic ulcer patients	less than 1,1 mmol/l (< 20 mg/100 ml)	1,1 mmol/l or over (≥ 20 mg/100 ml)
patients after proximal vagotomy without pyloroplasty	less than 1,1 mmol/l (< 20 mg/100 ml)	1,1 mmol/l or over (≥ 20 mg/ 100 ml)
patients after vagotomy and pyloroplasty	less than 1,7 mmol/l (< 30 mg/ 100 ml)	1,7 mmol/l or over (≥ 30 mg/ 100 ml)
patients after antrumectomy and partial gastectomy	less than 2,2 mmol/l (< 40 mg/ 100 ml)	2,2 mmol/l or over (≥ 40 mg/ 100 ml)

increase in blood glucose during LLT and GGLT is indicated to exclude general malabsorption syndrome.

So our study shows that a LLT with 50 g lactose is suitable to diagnose hypolactasia after gastric surgery. But you must follow from the diagnostic criteria recommended in this study. If they are not taken into consideration some patients will be wrongly diagnosed.

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SURGERY OF LARGE BOWEL GUNSHOT INJURIES

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SUMMARY

This retrospective study analyses the surgery and outcome of 385 cases of large bowel gunshot injuries. In 257 cases the wound was sutured, in 50 cases the injured bowel was exteriorized, and in 78 cases resection was performed. Post-operative diffuse purulent-faecal peritonitis occurred in 19.2 per cent of the cases. The overall mortality rate was 30.4 per cent. The techniques of choice should be considered the suturing of the wound combined with colostomy if the latter is required. In extensive damage exteriorization of the colon could be the simplest life-saving operation.

Surgery to treat large bowel gunshot injuries is a controversial problem and the mortality rate is high [1]. And yet as shown by Dufour D. and his co-workers [2] the lives of large numbers of the wounded with abdominal injuries can be saved 85 per cent or 75 per cent in the Afghanistan War [1] or 50 per cent in World War II [3]. This retrospective study analyses the surgical management and outcome of 385 unselected cases of isolated large bowel (267 cases) and combined large bowel and small intestine (118 cases) gunshot injuries sustained in the war in Afghanistan.

PATIENTS AND METHODS

All the 385 patients with the large bowel gunshot injuries were operated on at the specialized hospital.

The diagnosis was made on the basis of clinical signs, routine X-ray, laparocentesis, also laparoscopy or diagnostic laparotomy if needed. In latest years sonography was also used.

The wounded were mostly males, 18-40 of age. There were 327 (84.9 per cent) of bullet wounds and 58 (14.1 per cent) of fragment wounds. There were 300 (77.9 per cent) of perforating injuries and 85 (22.1 per cent) penetrating injuries of the colon. 269 (69.8 per cent) of all the cases were multiple injuries of the colon.

Only 119 (30.9 per cent) of the patients arrived within the first six hours after being wounded, 49 (12.7 per cent) patients from 7 to 12 hours and 218 (56.6 per cent) later than 12 hours after being injured. Diffuse peritonitis was diagnosed in 69 (17.9 per cent) cases. As to location the largest number of injuries was in the colon transversum (122 cases), followed by injuries in the colon ascendens (120 cases), in the colon descendens (67 cases), in the caecum (60 cases) and in the sigmoid flexure (16 cases).

The operating technique was chosen keeping in mind the general state of the wounded, as well as the size and location of the injury. Double-row suture as well as single-row suture was effectively used. During the operation peritoneal lavage was routinely performed and in some cases second-look operations combined with cleansing of the abdominal cavity had to be made. Surgery was complemented with intensive pre- and postoperative therapy of infusion, blood transfusion and antibiotics.

RESULTS

Bowel injuries of the size less than 2 cm with intact mesenteric blood supply (28 cases) were sutured. The wound was sutured followed by exteriorization of the damaged colon in 76 cases, extraperitonization in 47 cases, and proximal colostomy in 106 cases. Bowel exteriorization as loop colostomy was made in 50 cases.

Resection was performed by major wounds, multiple injuries in the segment, partial or total rupture of the bowel and mesenteric injuries in 78 cases. Right hemicolectomy with colostomy was performed in 12 cases, and right hemicolectomy with ileotransversal anastomosis in 28 cases.

Transverse colon resection with proximal colostomy was made in 25 cases and resection with proximal and distal colostomy in 9 cases. Sigmoid resection with proximal colostomy was performed in four cases. Of all the patients postoperative peritonitis developed in 74 (19.2 per cent) cases. Relaparotomy was performed in 45 (11.6 per cent) of the cases, and yet in this group 21 (46.7 per cent) patients died.

Colostomy was closed on the 45-70-th postoperative day. 117 (30.4 per cent) patients died mostly due to shock and diffuse purulent and faecal peritonitis.

DISCUSSION

The present paper reviews the treatment of large bowel gunshot injuries and early results of surgery. In World War II 46 per cent of the wounded were operated on within the first 6 hours [4], but in our experience we had to operate on 56 per cent of the arrivals who were hospitalized later than 12 hours after being injured, and yet we could achieve a satisfactory outcome.

The treatment plan chosen depended on the characteristics of large bowel injury, complications and general state of the patients. Routine laparocentesis with aspiration catheter revealing masses or fluid in the abdominal cavity proved to be a good diagnostic tool, which was also pointed out by Danne P.P and his co-workers [5].

We could find one report on conservative treatment of abdominal trauma in literature [6], but according to most authors [1, 2, 4, 7, 8] penetrating abdominal gunshot injuries require immediate surgical intervention.

In cases of large bowel injury suturing, the small intestine was routinely decompressed, but no decompression was made by colostomy. Small intestine decompression reduced the danger of dehiscence and following diffuse purulent and faecal peritonitis, which caused a 50 per cent mortality rate in the group of sutured and extraperitonized large bowel injuries.

P.N.Zubarev [9] stated a 6.9 per cent mortality rate in his similar group of patients with large bowel injuries operated on within the first six post-traumatic hours and he also stressed the importance of small intestine decompression in preventing dehiscence. Complications after colostomy developed in 15 per cent of the cases. It is of interest to note that D.Demetriades et al. [10] reported a 11 per cent complication rate by suturing and a 27 per cent complication rate by colostomy. We suppose that early colostomy can account for the reduced complication rate in our experience.

In the first years of World War II colon resection was made in 1.8 per cent of all the cases. In the last years of the war [11] bowel resection was replaced by the exteriorization of the damaged colon. In

modern times resection has again come to be used [9]. We had to resect the colon in 20.3 per cent of extensive wounds and we achieved a positive outcome. Yet in 19.2 per cent of the cases post-operative diffuse purulent-faecal peritonitis set in.

The mortality rate of 30.4 per cent can be put down to the haemorrhagic shock the late-arrivals were in and the post-operative complications of peritonitis and sepsis.

Our experience shows that in case of large bowel gunshot injuries surgery must be complemented with intensive pre- and post-operative conservative therapy. The operating technique is determined by the factors of injury kind, location and size and the general state of the patient. The technique of choice should be considered the suturing of the wound combined with colostomy if the latter is required.

In extensive damage, resection could be the life-saving approach as was proved in our experience. We would not recommend the exteriorization of the injured colon. This technique is to be used only to save operating time as in case of a patient in grave condition.

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EARLY MORTALITY AFTER 189 CORONARY BYPASS OPERATIONS FOR ACUTE MYOCARDIAL INFARCTION. RISK FACTORS AND OPTIMAL TIMING

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ABSTRACT

The role of coronary artery bypass surgery (CAB) in patients with recent myocardial infarction remains controversial. To define the operative risk more clearly, we reviewed 189 patients who underwent isolated CAB within 60 days after MI, early mortality was 8,4 %. We evaluated 25 preoperative and 5 intraoperative risk factors and their association between time (from onset of myocardial infarction to operation) and early mortality in seven groups with the different revascularization intervals. No correlation was found between risk factors and early mortality. Relatively low mortality (4,4 %) was noted in patients group who were revascularized within one week of the myocardial infarction. Operative mortality for postinfarction cardiogenic shock was 16,6 %.

Optimal timing of coronary artery bypass grafting (CABG) after acute myocardial infarction (AMI) is controversial, especially if myocardial function is impaired. Coronary Artery Bypass Surgery is performed to prevent further necrosis of the jeopardized myocardium [1]. Several reports have documented that the operative mortality in this setting is slightly increased [2-5]. There is a lot of information concerning the most important risk factors for CABG, but conclusions vary from one report to another [6-11]. We have chosen those patient parameters that are generally regarded as significant predictors of operative mortality [12-16] and made an attempt to find the association between time from onset of acute myocardial infarction to operation and postoperative early mortality.

MATERIAL AND METHODS

Between January 1981 and December 1990, 189 patients underwent CABG at Estonian Heart Center. The charts of patients who were revascularized within 60 days of a documented myocardial infarction, were selected for review. Two patients with reoperations were not included in this study group. Two prognostic categories were considered: survival and death. Twenty five preoperative variables and five intraoperative characteristics (Table 2) were evaluated in seven time dependent groups. Ejection fraction was determined by left ventriculogram during the interval between MI and operation. If several ejection fraction determinations were made, the measurement closest to the time of operation was selected. If both left ventriculographic and echocardiographic measurements were available at similar time between MI and operation, the left ventriculogram was chosen [18]. Of the 189 patients in the study group, 132 had ejection fraction determined by the left ventriculogram (70 %).

The patients were grouped into seven clinical categories according to interval from onset of AMI to complete revascularization. All operations were performed via a median sternotomy and with the aid of cardiopulmonary bypass, hemodilution (hematocrit 20 - 30 % and hypothermia 25 - 30 C). Myocardial preservation was achieved with cold potassium cardioplegia.

Statistical methods: Mean and one standard deviation, median and range or 95 % confidence limits (CL) were used to define two continuous variables, Welch test [19] was employed for comparison of two normally distributed samples. Discrete variables were expressed in % with 95 % CL and analysed with the chi-square method with Yates correction for continuity.

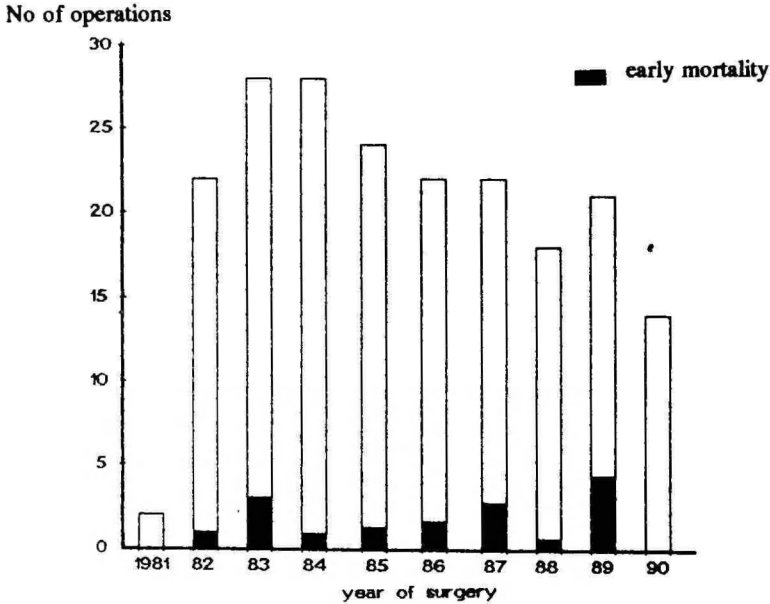
RESULTS

189 operations were performed and 16 deaths occurred (8,4%) during 30 days after operation. The annual proportion of operations and early mortality is depicted in Table 1.

The preoperative characteristics of the 189 patients according to whether they survived (n=173) or died (n=16) are represented in Table 2. There were no correlations with an increased risk of mortality. On the comparison of groups with Welch method $p=0,61$.

Table 1.

Annual proportion of early mortality in 189 coronary artery bypass operations for AMI between 1981 and 1990.



The operative characteristics for the survivors and nonsurvivors are shown in Table 3. The average number of grafts/per patient and mean cross clamp time were approximately the same for both groups. Different was mean bypass time ($p=0,1$). The range of ejection fraction was 21 to 84 %. The distribution of ejection fractions for the two groups ($p=0,43$) is represented in Table 4. The results of univariate analyses to examine the association between time from onset of AMI to revascularization and postoperative early mortality, as shown in Table 5. were not statistically significant ($p=0,1$). 10 % of the patients (19/189) who were in cardiogenic shock (Killip class 4), 4 patients died (21 %). In group 1. ($n=12$) [6 hours from AMI to revascularization] two patients were in cardiogenic shock after failed PTCA, both of them died. In group 2. ($n=13$) [6-24 hours from AMI to revascularization] four patients were in cardiogenic shock, one died (25 %). In group 3. ($n=46$) [1-3 days from AMI to revascularization] 4 patients were in cardiogenic shock, one died (25 %). In group 4. ($n=43$) [4-7 days from

Table 2.

Preoperative characteristics of the 189 Patient^A

Variable	Survivors (n=173)	Deaths (n=16)
AGE (yr) mean \pm SD yr.	50,7 \pm 7,97	51,6 \pm 6,32
< 40	15 (8,6)	0
40-50	65 (37,5)	8 (50)
50-60	86 (49,7)	8 (50)
> 65	7 (4)	0
SEX		
Male	165 (95,3)	14 (87,5)
Female	8 (4,6)	2 (12)
Previous MI	37 (21,3)	6 (37,5)
Transmural MI	117 (67,6)	13 (81,2)
Anterior Q wave MI	97 (56)	11 (68,7)
Inferior MI	67 (38,7)	5 (31,2)
Killip class:		
C1	124 (71,6)	12 (75)
C2	30 (17,3)	0 0
C3	1 (0,5)	0
C4	16 (9,2)	4 (25)
Diabetes	3 (1,7)	0
Preoperative intravenous thrombolysis	8 (4,6)	1 (6,2)
Preoperative intracoronary thrombolysis	61 (35,2)	4 (25)
PTCA	19 (10,9)	2 (12,5)
Catheterization data:		
Left Main Coronary Artery Disease (LMCA)	68 (39,3)	6 (37,5)
Number of diseased vessels:		
1	7 (4)	1 (6,2)
2	16 (9,2)	0
3	150 (86,7)	15 (93,7)
Circulation type		
Right	110 (63,5)	11 (68,7)
Left	22 (12,7)	2 (12,5)
Balanced	41 (23,6)	3 (18,7)

^A The number of patients in each prognostic category (survivors or deaths) that have the designated risk factor. The percentage of patients is shown in parentheses.

MI = myocardial infarction; SD = standard deviation

PTCA = Percutaneous Transluminal Coronary Angioplasty

AMI to revascularization] two patients were in cardiogenic shock, nobody of them died. In groups: 5. (n = 19), 6.(n = 18), 7.(n = 21) with revascularization intervals according to: 1-2 week, 2-4 week, 4-8 week, were in each 1 patient in cardiogenic shock, all survived. During 1-7 days after acute MI we operated on 89 patients, 6 of them (6,7 %) were in cardiogenic shock, 1 died (16,6 %). Overall early mortality for this group was 4,4 % (4/89). Another three nonsurvivors in this group died due to: congestive heart failure, severe postoperative bleeding from ascending aorta and pulmonary embolism. The causes of early mortality are represented in Table 6.

Table 3

Operative characteristics

	Survivors (n=173)	Deaths (n=16)
Mean cross clamp time (mins)	74.7 (SD ± 28)	73,8 (SD ± 34)
Mean bypass time (mins)	99,2 (SD ± 36)	150,3 (SD ± 119)
No. of distal anastomoses	502	50
No. of grafts/per patient	3,2	3,1
Complete revascularization	150 (86,7%)	11 (68,7%)

SD = standard deviation

Table 4

Distribution of Ejection Fractions

Ejection fraction (%)	Survivors (n=173)	Deaths (16)
mean	51,7 ± 12,9	49,1 ± 8,5
< 30	4	0
30-35	7	0
35-45	28	3
> 45	86	5

Table 5

Univariate analyses of the association between time from Myocardial Infarction to operation and early mortality

Interval	Survivors (n=173)	Deaths (n=16)	%
<6 H	12	2	16,6
6-24 H	13	3	23
1-3 days	46	3	6,5
4-7 days	43	1	2,3
1-2 week	19	4	21
2-4 week	18	2	11,1
4-8 week	21	1	4,7

p = not significant

Table 6

Early mortality after 189 coronary artery bypass operations for A M I in 1981-1990

Causes of death	n	%
Death in operating room	4	25
Death on postoperative day (1-30)	12	75
Stroke	1	6,2
Congestive heart failure	4	25
Renal failure	2	12,5
Pulmonary embolism	1	6,2
Bleeding from duodenal ulcer with septic complications	1	6,2
Bleeding from ascending aorta	3	18,7
Total	16	

DISCUSSION

Persistent or recurrent pain after myocardial infarction is a disturbing symptom that indicates that more myocardial tissue remains in jeopardy of further ischemic damage. Such situation may present as an extension of the primary infarct during hospitalization or it may manifest as postinfarction angina. Roberts and associates suggested that aggressive medical stabilization should be undertaken before CAB [20]. Hochberg and colleagues reviewed 174 patients undergoing early postinfarction revascularization [21]. They stated that timing of CAB after AMI was unimportant in patients with normal left ventricular function. However, patients with ejection fraction less than 50 % had a high mortality 32 % if the surgery was performed within 4 weeks of infarction. These authors suggested that such patients should not undergo CAB until 1 month after infarction. A major question was whether the interval between AMI and operation can be correlated with ejection fraction so that operation can be undertaken as early as possible but at a relatively low risk. DeWood and colleagues [22] reported an extensive experience with early operation for acute MI, operation was performed within 24 hours of infarction. The overall mortality was 4,4 % (31 / 701 patients). These investigators noted a significant increase in mortality if operation was performed in the period 6 to 24 hours after infarction compared with operations performed within 6 hours of infarction (8 % versus 3,8 %). They also noted that a major predictor of early mortality in the group with transmural MI, was preoperative cardiogenic shock. Nunley and colleagues [23] found an increased surgical risk if operation for pain was performed within 48 hours of infarction. They also noted an important increase in risk if shock was present preoperatively. Di Sesa and associates [24] reported important increase in mortality if cardiogenic shock was present preoperatively. These experiences and those of others [20, 25] have raised the major concern that a reperfusion injury may occur if operation is undertaken not immediately after onset of MI but within several hours to several days of the event. This study was performed to determine if the preoperative factors, intraoperative factors and time interval between onset of AMI to coronary artery bypass grafting independently increase the risk of operation. We recognize that the statistical value of this analysis is low because of the small number of patients operated on. No correlation was found between left ventricular ejection fraction and early mortality. We noted relatively

low mortality (4,4 %) in group of patients , who were revascularized within 1 week of the myocardial infarction and the operative mortality for postinfarction cardiogenic shock, was 16,6 %.

Conclusion: Aggressive medical treatment should be undertaken before CAB.

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EFFICACY OF TRANSESOPHAGEAL RAPID LEFT ATRIAL PACING FOR TERMINATION OF TYPE I ATRIAL FLUTTER

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ABSTRACT

Sixteen consecutive patients aged 61 ± 6 years with type I atrial flutter were tested. As antiarrhythmic treatment alone had failed, transesophageal left atrial pacing with rate of 400–750 ppm was carried out. The overall efficacy of rapid pacing was 81% with 10 cases of sinus rhythm and 3 cases of permanent atrial fibrillation at discharge from hospital. We conclude that transesophageal rapid atrial pacing is highly effective and safe for termination of type I atrial flutter.

Key words: Atrial flutter, Cardiac pacing, artificial

INTRODUCTION

Over the last decade, the attention of researchers and clinicians has been centered on ventricular rather than atrial arrhythmias. This contrasts with the growing interest in the hemodynamic effect of atrial arrhythmias due to their hemodynamic repercussions and development of systemic embolism. Among these atrial flutter (AF) is relatively common and its' termination is often a challenge to the clinician. Unfortunately, antiarrhythmic therapy often fails and in these cases the next step is usually DC cardioversion. However, recent studies of human type I AF have demonstrated reentry circus movement in the right atrium along a ring of tissue between the two venae cavae [1].

Consequently, this might be the condition suitable for antitachycardia pacing. Transesophageal left atrial pacing represents a noninvasive way of treatment, simple to perform and almost free of complications.

This study is to elucidate the efficacy of transesophageal rapid left atrial pacing for termination of type I AF.

PATIENTS AND METHODS

We tested sixteen consecutive patients, 14 females (88%) and 2 males aged 61 ± 6 (M \pm SD) years with type I AF. In 8 cases (50%) the underlying heart disease was coronary artery disease (including one case of acute myocardial infarction), in 3 cases (19%) dilated cardiomyopathy, in 2 cases (13%) rheumatic valve disease and in 1 case (6%) systemic hypertension, hypertrophic cardiomyopathy and myocarditis. All patients had received antiarrhythmic therapy (mainly verapamil, Class IA or a beta blocking agent, digoxin) which turned out to be unsatisfactory. The duration of AF ranged from 1 to 21 days (mean 9 ± 6 days). The mean atrial rate was 277 ± 27 bpm with conduction to the ventricles of 2:1 to 4:1. The average prepping NYHA functional class was 2.3 ± 0.4 .

Using standard equipment for electrophysiologic study transesophageal rapid left atrial pacing was carried out. Up to 4 bursts with rate of 400–750 ppm (mean 590 ± 120 ppm) and duration of 3–5 seconds were carried out. The procedure was regarded successful if AF were converted to sinus rhythm or atrial fibrillation.

RESULTS AND DISCUSSION

The overall efficacy of left atrial pacing for termination of AF was 81%. Sinus rhythm was restored within 1 minute in 4 patients and within 24 hours in 3 patients. In 6 cases atrial fibrillation was produced including 3 cases when it was converted to sinus rhythm by DC cardioversion afterwards. The remaining 3 cases were unsuccessful as AF recurred within 24 hours. Repeated pacing after 3–5 days of antiarrhythmic treatment was no help either. These 3 patients had the most severe underlying diseases in our group: acute myocardial infarction, dilated cardiomyopathy and rheumatic valve disease. However, in two cases ventricular rate was lowered to 80–90 bpm and thus some clinical improvement was achieved. Average NYHA functional class dropped from prepping value of 2.3 ± 0.4 to 1.4 ± 0.6 ($p < 0.01$). In all but one case antiarrhythmic treatment was continued after discharge from the hospital. Pacing was well tolerated by all patients and no complications occurred.

We did not relive any correlation between the efficacy of rapid pacing and prepacing atrial or ventricular rate. Neither was the pacing rate critical: AF responded equally well to the rate range of 400–750 ppm.

The overall success rate of 81% is comparable to Amsel et al [2], who used transvenous right atrial overpacing and to other methods of AF termination such as single extrastimulus technique [3, 4] and radiofrequency catheter ablation [5]. Compared to rapid pacing single extrastimulus technique seems to produce less cases of atrial fibrillation. Radiofrequency catheter ablation, although being an invasive and more sophisticated method than transesophageal atrial pacing, terminates AF and what is not less important, prevents arrhythmia reinduction. Nevertheless, transesophageal left atrial pacing remains an attractive alternative to more complicated invasive methods of AF treatment.

We conclude that transesophageal rapid left atrial pacing is highly effective and safe for termination of type I AF. However, antiarrhythmic treatment may be necessary to avoid recurrence of AF.

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COMPARATIVE LONG-TERM FOLLOW-UP OF ATRIAL AND VENTRICULAR PACED PATIENTS WITH SYMPTOMATIC SICK SINUS SYNDROME

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ABSTRACT

Fifty-eight ventricular and twenty-two atrial paced symptomatic sick sinus syndrome patients aged 60 ± 11 and 61 ± 9 years were followed up for 75 ± 10 and 43 ± 9 months respectively. During noninvasive electrophysiologic study intrinsic heart rhythm and the state of atrioventricular conduction were checked. Atrial paced patients showed better survival and lower incidence of permanent atrial fibrillation than ventricular paced patients: 95% vs 78% and 0% vs 36% ($p < 0.01$) respectively. No development of high-grade atrioventricular block was documented during atrial pacing. We conclude that atrial pacing is safe for patients with sick sinus syndrome and should be preferred to ventricular.

Key words: Cardiac pacing, artificial; Pacemaker, artificial; Sick sinus syndrome.

INTRODUCTION

Patients with symptomatic sick sinus syndrome (SSS) compromise 30–50% of those requiring permanent cardiac pacing in developed countries [1]. In contrast to atrioventricular (AV) block SSS is known to have comparatively benign natural course and the survival rate of paced patients does not differ significantly from those of not paced [2]. However, the quality of life can noticeably be improved by physiologic pacing. Atrial pacing has been reported to provide higher cardiac output than ventricular [3, 4]. Furthermore, in cases of preserved retrograde ventriculoatrial conduction pronounced deterioration of hemodynamics may lead to pacemaker syndrome [5]. Ventricular pacing has been

characterized by high risk of embolic events and development of permanent atrial fibrillation [AF; 6]. Although atrial pacing offers both AV synchrony and a normal ventricular activation pattern, it has been used quite infrequently [1]. This may be partly due to the fear of impeding high-degree AV block and difficulties in obtaining stable fixation of the atrial lead.

This long-term follow-up study was designed to compare atrial and ventricular paced symptomatic sick sinus syndrome patients in respect of survival rates, development of chronic AF and AV conduction defects.

PATIENTS AND METHODS

Eighty unselected symptomatic SSS patients who had undergone permanent cardiac pacing were included in this study. The ventricular paced subgroup consisted of fifty-eight patients, 38 females (38%) and 20 males aged 60 ± 11 (M \pm SD) years. Twenty-two patients, 14 females (64%) and 8 males aged 61 ± 9 years had received an atrial pacemaker. In both subgroups in the majority of cases an underlying heart disease such as coronary artery disease, systemic hypertension or cardiomyopathy could be diagnosed. The remaining 25% of cases were classified as idiopathic. The leading indication for pacemaker insertion were syncopal attacks in 81% of ventricular and 76% of atrial paced patients. The follow-up time was 75 ± 40 months and 43 ± 9 months respectively.

In 39 of ventricular and 21 of atrial paced patients transesophageal electrophysiologic study was carried out. The intrinsic heart rate and rhythm, AV conduction Wenckebach point at decremental left atrial pacing were determined. Besides, in ventricular paced patients the presence of retrograde ventriculoatrial conduction was tested.

RESULTS

The survival rate of ventricular paced patients was 78%. Thirteen patients aged 68 ± 9 years had died of various cardio- and cerebrovascular events. This is opposed to only one atrial paced patient (5%), who died of congestive heart failure during follow-up ($p < 0.01$).

No patient had had syncopal attacks after pacemaker insertion in either subgroup. Still, a few among ventricular paced ones, particularly

those having intact retrograde ventriculoatrial conduction, complained on milder dizziness and hypotension, that may be attributed to pacemaker syndrome.

All patients were either in sinus rhythm or AV escape rhythm at implantation. At follow-up among ventricular paced patients sinus rhythm persisted only in 49% and AV escape rhythm was present in another 10% of cases. In 36% and 5% of ventricular paced patients permanent AF and high-grade AV block had developed. In atrial paced subgroup no patient had second or third degree AV block, neither was permanent AF diagnosed ($p < 0.01$). Two patients (10%) having first degree AV block at implantation showed the same degree of AV conduction defect at follow-up. Another 2 patients (10%) who had had intermittent AF were classified as bradycardia-tachycardia syndrome.

Intrinsic heart rate was 58 ± 16 ppm in ventricular and 52 ± 14 ppm in atrial paced subjects at follow-up. Atrioventricular conduction Wenckebach point was 124 ± 21 ppm in ventricular paced patients. In this subgroup 46% of patients showed 1:1 ventriculoatrial conduction. Among these 7 patients had normal AV conduction and a suggestion was made to change their pacing mode to atrial. In atrial paced subgroup AV node Wenckebach point was 150 ± 21 ppm initially and had changed nonsignificantly to 143 ± 22 ppm at follow-up.

DISCUSSION

Although not directly comparable, atrial paced patients showed better survival and lower incidence of chronic AF than those paced from the ventricle. In this respect our investigation is in the same line with studies of Rosenqvist et al [7] and Santini et al [8]. The 36% incidence of permanent AF in ventricular paced patients is impressive. It is significantly higher than that of atrial paced subgroup. We have to agree that atrial pacing may have somewhat protective effect on the onset of atrial tachyarrhythmias. In case antiarrhythmic medication is still needed, it can be employed in most cases. However, regular testing of AV conduction is mandatory to avoid further depression of AV conduction.

Development of high-degree AV block which makes an atrial pacemaker ineffective is perhaps the most serious threat to the patient's life. In some series it has been noticeably high. Markewitz et al (9) have reported of 14.9% incidence of complete AV block at follow-up of 41

months. Partly, at least, it is the question of patient selection criteria. The key question to be answered is to what extent AV conduction may be defective to provide still safe atrial pacing.

In our series no significant change in AV conduction Wenckebach point was observed during an average of 3.6 years of atrial pacing. Even in these cases when it was as low as 100–120 ppm the outcome was satisfactory. No second or third degree AV block developed and no changing of pacing mode to VVI or DDD was needed. Van Mechelin et al even suggest that the deterioration of antegrade AV conduction is possible more often related to use of antiarrhythmic drugs rather than degeneration of the AV conduction system itself (10).

We conclude that atrial pacing provides better survival and lower incidence of permanent atrial fibrillation than ventricular pacing. Development of high-grade atrioventricular block is uncommon and with some precautions atrial pacing can be employed even in cases of moderate AV conduction defects (Wenckebach point 100–120 ppm).

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EPIDEMIOLOGY AND SURGICAL TREATMENT OF CHOLELITHIASIS IN II SURGICAL DEPARTMENT OF TARTU UNIVERSITY HOSPITAL IN 1979-1992.

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Since 1882, when Langenbuch described the first open cholecystectomy until 1987 when Phillipe Mouret started laparoscopic cholecystectomy, the use of open cholecystectomy, was a standard method of treatment of cholelithiasis. Out of new methods of treatment of cholelithiasis dissolution of gallstones and shock-wave lithotripsy have been taken into use in the world. Open cholecystectomy as the generally preferred method is not regarded up-to-date in the elective treatment and laparoscopic cholecystectomy is used more and more [1, 2].

The aim of the present article is to give retrospective review of the changes in the epidemiology of cholelithiasis, in the surgical treatment and of its results in II surgical department of Tartu University Hospital in 1978-1992. In 1993 a transfer to laparoscopic cholecystectomy is also taking place in our hospital.

MATERIAL AND METHODS

The work has been carried out on the bases of the statistic data of the Tartu University Hospital computer. An investigation was carried out in two five-years periods differing from each other by the diagnosis of cholelithiasis. The first period covers the years 1978-82 when the main diagnostical method of cholelithiasis was oral or intravenous cholecystography. In the second period, 1988-92 the preferred diagnostical method has been sonography.

During the 10 years of observation (two periods together) 2103 patients (521 male and 1552 female) with different forms of cholelithiasis had been treated. The number of elective patients was 1633 and that of emergency patients 466.

According to age both elective and emergency patients were divided into three groups: 1. up to 60 years, 2. 61-75 years and 3. over 75 years old.

RESULTS

Looking at the percentage of sexes one can see that the percentage of women among elective patients has been growing (table 1). In the first period the male to female ratio was 1:3, in the second period it was 1:4. In patients with acute cholecystitis the male to female ratio was 1:2 in both periods.

Table 1.

Distribution of patients according to sex

	I period		II period	
elective patients	796	(75%)	841	(81%) ^x
male	202	(25%)	167	(20%)
female	594	(75%)	674	(80%) ^x
emergency patients	270	(25%)	196	(19%) ^x
male	90	(33%)	62	(31%)
female	180	(67%)	134	(69%)
Total	1066		1037	
male	292	(27%)	229	(22%)
female	744	(73%)	808	(78%) ^x

x - p < 0,01

The data show (table 1) that the percentage of elective patients has increased. While in the first period the percentage of elective patients was 75%, the corresponding percentage in the second period was 81%. The overall number of patients in the second period was 2,7% smaller compared to the first period.

Looking at the age structure of patients (table 2) one can see that in the second period the percentage of patients up to 60 years of age has diminished, both in emergency and elective cases. In emergency cases the percentage of patients over 75 has increased from 12% in the first period to 23% in the second period.

Table 2.

Age structure of patients.

	I period		II period	
elective patients				
< 60	638	(80%)	610	(73%) ^{xx}
61-75	136	(17%)	190	(23%)
> 75	22	(3%)	41	(4%)
emergency patients				
< 60	159	(59%)	88	(45%) ^x
61-75	79	(29%)	62	(32%)
> 75	32	(12%)	46	(23%) ^x
Total				
< 60	797	(75%)	698	(67%)
61-75	215	(20%)	252	(24%)
> 75	54	(5%)	87	(9%)

x - p < 0,01; xx - p < 0,001

The data show that in the second period operative treatment of emergency cases has increased. While 46% of emergency patients were operated in the first period, the corresponding percentage in the second period was 53%.

Table 3.

Operative treatment rate

	I period		II period	
elective patient	399	(50%)	621	(74%) ^x
emergency patient	123	(46%)	103	(53%) ^x

x - p < 0,01

Table 4 gives a survey of operative methods used. In the second period 85% of elective operations were simple cholecystectomies and the ratio of biliodigestive anastomoses decreased by 6%. In the operative treatment of emergency cases the role of simple cholecystectomy has not much changed, in the first period 59% and in the second period 56% ($p < 0.05$). However, in the second period in emergency patients the role of biliodigestive anastomoses has diminished and common bile tract drainage without choledochotomy has increased by 10% (table 4.).

Table 4

Operation methods				
	I period		II period	
elective patients				
cholecystectomy	337	(84,5%)	529	(85%)
cholecystectomy with common bile duct drainage	7	(1,8%)	24	(3,9%)
cholecystectomy with choledochotomy	8	(2%)	31	(5%)
cholecystectomy with biliodigestive anastomosis	34	(8,5%)	16	(2,6%)
other	13	(3,2%)	21	(3,5%)
emergency patients				
cholecystostoma	3	(2,4%)	0	
cholecystectomy	73	(59%)	58	(56%)
cholecystectomy with common bile duct drainage	13	(11%)	22	(21%)
cholecystectomy with choledochotomy	2	(1,6%)	9	(9%)
cholecystectomy with biliodigestive anastomosis	28	(23%)	10	(10%)
other	4	(3%)	4	(4%)

Table 5 indicates, that in elective cases there was no postoperative mortality in the first period and in the second period it was 0,3%. In emergency cases postoperative mortality was the same in the both periods, 6,5% in the first period and 6,8% in the second period.

Postoperative mortality

	I period	II period
elective patient	0	2 (0,3%)
emergency patient	8 (6,5%)	7 (6,8%)

DISCUSSION

The results show that in both periods approximately the same number of patients with cholelithiasis were treated. The number of elective patients increased in the second period. This can be taken as the result of the application of sonography, the fact being also referred to by sources concerned [3]. At the same time our data show that there is an increase in the percentage of elective female patients (table 1). According to literature the tendency is vice versa. The number of men suffering from cholelithiasis is increasing [4].

In emergency patients the sex rates have remained the same during the past 15 years.

The second period is characterized by noticeable decrease of emergency cases as compared with the first period, 25% and 19% respectively, which is probably connected with the rise of the number of elective operations (table 1). The percentage of patients over 60 has risen by 7% in the second period among elective patients. The same tendency is also referred to by other authors. Patients over 60 suffering from cholelithiasis constitute 1/3 of the patients [6, 7, 8].

In emergency cases the percentage of patients over 60 has increased by 14% in the second period. Increase in the frequency of emergency cases in elderly patients was also found in our previous research [5].

In half of emergency cases we have used surgical treatment, while the application of surgical treatment has increased by 7% in the second period (table 3). On the bases of literature one can also conclude that in the treatment of emergency cases, surgical treatment is the most preferred one for several reasons [8, 9, 10].

Comparing the methods of operations (table 4) we can see that the number of biliodigestive anastomoses has decreased both in elective and in emergency patients. At the same time the number of operations on common bile duct has increased during the second period. This change

is likely to be connected with the application of endoscopic papillosphincterotomy. The structure of our operation methods in elective operations in the second period is analogical to the data in literature [11]. The percentage of simple cholecystectomy in the surgical treatment of acute cholecystitis is below 60% in both periods. In emergency cases manipulations on the common bile duct are more frequent, as the occurrence of stones in common bile duct is between 12-17% [7].

In our patients the rate of postoperative mortality in emergency cases stands high, 6,8% in the second period. One of the reasons may be the increase of elderly patients and secondly a more frequent application of surgical treatment. However, according to other authors, the mortality rate is 2% or lower [6, 8]. The 0,3% mortality in elective surgery is a good result.

The results of our work show that there is an increase in the percentage of elderly patients both in elective and emergency cases. A more frequent use of elective operative treatment of cholelithiasis results in the diminished number of emergency cases.

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MANAGEMENT OF BENIGN BILIARY OBSTRUCTION

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In the period of 1981-1992, 159 patients with occlusive biliary obstruction caused mainly by cholelithiasis were treated in the I Department of Surgery of Maarjamõisa Hospital.

There were 68 males (42%) and 91 females (58%). The age of operated patients was: under 60 years - 33 (31%), 60-70 yrs - 28 (26%) and 47 patients (43%) were over 70 years old.

The operative treatment was performed on 108 patients (68%) and in 51 pts (32%) treatment was conservative. The mortality in the group of operated patients was 7,4% (8 pts) and in conservatively treated 16,0% (8pts).

The group of conservatively treated patients included: Patients with spontaneous disappearance of clinical signs (passage of small stones).

Four patients in which biliary obstruction was relieved by endoscopic papillectomy.

Patients refusing operation or having excessive surgical risk (extreme age, septic shock, hepatic and/or renal insufficiency); 8 of them died.

In the group of 108 patients operated for occlusive jaundice 40 (37%) had accompanying acute cholecystitis, 37 (34%) cholangitis and 5 (5%) biliary pancreatitis. Cholecystectomy was already performed at an earlier period in 9 patients.

In conservatively treated patients acute cholecystitis was observed in 27 (53%) and biliary pancreatitis in 7 (14%) of patients.

Among laboratory determinations liver function tests as serum alkaline phosphatase, transaminases, bilirubin, prothrombin as well as serum amylase was made. Endoscopic retrograde choledochopancreatography was performed in 6% and percutaneous transhepatic cholangiography in 7% of patients. Since 1987 ultrasonography was routinely used.

Operations performed are presented in table. Early interventions in the first 48 hrs were carried out in 11 % of patients; 89 % were operated in a later period. Intraoperative preexploratory cholangiography was used in 70 patients (65 %).

Table

Operation	Number	Complications	Death
Cholecystectomy, external biliary drainage	24	4	1
Cholecystectomy, choledochotomy, external biliary drainage	48	10	6
Cholecystectomy, choledochoduodenostomy	22	3	1
Cholecystectomy, sphincteroplasty	3	-	-
Choledochoduodenostomy	9	2	-
Sphincteroplasty	2	-	-
Total	108	19	8

Biliary drainage was performed through the cystic duct or in cases of choledochotomy through the incision. Drainage was removed usually in 10-14 days and before its removal control cholangiograms were obtained.

Absolute indications for common duct exploration were jaundice, cholangitis, a palpable stone, positive preoperative or operative cholangiogram. Relative indications included a dilated duct, mild jaundice, history of pancreatitis and small gallbladder stones in conjunction with a dilated cystic duct.

Choledochotomy was in 48 patients after exploration and stones removal closed with a biliary external drainage.

Biliodigestive anastomosis was performed in 31 patients, including 9 operations for postcholecystectomy syndrome. Choledochoduodenostomy was preferred (31 cases) although transduodenal sphincteroplasty (5 cases) may prove equally satisfactory.

The main indications for choledochoduodenostomy were: multiple choledocholithiasis in the entire ductal system; the inability to pass 3-4 mm probe through the ampulla of Vater because of fibrosis or an inflammatory mass which constricts it (usually localized pancreatitis). For performing a choledochoduodenostomy a diameter of duct at least 11 mm is needed to insure adequacy of the anastomosis. Transduodenal sphincteroplasty was preferred in patients with undilated common duct and/or in cases of impacted stone. In 3 patients with retained stones after common duct exploration endoscopic sphincterotomy was carried out.

Hospitalization for operated patients lasted up to 10 days in 9 patients, to 2 weeks in 7 patients, 3 weeks in 20 and more than 3 weeks in 69 patients (64%).

Postoperative complications (2 seromas, 6 infections); 2 cases of acute pancreatitis, hepatic insufficiency and intestinal fistula. Postoperative pneumonia, stroke, localized peritonitis, intraperitoneal hemorrhage and acute renal insufficiency was observed each in one patient.

From 108 operated patients 8 died (mortality 7,4%). Four patients died from cardiovascular insufficiency, one from intraperitoneal hemorrhage and three from hepatic and/or renal insufficiency.

From this retrospective study of 108 operated patients with nonmalignant biliary obstruction may be concluded:

About 1/3 of patients may be treated conservatively or an elective operation may be performed at a later period.

Choledochoduodenostomy was a simple and safe operation for relieving biliary obstruction,

A great number of patients are old and/or have an excessive surgical risk. In many of them biliary obstruction can now be relieved by endoscopic methods of surgery.

25 YEARS OF RENAL TRANSPLANTATION IN TARTU

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Renal transplantation is now an accepted treatment of patients in end-stage renal failure. A successful transplantant restores not merely life, but an acceptable quality of life to such patients.

Renal transplantation in Tartu started in 1986 when the first transplantation was done by Artur Linkberg, Endel Tünder and Harri Tihane. It became possible because in 1966 the first hemodialyses was performed by Harri Tihane. Transplantation became a routine treatment in the 80-ties, because of an increasing number of patients were being held on regular dialyses waiting for transplantation and a rise of a number of transplants both cadaver and live related occurred. Our center has gone same way as all centers of the former USSR. Despite the fact that a number of transplantations as well as the results were not so good as in the Western countries, Tartu was among the active transplantation centers. Renal transplantation developed hand in hand with a growth of a number of dialyses places.

25 years of renal transplantation can be divided into three periods. the first period lasted from 1968 to 1984 when totally only 61 transplantations were performed. There were few dialyses machines and a very high morbidity and mortality of patients. The second period from 1985 to 1989 is characterized by the growth of dialyses and transplantation activities mainly due to 8 places dialyses system. In this period 66 transplantations were performed with about 50% of annual graft survival. In this period unsatisfactory long-term graft function obtained under conventional immunosuppressive therapy (azathioprine and steroids) obliged us for ethical reasons to interrupt living related kidney transplantation until 1990 when a more effective immunosuppressive drug cyclosporin became available. During the third period from 1990 until the present time 70 transplantations, theramong 15 from living donors were made. During the last three years 20-25 renal transplantations have been performed with about 80% of one-year acturial graft survival. Our current immunosuppressive therapy is based on cyclosporine, azathioprine

and steroids. Rejection episodes are treated by steroids 15 to 20 mg/kg per day. Many previous contraindications to kidney donation, such as the bilateral presence of multiple renal arteries have been progressively eliminated by improvements of surgical technique. Presently only a negative direct cross match between donor and recipient, and the absence in a donor of malignant tumors, active infections and cardiovascular or kidney disease are required to perform renal transplantation from living donors.

Since 1986 there have been 197 renal transplantations performed upon 182 patients and in 24 patients from living donors. Recipients were aged between 12 and 64 years. 86 patients were males and 96 females.

The causes of renal failure were chronic and subacute glomerulonephritis in 112 patients, chronic pyelonephritis in 23 polycystic disease in 18, analgesic nephropathy in 13, hypertensive nephrosclerosis in 4, nephrolithiasis in 4, diabetes mellitus in 3, lupus erythematoses in 2, amyloidosis in 2 and tuberculosis in 1 patient. Management of patients with autosomal dominant polycystic kidney disease are of particular interest because of inherent risk factors. Our experience with polycystic kidney disease patients demonstrate that renal transplantation is an effective form of treatment. Native pre-renal transplantation nephrectomy should not be performed on a routine basis prior to transplantation, unless absolutely indicated. Patients with diagnoses of lupus erythematoses, amyloidosis, diabetes mellitus are considered to have good indications for renal transplantation since results are equivalent to those of general population.

Among 182 patients transplanted 58 survive with functioning grafts. Patients with grafts functioning between 1 and 14 years after operation were 92, which represents 50% of those who received a graft during this period. In 15 patients two transplantations and in one patient three transplantations were performed. The major reason for graft failure was rejection, most failures occurred within the early months following transplantation. Among 90 patients who died before 1 year after operation rejection, drug toxicity, infection, non-functioning grafts and technical complications were frequently interrelated and caused most deaths.

The population of Estonia is 1,5 million and it means that some 90 new patients need an active treatment of renal failure every year. Dialyses and transplantation are costly treatments. Assuming that treatment of patients with end-stage renal failure is justified, the transplantation is by far the cheapest option available.

There are two great problems which must be resolved. The first one is concerning dialyses. There are 8,0 dialyses places per million population in Estonia and the lack of dialyses units-set. The second problem is connected with absence of up-to-date national legislation. We have no laws on health-care, transplantation, harvesting of cadaveric organs and obtaining them from living relatives. All that makes active treatment of end-stage failure extremely difficult, but the justification for the treatment of end-stage renal failure by an integrated programme of dialyses and transplantation seems self-evident, with the primary aim being to achieve a successful transplant, using dialysis to maintain patients while awaiting a transplant, and for for those patients who are unsuitable for transplant for medical or immunological reasons.

**EXPERIMENTAL LIVER TRANSPLANTATION
IN ESTONIA**
as preparation for clinical liver transplantation
Preliminary report

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During the last decade liver transplantation has become an accepted surgical procedure for the treatment of irreversible liver diseases. In the final stage of chronic liver diseases (primary biliary cirrhosis, primary sclerosing cholangitis, cirrhosis from chronic active hepatitis) liver transplantation is the only possible efficient treatment method. Excellent results have been achieved by transplanting liver in children suffering from biliary atresia, acute liver failure and metabolic disorders.

The incidence of liver diseases incurable with traditional methods, and the need for liver transplantation seems to vary in different countries from 4 to 12 per one million inhabitants per year according to different authors [1, 2]. Based on that, the need in Estonia (with the population of 1,5 million) would be 6-18 liver transplantations annually. The estimation of our hepatologists, pediatricians and intensive care specialists is that our needs would be about 10 liver transplantations for adults and 2 to 4 for children annually. These facts show that the problem of liver transplantation must be solved in Estonia.

For liver transplantation as a procedure, first the operative technique and secondly the prevention of the immunological rejection of the graft is required. The international experience shows that the first stage in a liver transplantation program is preferably experimental transplantation. The development of liver transplantation in the Nordic Countries, especially in Finland, and close scientific cooperation with the Surgical Hospitals of Tartu and Helsinki Universities has contributed much to our program. In 1990-1991 3 members of our working group have studied the problems of liver transplantation at Helsinki University Hospital. In 1990 the first successful experimental liver transplantation was performed in Tartu University vivarium by dr. K.Höckerstedt from Helsinki and Tartu University transplantation team.

The experimental liver transplantation programme in Tartu

University for 1991-1994 is the next stage in our efforts. The scientific supervisors for this programme are Prof. J. Ahonen and Dr. K. Höckerstedt from Helsinki University and Prof. R. Talvik from Tartu University. Our programme for 1991-1994 is the following:

I Stage 1991-1992: 30 experiments to gain experience in operating and anesthesiological techniques.

II Stage 1993-1994: 20 experiments to study the possibilities of preventing, diagnosing and treating transplant rejection.

This preliminary report will describe the accomplishment of a satisfactory operative procedure. Since March 1991 up to Jan. 1993 30 liver transplantation experiments have been performed in Estonian landrace piglets weighting 20-35 kg. The donor and the recipient piglets were approximately of the same size and from the same litter. Prior to the operation all the pigs, both the donors and the recipients, were anaesthetized with ketalar and intubated by a cuffed rubber endotracheal tube using a laryngoscope with a long illuminated blade. The maintenance of anaesthesia during the operation was achieved with florotan, nitrogenoxide and an oxygen respirator. The recipient animals were monitored during the operation with oxymonitor, capnomonitor, cardiomonitor (Helligi SMC-108). All the recipients underwent orthotopic liver allotransplantation with the application of a veno-venous shunt. The cold ischemia time was approximately 2.5 - 4.5 hours. During the transplantation the pigs received 0.2 - 2.0 l donor blood, 0.1 - 0.5 l colloid solutions, 1.0 - 2.0 l isotonic saline, 0.2 - 0.6 l 4,8 % sodium bicarbonate solutions and 1000-3000 U heparin. Antibiotics were administered on the day of transplantation and during 3 days postoperatively. Immunosuppressive treatment consisted of Solumedrol 125 mg on the day of operation and during 3 days postoperatively and Sandimmun 100 mg on the 1st, 2nd and 3rd day postoperatively.

The surgical technique of the donor operation followed closely the description published by R. Calne 1987 [3]. There were only minor differences in the preservation solution. We used a "Euro-Collins" solution instead of the preservation fluid based on the plasma protein fraction. The surgical technique of the recipient operation is also based mainly on the technique published by R. Calne. There were some modifications in the donor liver implantation, recommended by K Höckerstedt. In our experiments, we performed the infrahepatic vena cava anastomosis before the arterial anastomosis with the aim of reducing the clamping time of the infrahepatic vena cava in order to quickly restore the central venous reflow. Secondly, there were some

cava anastomosis before the arterial anastomosis with the aim of reducing the clamping time of the infrahepatic vena cava in order to quickly restore the central venous reflow. Secondly, there were some differences in the arterial anastomosis technique. Prof. R. Calne anastomosed the donor aortic patch to the recipient aorta using the running Prolene stitch. In our experiments, we anastomosed the donor aortic patch to the recipient hepatic artery at the place of its departure from the gastroduodenal artery using single prolene stitches. Thirdly, according to R. Calne the liver was transplanted with retaining the gall-bladder, whereas in our experiments in most cases we transplanted the liver after cholecystectomy and anastomosed the common bile ducts end to end.

Since 1991 up to now our group has performed 30 liver transplantations. In 20 cases the procedure was successful, 13 piglets survived from 2 days to 7 weeks after the operation. We divided our experiments into two periods. The first period including the 16 liver transplantations performed in 1991, and second consisting of the 14 liver transplantations performed in 1992 after our liver transplantation team was formed.

In the first period in 8 cases out of 16 the transplantation procedure was successful, 6 piglets died during the first postoperative day, two animals survived from 2 to 7 days. In the second period 12 transplantations out of 14 were successful, 1 piglet died during the first postoperative day and 11 animals survived from 2 days to 7 weeks. There were statistically significant differences in the successful liver transplantation procedures ($X^2 = 4.28$; $p < 0.05$) and in postoperative survival rates ($X^2 = 10.7$; $p < 0.01$) between the two periods. In 1992 we were able to improve the results of our experiments by gaining a statistically significant shortening of the whole recipient operation time (from approximately 6 to 4 hours $t = 3.94$; $p < 0.001$) and of the anhepatic time in particular (from 72 to 57 min. $t = 2.76$; $p < 0.05$).

In the first period we had serious technical problems with vascular anastomosis. An incorrect suprahepatic vena cava and vena porta anastomosis caused the inadequate venous reflow and resulted in the death of the animal on the operating table. Practical training helped us to gain skills in the operating techniques and to significantly improve our transplantation results in the second period.

Another serious problem in the first period was associated with defective blood coagulation. We completed our transplantation procedure but our piglets died during the first postoperative day due to intra-abdominal hemorrhage. Most of authors [4, 5, 6] associate intra- and

perioperative coagulopathies in liver transplantation with a prolonged anhepatic period since no coagulation factors are produced during this period. Reducing the revascularisation time of the liver graft by approximately 15 min (from 72 to 57 min.) helped us to gain better survival in 1992.

In the second period we were faced with biliary and gastrointestinal tract complications. Different techniques have been used for biliary tract reconstruction in our experiments: we anastomosed the common bile ducts end-to-end according to R. Calne but in three cases common bile duct necrosis and bile peritonitis developed. Perhaps this complication is due to the bile duct blood supply individual specificity like in man and cholecystojejunostomy should be used in questionable cases. In a few cases, after the liver transplantation, gastrointestinal bleeding arose from acute gastric and acute duodenal ulcers. In one case acute duodenal ulcer perforation and peritonitis developed. We know that in his basic experimental liver transplantation techniques Sir Roy Calne performed vagotomy with gastric drainage to prevent gastrointestinal complications, but later experimentators have not used it. In our experiments we have used perioperative histamine H2 receptor antagonist administration.

All our animals were sacrificed and an autopsy was carried out mainly to exclude intraabdominal complications. In 4 cases no abdominal complications were revealed but the histological examination showed an irreversible graft rejection.

As it is difficult to establish an acute liver allograft rejection, the aim of our further investigations is to study the possibilities of preventing, diagnosing and treating transplant rejection. In our opinion we have all the facilities for solving these problems and for finishing our experimental liver transplantation programme in the period of 1993-1994:

1. We have established an experimental liver transplantation team determined to resolve liver transplantation problems in Estonia.

2. We have the immunological laboratory potential for diagnosing allograft rejection.

3. We have the possibility of administering immunosuppressive therapy with the help of modern clinical pharmacological laboratory.

4. We are in continuous cooperation with our colleagues from Helsinki University in the field of organ transplantation.

In our opinion, introduction of the liver transplantation in Estonia is the only chance for our end-stage liver diseases patients to get an effective treatment in their own country.

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SOME ASPECTS OF THE DEVELOPMENT OF THYROID SURGERY IN ESTONIA

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As it is known from literature the first operations on thyroid gland in Estonia were carried out in 1892 in Tartu by W.M. Zoege v. Manteuffel and 1893 in Tallinn by W. Greiffenhagen. Both surgeons continued their operations on thyroid gland and results of their first and following operations were successful according to the data of their publications.

At the beginning of this century the professor of Tartu University K. Konik in his dissertation 1908 critically evaluated Jaboulay's method of operation on sympathetic nervous system in the treatment of Basedow disease. As the results of other explorers and practitioners also confirmed Konik's conclusion, Jaboulay's method was abandoned.

The first publication about the using of iodination (or Plummer's method) in preparing thyrotoxic patients for operation in Estonia, was issued by C. Prima in 1934. C Prima worked in a district hospital. He confirmed the importance of preoperative iodination of thyrotoxic patients in avoiding or reducing postoperative reaction or shock. C. Prima, operating patients with goitre under local anaesthesia, appreciated also the importance of technical delicacy in performing thyroid operations for achieving better results in surgical treatment. He denied damages of recurrent or laryngeal nerve among the operated patients by him. So he had no mortal cases,

Data from almost the same period were published by prof. U. Karell from Tartu in 1943 (H. Normann). His study provided the largest statistical analysis of thyroid surgery (350 operations) of this period (1921-1943) in Estonia. But only the number of operated patients and postoperative mortality rate were given. During this period surgeons in Estonia used the classical method of resection of goitre, with ligation of magistral arteries of the thyroid gland. In clinic, headed by prof. U. Karell from 1932 to 1943 201 goitre patients were operated with 0,5% postoperative mortality.

Summoning the information from C. Prima, U. Karell and oral data of their contemporary colleagues we can conclude that the results of surgical treatment of thyroid diseases in the period before World War II in Estonia were good. The results were nearly the same during the years after the war.

The most important for the further development of thyroid surgery was the foundation of republic dispensary for patients with endocrine diseases in Tartu in 1951. In this way these patients were concentrated in the specialized outpatient clinic and straightly directed into the central surgery clinic of Tartu University.

In connection with research work of surgical treatment of goitre A. Kliiman introduced the method of goitre resection with intracapsular persection of vessels and devascularisation of thyroid tissue in 1951. The advantage of the method of intracapsular devascularisation of goitre is diminishing of the area of operation trauma and avoiding damage of parathyroid structures (nerves, parathyroid tissue etc.), their vascularization and trophic conditions.

At the same time with the innovations in operating technique attempts were made to diminish the trauma of surgical treatment (in preoperative, operative and postoperative stages) by means of medicamentose sleep, using barbiturates. The new operating methods entirely justified themselves. Subtotal resection of thyroid tissue is the dominating method in operations of toxic goitre. But barbiturates were replaced with more effective drugs - with neuroplegic and -lytic medicaments and with their combinations - so called lytical compounds. These agents are more suitable for use in thyrotoxic patients.

Results of surgical treatment were worse than in the previous period - early postoperative mortality was higher (see in table) than in the previous period.

Therefore scientific studies were continued to achieve better results in more complicated group of thyrotoxic patients.

The following problem was how to minimize the reaction of thyrotoxic patient to psychical and physical trauma with intensive care and medication in operative and postoperative period. We used the ganglio- and neuroleptic and -plegic agents, ganglio blockers, tranquillizers and lytical compounds in combination with physical cooling of patients for this purpose. These means were applied on princip in status similar of artificial hibernation (or artificial winter sleep), with diminishing intensity of vital functions towards "vita minima". This method was introduced by A. Laborit and P. Huguenard.

We applied such method during and after the operation and achieved good results in minimizing the pathologic reactivity of organism during this period.

In preoperative period hibernation was used in combination with specific thyreostatic therapy. During the operation hibernation was used as a potent agent for local anaesthesia and narcosis and in postoperative period the artificial hibernation was used in direct intensive care of patients. For effective using and control of such kind of therapy, it was necessary to applicate continious clinical, machine and laboratory monitoring of vitally important functions of patients.

Results of such kind of therapy were analysed, summarized and published in dissertations and in numerous other scientific works of A. Kliiman, E. Teeäär, V. Mandel and others in the years from 1965 to 1972.

The main positive results were:

- the continuous decrease of the risk of operation,
- the lowering of postoperative mortality rate,
- the lessening of severity and frequency of postoperative reaction.

Radical changes in the field of surgical treatment of thyrotoxic patients occured after the introducing of general anaesthesia for most of the patients undergoing operation on thyroid gland. The first goitre in narcosis was operated in our clinic in 1949, but as a prevailing method of anaesthesia in thyroid operations narcosis has been used only since 1986. Up to approximately 4000 goitre patients have been operated under general anaesthesia in our clinic now and therefore we can make some important conclusions about using it.

Contemporary varied narcosis has set the patient first of all from psychoemotional stress, and made shorter the duration of operation in comparison with local anaesthesia.

General anaesthesia creates better conditions for leading the vitally important functions of organism (circulation, metabolic, endocrine etc.) and stabilizing them. In more severe technical situations (complicated extirpation, dangerous haemorrhage, asphyxia etc.) there are better possibilities to solve the critical situation.

It is important to mention that the occurence of postoperative reactions such as asthenia, psychical and motorical anxiety, hyperthermia etc. and their intensity and frequency has diminished due to the operating in narcosis. Need for the postoperative intensive care has decreased. The number of operative complications has also decreased.

Years	Number of patients		Euthyroid patients		Difficult thyrotoxic patients		Basedow type		Malignant goiter patients		Recidiv goiter patients		Local anaesthesia		Narcosis		Recurrent nerve damage		Transient hypoparathyreosis		Number of cases		Postoperative letality	
1953-1962	1093	92	145	184	11	55															6		0,55	
1963-1972	1335	526	99	204	31	62															2		0,15	
1973-1982	1769	725	139	245	49	50															-		0,03	
1983-1992	1583	589	343	311	43	74															1			
	5780	1932	726	944	134	241															90		36	9
%%		33,3	12,5	16,3	2,3	4,3															1,5		0,6	0,15

The description of methods of general anaesthesia used in our clinic is published in earlier articles and abstracts (see the added literature).

Here special attention must be paid to the indications for mask or endotracheal narcosis.

Absolute indication for endotracheal intubation is the stenosis, compression or dislocation of trachea by goitre, as well as insufficient outer breathing due to other reasons.

In the other cases, particularly when the operation is expected to be short, mask narcosis should be recommended as less traumatizing for trachea. Nearly 3/4 of goitre operations were performed in mask narcosis without complications in our clinic periodically.

The above described facts, data, principles and problems were the main ones, to which the author wished to pay attention.

For final decision about the whole complex of problems in connection with surgical treatment of thyroid diseases, some statistic data will be presented below to characterize the group of our patients and the results of their surgical treatment (table!) in dynamics within last 40 years.

The results of surgical treatment in early postoperative period could be evaluated as good. Postoperative mortality for the whole group operated on after World War II (5979 patients) was 0,15%, within the group operated on in the years 1970–1972 (3600 patients) less than 0,03% (1 case).

From characteristic complications there were damages of recurrent and laryngeal nerves in 1,5% of operated patients, varying periodically. In many cases of them the disturbances of voice and swallowing were transients.

The signs of hypoparathyroidism appeared in 0,6% of operated patients, but all these signs were of transient character and disappeared after substitutional treatment with hormonal therapy, vitamins and calcium in the period of insufficiency. We have no problems with postoperative hypothyreosis or recidive goitre among our patients.

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RESULTS OF FEMOROPOPLITEAL AND SYNCHRONOUS COMBINED AORTO-FEMORAL/FEMOROPOPLITEAL BYPASSES

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Atherosclerotic occlusive disease of the femoropopliteal arteries is one of the most commonly encountered problems in vascular surgery [13]. Femoropopliteal autovenous bypass is the procedure of choice for single level femoropopliteal occlusive disease [1-4, 7, 9, 10-11, 13, 15-16, 17, 20-21].

Vascular reconstruction is more difficult when occlusive disease affects limb vessels at multiple levels [2, 8, 12, 19]. When compared to patients with single level disease, patients with multilevel disease are older, predominantly male, more likely to have associated atherosclerotic diseases, and they have severe ischemia of lower extremities [8, 12, 19]. The incidence of multilevel lower extremity occlusive disease probably occurs in 20% to 60% of patients undergoing arterial reconstruction [19].

Traditional surgical treatment for patients with multilevel disease consisted of restoration of inflow to the common femoral arteries (CFA) or deep femoral arteries (DFA) as the initial procedure [2, 19]. Failure to relieve ischemic symptoms because of persistent distal arterial obstructive disease requires a second operation for distal femoropopliteal/tibial bypass in 10% to 56% of patients [3, 8].

MATERIAL AND METHODS

Patients. From January 1975 through December 1988, 396 reversed femoropopliteal (FP) bypasses were performed in 369 patients for occlusive arterial disease of the lower extremity at Tartu University Hospital. These 396 operations included 344 standard FP bypasses and

54 synchronous combined sequential aortofemoral and femoropopliteal (AF + FP) bypasses. There were 361 men (91.2%) and 35 women (8.8%) with a mean age of 61 + 10 years, range 23 to 95 years. The arterial lesions were classified as atherosclerotic in 356 patients (90.0%) or thrombangiitic (endarteriitic) occlusive disease in 40 patients (10.0%). The risk factors and previous vascular reconstructions or other operations are presented in Table I.

The risk factors for peripheral vascular disease in this group of patients included coronary artery disease (30.3%), symptomatic cerebrovascular disease (4.5%), hypertension (7.3%), diabetes mellitus (3.5%) and smoking (81.5%). Most patients had multiple risk factors.

Table I

Characteristics of the patients undergoing standard FP bypass or synchronous combined sequential AF + FP reconstructions

	FPB	AF + FPR	Total
	No. - %	No. - %	No. - %
No. of operations	342 - 86.4	54 - 13.6	396 - 100.0
Risk factors:			
Coronary artery disease	88 - 25.7	32 - 59.2	120 - 30.3
Cerebrovascular disease	15 - 4.4	3 - 5.5	18 - 4.5
Hypertension	22 - 6.4	7 - 13.0	29 - 7.3
Diabetes mellitus	10 - 2.9	4 - 7.41	4 - 3.5
Smoking	274 - 80.1	49 - 90.7	323 - 81.5
Previous operations:			
Aortoiliac reconstruction	38 - 11.1	- -	38 - 9.6
Lumbar sympathectomy	60 - 17.5	2 - 3.7	62 - 15.7
Profundoplasty	2 - 0.6	23 - 42.6	25 - 6.3
Contralateral amputation	13 - 3.8	6 - 11.1	19 - 4.8

Indications for operations. Severe claudication was the indication for the initial bypass procedure in 61 patients (15.4%) and critical limb-threatening ischemia in 335 patients (84.6%). Ischemic rest pain was present in 152 patients (38.4%) and gangrene or nonhealing ulcer in 183 patients (46.2%).

Angiography. In all patients preoperative angiography using standard translumbal or Seldinger aortoarteriography or transfemoral arteriography was performed. In many patients with critical ischemia where preoperative angiography was inadequate to demonstrate distal runoff we have performed intraoperative prereconstructive angiography.

The runoff was classified by angiograms: as good when the popliteal artery and two or three tibial arteries were patent; as fair when popliteal artery and one tibial artery was patent; as poor when an isolated popliteal segment with collateral runoff was present.

According to this classification good runoff was found in 181 patients (45.7%), fair - in 153 (38.6%) and poor in 55 patients (13.9%). In seven patients (1.8%) the exact state of runoff was unknown.

Surgical procedures. In this study, we describe our retrospective results of 342 FP bypasses with single level lower extremity arterial occlusive disease and 54 operations with multilevel occlusive disease with simultaneous sequential inflow and outflow procedures consisting of aortobifemoral bypasses in 38 (70.4%), unilateral aorto/iliofemoral bypasses in 12 (22.2%) and iliac endarterectomies in 4 patients (7.4%), combined with outflow procedures, including above-knee FP in 1 (1.8%) and below-knee FP bypasses in 53 patients (98.1%). Site of proximal and distal anastomosis are presented in Table II.

Table II

Site of proximal and distal anastomosis

Site of anastomosis	No.	%
Site of proximal anastomosis:		
Common femoral artery (CFA)	282	71.2
Superficial femoral artery (SFA)	109	27.5
Deep femoral artery (DFA)	5	1.3
Site of distal anastomosis:		
Above-knee	14	3.5
Below-knee	382	96.5

Graft material. Greater saphenous vein (GSV) was the material of choice and was used in 358 patients (90.4%). The vein was considered adequate when having 4 mm or more in diameter. Synthetic prosthesis was used in 25 (6.3%) and allovein - in 10 patients (2.5%). Composite graft from prosthesis and autovein was constructed in 3 cases (0.8%).

All FP bypass grafts were performed in a reversed method.

Follow-up and statistical analysis. Follow-up ranged from 2 to 169 months, with a mean of 48 months. Sixteen (4.0%) of 396 patients were lost to follow-up. The patients were examined 3 months after discharge from the hospital, every 6 months during the two first postoperative years, and every one year thereafter. The graft patency was determined by symptoms of recurrent ischemia and clinical examinations. Where needed, urgent arteriography was performed.

Graft patency (GPR) and limb salvage rates (LSR) were calculated by the cumulative life-table method according to the standards proposed by the Ad Hoc Committee on Reporting Standards, Society for Vascular Surgery/International Society for Cardiovascular Surgery. The comparisons were done by use of the paired Student t test and the correlations - by use of linear regression analysis. Statistical significance was assumed at the 95% confidence level ($p < 0.05$).

RESULTS

Mortality. The operative mortality within 30 days after operation was 3.8% (Table IV). The causes of death were pulmonary embolism in five patients, myocardial infarction, cardiovascular and renal insufficiency in three patients, sepsis in four patients. Late mortality occurred in 10,1% (40 patients). Most late death were due to associated diseases. Sixteen patients (4%) were lost to follow-up.

Early complications. Postoperative hemorrhage occurred in 12 patients and early thrombosis of the graft - in 74 patients (Table III). Hemorrhage followed one of two patterns. First was seen in 9 patients in whom bleeding occurred within 24 hours of the initial operation. In all these patients the complication was apparently connected with technical problems. The second pattern was seen in 3 patients in whom bleeding occurred from 3 to 30 days after the initial operation. This was always related to the graft infection. Hemorrhage was initially controlled in all 12 patients, but later recurred requiring amputation of the affected limb.

Early thrombosis within 30 days after operation occurred in 74 patients. Successful reoperations were performed in 35 patients. The apparent causes of thrombosis were inadequate outflow in 32 patients (43.2%), technical problems in 20 (27.0%), inadequate inflow in 3 (4.0%), vein size - too small in 6 (8.1%) and in 13 patients (17.6%) the cause was undetermined.

Comparison the late CPR of FP bypass graft with and without early thrombosis is presented in Fig.1.

Table III

Early complications of the FP reconstructions

Complications, results	No.	%
Hemorrhage	12	3.0
Successful reoperations	9	75.0
Amputations (infection)	3	25.0
Thrombosis	74	18.6
Successful reoperations	35	47.3
Occlusions	17	23.0
Amputations	22	29.7

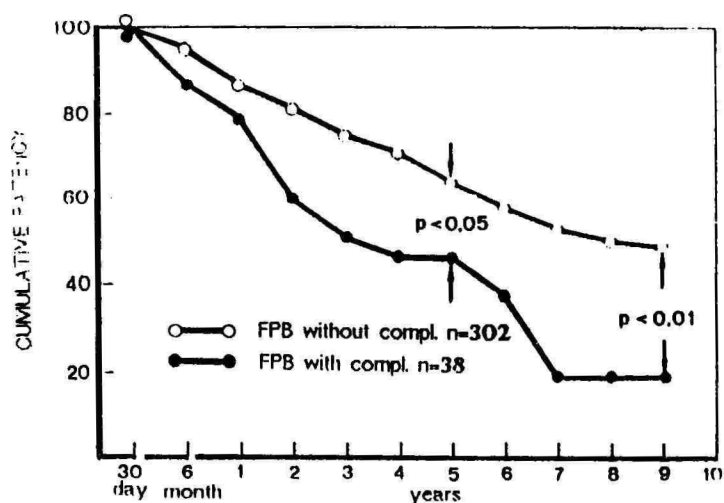


Fig. 1. Comparison the late CPR of FP bypass graft with and without early complications.

The difference between CPR of FP bypass with and without early thrombosis remained statistically significant at 2 years (59.9% vs. 80.9%, $p < 0.05$).

Table IV presents the early results according to the anatomical site of reconstruction.

Table IV

Early results (to 30 days) of 396 FP bypass

Operations No.	Results of operations				
	Patent	Closed	Amputation	Death	
	No. - %	No. - %	No. - %	No. - %	
Af ± FPB	54	45 - 83.3	1 - 1.8	2 - 3.7	6 - 11.1
FPB	342	294 - 86.0	16 - 4.76	23 - 6.7	9 - 2.6
Total	396	339 - 85.7	17 - 4.3	25 - 6.3	15 - 3.8

Early graft patency and limb salvage. Overall femoropopliteal cumulative graft patency and limb salvage is shown in Fig.2 and in Table VI with the use of the life-table method. The 30-day GPR and LSR were $89.9 \pm 1.5\%$ and $94.2 \pm 1.2\%$, respectively ($p > 0.05$).

The GPR and LSR at 30 day of synchronous combined AF + FP and standard FP bypass grafts were 94.1 ± 3.3 and $89.3 \pm 1.6\%$ ($p > 0.1$), 96.0 ± 2.7 and $93.9 \pm 1.3\%$ ($p > 0.1$).

Late graft patency and limb salvage. In overall FP bypass grafts the cumulative patency and limb salvage rate was 78.0, 71.0, 56.7, 40.0, 30.0% and 90.0, 86.6, 77.9, 65.9, 65.9% respectively at 1, 2, 5, 10, 13 years after operation (Table V, Fig. 2). The difference between cumulative patency and limb salvage rates remained statistically significant at 5 years ($p < 0.05$).

The synchronous combined aortofemoral and femoropopliteal bypass grafts in one and two stages were 83.3, 75.8, 62.9% and 70.2, 36.2, 36.2% respectively at 1, 3, 5 years after operation (Fig. 3). The results of simultaneous combined AF + FP bypass in one stage were substantially better at 5 years ($p < 0.001$).

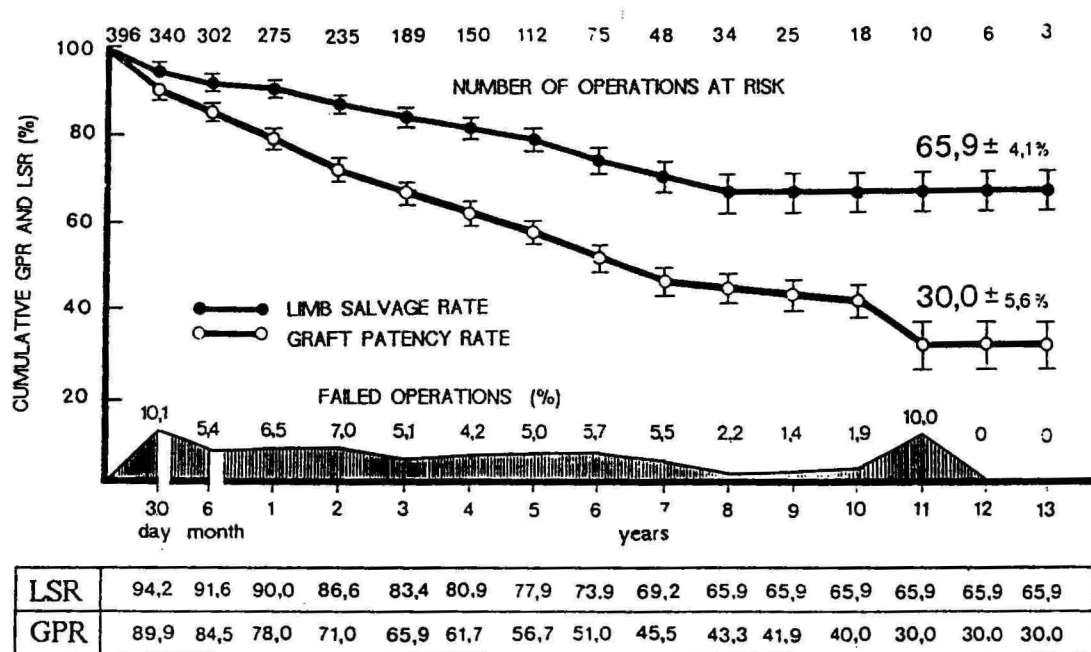
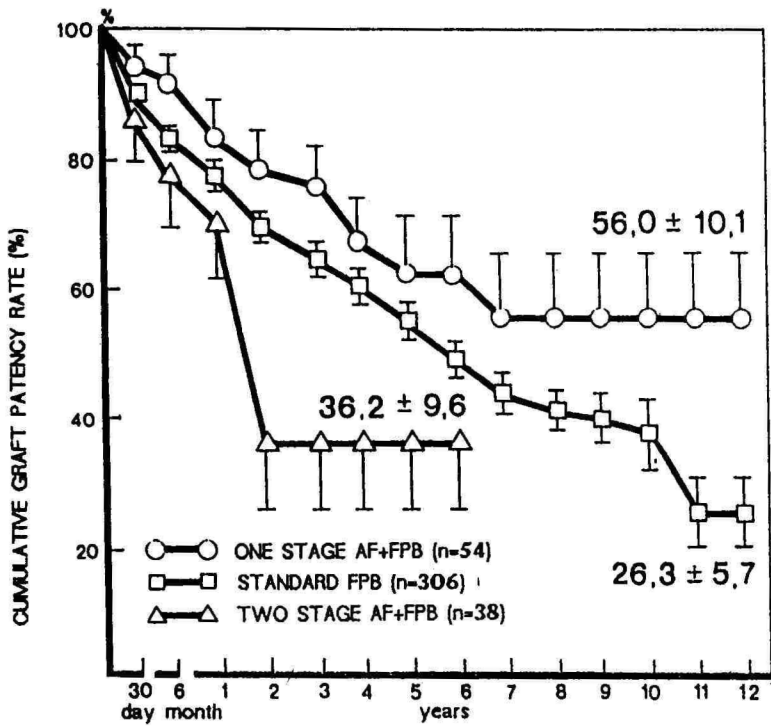


Fig. 2. Secondary cumulative graft patency rate (GPR) and limb salvage rate (LSR) of 398 femoropopliteal bypasses follow-up from 2 to 169 month (mean 48 ± 37 mo.)



94,1	83,3	75,8	62,9	56,0	56,0	56,0
89,3	77,2	64,4	55,7	44,0	41,6	26,3 ...
86,3	70,2	36,2	36,2	—	—	—

Fig. 3. Cumulative patency in patients with:
 - standard femoropopliteal bypass;
 - aortofemoral and femoropopliteal bypass in one stage;
 - aortofemoral and femoropopliteal bypass in two stages.

Table V

Overall secondary femoropopliteal bypass grafts patency

Interval	AT risk	Failed grafts	Withdrawn			Interval patency (%)	Cumulative patency (%)	SE*
			Duration	Lost	Death			
0-30day	396	39	0	2	15	0.899	89.9	1.5
1-6 mo.	340	20	17	0	1	0.940	84.5	1.9
6-12 mo.	302	23	3	0	1	0.923	78.0	2.1
1-2 yr.	275	24	14	0	2	0.910	71.0	2.4
2-3 yr.	235	16	19	3	8	0.927	65.9	2.5
3-4 yr.	189	11	19	3	6	0.937	61.7	2.7
4-5 yr.	150	11	19	2	6	0.919	56.7	2.8
5-6 yr.	112	10	17	4	6	0.900	51.0	3.1
6-7 yr.	75	7	13	1	6	0.892	45.5	3.4
7-8 yr.	48	2	10	0	2	0.952	43.3	3.5
8-9 yr.	34	1	6	1	1	0.967	41.9	3.7
9-10 yr.	25	1	6	0	0	0.954	40.0	4.0
10-11 yr.	18	4	3	0	1	0.750	30.0	5.6
11-12 yr.	10	0	4	0	0	1.000	30.0	5.6
12-13 yr.	6	0	3	0	0	1.000	30.0	5.6

* Standard error

DISCUSSION

In our experience the main underlying cause of chronic limb ischemia was atherosclerotic occlusive disease (87.4%); much more seldom endarteriitis (thrombangiitis) obliterans.

The main indication for reconstructive surgery on the femoropopliteal segment was limb threatening ischemia (in 84.7% of cases). Severe disabling claudication was indication for surgery in 15.3% of cases. A number of surgeons have wider indications for

surgery in a group of patients with intermittent claudication. They operated upon 31-55% of their patients for claudication [4, 5, 9, 13].

Table VI

Results reported in the literature for FP bypasses

Author, year	No.	Morta- lity %	Cumulative patency, %				
			30-days	1 yr.	3 yr.	5 yr.	10 yr.
Buda et al.[4], 1976	276	4.5	-	58	47	40	-
DeWeese et al.[9], 1977	113	2.6	64	63	60	58	45
LoGerfo et al.[13], 1977	154	2.9	95	83	72	72	-
Naji et al.[15], 1978	100*	0	97	86	80	70	-
Naji et al.[16], 1978	100**	3.0	90	67	54	47	-
Grimbley et al.[11], 1979	329	0.4	93	91	85	70	34
Reichle et al.[17], 1979	310	3.2	83	68	64	60	54
Szilagyi et al.[20], 1979	429	1.9	84	70	62	56	44
Cranley,Hafner[5], 1981	416	-	94	82	69	61	46
Veith et al.[21], 1986	147	2.0	-	86	68	-	-
Authors, 1989	342	2.6	8.9	77	64	56	38

* Indication for operation - 100 % claudication

** 100 % critical limb ischemia (rest pain, gangrene or ulcers)

Every reconstructive operation carries some risk of death and/ or limb loss. Furthermore, the majority of patients with intermittent claudication can expect their symptoms to remain stable or even improve with conservative treatment. Therefore we are not very liberal of operating patients with mild to moderate claudication. In operations for claudication we considered essential a good outflow through two or more patent tibial vessels.

The early thrombosis (within the first 30 postoperative days) after femoropopliteal reconstruction occurred in 74 patients(18.6%). From these, 35 patients (47.3%) were successfully reoperated. Craver et al. reported the 8.4% rate of early thrombosis after femoropopliteal reconstructions [6]. In our experience the higher rate of early thrombosis was frequently connected with poor outflow (32 patients, 43.2%).

The overall 10 years cumulative patency for femoropopliteal reconstructions was 40%, what is somewhat lower from these reported in literature (Table V). Our less favourable results could be explained

by great number of patients with limb-threatening ischemia and utilizing synthetic graft (6.3%) or alloveins (2.5%) of cases.

Life table analysis of femoropopliteal reconstructions with regard to cumulative patency of transplantats and cumulative limb survival demonstrated that possibility for limb survival after graft thrombosis is greater than longer the graft has been functioned. This is in a good accordance with previous reports.

The late results of simultaneous one stage aortofemoral and femoropopliteal bypass were substantially better and must be preferred to aortofemoral and femoropopliteal reconstruction performed in two separate stages.

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THE MANAGEMENT OF OCCLUDED AORTOFEMORAL GRAFT LIMB

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Occlusion of an aorto(ilio)femoral bypass graft is an increasingly common problem because from year to year the frequency of aortofemoral reconstructions grows.

Despite of critical patients selection, noninvasive hemodynamic assessment and complete preoperative angiography, graft occlusion occassionally occurs. The purpose of the present report is to present our experience with occluded aorto(ilio)femoral graft limb.

MATERIAL

From January 1972 through December 1992 168 reoperations in 152 patients were performed for an occluded limb of an aorto(ilio)femoral bypass graft. The patients ranged in age from 38 to 75 years, three women among them. During this period 736 aortobifemoral and 254 aorto(ilio)femoral unilateral bypasses were performed (1717 limbs). All the initial aortobifemoral bypasses employed a Dacron (Lavsan) prosthesis. The proximal anastomosis was end-to-side to the infrarenal aorta except for the patients with concomitant aneurysmal disease to whom end-to-end anastomosis was performed. The distal graft limbs were anastomosed end-to-side to the common femoral arteries near the bifurcations with endarterectomy or profundoplasty if necessary. Occluded limbs were determined by physical examination and by preoperative angiogram. Graft limb thrombosis occurred from 2 to 236 month from the initial reconstruction. During the first 5 years after the primary reconstructions 87 % of late occlusions occurred.

MANAGEMENT OPTIONS

The commonest cause of graft limb occlusion was outflow obstruction which is due either to the progression of the atherosclerotic occlusive disease, especially in the deep femoral artery, or to the development of intimal hyperplasia at the distal anastomosis. Much more seldom the causes of occlusion were progression of atherosclerosis in inflow tract, false aneurysm, graft kinking and others.

A graft limb occlusion in the the aortofemoral graft usually causes severe ischemia. In our experience about 88 % of patients suffer from severe ischemia that is dangerous for the limb survival. For such patients emergency revascularization is indicated. If ischemia is not immediatly limb threatening,urgent revascularization in the first days was performed. Some operations were performed on a later period up to 4 months after occlusion, depending on less severe symptoms and patients late readmission to the hospital.

Our experience suggested that transfemoral retrograde thrombectomy with outflow reconstruction (usually with profundoplasty) was in most cases possible for revascularization of the occluded limb. The replacement of the occluded limb with or without outflow reconstruction was used in 20 cases. Operation was used in patients with occlusion of a whole bifurcation graft and/or in cases were transfemoral thrombectomy was unsuccessful. Isolated thrombectomy (14 operations) was performed during the period of our first reoperations.

For treatment of an occluded limb of an aorto(ilio)femoral bypass graft we mostly used thrombectomy with reconstruction of distal anastomosis (usually with profundoplasty). Our operation technique was in some aspect different from these in literature [1, 3, 4, 6].

First the groin was explored through the previous incision exposing and mobilizing the prosthesis, common femoral artery, superficial femoral artery and deep femoral artery with its branches. Then the occluded graft limb was transected just proximally to the distal anastomosis. The distal part of the prosthesis was excised from the common femoral artery. This provided the best conditions for a subsequent endarterectomy from the common and deep femoral arteries and profundoplasty. Then the ballon-catheter thrombectomy of the occluded graft was made. This step is greatly facilitated by using the new interposed distal segment of prosthesis. Continuity was restored by end-to-side anastomosis between the new distal segment of graft and the common femoral artery as in the initial reconstruction.

If an organized, old thrombosis is present, complete thrombectomy may be more difficult. In these cases many surgeons advocate replacement of a graft. In our method the balloon-catheter is placed inside the small, stiff plastic urinary bladder catheter, whose tip was excised. It is almost always possible to push such a stiff catheter through the organized thrombus, then inflate the balloon and perform retrograde thrombectomy.

In 6 cases when the deep femoral artery was hypoplastic or diffusely damaged the additional outflow was established by an autovenous femoro-popliteal bypass. In two patients with poor risk, to whom adequate inflow could not be accomplished by thrombectomy, extraanatomical femoro-femoral bypass was performed.

RESULTS

The results of secondary repair are not as good as the initial one. Data concerning the early patency of the graft limb occlusion repair are summarized in the Table 1. The patency rate for all the procedures was 86,3 %. Amputation rate was 10,7 % and mortality 4,2 %.

The follow-up ranged from 1 to 252 months. The total cumulative patency was 75,6 % and 54,1 % accordingly after 5 and 10 years. The cumulative 10 years patency was 58,2 % for thrombectomy with profundoplasty 57,8 % for replacement of occluded limb and 33,4 % for isolated thrombectomy.

DISCUSSION

Many approaches have been advocated for the correction of an occluded limb of an aorto(ilio)femoral bypass graft. Many authors advocated replacement of the occluded limb through an intraabdominal or extraabdominal approach and mentioned thrombectomy only to condemn it [2, 5, 9]. The others reported that thrombectomy only or combined with profundoplasty was an adequate procedure for the correction of the graft limb thrombosis [1, 8]. Extraanatomical methods for the establishing inflow are also mentioned [2, 5]. Two moments in every reoperation for an occluded limb are considered: restoration of the inflow and reconstruction of the outflow. A number of the authors report that reconstruction of the deep femoral artery was required in most patients in order to allow satisfactory outflow [7, 10]. Our experience suggests that thrombectomy with distal anastomosis reconstruction (using

a new distal segment of prosthesis often with profundoplasty) is a method of choice for the correction of an occluded limb of an aorto(ilio)femoral bypass graft.

Table 1

Early patency (30 day)

Operation	Limbs	Patent	Occluded	Amputation	Death
Replacement of the occluded graft limb	20	17	1	1	2
Isolated thrombectomy	14	10	4	3	1
Thrombectomy with distal reconstruction					
* with profundoplasty	104	94	10	9	3
* without profundoplasty	22	19	3	2	1
* with autovenous femoro-popliteal bypass	6	4	2	2	0
Extraanatomical bypass	2	1	1	1	0
TOTAL	168	145	21	18	7
		86,3%	12,5%	10,7%	4,2%

It is interesting to note that thrombectomy either alone or in conjunction with an outflow reconstruction resulted in 127/146 (87 %) patency with operative mortality rate 3,4 %, whereas in 22 cases, where the limbs were treated with a replacement of occluded limb or extraanatomical inflow, the patency rate 18/22 (82 %) was obtained and operative mortality for this group was 9,1 %. Therefore we considered the replacement of an occluded limb an alternative procedure in cases where thrombectomy was not successful or if there rose any question about the adequacy of the flow through the thrombectomized graft.

SUMMARY

Thrombectomy with distal anastomosis reconstruction and profundoplasty is often an operation of choice for the graft limb occlusion. This procedure is characterized by low operative trauma and mortality rates.

LITERATURE

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SURGICAL TREATMENT OF CRITICAL LEG ISCHAEMIA IN PATIENTS WITH MULTISEGMENTAL ATHEROSCLEROSIS

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Suturing outside the posterior wall of end-to-side anastomosis on popliteal or tibial arteries, technical difficulties may occur [5]. When suturing outside presents technical difficulties it is recommended to use inside technique [3, 6]. Suturing the posterior wall of the anastomosis inside all the layers of the arterial and graft's wall are well differentiated and can be taken into the suture bite as needed.

Using the usual technique end-to-side anastomosis the sutures fix intima to the arterial wall. This technique prevents dissection of intima by the arterial blood flow and formation of intimal flap [1, 2, 4].

In the paper we present a new modification of end-to-side anastomosis of the femoro-tibial bypass, especially suitable for patients with thickened intima of tibial arteries due to atherosclerosis.

TECHNIQUE

The technique of constructing end-to-side anastomosis between venous graft and tibial artery is shown in fig. 1-6.

The distal end of the venous graft is fixed to the proximal end of the arteryotomy with a single suture. The initial suture is made near the edge of the vein penetrating all the layers of the graft's wall and 1/2 of the thickness of the arterial wall (including tunica adventitia) (Fig. 1).

Completing the suture, the edge of the graft and the adventitial part of the arterial wall are in contact. Then through the adventitia of the arterial wall the needle is brought to the arterial lumen. The back side of the anastomosis is sutured - from inside. With proximal 4 suture throws (1/4 of the length of the anastomosis) the edge of the graft and half of the thickness of the arterial wall (tunica adventitia) are brought into contact (Fig. 2).

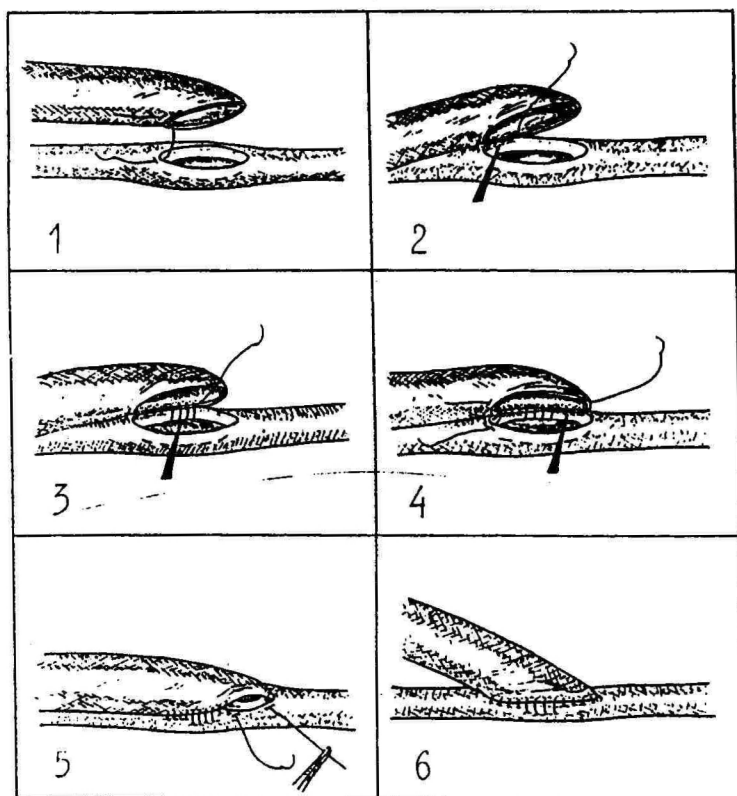


Fig. 1-6.

In this case the suture line is on the same level with the inner surface of the artery and no stricture will occur. The running suture in the medium part of the end-to-side anastomosis (4 suture throws) penetrates through all the layers of the graft's and arterial wall (fig. 3). The distal running suture (1/4 of the length of the anastomosis) connects the edge of the graft to half of the thickness the arterial wall (including t. adventitia) (Fig. 4).

Another suture is started in the proximal end of the anastomosis in the vicinity of the previous one. Proximal ($1/4$ of the length of the anastomosis) 4 suture bites penetrate the whole of the graft's wall and half of the thickness of the arterial wall (Fig. 5). The running suture in the medium part of the end-to-side anastomosis (4 suture throws) penetrates through all the layers of both the graft's and the arterial wall. Then the distal part of the anastomosis is completed with suture bites penetrating all the layers of the venous graft's wall and half of the thickness of the arterial wall (including tunica adventitia) (Fig. 6).

DISCUSSION

Using the ordinary technique a higher area forms on the suture line that stretches into the lumen of the artery. This area is the higher the thicker are the walls of the artery and the autovenous graft. It narrows the lumen of the artery what is especially important in constructing the distal end-to-side anastomosis of a bypass.

The usual technique is suitable for the patients who have femoro-popliteal bypass operation performed on femoral and popliteal arteries with relatively elastic wall. The diameter of these arteries in the region of end-to-side anastomosis is more than 4 mm. In these cases the stricture caused by the suture line is not significant and does not cause thrombosis of the bypass.

In cases of femoro-tibial bypass operations when the diameter of the tibial artery lumen in the region of the distal anastomosis is 2–4 mm and the intima of the artery is thickened due to atherosclerosis, the suture line may cause stricture and thrombosis of the bypass.

The advantage of the new method presented here lies in the fact that suture line does not narrow the lumen of the artery. This is achieved because in the proximal and distal ($1/4$ of the anastomosis length) parts of the distal end-to-side anastomosis the suture bites penetrate only $1/2$ of the thickness of the arterial wall (including t. adventitia). In these areas of the anastomosis the suture approximates the end of the venous graft to the $1/2$ of the thickness of the arterial wall (including t. adventitia).

Thus the suture line does not stretch higher than the edge of the atherosclerotically thickened tunica intima. It may even be below the level of tunica intima (Fig. 3, 4). Thus in the proximal and distal parts of the anastomosis the artery preserves its diameter.

In the medium part of the end-to-side anastomosis (1/2 of the length of the anastomosis) its inner diameter is bigger than the inner diameter of its proximal and distal parts. Thus the suture line does not narrow the lumen of the anastomosis.

The sutures in the medium part of the anastomosis penetrate through all the layers of the arterial wall (Fig. 3).

On the sides of the anastomosis tunica intima is well fixed to the wall of the artery. In the ends of the anastomosis tunica intima is not fixed to the wall of the artery well. But in these areas the inner surface of the venous graft's edge is on the same level with the thickened tunica intima. Therefore no loose flap will form that might obstruct the lumen of the artery.

In the following we present the results of the operations performed on 61 patients in the Department of Vascular Surgery of Tartu University Hospital from 1987 to 1989.

The indication of reconstructive surgery on the main arteries of lower extremities was obliterative atherosclerosis, in 47 cases the 4th severity grade, in 14 cases the third severity grade.

To improve the bloodflow in cases of occlusion in femoropopliteal or tibial arteries the femoropopliteal-tibial bypass was performed using the well known method. The distal anastomosis was constructed as described here.

In 55 cases the arterial circulation of the lower extremity improved. Necrotic tissue on the toes was removed. All these patients were let out of the hospital with functioning bypass.

In 3 cases the cause of the graft's thrombosis was insufficient blood flow through the isolated segment of the tibial artery. In 2 patients thrombosis occurred due to bad autologous vein graft (in 1 case the diameter of the graft was over 10 mm, in 1 case the graft was too long). In 1 case the graft's thrombosis occurred due to infection.

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COMPARISON OF DIFFERENT EXPERIMENTAL MODELS OF TRANSPLANTATION OF A SEGMENT OF SMALL INTESTINE ON VASCULARIZED PEDICLE

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Reconstructing the pharyngoesophageal defects is one of the most actual problems nowadays. Stomach grafts have been used as well as jejunal and colonic grafts on vascularized pedicle [1].

Restoring the entirety of hypopharynx and oesophagus the small and the large intestine have been used [2]. According to T. Adhya, K. Lotha, S. Shoraria et al. [3] small intestinal grafts on vascularized pedicle are more suitable for reconstructing the defects of cervical oesophagus because the diameter of jejunum is similar to the diameter of oesophagus. Using jejunal graft on vascularized pedicle for reconstructing cervical oesophagus postoperative mortality is only 3-5%, the patients have to stay in the hospital for 2-3 weeks and can swallow food on the 10.-14. day already [4].

Main causes of failure in the operation of reconstructing cervical oesophagus with small intestinal graft are technical mistakes in connecting blood vessels. To acquire the method operations have been performed on animals (mostly dogs), using different experimental models. The close (immediate) postoperative results of removing the cervical oesophagus and replacing it with small intestinal graft on vascularized pedicle in dog are good (surviving up to 80%). But in late postoperative period (during 2-3 weeks after the operation) most of the dogs die of pneumonia, sepsis, extensive wound infection or starving [5, 6, 7]. To follow the viability and function of the small intestinal graft for a longer period (several months) R.W.Smith, C.J.Garvey transplanted the jejunal graft in the subcutaneous tissue of the neck in 3 dogs connecting the graft's vein end to side with the external jugular vein and the graft's artery end to end with truncus thyrocervicalis. The jejunal graft's ends were brought out on the neck as jejunostomas.

Chen Zicong-xei, Yong Dong-yue, Chang Di-sheng [8] performed the transplantation of the small intestinal graft to the neck in 5 dogs, the

artery and vein were connected as described above. One end of the graft was connected to the oesophagus end to side end the other brought out as ileostoma.

According to the literature different experimental models have been used to acquire necessary experience for transplanting small intestinal graft.

The purpose of this study was to find out the best experimental model for practising the transplantation of small intestinal graft.

In the study small intestinal graft transplantation has been performed using 3 different methods in 3 groups of dogs.

In the first group small intestinal diverticle was made. No data have been published about this experimental model.

In the second and third groups the above described experimental models were used [5, 8].

MATERIALS AND METHODS

In the first experimental group in 15 mongrel dogs small intestinal diverticle was made with the aid of small intestinal graft. Through laparotomy small intestinal graft was formed (8–12 cm long) using the segment 60 cm proximal to caecum. The vascularized pedicle was formed by the longest and largest branch of the mesenterial artery and vein. The proximal and distal end of the ileal graft were cut in between clamps. Subsequently mesentery and the vessels supplying the graft were transected (the artery and vein were cut near the main trunk of a. and v. mesenterica sup.). Then the vein (diameter 1,5–3,5 mm) was restored end to side using continuous suture with 8/10 prolene and the artery (diameter 1–2 mm) end to end with single 10/0 prolene atraumatic suture. Suturing the artery and vein magnification of 3–6 times and microsurgical instruments were used. Then continuity of the small intestine was restored performing end to end anastomosis with two suture lines. One end of the graft was closed.

In the second group in 28 mongrel dogs ileal graft on vascularized pedicle was transplanted in the subcutaneous tissue of the neck. The ends of the graft were brought out as ileostomas.

The small intestinal graft (9–16 cm long) was formed as described in the first group. The graft's vessels were perfused with cold Ringer and heparin solution at +8...+4°C until it turned white. On the neck the external jugular vein and the thyrocervical trunk were dissected.

The graft's vein was anastomosed end to side with the external jugular vein and the graft's artery with the thyrocervical trunk end to end. The graft was placed in subcutaneous pocket and the ends of it fixed on the neck as ileostomas.

In the third group in 9 mongrel dogs oesophageal fistula was formed on the neck using ileal graft. The graft was disconnected similar to the first two groups. Before transecting the intestine the graft was emptied. Then the graft's vessels were irrigated with cold Ringer and heparin solution at $+4...+8^{\circ}\text{C}$ likely to the second group. Subsequently one end of the graft was connected to the oesophagus end to side. The other end of the ileal graft was fixed on the neck as ileostoma.

RESULTS

In the first group (Table 1) in 9 animals of 15 (follow-up period 2-45 days) the wound healed per primam. The autopsy showed viable intestine able to contract. The lumens of the artery and vein were open.

6 of 15 animals had complications 3 of them had thrombosis (2 of the artery and 1 of the vein). At the end of the operation the graft was viable, pulsations were seen on the artery and the vein were filled. By the 4.-6. postoperative day these dogs had developed peritonitis due to the necrosis of the graft.

2 of the remained 3 animals had infection of the laporatory wound and eventration due to it (in the second postoperative week). One animal had bowel obstruction due to the stenosis of the intestinal anastomosis (in the 30. day). Complications occurred mostly in the first and second postoperative week.

In the second experimental group (table 2) in 9 of the 28 dogs (period of follow-up 5-123 days) the operation wounds healed per primam. 6 animals of the 9 (the time of intestinal ischaemia 1 hour 30 min to 2 h 10 min) showed secretion of sanguinary mucus from the ileostomas for 3-4 days after the operation. The mucosa seen in the ileostomas was hyperaemic and oedematous. Later the sanguinary secretion stopped, mucosa developed normal colour and there was minimal secretion of whitish mucus from the ileostomas. In 3 cases (the time of intestinal ischaemia less than 1 h 30 min) the intestinal mucosa was of normal colour during the postoperative period. No sanguinary secretion from the ileostomas occurred.

Table 1.

Forming small intestinal diverticle

Results	Nr. of experiments
Viable diverticle, lumens of the vessels open	9
Thrombosis of the vessels of vascularized pedicle	3
Infection of the wound	2
Bowel obstruction	1
Total	15

Table 2.

Transplanting ileal graft in the subcutaneous tissue of neck (time of follow-up 5-123 days)

Results	Nr. of experiments
Viable graft, lumens of the vessels open	9
Thrombosis the vessels of vascularized pedicle	9
Infection of the wound	3
The animal removed the graft (scratching)	4
The cause of death unclear	2
Overdose of halothane	1
Total	28

Another 9 of the 28 animals developed thrombosis of the artery (4 cases) or the vein (5 cases) in the first or second postoperative day. The causes of the thrombosis were difference between the diameters of the graft's and the recipient's arteries in 1 case /the musculocutaneal artery (\varnothing 1,0 mm) was connected with the graft's artery (\varnothing 1,75 mm)/. Connecting arteries of different diameters technical difficulties occurred. In one animal the approximator used to bring the ends of the graft's and recipient's arteries nearer to each other was attached too tightly, traumatizing the inner layers of the arteries causing thus thrombosis. In two dogs the graft's artery was uncorrectly approximated to the recipient's artery and it caused technical difficulties in forming the anastomosis. It resulted in the thrombosis of the graft's artery.

Thrombosis of the vein occurred in 5 cases of the above mentioned 9. In 2 of them the cause was tension of the vascularized pedicle when it was implanted in the subcutaneous tissue of the neck. In 1 dog the vein under tension narrowed and curved near the anastomosis causing impediment of flow in the postoperative period. The other dog developed a rupture of the anastomosis due to strain.

In the remaining 3 of the 5 cases of vein thrombosis technical mistakes in anastomosing the graft's vein to the external jugular vein were the cause. In 1 case suturing the front side of the anastomosis one suture bite penetrated the back side causing narrowing and thrombosis of the anastomosis. In the second animal the distance between two suture bites was too long and haemorrhage occurred in this region. A hematoma with the diameter of 5 cm developed, narrowed the anastomosis and caused its thrombosis. In the third dog the external jugular vein was damaged with the electrocoagulator. In the damaged region vein thrombosis occurred and spread to the graft's vein.

10 of the 28 animals died of various other causes not connected with the graft's circulation. 3 of them developed extensive cervical wound infection due to its contamination with intestinal contents. After perfusing the graft's vessels with cold (+5...+8) Ringer and heparin solution ileal graft spasm occurred. When finding the graft a suitable position in the subcutaneous tissue and fixing it a clamp fell off its end and the cervical wound and its surroundings were contaminated with intestinal contents. The dogs died in two weeks after the operation. In remaining 7 dogs it was impossible to follow up the graft after the operation (four animals scratched the graft off; 2 died immediately after the operation, the causes of death unclear; 1 animal died of the overdose of halothane).

In the third group the time of follow-up of 9 animals was 5-123 days (table 3).

In 6 of the 9 dogs the wounds healed per primam. In first 3 postoperative days minimal secretion of sanguinary mucus occurred. Later the secretion stopped. The mucosa seen in the fistula was of normal colour. Later when licking milk, a small part of the milk came out of the fistula. The oesophageal fistula did not impede the dog's eating.

In 2 of the animals of the third group the cause of death remained unclear. One dog had extensive wound infection.

Table 3.

**Forming oesophageal fistula with ileal graft
(period of follow-up 5-123 days)**

Results	Nr. of experiments
Viable graft, lumens of the vessels open	6
Wound infection	1
The cause of death unclear	2
Total	9

DISCUSSION

One of the most frequent cause of failure of reconstructing the defects of the cervical part of oesophagus is the thrombosis of the vascularized pedicle's vessels and necrosis of the graft due to it.

First, the failure in connecting the graft's vessels is caused by faults in microsurgical technique and bad visibility in constructing anastomosis. In 4 dogs of the second group these were the causes of failure.

Second, tension of the vascularized pedicle after constructing the anastomosis results in failure. The tension itself is caused by technical mistakes during the operation or by shortness of the vascularized pedicle. To get vascularized pedicle as long as possible we chose the ileal segment supplied with blood by the longest and widest branch of the sup. mesenteric artery. To avoid tension in the pedicle we fixed the graft in suitable position. (Excessive looseness should be avoided as well because it causes kinking of the blood vessels). In the 3 animals of the second group the vessels of the vascularized graft remained in tension, resulting in their thrombosis and necrosis of the graft.

Third, the success of transplanting the small intestinal graft depends a great deal a the surgeon's ability to improve his microsurgical technique. Thus can be done on animals using various experimental models. According to our research the most suitable model for acquiring microsurgical techniquir is the model used in the second study group (transplanting small intestinal graft on a vascularized pedicle in the subcutaneous tissue of neck). The experimental model used in the first group suits to surgeons who have no experience in microsurgery. The third experimental model can be used when there is good microsurgical experience.

Fourth, a significant role in the failure of transplanting small intestinal graft is played by severe wound infection [2, 5]. One of the causes of severe wound infection was contamination of the wound with intestinal contents due to detaching of the clamp from the graft's end either during perfusion of the graft or during its fixation in the subcutaneous tissue. Contamination of the wound with intestinal contents caused severe wound infection in 5 dogs. To avoid wound contamination we closed the graft's end with temporary sutures immediately after transecting the intestine. We removed the temporary sutures when the blood vessels were connected and the wound closed and formed ileostomas.

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SPLIT ILEUM FREE-TISSUE TRANSFER IN OESOPHAGEAL RECONSTRUCTION

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During the last ten years several articles on the experimental and clinical application of jejunal transfers have been published. According to this method the jejunum is cut along the antimesenteric edge and the patch on its vascular pedicle is transferred to the oral or cervical part of the oesophageal defect. According to G. Buckspan et al. [2] the patch is sufficiently thin and supple, for reconstruction of defects of the oesophagus and most importantly it has got a mucous membrane, which makes it indispensable in plastic operations of the oral cavity, pharynx and jugular oesophagus. G. Buckspan et al. used split jejunal free-tissue transfer to reconstruct defects after oropharyngeal resections in ten patients. D. Robinson, A. Macleod [3] published data about thirty-seven microvascular free jejunal transfers in reconstruction of the upper cervical oesophagus, with one failure per sixteen operations. R. Hester, F. McKonnel [1] reported about a case of longitudinal stricture of the oesophagus in which a jejunal flap was sutured to the anterior wall of the oesophagus, and about another case in which a segment of jejunum replaced the stricture of hypopharynx. The authors outlined the intricacy of the procedure of replacing, especially in the far end of the transplant, R. Sheen, G. Mitchell and B. O'Brien [4] reported about experiments with animals where jejunal graft was used to cover the bare lower jawbone in the oral cavity. N. Jones, P. Eadie, E. Myers [5] published data about clinical case where a jejunal graft with double lumen was used to reconstruct simultaneously the oral cavity, pharynx and jugular oesophagus.

According to the published data we can conclude that partially or entirely slit intestinal patches can be used more widely in reconstruction of the oral cavity instead of using them just as a conduit in the cervical oesophagus. The aim of the paper.

1. Determining the viability of the intestinal patches formed of the distal part of the small intestine.

2. Uncovering the technical mishaps that may occur during the transfer of the intestinal patch to the neck in order to replace oesophageal defects.

3. Improving the methods of microvascular ileal transfer in order to minimize the duration of ischemia.

METHODS AND MATERIALS

The experimental group included ten dogs with body weight of 35–40 kg. Anaesthesia was given according to the standard procedure: premedication included 10–20 ml of 1% morphinehydrochloride solution (1,0 ml/kg of body weight), 1–2 ml of 2,5% aminasine solution and 0,5–1,0 ml of 0,1% atropine sulphate solution injected intramuscularly.

Endotracheal inhalation anaesthesia was maintained with halothane and a mixture of nitrous oxide and oxygen in ratio 2:1.

We used two methods to widen the oesophageal lumen by inserting a vascularized longitudinal patch.

1) At first the posterior wall of the patch was fixed to the oesophageal defect, subsequently the blood supply was restored (six experiments).

The operation started with a skin cut on the right side of the neck separating and preparing vessels, namely the external jugular vein (*v. jugularis externa*) and the superior thyroid artery (*a. thyroidea superior*), and the (cervical) part of the oesophagus which was mobilized and taken onto threads. The operation field around the oesophagus was isolated with gauze napkins, which had been moistened with 10% solution of dioxydine. Laparotomy was performed, the ileal graft on its vascular pedicle, 6–9 cm long containing artery and vein was formed. The diameter of the artery was 1,0–2,0 mm, of the vein – 2,0–3,0 mm. The length of the intestinal transplant was 3–8 cm, the width – 2–3 cm. This intestinal graft with its vascular pedicle was immediately on a gauze napkins transferred to a separate preparation table where the lumen of the ileum was opened slitting it longitudinally along the antimesenterial border. With a gauze puff the inside was removed, the mucous membrane bathed with the solution of dioxydine. Along the oesophagus a cut in accordance with the length of the transplant was made. The lumen of the oesophagus was treated with a gauze napkin moistened with dioxydine. The patch was transferred to the neck and sutured in isoperistatic position to the posterior wall of the oesophageal defect from

inside with one suture line. Having secured the defect and the patch with gauze napkins and changed instruments, the venous anastomosis between the external jugular vein and the vein of the patch was made end to side, and the arterial anastomosis end to end between the superior thyroid artery (a. thyroidea superior) and the artery of the transplant using an approximator and 9-0, 10-0 synthetical sutures. Duration of ischemia was from 80 to 90 min.

Next the sutures were completed on the anterior wall of the patch and a second line of sutures between the serous membrane of the transplant and the muscular layer of the oesophagus was made. The method worked out by A. Chernousov was used. Atraumatic synthetic suturing material of the types was used: "Dexon", "Vicryl", "PDS" (threads 2-0, 3-0 with the length of the needle 20-25 mm).

In the second group the following method was used:

2) Restoring the blood supply, then suturing the intestinal patch to the defect of the oesophagus (four experiments). Similar to the operation in the first group it was commenced with a cut on the left side of the neck separating and preparing the vessels: the external jugular vein and the superior thyroid artery; and the jugular part of the oesophagus, which was separated and taken on to threads. Laparotomy was performed, the transplant of the ileum on a vascular pedicle 3-8 cm long was formed.

The intestinal graft on its vascular pedicle on a gauze napkin, was immediately transferred to a separate preparation table where the lumen of the ileum was slit longitudinally along the antimesenterial border. With a gauze puff the inside was removed, the mucous membrane bathed with the solution of dioxidine.

Subsequently the transplant was isolated with gauze napkins and transferred to the jugular area where first of all an end to side anastomosis was made between the grafts vein and the external jugular vein. The diameter of the vein was from 2 to 3 mm. The arterial anastomosis was formed end to end with the superior thyroid artery. The diameter of the artery was from 1 to 2 mm. After the vascular stage, a cut of 3-8 cm was made into the oesophagus. The patch was sutured to the defect of the oesophagus along the posterior wall, then along the anterior wall. The first line of sutures was made between the musous membrane of the oesophageal defect and the patch. The second line was serous-muscular sutures between the patch and the oesophagus.

The operation was completed leaving a drain of perforated silicone tube in the operated area on the oesophagus, cleansing entirely the

operation wound with 10% solution of dioxydine in the amount of 40-60 ml and before suturing the wound powder of antibiotics was sprinkled to it (using Ampicillin with Kanamycin, Streptomycin or Monomycin). Prophylaxis of infection was carried out two hours prior to the operation and continued during 2-3 days.

RESULTS

In the first group all six transplants turned pink after the blood flow was restored. Weak peristalsis could be observed. In four experimental animals out of the six wounds healed quickly. Two or three days after the operation water was given orally, after 4-5 days - liquid food. Later the four animals did not have any eating disorders due to the operation. In two out of the six animals (Experiments No 74 and 75) since the second post-operative day liquid secretion from the drain was noticed after swallowing water, the drain was in the proximal end of the wound. In these cases the drain was left in place for about two weeks and was removed only after the secretion had completely stopped.

The period of follow-up of these six animals was 50-343 days. Then under general anaesthesia incision was made and the condition of the patch was estimated macroscopically. In all cases the patch was of light pink shade, located at the proximity of 1-2 cm away from the larynx of the dog along the left lateral wall of the jugular oesophagus.

Examining the mucous membrane in the experiments No 68, 70, 76, 77, in all cases complete healing of the oesophageal-intestinal border was observed. In the experiments (No 74, 75) where fistulae occurred, the ends of the intestinal patch were not precisely connected to the wall of the oesophagus. In these places the mucous membrane was folded and had scarred texture. In our opinion in these experiments the suturing of the mucous patch was inaccurate. At the dissection all anastomoses were patent. Thrombotic mass in the lumen of the vessels was not observed. There were no derangements in the peritoneal cavity.

In the second group all the four animals had serious postoperative complications. In two out of 4 animals (Experiments No 71 and 72) the arterial anastomosis, completed before the intestinal transplant was sutured, turned out to be under tension. The transplant was of grey color, spastic, the pulsation of the arteries was not observed. Thrombosis of the artery was diagnosed. Therefore in these cases the arterial anastomosis was resected and replaced by a venous graft taken from the

mesentery of an identical segment of intestine in the peritoneal cavity. The length of the venous graft was 5 mm, diameter 1,7 mm. In these experiments the duration of ischemia was up to 160 min. The transplant turned pink, the pulsation of arteries was observed. The operation wound was closed.

In the two remaining animals the arteries and veins were connected in the manner described above (the diameter of the artery 1,5 mm, the diameter of the vein 2,5 mm, a 5 cm patch to 2 cm). After the restoration of the blood flow the patch also turned pink. Further on it was sutured in two layers to the defect of the oesophagus. After this procedure when the oesophagus taken on thread-holders was placed in right position, the vascular pedicle remained under tension. The operation wound was closed.

On the second-third days in four of the ten above-described experiments thrombosis of the artery was diagnosed.

At dissection the transplanted intestinal patches were necrotic of greyish-brownish color, sutures of the transplant and patches were severed, arteries and veins were thrombosed. Three or four days after the operation liquid secretion started, the sutures of the wound opened. The dog were excluded from the experiment. The four described animals received I.V. infusion of Rheopoli-glycini - 200-400 ml and Curantyli - 2,0 on the first and second postoperative days, but without positive results.

DISCUSSION

According to literature, at first the transplant is fully sutured to the defect of oesophagus, and then the vessels are connected. R. Sheep et al. [4] used this method in eight dogs; G. Buckspan et al. [2] successfully carried out ten operations in clinic on strictures of the upper cervical part of oesophagus. J. Reuther et al. [7] described six patients who were operated on for stricture of the cervical part of oesophagus. Ti-Cheng et al. [6] carried out two operations. Using the above mentioned method the transplant is in the state of ischemia while the whole patch is being sutured and the vessels are being connected. In order to shorten the period of ischemia we changed the above mentioned method in our work. At first in six experiments we fixed the transplant to the posterior wall of the oesophagus by means of continuous suture. In our opinion, this method has two advantages:

First, suturing of the anterior wall of the defect of the oesophagus is performed with revived blood circulation.

Second, the method applied allows us to insert the first line of sutures between the mucous-submucous membranes of the patch on vascular pedicle and the anterior wall of the oesophageal defect correctly thereby the factor of the time has no significance.

The disadvantage of our modification lies in the fact that the oesophageal defect is left open during the period of fixing the patch to the posterior wall as well as during the period of anastomosing the vessels and inserting the first line of sutures to the mucous-submucous membrane of the oesophagus.

While applying the method of R. Sheen et al. [4] and G. Bucksan et al. [2] the defect of the oesophagus also is open, but only for the first period of suturing the patch to the defect of the oesophagus.

Consequently, applying our modification the danger of infection of the wound is more probable than while applying the method of Sheen, Mitchel (1989) and Bucksan, Neuton (1986). Usually, suturing the patch to the anterior wall of the oesophageal defect, and inserting the second line of sutures takes approximately 30–40 minutes. Our method allows us to shorten the period of ischemia. The suturing of six patches confirmed the advantages of such modification. The two fistulae occurred in the initial period of our work due to inexperience.

The following task was set in the second experimental group (four dogs): the period of ischemia of the transplanted patch was to be shortened to 40–50 minutes. Therefore, at the beginning of the operation the vessels of the patch were connected with those of the recipient. Thereafter the revascularized patch of small intestine was sutured to the defect of the oesophagus. In the first experimental group while first suture line between the patch and the posterior wall of the oesophagus is performed, the patch is in the state of absolute ischemia. In the last group suturing of the patch to the oesophageal defect was carried out with restored blood flow. The advantage of this modification (the second experimental group) lies in the fact that the patch on vascular pedicle is in absolute ischemia only during the period of connecting the vessels. On the other hand the disadvantage of this modification is that during the saturation of the transplant to the defect of the oesophagus the thyroid artery and the end of the artery of the patch are not in the same vertical projection. Therefore tension of the patches artery occurs which results in the rupture of the internal elastic membrane and intima, and further on – in arterial thrombosis.

The above mentioned disadvantage was the reason of the arterial thrombosis of the patch in our four experiments. In two of these experiments arterial thrombosis of the transplant occurred at the end of the operation and we had to restore the blood flow by means of a venous graft. In the early post-operative period (two-three post-operative days) all four of the transplanted patches became necrotic.

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TREATMENT OF OESOPHAGEAL ATRESIA

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The classification of Vogt is being used all over the world to group types of oesophageal atresia. The most common types are Type IIIb (91%), followed by Type II (6%) and Type IIIc (2%) (Fig. 1 and 2).

As Kluth has stated, the pathogenesis is still unknown and there are cases which cannot be explained with a defective separation of the foregut and the trachea.

Oesophageal atresia like any other malformation is frequently combined with other congenital defects (33%). the most common additional malformations are gastro-intestinal (10%) and cardio-vascular ones (10%) (Table 1).

Diagnostic procedures for oesophageal atresia should be performed immediately after the baby is born in the delivery room. The oesophagus should be examined a gastric tube (8-10 Char.).

Roentgenologically oesophageal atresia can be diagnosed with the help of air or water-soluble iodine containing contrast media of about 1 ml. NO BARIUM! Roentgenogram will reveal whether there is an oesophageal-tracheal fistula or not. In rare cases the atresia of Type II is simulated by the closure of the fistula with mucus.

Oesophageal atresia is treated by extrapleural defecting of the oesophageal-tracheal fistula, by closing the fistula and by performing an oesophageal segments end-to-end anastomosis. The best ligature material is resorbable material (Dexon, Vicryl) as silk sutures may often develop a leak.

When no post-operative complications have developed, an oesophagogram is made on the fourteenth post-operative day. Oral feeding can be started, if no leakage is present. On the 21st post-operative day bougienage of the oesophagus is performed (Bougie No. 20-22). The follow-up period lasts two years in order to detect an early stenosis of the anastomosis or gastro-oesophageal reflux.

Table 1.

**Additional malformations
(16 authors personal observations)**

Total number 1638		Additional malformations and defects Total 541 = 33,0%					
Author	Number of children	Distribution of Additional Malformations					Total
		Cardio- vasc.	Gastro- intest.	Urogen- tial	Others		
Hollings (1958)	54	13	8	-	3	24	
Stephens (1956)	134	13	14	16	7	50	
Hecker (1962)	32	8	1	-	-	9	
Kafka (1966)	87	14	11	4	4	33	
Rehbein (1968)	388	15	37	10	34	96	
Total	719	72	74	32	48	226	
		=10%	=10,3%	=4,4%	=6,7%	=31,4%	

The mortality rate is about 5-10% at present.

The treatment of oesophageal atresia of Type II offers some difficult problems for the surgeon. The segments are very often too much distanced from each other and direct anastomosis is therefore impossible. Today in such cases the following techniques are in use:

1. Bougienage and elongation of the segments,
2. transposition of the colon,
3. transposition of the stomach.

Lindahl in his long-term study noticed oesophageal-gastric mucosal metaplasia (precancerous) in ten children out of nineteen operated on with the technique of stomach transposition. The metaplasia is a high risk factor for oesophageal adenocarcinoma in the patients adult life. This is a convincing argument for giving up the technique.

Transposition of the colon can also be followed by serious complications such as megacolon, reflux-colitis with bleeding, ulceration and perforation, even necrosis of the transplant.

At an international symposium on oesophageal atresia in Berlin in 1990, most pediatric surgeons gave preference to bougienage (Howard and Myers (1965), Hays (1966), Haße (1968).

The therapy starts with gastrostomy without collar oesophagostomy. On the tenth day dilation of both oesophageal segments is started (20

minutes a day) through the mouth and the gastrostomy. During these 6-8 weeks of dilatation the upper oesophageal segment must be cleaned by suction every 10-15 minutes to avoid aspiration. This is the responsibility of the nurses during the period of intensive care therapy. As to the duration of bougienage, it is essential that the lengthened oesophagus segments should overlap each other at least by one cm before an anastomosis can be performed. We lost the first child treated with bougienage because of a leak in the anastomosis. The leak developed due to distraction of segments although roentgenologically the segments seemed to overlap well.

Two children out of six died.

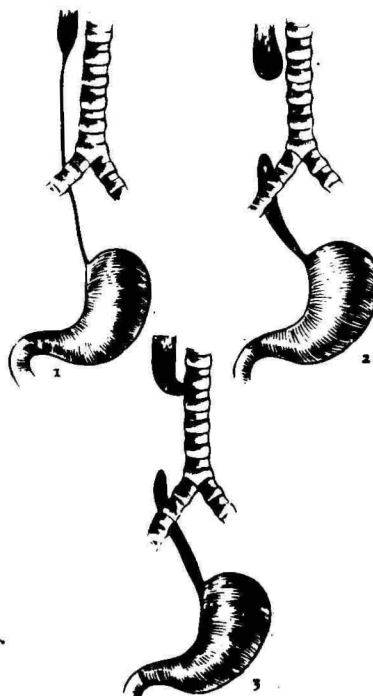


Figure 1. Vogt's classification of oesophageal atresia Types 1, 2 and 3A

Complications: After the operation for oesophageal atresia of Type IIIb 6-26% of the children are reported to suffer from anastomosis insufficiency and 8-20% from anastomosis stenosis (Holschneider). Post-operative gastro-oesophageal reflux (GER) was present in the range

of 5 to 48% of the cases (Holschneider). Reflux can cause oesophagitis as well as recurrent pneumonia caused by aspiration during sleep. Should reflux be suspected, diagnostic endoscopy, manometric and pH measurements are to be undertaken. Reflux is at first treated conservatively, but when conservative therapy fails and oesophagitis of the second or third degree is developing, surgical treatment is indicated.



Figure 2. Vogt's classification of oesophageal atresia Types 3B and 3C

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CLINICAL EXPERIENCE OF TREATING OMPHALOCELE GASTROSCHISIS (1962-1991)

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Omphalocele was described first by Parè in 1594, gastroschisis by Calder in 1733 (Figures 1 and 2).

The report by Lindfors (1893) was very important for the progress in the surgical treatment of large omphaloceles. In his paper Lindfors reviewed 19 omphalocele operations on newborns which had been reported in medical world literature. Four of the babies had died.

While Lindfors wrote about the removal of the hernia sac, which is an intra-abdominal operation technique, Olshausen recommended an extraperitoneal technique of removing Wharton's jelly and covering the remaining peritoneum with skin. This technique was rediscovered and modified by Gross (1948).

My report will be devoted to my nearly thirty years of experience in treating omphalocele and gastroschisis.

Before the prenatal ultrasound technique became available, the paediatric surgeon was confronted with cases of omphalocele and gastroschisis quite unforwarned. Prenatal sonography makes early intrauterine diagnosis possible.

Today the newborns with the prenatal diagnosis of large omphalocele are delivered by Cesarian section, they are packed into a sterile plastic bag with only the baby's head protruding and taken to the operating room immediately after delivery. This will protect the omphalocele sac from rupture and prevent contamination of the intestinal loops with pathogenic germs during the delivery.

In 1962-1969 we treated fifteen newborns for omphalocele and twenty-two children for gastroschisis, using the operating technique of Olshausen and Gross, i.e. we covered the hernia sac or intestine loops with mobilised skin (Figure 3). The outcome was poor. Eighteen out of 37 babies died, the mortality rate was 50%. And then there was the big problem of secondary operation to correct the resultant monstrous hernia of the abdominal wall (Figure 4).

In 1969 we gave up this operative technique and we preferred the technique of Schuster in cases where it was not possible to make a primary anatomically well-grounded closure of the abdominal wall. The Schuster technique involves the suturing of a Silastic sheet into the fascia defect leaving the hernia sac of the omphalocele in place. The intestine loops of gastroschisis are cased in a Silastic tube (Figure 5 and 6). This makes it possible to avoid a high intraabdominal pressure, a high diaphragm position with respiratory insufficiency as well as compression of the vena cava resulting in cardiac insufficiency. The abdominal wall is usually sutured 3-6 weeks after twisting the Silastic sheet. By this procedure the too small abdominal cavity will be gently expanded (Figures 7 and 8).

Only four babies died out of thirteen newborns operated on for gastroschisis using the schuster technique. The outcome of operating large omphaloceles was equally good as only four babies out of twelve died.

Duraplastic-operation described by Joppich was performed on three newborns and they survived the operation. However, in two babies the implants became infected and had to be removed (Figure 9).

Primary anatomically well-grounded closure of the abdominal wall was performed in two babies.

A premature baby with laparoschisis and total absence of the ventral and lateral abdominal musculature was inoperable and died.

Finally it is a worth mentioning here that according to Menardi a meshgraft skin transplant can be successfully used if the original implant has become infected.

POSTOPERATIVE TREATMENT

In the period of 1962-1966 we noticed in the postoperative care of the babies operated on for gastroschisis that the passage of meconium and stools, primarily normal, became blocked combined with a bile-colored reflux, usually in the period of the 7.-14. postoperative days. Ileus due to adhesions or strangulation was suspected. Abdominal X-ray revealed fluid-levels. Relaparotomy followed, in some cases repeatedly. The findings by repeated operations were disappointing. There were adhesions but never was the stenosis of the intestinal lumen confirmed. This experience made us give up relaparotomy for babies in the state described above. They were parenterally fed through central venous catheters, for weeks if necessary.

The outcome was unexpectedly. The babies survived and after days and even weeks of parenteral nutrition they had normal stools and developed normal intestinal peristalsis.

Our results are presented in Tables 1 and 2.

Table 1

Laparoschisis N = 40 therapie

		+
Olshausen u. Gross	22	11
Schuster (Silastic)	13	4
Lyo dura	2	-
Primärer verschluß	2	-
Inoperabel	1	1

Table 2

Omphalocele N = 41 therapie

		+
Mercurochr. (bis 1964)	4	3
Twistmethode	2	-
Einzeitige operation	7	1
Olshausen u. Gross	15	7
Schuster (Silastik)	12	4
Dura-plastik	1	-

In conclusion can be said that

1. Prenatal sonography makes early diagnosis and carefully planned treatment of omphalocele and gastroschisis possible.

2. The Schuster technique, the use of Silastic sheet has markedly reduced the mortality rate in the treatment of large omphaloceles. Today the mortality rate of omphalocele and gastroschisis is about ten to fifteen per cent.

3. In case of repeated bile-colored reflux and absence of stools, relaparotomy would mean a delay in the recovery. A prolonged parenteral nutrition is indicated.



Figure 1. Large omphalocele.



Figure 2. Gastroschisis with leathery thick inked intestinal loops and peritonitis.



Figure 3. Gastroschisis. Intestinal loops covered with skin. The technique of Olshausen and Gross.

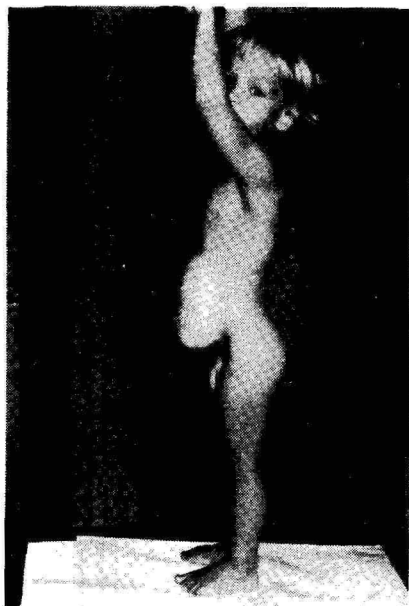


Figure 4. The child after operation for gastroschisis according to Olshausen and Gross. Large hernia of the abdominal wall.

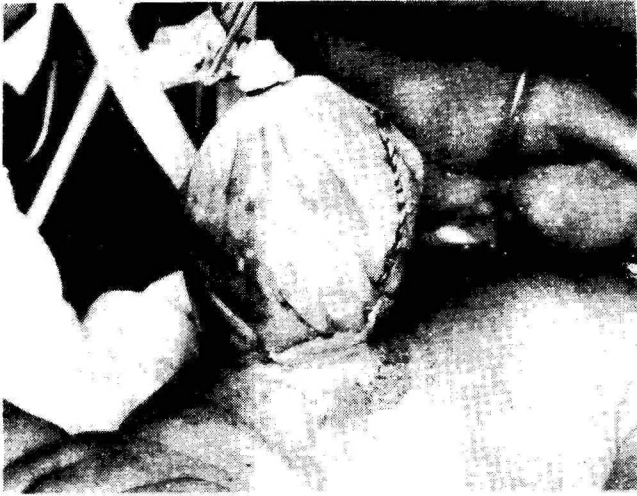


Figure 5. Omphalocele sac covered with Silastic sheel.



Figure 6. Gastroschisis. Intestinal loops sewn into Silastic tube.

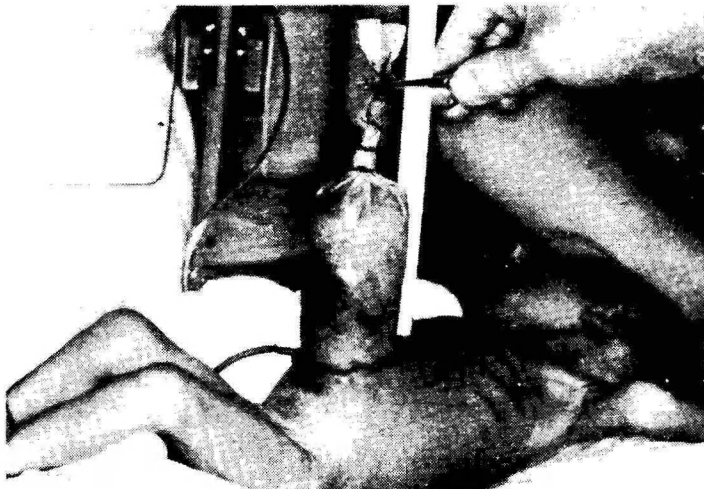


Figure 7. Status after two weeks of Silastic tube twisting.

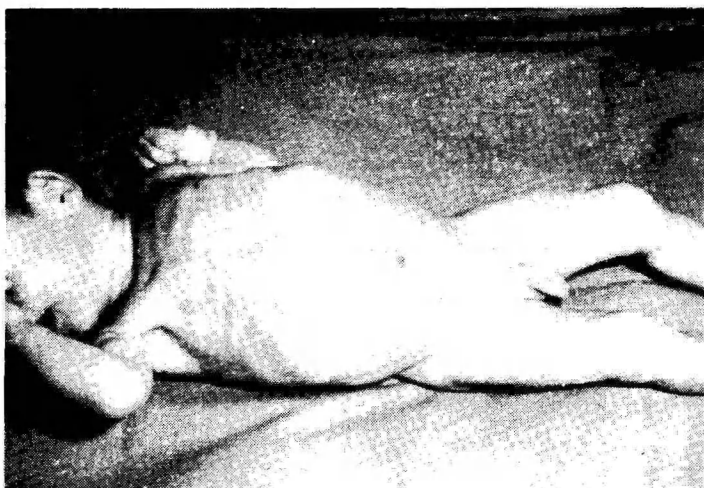


Figure 8. Status after the removal of the Silastic tube. Four weeks after the suturing of the abdominal wall. See also Figures 8 and 9a.

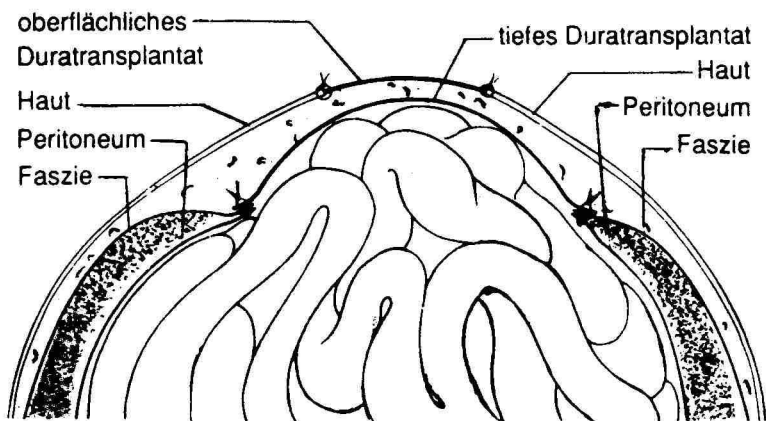


Figure 9. Schematic presentation of gastroschisis treated with dura transplantation.

PROPHYLAXIS OF VENOUS THROMBOEMBOLISM IN ORTHOPAEDIC SURGERY

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Thrombembolic risk in orthopaedic surgery

Venous thromboembolism is a serious complication of surgery. The evidence from studies of postoperative death in developed countries is remarkably consistent: if no prophylaxis is given, 0.5-3.4% of patients die from pulmonary embolism (PE) after major surgery of any kind. The overall deep venous thrombosis (DVT) incidence in orthopaedic surgery without thromboprophylaxis is about 50% [1, 5, 13, 17].

Clinical studies using venography and post-mortem studies have shown an association of at least 70% between pulmonary embolism and the presence of DVT in the leg. DVT can be regarded as the underlying origin of pulmonary embolism in nearly all postsurgical patients [1, 17, 19, 25, 27].

The factors involved in the development of venous thrombosis can be divided into three main groups, sometimes referred to as Virchow's triad:

- changes in the properties of the blood
- changes in blood flow
- changes in the vessel wall

Changes in the properties of the blood:

- tissue thromboplastins are released into the bloodstream
- coagulation factors are activated
- there is often an increase in the platelet count, with an increase in platelet stickiness.

Changes in blood flow: blood flow through the leg veins is reduced during surgery unless special preventive measures are taken. This reduction in flow has a potent effect on the valve pockets, where the flow is the most stagnant and in which many postoperative thrombi originate from [1-5].

Changes in the vessel wall:

- During surgery on the legs, especially operations on the hip and knee, veins may be stretched and distorted, producing breaches in the endothelium that expose collagen and basement membrane, both of which are potent activators of platelet adhesion and coagulation. During perioperative and postoperative periods "fibrinolytic shutdown" can often occur.

- Several other factors, including prostacyclin (PG I₂), are produced and released by normal vascular endothelium. Changes in endothelial function during and after surgery may reduce or prevent their release.

An overview of the results from major studies suggests that the risk of DVT is greatest in patients undergoing orthopaedic surgery to the leg (Table 1) [4, 5, 8, 9, 18, 27, 30, 34, 35, 41].

Factors that may increase the average risk of thromboembolic complications in patients undergoing surgery are: age over than 40 years, malignancy, infection, obesity, previous thromboembolism, family history of thromboembolism, varicose veins, trauma, re-operation, oestrogen therapy, renal transplantant recipient, neurological disorders.

Table 1.

The incidence of fatal pulmonary embolism after various surgical procedures (Mean data based on several studies)

Type of operation	Death rate from pulmonary embolism
General abdominal surgery	0.8%
Elective hip surgery	2.4%
Hip fracture surgery	5.9%

Thromboprophylactic methods in orthopaedic surgery

Physical methods

- graduated elastic compression stockings, which must be fitted individually

- intermittent pneumatic compression of the foot and calf [20]

- electrical stimulation of calf muscle

Pharmacological methods

Drugs that could be of benefit in thromboprophylaxis by an effect on blood coagulability can be classified into three main groups:

- those that alter platelet function
- those that enhance fibrinolytic activity
- those that interfere with coagulation mechanisms

Drugs which alter platelet function

Aspirin has theoretical attractions as an inhibitor of thrombosis. The use of aspirin in thromboprophylaxis has been investigated in several clinical trials, but the results have not been uniform. Most trials have shown no significant prophylactic effect when DVT is assessed by leg scanning, but in one trial of patients undergoing hip replacement surgery, a significant protective effect of aspirin against DVT was seen in men but not in women [6, 13, 17, 18, 29].

At present it can be said that aspirin has not been shown to have a significant prophylactic effect against either DVT or PE.

The results of trials performed to date concerning drugs that enhance natural fibrinolytic activity have been uniformly disappointing. Phenformin and ethyloestrenol have not been shown to prevent the incidence of DVT in surgical patients [8, 15].

Drugs that interfere with coagulation mechanisms: two main types of drugs have been used to influence the clotting cascade and inhibit venous thrombosis:

- oral anticoagulants
- heparin and heparin derivatives
- dextrans

The results from the Oxford metaanalysis provide powerful evidence of the effect of low-dosis heparin prophylaxis in orthopaedic surgery.

The most important advance in surgical thromboprophylaxis over the past few years has been the development and clinical investigation of low molecular weight heparin (LMWH) preparations [9-12, 14, 16, 23, 24].

Placebo-controlled trials of LMWH [30, 39, 41] and trials in which LMWH is compared with conventional low-dose heparin [1-3, 10-12, 24, 27, 32] have shown the following:

- LMWH preparations (e.g. Fragmin, 2500 IU in a single daily dose) reduce the overall incidence of DVT in general surgery by at least 70% - the same reduction as obtained with heparin 5000 IU twice daily. The results of some comparison trials with heparin suggest that LMWH has a greater effect than heparin; none suggest a lesser effect.

- The percentage of reduction in DVT is similar to that seen with heparin in patients undergoing all types of major abdominal surgery, and it is even greater in those with malignant disease.

- LMWH is similarly or more effective in orthopaedic surgery (e.g. total hip replacement), with Fragmin given as a once- daily dose of 5000 IU, compared with heparin given as 5000 IU three times daily. A similar result has also been observed with another LMWH , Enoxaparin [32].

- LMWH prophylaxis with Fragmin is more effective than dextran 70 in postoperative thromboprophylaxis for patients who have undergone orthopaedic surgery [11, 12]

- LMWH preparations provide effective prophylaxis against PE. Trials to date have investigated a smaller number of patients than that in the heparin meta-analysis, but the results suggest that the effect of LMWH against PE is at least as great as that of conventional low-dose heparin.

- The incidence of haemorrhagic events with LMWH prophylaxis is not greater than in placebo-treated patients undergoing general surgery, hip replacement or surgery for hip fracture [30, 38, 40]. The incidence of minor haemorrhagic events is broadly similar to that with low-dose heparin in most trials. Although in one trial a lower incidence was observed with LMWH [11, 12]. As with heparin, the benefits of prophylaxis far outweigh any slight increase in minor bleeding complications.

- A single daily injection of LMWH is more convenient, and likely to lead to a higher compliance rate than twice- or three times daily injections of heparin.

Practical recommendations for prophylaxis

Low- and medium-risk patients should be given routine prophylaxis with one of the following regimens:

- heparin, 5000 IU 2 hours preoperatively followed by 5000 IU twice daily for 7 days or until full mobilization

- LMWH, 2500 IU 2 hours preoperatively followed by 2500 IU once daily for 7 days or until full mobilization.

High-risk patients should be given routine prophylaxis with either of the following regimens:

- heparin, 5000 IU 2 hours preoperatively followed by 5000 IU three times daily for 7 days or until full mobilization

- LMWH, 5000 IU 12 hours preoperatively (alternatively, 2500 IU

2 hours preoperatively and a further 2500 IU 12 hours later on the day of operation) followed by 5000 IU once daily for 7 days or until full mobilization.

Postoperative thromboembolism and thromboprophylaxis in elective hip replacement patients in Tartu University Hospital.

213 patients (104 males and 109 females, average age 58.2) were operated in the orthopaedic department of Tartu University Hospital in years 1982-1993. In 213 patients aspirin (500mg two times a day) for thromboprophylactic therapy was used. In 4 patients clinically significant postoperative DVT occurred. In 4 cases PE was diagnosed and 2 of those patients died (on the 7 and 9 postoperative day). The incidence of fatal PE (1%) is in good correlation with data from different studies in which the incidence of fatal PE is 1-5%. The peak incidence occurs from Day 5 to about Day 10.

In 41 patients in addition to aspirin LMWH (Fragmin, Kabi-Pharmacia, Sweden) in dose 2500 IU once daily during 10 days was used. No incidence of DVT or PE was observed in this group. LMWH did not show any increase in the risk of major bleeding. Using published data and our experience it can be concluded that LMWH is an effective, safe and convenient antithrombotic agent in thromboprophylaxis after elective hip replacement.

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