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Abstract

This article provides an analysis of the results of surgical treatment of patients with various forms of coronary artery disease, the study of the quality and reliability of myocardial revascularization, assessment of patency and functional viability of coronary grafts in the early postoperative period using echocardiography and myocardial perfusion scintigraphy.

The retrospective material of our study is based on the results of surgical treatment of 130 patients with coronary artery disease who were operated on in the IHD department over the past year. All patients underwent examination according to a standard protocol: electrocardiography, 24-hour Holter monitoring, selective coronary ventriculography and shuntography, echocardiography, perfusion scintigraphy before and after surgery, drug stress test to assess myocardial perfusion and contractility and its differentiation (ischemia, scarring) with hypoperfusion.

Keywords
ischemic heart disease, coronary artery bypass grafting, assessment of myocardial perfusion

Перфузиялық сцинтиграфия мәліметтері бойынша миокардтың жиырылу қабілеті төмендеген науқастардың тәж артерияларын шунттаудың ерте нәтижелері

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Аңдатпа

Бұл мақалада ЖИА-ның түрлі формалары бар науқастарды хирургиялық емдеудің нәтижелерін талдау, миокард реvascularизациясының сапасы мен сенімділігін зерттеу, миокардтың эхокардиографиясы мен перфузиялық сцинтиграфиясын қолдану арқылы операциядан кейінгі ерте кезеңдегі коронарлық шунттардың өткізгіштігі мен функционалды өміршеңдігін бағалау келтірілген.

Біздің зерттеуіміздегі ретроспективті материал соңғы жыл ішінде ЖИА бөлімшесінде ота жасалған, жүректің ишемиялық ауруы бар 130 науқасты хирургиялық емдеудің нәтижелеріне негізделген. Науқастардың барлығы стандартты хаттама бойынша қарап-тексерулерден өтті: электрокардиография, тәуліктік Холтер мониторингі, селективті коронаровентрикулография және шунтография, эхокардиография, операцияға дейінгі және одан кейінгі перфузиялық сцинтиграфия, миокардтың перфузиясын және жиырылуын және гипоперфузиясы бар миокард аймағындағы оның жіктелуін (ишемия, гипертрофия, тыртық) бағалауға арналған медикаментоздық жүктеме тесті.

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Непосредственные результаты коронарного шунтирования пациентов со сниженной сократительной способностью миокарда по данным перфузионной сцинтиграфии

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Аннотация

В данной статье приведен анализ результатов хирургического лечения больных с различными формами ИБС, изучение качества и надежности реваскуляризации миокарда, оценка проходимости и функциональной жизнеспособности коронарных шунтов в раннем послеоперационном периоде путем использования эхокардиографии и перфузионной сцинтиграфии миокарда.

Ретроспективный материал нашего исследования основан на результатах хирургического лечения 130 пациентов с ишемической болезнью сердца, оперированных в отделении ИБС за последний год. Все пациенты проходили обследование по стандартному протоколу: электрокардиография, суточный холтеровский мониторинг, селективная коронароангиография и шунтография, эхокардиография, перфузионная сцинтиграфия до и после операции, медикаментозный нагрузочный тест для оценки перфузии и сократимости миокарда и его дифференциации (ишемия, гибернация, рубец) в зона миокарда с гипоперфузией.

Ключевые слова

ишемическая болезнь сердца, коронарное шунтирование, оценка перфузии миокарда

Introduction

Nowadays, Ischemic heart disease is still challenging problem and remains the dominant pathology among diseases of the cardiovascular system. The most radical way of treating patients with ischemic heart disease is surgical myocardial revascularization [3, 4, 7].

In recent years, due to the “popularization” of endovascular methods of the treatment, the contingent of patients in cardiac surgery departments has significantly changed: the number of patients with severe multi vascular lesions of coronary arteries has increased. The expansion of indications for CABG led to the increase the percentage of complicated forms of IHD: acute coronary syndrome, concomitant valvular dysfunction of the heart, severe heart failure [1,8,10].

There is also an increase in the number of patients with severe concomitant pathology: diabetes mellitus, a malignant arterial hypertension (AH) damaging target organs, multifocal atherosclerosis, cerebrovascular disease, and renal failure [2].

Currently, there is an opinion, in which the number of formed shunts is not less than the number of affected coronary arteries. To control the quality of CABG and PCI of the coronary arteries, it will be a very informative to use of endovascular techniques that require hospitalization and preparation of patients for examination [6,7,11]. Existing methods of assessment blood flow velocity through shunts (ultrasound and electromagnetic flowmetry) allow just only indirectly assess the adequacy of myocardial revascularization. An ideal way to assess the adequacy of the performed

anastomoses and the completeness of myocardial revascularization could be the method of intraoperative coronarography [5,9,15]. It allows real-time monitoring of perfusion zones through each shunt and to determine the presence of intra and inter-system collaterals, as well as assess the quality of performed anastomoses [8,12,14]. Thus, a truly adequate revascularization can be achieved when blood flow is restored throughout the myocardium. An alternative method for examining the quality of revascularization may be myocardial perfusion scintigraphy (MPS), which is also possible on an outpatient basis.

Aim of the study

Study of the quality and reliability of myocardial revascularization, assessment of patency and functional viability of mammary-coronary and aortocoronary shunts in the early postoperative period.

Material and methods

The retrospective material of our research is based on the results of surgical treatment of 130 patients with ischemic heart disease who underwent surgery in the IHD department over the past year.

The age of patients ranged from 40 to 72 (mean 52.5±7.2) years, 16 were female (13%) and 114 were male (87%), respectively.

All patients had along ischemic heart disease-history, who also suffered from one or more myocardial infarction. 120 patients had class II – III of angina, 6 patients had unstable angina, and 2 patients had class IV of angina. 86 patients had a concomitant pathology – hypertension (most of them

drug resistant), 30 patients had type II diabetes mellitus, at the state of subcompensation.

All patients are examined by standard protocol: electrocardiography, daily Holter monitoring, selective coronaroveniculography and shuntography, echocardiography, perfusion scintigraphy before and after the surgery, drug induced load test to assess perfusion and contractility of the myocardium and its differentiation. (ischemia, hibernation, scar) in hypoperfused areas. According to echocardiography, in the preoperative period, the average EDVLV was 175.5 ± 48 ml, the average EF LV was $45.8 \pm 5.1\%$, respectively (Table 1). In 8 patients, aneurysm of the left ventricle was diagnosed. According to perfusion scintigraphy (PS), all patients had defects in myocardial perfusion of varying severity, the average perfusion defect was $41\% \pm 9.6$.

Localization of foci of hypoperfusion areas in all patients matched with angiographic data. On the one hand, according to MPS, in all cases (100%), there were a lesion of the anterior wall and apex, while, in isolated septal segments ranged from 47 to 69%, in lateral segments from 27 to 43%, in segments of the lower wall from 14 to 37%, respectively. On the other hand, according to coronaroveniculography (CVG), a subtotal stenosis of the LCA trunk was 17%, proximal stenosis of the right coronary artery in 27.4% cases, multiple lesions of the right coronary artery in 23.7% cases and three-vessel lesion in 87% cases, respectively. All operations were performed using multicomponent anesthesia under cardiopulmonary bypass and pharmacological cold cardioplegia (Del Nido). All affected coronary arteries were shunted. By the number of performed shunts: 4 shunts for 10 patients, 3 shunts for 60 patients, 2 shunts for 48 patients and 1 shunt for 8 patients, respectively. The anterior descending branch of the left coronary artery was bypassed in 94% of cases, the right coronary artery in 68% of cases. The circumflex branch of the left coronary artery was bypassed in 66% of patients, the diagonal branch of the anterior descending artery in 38% of patients, the intermedia artery in 15% of patients (Table 2). The total number of shunts per patient was 3.2 ± 0.9 .

In the postoperative period, control echocardiography and perfusion myocardial scintigraphy were performed on days 6-7 (Table 3). The results of echocardiography showed an improvement of left ventricular contractility. There is an increase in EF LV to 49.5 ± 5.7 , a decrease in EDV by 17% (135.1 ± 25 ml), respectively.

One of the most reliable research methods for direct assessing myocardial blood supply at the microcirculation level is myocardial perfusion scintigraphy (MPS). According to MPS, in the presence of a sufficient amount of hibernated myocardium, there

is a decrease in perfusion defect by $14.2 \pm 5.7\%$. Myocardial perfusion scintigraphy (MPS) is a radioisotope research method designed to assess myocardial blood supply at the level of microcirculation. The method is based on assessing the distribution of intravenously administered radiopharmaceutical (RP) in the heart muscle by accumulating of RP in intact cardiomyocytes.

Actually, regions of the myocardium with normal blood supply create a picture of equal distribution of RP, whereas, areas of the myocardium with a relative or absolute decrease in blood flow (due to ischemia or scarring) have a decrease in RP distribution due to perfusion defects. The distribution of RP in the myocardium depends on both, perfusion itself and the integrity of the sarcolemma and the preservation of cellular metabolism.

Currently, the method of perfusion scintigraphy (MPS) has already implemented into clinical practice in our department, and is used in the preoperative and postoperative period. According to MPS, all patients with IHD who underwent CABG showed improvement in myocardial perfusion.

Discussion

The clinical management of patients suspected of having angiographically significant coronary artery disease (ASCAD) is often aided by the performance of stress tests, such as myocardial perfusion scintigraphy (MPS), echocardiography, especially in patients with reduced myocardial contractility [16]. Myocardial perfusion scintigraphy (MPS) offers an accurate and robust tool to appraise the ischemic (i.e. clinical) impact of suspected coronary artery disease. Accordingly, patient stratification according to MPS results, not only clarify the association between ischemic burden and event rates in patients with or at risk for coronary artery disease [17], but also could avoid the surgeon (preoperatively performed MPS) from unexpected errors. Moreover, it allows to assess the quality of performed operation and identify ischemia (if it exists) in patients with previous revascularization. But, routine usage of MPS in patients who underwent myocardial revascularization is still challenging. As according to Nael Aldweib et al., MPS based study found no evidence that repeat revascularization provides a survival benefit, even in patients with inducible ischemia [18]. Thus, MPS should be used just in patients with reduced myocardial contractility or remaining ischemia after myocardial revascularization. As for transthoracic echocardiography, several studies has shown that the myocardium may regain contractile function after prompt revascularization if viable dysfunctional myocytes are presents, and transthoracic echocardiography is a cheaper and accessible way to assess it intra and postoperatively, using wall mo-

tion score index (WMSI) [19]. Rahimtoola claim that dysfunctional, ischemic myocardium may improve when perfusion is restored [20]. The improvement in WMSI can be explained by the revascularization procedure and suggests present viability, due to the existence of hibernating or stunned myocardium.

Conclusions

Coronary bypass surgery (CABG) is an effective method of myocardial revascularization in patients with severe lesion of coronary arteries and low ejection fraction. At the same time, noninva-

sive diagnostic methods have a high degree of reliability in determining the patency and functional condition of coronary shunts in patients with IHD. According to the MPS, there is a significant decrease in perfusion defect after CABG in patients with sufficient number of hibernated myocardium, which indicates the restoration of hibernated myocardium in early postoperative period. In the presence of a vital dysfunctional myocardium, these patients should undergo either, coronary artery bypass grafting (CABG), percutaneous coronary intervention (PCI).

Table 1.
Patient characterization

Indicator	Number and proportion of patients
Suffered from macrofocal MI with Q wave	30 (23 %)
Suffered microfocal MI without Q wave	112 (86,1 %)
Unstable angina	6 (4,6 %)
Angina pectoris: FC II - III	92 (70,7 %)
FC IV	2 (1,5 %)
Type II diabetes	30 (23 %)
Hypertonic disease	86 (66,1 %)
Postinfarct Aneurysm of LV	8 (6,15 %)
Ejection fraction (EF)	45,8±5,1 %
End Systolic Volume (ESV)	68,3±5,1 %
End-diastolic volume (EDV)	165,5±48,5 %

Table 2.
Surgeries performed on patients with IHD

Shunted coronary artery	LAD n (%)	RCA n (%)	LCX n (%)	DB n (%)	AI n(%)
The number of distal anastomoses	122 (94 %)	88 (68 %)	85 (66 %)	49 (38 %)	19 (15 %)

Table 3.
Comparative characteristics of indicators of Echocardiography

Indicator, unit	Before surgery (n=90)	After surgery (n=90)	P value
EDV, ml	165,5±48,8	135,1±25,9	P < 0,001
EF, %	45,8±5,1	49,5±5,7	P < 0,001

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Conflict of interest

The authors declare that they have no
 conflicts of interest

Keywords

neck injury, carotid artery
 dissection with thrombosis,
 reconstructive surgery,
 a mathematical model of defeat

GUNSHOT WOUND TO THE NECK WITH THROMBOSIS OF THE COMMON CAROTID ARTERY IN THE DELAYED PERIOD. (ANALYSIS OF CLINICAL OBSERVATION)

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Abstract

A case of non-penetrating neck injury with contusion and dissection of the common carotid artery with transition to the internal carotid artery is presented in a clinical observation. The clinical picture of the development of brain failure after thrombosis of the common and internal carotid arteries and regression of brain symptoms after reconstructive surgery is presented. A mathematical model of the lesion mechanism is analyzed separately. It is concluded that in case of a non-penetrating wound of the neck with a traumatic weapon, the revision of the underlying tissues should be mandatory.

**Алшақ кезеңдегі мойынға оқ тию жарақатымен қосарланған
 жалпы ұйқы артериясының тромбозы.
 (Клиникалық бақылауды талдау)**

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мойынның жарақаты, тромбозы
 бар ұйқы артерияларының
 стратификациясы,
 реконструктивті хирургия,
 зақымдалудың математикалық
 моделі

Аңдатпа

Клиникалық бақылауда ішкі ұйқы артериясына ауыса отырып, жалпы ұйқы артериясының контузиясы мен стратификациясы бар мойынның енбейтін жарақаты көрсетілген. Жалпы және ішкі ұйқы артерияларының тромбозынан кейін ми жеткіліксіздігінің дамуының клиникалық көрінісі және реконструктивті операциядан кейін ми симптомдарының регрессиясы ұсынылған. Зақымдану механизмінің математикалық моделі бөлек талданады. Мойын жарақатсыз жарақат алған кезде, тиісті тіндерді тексеру міндетті болуы керек деген қорытынды жасалды.

**Огнестрельное ранение в шею с тромбозом общей сонной артерии в отсроченном периоде.
(Разбор клинического наблюдения)**

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Авторы заявляют об отсутствии конфликта интересов

Аннотация

В клиническом наблюдении представлен случай не проникающего ранения шеи с контузией и расслоением общей сонной артерии с переходом на внутреннюю сонную артерию. Представлена клиническая картина развития мозговой недостаточности после тромбоза общей и внутренней сонных артерий и регресс мозговой симптоматики после реконструктивной операции. Отдельно проанализирована математическая модель механизма поражения. Сделан вывод, что при непроникающем ранении шеи травматическим оружием, ревизия подлежащих тканей должна быть обязательной.

Ключевые слова

ранение шеи, расслоение сонных артерий с тромбозом, реконструктивная операция, математическая модель поражения

Relevance

Various injuries with damage to soft and underlying tissues is an inalienable price for the development of scientific and technological progress.

The etiology of injuries is diverse and determined, as the way of life of various socio-economic segments of the population and is determined by many factors, ranging from interpersonal violence and terrorism and ending with accidents [1].

The neck, as an anatomical region, unites many organs and, first of all, vessels, nerves, trachea, esophagus. Most of these formations are quite difficult to access for research and surgical revision. This determines the special position of neck wounds in emergency surgical practice. Sometimes the urgency of the situation, the threat of the development of lethal complications does not leave time for a scrupulous examination of the victim.

The experience gathered by generations of civil and military surgeons has not turned the care of patients with vascular and neck injuries into a simple and clear procedure and, despite the progress of medical science, the results of their treatment need to be improved. The approach of different surgeons to the treatment of injuries of the major vessels of the neck differs significantly in many fundamental points. Some surgeons are supporters of the mandatory revision of the so-called penetrating neck wounds [2-13].

Others adhere to a more wait-and-see tactic, justifying it with a relatively high percentage of negative revision results [14, 15, 16, 17, 8, 10, 11, 12, 13]. There are few publications on this issue in Russia; the most complete is the monograph by A.I. Yunina [14].

In the most representative analysis of neck injuries conducted by D. Demetriades and M. Stewart [3], damage to the major vessels was present in 33.5% of the victims, the mortality rate was 11%, 4 (13.7%) had injuries of parenchymal organs of the neck (in 26 - the thyroid gland, in 18 - the salivary glands).

Analysis of 492 clinical observations allowed Abakumov M.M. et al [15] to reveal some regularities in the course of lesions in this localization. The authors divided all lesions into superficial and deep; however, surgical practice shows that even at first glance, superficial damage to soft tissues does not guarantee the safety of the underlying structures. In surgical practice, there are cases when a complication develops in a delayed period after the initial surgical treatment [16]. This is especially true for gunshot wounds.

Another side is the fact that damage to the carotid arteries, with their subsequent thrombosis, in essence, is a model of acute cerebrovascular accident of the ischemic type, and in this case, the dynamics of the development of neurological deficit with its subsequent regression is of great interest, and the identification of the mechanism of damage is forensic.

We present our own experience of observation and treatment of a patient with a gunshot wound to the neck.

Clinical observation. Patient: K. medical record number No.14895, born in 1984

Date and time of admission: 12.12.20 .. 1.55

Diagnosis at admission: Gunshot wound to the neck, left hand, right thigh.

The wound was made from a nonlethal pistol CCA (reference "Osa" is a barrelless pistol, a multi-functional complex of civilian weapons of non-lethal action, designed for active self-defense, signaling and illumination of the area. Today it is the most powerful non-lethal weapon available to citizens on the Russian market. Type of ammunition - 18 × 45T - beanbag round equipped with a rubber bullet with a metal core. Such a traumatic element at a distance of self-defense retains energy sufficient to suppress criminal attacks on the personality of the defender. The initial energy of the traumatic element is from 85 to 91 joules [17].

12.12.20 .. 3.20-3.50 PST of neck wounds. PST of wounds of the right thigh. PST of wounds of the left hand.

Osteosynthesis of the third metacarpal bone of the left hand.

13.12.20. 11.30 Examination by a neurosurgeon:
Neurological status: Consciousness at the level of moderate stun. Glasgow Coma Scale 13 points. Inhibited, partially disoriented in time. Meningeal symptoms: no. Pupils OD = OS. The photoreac-

tions of the pupils are vivid. The movement of the eyeballs in full. N.trigminis exit points are painless; the sensitivity on the face is preserved. Eye fissure D = S, the left nasolabial fold is smoothed. There is no spontaneous nystagmus, hearing is preserved. Swallowing and phonation are not disturbed, the soft palate is mobile during phonation, the pharyngeal and palatine reflexes are lively D = S. Full head and shoulder girdle movements. Tongue in the midline. Sensitive area: no pathology. Muscle tone is reduced in the left extremities. Muscle strength is reduced in the left extremities: in the arm - 2 points, in the leg - 4 points. Tendon reflexes from the upper and lower extremities are alive S>D. There are no pathological foot reflexes. The coordination sphere and higher cortical functions were not investigated due to the severity of the condition.

Lumbar puncture: a colorless, transparent liquid was obtained.

Echoencephalography: no displacement of the midline structures.

Diagnosis: ACVA on ischemic stroke in the right hemisphere. There are no data for head injury. 13.12.20.. 11.40 Ultrasonic doplerography of the neck vessels: CCA contusion with detachment of the intima and CCA thrombosis.

13.12.20.. 13.00-14.50 Clinical diagnosis: bullet wound of the neck, contusion of the CCA wall, dissection of the CCA wall. Thrombosis of the right CCA. ACVA in the right SMA.

Surgery: Prosthetics of the right CCA with a synthetic explant.

Surgery description: 13.12.20 ..16.00 Examination by a neurologist at Anaesthesiology & ICU.

Neurological status: At the time of examination, the phenomena of drug sedation persist. On artificial respiration.

Kernig's symptom on the right is 160°. A glance at an object does not fix. Pupils OD=OS, live photo-reactions. Corneal reflexes are lively, symmetrical. Eye fissure D=S. The left cheek is sailing. There is no spontaneous nystagmus. Tongue in the oral cavity along the midline. Reacts to painful stimuli by flexing the right upper limb. It is not possible to adequately investigate muscle tone due to drug sedation. Twitching of the muscles of the right extremities is periodically noted. The left lower limb is rotated outward. Motor sphere: muscle tone is reduced in the left extremities. Muscle strength is reduced in the left extremities: arm - 2 points, leg - 4 points. Reflex sphere: tendon reflexes from the upper and lower extremities are low, S>D. Babinsky's symptom is positive on 2 sides.

Diagnosis: Acute ischemic cerebrovascular accident in the right middle cerebral artery. Left hemiparesis. Thrombosis of the right CCA. Condi-

Figure 1.

Bullet removed
12.12.20. 13.05 Transferred to the department of surgery -1.
13.12.20. 9.40 General condition progressively worsens, cerebral symptoms began to increase: lethargy, adynamia; weakness in the left limbs.



tion after prosthetics of the right common carotid artery.

14.12.20.. 15.15 Examination by a neurologist (the next day after the surgery)

Neurological status: consciousness at the level of moderate stupor. Glasgow Coma Scale 13 points. Lethargic, adynamic. Understands the addressed speech. Follows simple instructions.

Moderately expressed cerebral symptoms. Kernig's symptom 150°.

Smelling is not impaired. The fields of view are roughly preserved. Pupils OD=OS, direct and friendly vivid photoreactions. The movement of the eyeballs in full. The n. trigeminus exit points are painless. Hypesthesia of the left half of the face. Corneal reflexes are lively, symmetrical. Eye fissure D=S, the left corner of the mouth is lowered. There is no spontaneous nystagmus, hearing is preserved. Swallowing and phonation are not disturbed, the soft palate is mobile during phonation, the pharyngeal and palatine reflexes are lively D=S. Full head and shoulder girdle movements. The tongue deviates to the left, there is no atrophy. Left hemiparesis. The tone in all the studied muscle groups of the left extremities is reduced. Decreased muscle strength in the left extremities: arm-plegia, leg-4 points. Tendon reflexes from the upper and lower extremities are alive, S>D. Babinsky's symptom on the left. The FNT is performed with the right hand with intention. Controls the functions of the pelvic organs. No higher cortical dysfunctions were found.

27.12.20.. The patient's condition is satisfactory. Transferred to the Department of Neurology for neurorehabilitation.

Neurological status: consciousness is clear. Glasgow Coma Scale 15 points. Contact, adequate, oriented in space, time and self.

There are no general cerebral symptoms. Kernig's symptom 160° on both sides.

Smelling is not impaired. The fields of view are roughly preserved. Pupils OD=OS, direct and friendly vivid photoreactions. The movement of the eyeballs in full. The n. trigeminus exit points are painless. Hypesthesia of the left half of the face. Corneal reflexes are lively, symmetrical. Eye fissure D=S, the left corner of the mouth is lowered. There is no spontaneous nystagmus, hearing is preserved. Swallowing and phonation are not disturbed, the soft palate is mobile during phonation, the pharyngeal and palatine reflexes are lively D=S. Full head and shoulder girdle movements. The tongue deviates to the left, there is no atrophy. Light hemihyperesthesia on the left. The tone in all the studied muscle groups of the left extremities is reduced. Decrease in muscle strength in the left extremities: in the hand proximally - 2 points, distally - 0 points, in the leg - 3 points. Tendon reflexes from the up-

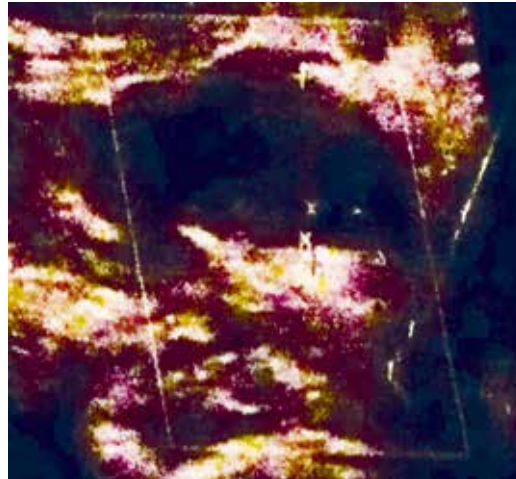


Figure 2.
Sonogram of the damaged vessel



Figure 3.
View of the resected common carotid artery (CCA)



Figure 4.
Dissection of the posterior wall of the CCA with a break in the bifurcation and thrombosis

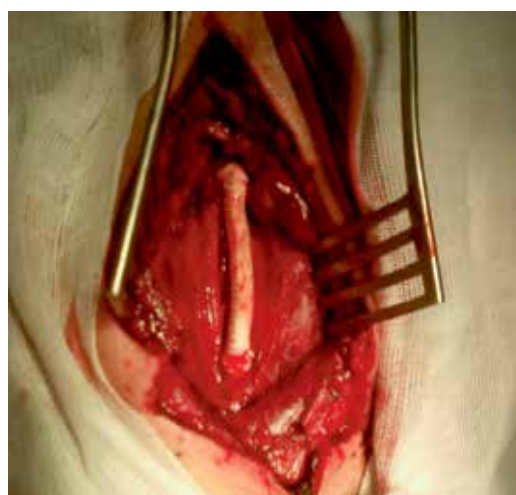


Figure 5.
Prosthetics of CCA with a synthetic explant

per and lower extremities are alive, S>D. Babinsky's symptom on the left. FNT with the right hand is satisfactory. Controls the functions of the pelvic organs. No higher cortical dysfunctions were found.

Treatment: antioxidants, antihypoxants, neuro-protectors, neurometabolites, anticoagulants, vase active drugs, antispasmodics, exercise therapy, massage.

N/B: restorative measures: exercise therapy and massage of the left upper limb are limited, due to the presence of a fracture of the third metacarpal bone in the patient.

30.12.20 .. The patient was discharged at his own request to continue treatment at the place of residence.

Discharge condition: overall status. The overall condition is satisfactory. Consciousness is clear, Glasgow Coma Scale = 15 points. Active position. The skin is pale pink, moderate moisture, clean. Healing of postoperative wounds without complications. In the lungs, vesicular breathing, no wheezing. Breathing is rhythmic. Respiration rate 16 per min. Heart sounds are clear. The rhythm of the heartbeats is correct. Heart rate 70 beats. in min. Blood pressure on the left arm is 120 and 80 mm Hg. The abdomen is not enlarged. The muscles of the anterior abdominal wall are actively involved in the act of breathing. On palpation, the abdomen is soft, painless. Symptoms of peritoneal irritation are negative. The liver is not enlarged. Symptom Pasternatsky neg. at both sides. Bowel and bladder habits are normal.

Neurological status: there are no general cerebral and meningeal symptoms.

Smelling is not impaired. The fields of view are roughly preserved. Pupils OD=OS, direct and friendly vivid photoreactions. The movement of the eyeballs in full. The n.trigtmis exit points are painless. Sensitivity disorders on the face are not noted. Corneal reflexes are lively, symmetrical. Eye fissure D=S, the left nasolabial fold is smoothed. There is no spontaneous nystagmus, hearing is preserved. Swallowing and phonation are not disturbed, the soft palate is mobile during phonation, the pharyngeal and palatine reflexes are lively D=S. Full head and shoulder girdle movements. Midline tongue, no dysarthria.

Light hemidysesthesia on the left.

The tone in all the studied muscle groups was not changed. Decrease in muscle strength in the left extremities: in the hand proximally - 3 points, distally - 1 point, in the leg - 4.5 points. He walks within the department without the help of another person. Manner of walking is not changed.

Tendon reflexes from the upper and lower extremities are alive, S>D. Upper symptom Rassolimo on the left. Babinsky's symptom on the left.

Coordination is not broken.

Controls the functions of the pelvic organs.

No higher cortical dysfunctions were found.

Discharge diagnosis:

Primary: Gunshot wound to the neck. Contusion injury of the right common carotid artery with the development of thrombosis. Condition after prosthetics of the common carotid artery with a synthetic explant.

Complications of the primary: Brain infarction in the right middle cerebral artery dated 13.12.20 ... Rough hemiparesis on the left.

Secondary: A gunshot wound to the left hand with a fracture of the third metacarpal bone. Osteosynthesis of the third metacarpal bone.

A gunshot wound to the right thigh.

We distinguish between superficial wounds (before platysma) and deep (when the wound channel "penetrates" through the platysma into a more dangerous zone). Naturally, deep neck wounds can penetrate into the oral cavity, pleural cavity, pharynx, esophagus, larynx and trachea, and then they can be classified as penetrating [15].

Obviously, this issue does not have an analytical solution, but the methods of numerical analysis have shown their great efficiency in solving such problems [18, 19]. At SSU named after Chernyshevsky, a mathematical model of the probable damage mechanism was built.

A rubber bullet with a metal core was simulated, the human neck was composed only of muscles (the water content in the skin was about 75%, in the muscles about 80%, in the subcutaneous adipose tissue about 95%). It can be seen that the bullet is slightly deformed, and a cavity is formed in the neck. The calculation time is 1 millisecond.

Extrapolating the results of an intraoperative finding and numerical analysis (modeling) to the anatomy of the neck (the location of the triangles of the neck, muscles, fascia and vascular bundle), the sequence of events is as follows - the bullet passed through the skin and underlying tissues, but did not significantly damage the deep fascia. The damage to the carotid artery was mediated by surging shock, and, therefore, such injuries will always lead to damage to the underlying tissues.

Conclusion

In our observation, we met with dissection of the CCA with subsequent thrombosis and the development of ischemic cerebrovascular accident. Dissection can be spontaneous, traumatic, or iatrogenic [20].

Despite the fact that the case of traumatic dissection of the carotid artery was described for the first time back in 1872 [21], even at the moment the

true incidence of the disease is unknown, since the dissection can be asymptomatic, often has a nonspecific character, and the phenomena of cerebrovascular insufficiency are sometimes arrested independently and invisible to patients [20].

Until now, there is no unequivocal opinion regarding the mechanism of development of neurological deficit in this disease. In 1991, Weiler C. et al. summarized the experience of 11 patients with dissection and stroke. Six of them had acute cerebrovascular accident (ACVA) occurred as a result of embolism in an intracranial artery, while the remaining five - as a result of a decrease in perfusion pressure in the corresponding area of the brain caused by a sharp compression of the true lumen of the artery [22]. Based on this, the authors concluded that only half of the patients develop stroke because of cerebral artery embolism, while in the other half, dissection leads to a decrease in blood flow in the distal intracranial cerebral arteries. Five years later, Steinke et al. examined 67 patients with dissection of the carotid arteries [23]. Among them, cerebral infarction was detected in 37 (55%) patients out of 67 examined, the cause of which, from the point of view of the authors, was an embolism intracranial by thrombotic masses from the site of ICA dissection, which was confirmed by the results of autopsy of patients who died from stroke: branches of the middle cerebral arteries (MCA) on the affected side were thrombosed. The hemodynamic mechanism of the development of ischemic brain damage was identified only in 16% of cases. Christian Lucas et al. obtained similar results: only 7.7% of patients with dissection had a hemodynamic mechanism, while 92.2% had an embologic stroke [24]. Ben-

ninger D.H. also speaks in favor of the leading role of thromboembolism in the development of cerebrovascular accidents. et al. [25].

Since the 19th century, analysis of the clinical course of neck injuries has revealed certain patterns [30-34]. In our clinical observation, we tried to show that even a non-penetrating injury to the neck can lead to damage to the carotid arteries.

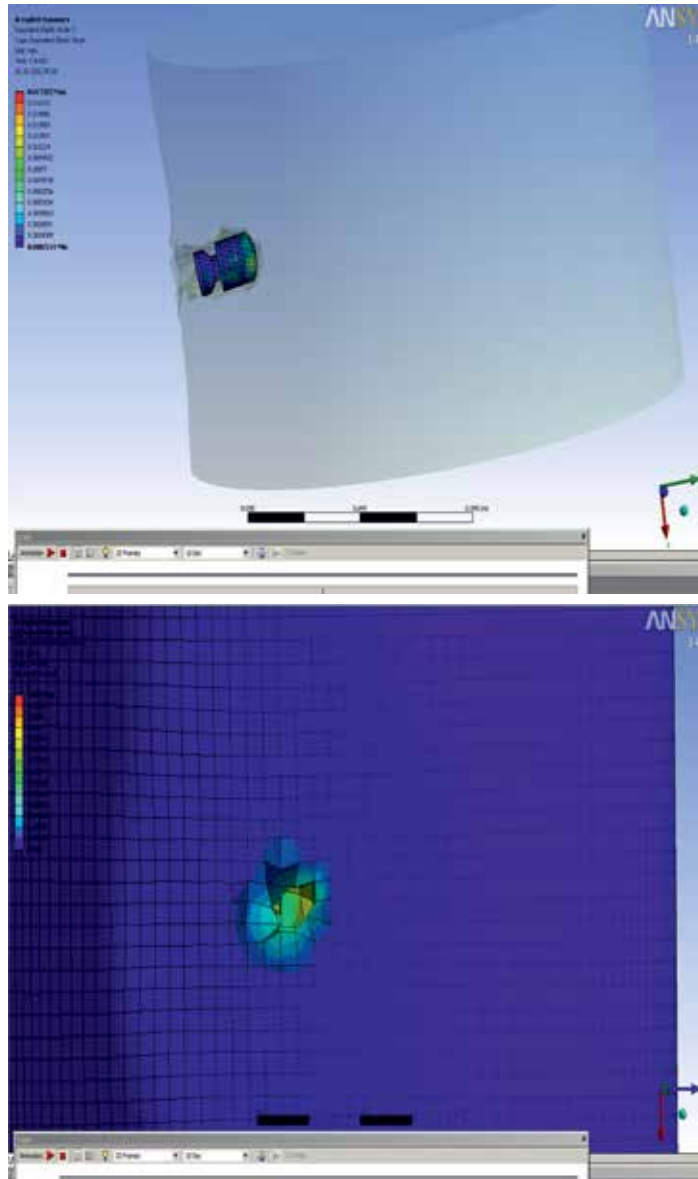


Figure 6.
Description is provided in the text

	Schievink et al. [26]	Lucas et al. [27]	Mokri et al. [28]	Vilela et al. [29]
Headache	72%	14%	11%	38%
Cerebrovascular disease (OCVA + TIA)	63%	65%	72%	82%
Incomplete Horner's syndrome + cranial nerve paresis	37%	8%	22%	14%
Neck pain	No ind.	9%	5%	No ind.

Table 1.
Clinical manifestations by age

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DAMAGE TO THE BILE DUCTS AFTER LAPAROSCOPIC CHOLECYSTECTOMY. REVIEW

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Conflict of interest
The authors declare that they have no
conflicts of interest

Abstract

This article provides a review of the literature on bile duct injuries after laparoscopic cholecystectomy. Laparoscopy is considered the gold standard in the treatment of gallstone disease. This technique has a number of positive advantages: minimally invasiveness, quick rehabilitation, a shorter hospital stay, a good cosmetic effect, and a low lethal outcome. Along with these advantages, the number of complications also increased: damage to the bile ducts, hepatic vessels, bile leakage, formation of strictures, defects in drainage of the biliary tract and improper treatment of the cystic duct, insufficient drainage of the abdominal cavity.

Today, many aspects of surgical treatment and prevention of bile duct injuries remain controversial and are still considered relevant. The main reasons for this complication are: lack of experience of the surgeon, inattention, ignorance of the main options and possible anomalies of important anatomical structures in the area of the hepatic hilum and hepato-duodenal ligament, technical errors.

Keywords

iatrogenic trauma to the bile ducts,
damage to the bile ducts, laparoscopic cholecystectomy

Өт жолдарының лапароскопиялық холицистэктомиядан кейінгі зақымдалуы.
Әдебиет шолуы

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Аңдатпа

Осы мақалада өт жолдарының лапароскопиялық холицистэктомиядан кейінгі зақымдалуы туралы әдебиетке шолу ұсынылған. Лапароскопия өт жолдарында тас байланатын ауру түрлерін емдеудегі ең негізгі стандарт болып табылады. Бұл әдістің бірқатар артықшылықтары бар: инвазивтіліктің аз мөлшерде болуы, тез қалпына келуі, ауруханада аз ғана уақыт жату, косметикалық әсері жақсы, өлім жағдайының өте аз кездесуі. Осы артықшылықтармен қатар асқынулардың саны да өсті: өт жолдарының, бауыр тамырларының зақымдануы, өт жұмысының нашарлауы, өт жолдарының тарылуы, өт жолдарын айдаудағы ақаулар және өт қабы айналымын дұрыс өңдемеу, іш қуысын жеткіліксіз түрде айдап шығару.

Бүгінгі таңда хирургиялық емдеудің көптеген аспектілері және өт жолдары жарақаттарының алдын алу бүгінгі таңға дейін даулы мәселе болып келеді. Осы асқынулардың негізгі себептері: хирургтың тәжірибесінің жеткіліксіз болуы, ұқыпсыздық, бауыр қақпалары мен бауыр-дуоденальды байлам аймағындағы маңызды анатомиялық түзілімдердің негізгі нұсқалары мен мүмкін болатын ауытқуларын білмеу, техникалық қателіктер.

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Повреждение желчных протоков после лапароскопической холицистэктомии. Обзор литературы

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Аннотация

В данной статье представлен обзор литературы о повреждениях желчных протоков после лапароскопической холицистэктомии. Лапараскопия считается золотым стандартом при лечении желчнокаменной болезни. Данная методика имеет ряд положительных преимуществ: малоинвазивность, быстрая реабилитация, более короткий срок пребывания в стационаре, хороший косметический эффект, низкий летальный исход. Вместе с данными преимуществами возросло и число осложнений: повреждение желчных протоков, печеночных сосудов, желчеистечение, образование стриктур, дефекты дренирования желчных путей и неправильная обработка пузырного протока, недостаточное дренирование брюшной полости.

На сегодняшний день многие аспекты хирургического лечения и профилактика травм желчных протоков остаются спорными и по сей день считается актуальным. Основные причины данного осложнения: отсутствие опыта хирурга, невнимательность, незнание основных вариантов и возможных аномалий важных анатомических образований в зоне ворот печени и печеночно-дуоденальной связки, технические ошибки.

Ключевые слова

ятрогенная травма
желчевыводящих протоков,
повреждение желчевыводящих
протоков, лапароскопическая
холицистэктомия

The urgency of the problem

Gallstones constitute a significant health problem in developed societies, affecting 10% to 15% of the adult population [1]. With an increase in the incidence of cholelithiasis, the number of surgical interventions on the gallbladder and bile ducts is increasing everywhere. The frequency of damage to the bile ducts during open cholecystectomy remains stable and amounts to 0.05-0.2% [2]. The widespread use of laparoscopic interventions contributed to an increase in iatrogenic injuries by 2-10 times to the level of 0.08-2.7 (Table 1) [3]. Also, the results of surgical treatment of injuries of the bile ducts indicate a high frequency of complications (48.7%), mortality (13-25%) and unsatisfactory long-term results (20-30%) [4]. Scarring of anastomoses reaches 8.4-28.3% [5]. Iatrogenic injury of the biliary tract have increased in incidence in the first decade with the introduction of laparoscopic cholecystectomy. Although a number of factors have been identified with a high risk of injury (and number of technical steps have been emphasized to avoid these injury, the incidence of the bile duct injury has reached at least double the rate observed with open cholecystectomy [6]. The aim of this work is to identify and assess the significance and degree of iatrogenic and biliary complications during laparoscopic cholecystectomy on the basis of the literature data, as well as to pay attention to the factors that increase the likelihood of complications and techniques to avoid these complications.

Material and methods

The article was analyzed from 2015 to 2020 in electronic databases (Cochrane, PubMed) of evidence-based medicine. 138 articles were found. The analysis of the condition of 815 patients (age from 21-70) was carried out. The average age is 46.32 ± 4.64 years. The disease was detected more often in women than in men [7]. According to autopsy data, the detection of stones in the gallbladder is 20-25% [8, 9].

Risk factors for bile duct injury after laparoscopic cholecystectomy

In the works of authors Fedorov, R. Martin and R. Rossi have identified several groups of risk factors for complications during LCE as dangerous anatomy (various structures of the extrahepatic bile ducts, arteries and the presence of pronounced fatty tissue in the gates of the liver and hepato-duodenal ligament), dangerous pathological findings (acute cholecystitis, stone in Hartmann's pocket, short cystic duct, thickened walls of the gallbladder, dilated common bile duct, chronic scars of the gallbladder, bleeding into Calot triangles, adhesions in the abdominal cavity), dangerous surgery (mobilization of the gallbladder body from the liver, maximum mobilization Kahlo's triangle closer to the wall of the gallbladder, intraoperative cholangiography or laproscopic ultrasound, mobilization of the gallbladder from the bottom, performing subtotal cholecystectomy with pronounced cicatricial process and if it is not possible to mobilize it, conversion) [23,24].

Authors, educational institutions, departments	The Title of an article	Research year	Number of patients	Incidence rate
Institute of Gastroenterology of the Academy of Medical Sciences of Ukraine, Dnipetrovsk National University [10].	Iatrogenic complications of laparoscopic cholecystectomy	1993-2003	3864-LCh 46- IBDD	1,19%
Khalidov O.Kh., Gudkov A.N., Dzhaddzhiev A.B., Kartsev A.G., Fomin V.S., Dmitrienko G.P. [7].	Extrahepatic bile duct injury during laparoscopic cholecystectomy	2007-2017	1787- LCh 8- IBDD	0,45%
Filistovich V., Turchina S., Maslennikov S., Filistovich A. [11].	Severe damage to the external bile ducts in laparoscopic cholecystectomy	2004-2008	21- IBDD	
Kubachev K.G., Fokin A.M. [12].	Iatrogenic damage to the extrahepatic bile ducts in laparoscopic cholecystectomy	2001-2016	113- IBDD	39,8%
N. A. Maistrenko, P. N. Romashchenko, A. S. Pryadko, A. K. Aliev [4].	Substantiation of surgical tactics for iatrogenic injuries of the bile ducts	1988-2005	254- IBDD	
Takeyuki Misawa, Ryota Saito, Hiroaki Shiba, Kyonsu Son, Yasuro Futagawa, Takuya Nojiri, Kumiko Kitajima, Tadashi Uwagawa, Yuichi Ishida, Yuji Ishii and Katsuhiko Yanaga [13].	Analysis of bile duct injuries (Stewart-Way classification) during laparoscopic cholecystectomy	1990-2005	5750- LCh 34- IBDD	0,59%
Andrea Frilling, Jun Li, Frank Weber, Nils Roman Fruhauf, Jennifer Engel, Susanne Beckebaum, Andreas Paul, Thomas ZoÉpf, Massimo Malago, Christoph Erich Broelsch [14].	Major Bile Duct Injuries After Laparoscopic Cholecystectomy: A Tertiary Center Experience	1998-2003	40- IBDD	
J. Li, A. Frilling, S. Nadalin, A. Paul, M. Malago and C. E. Broelsch [15].	Management of concomitant hepatic artery injury in patients with iatrogenic major bile duct injury after laparoscopic cholecystectomy	1998-2005	40-IBDD	17 %
S. C. Schmidt J. M. Langrehr U. Settmacher P. Neuhaus [16].	Chirurgische therapie von gallengangverletzungen nach laparoskopischer cholezystektomie . welchen einfluss auf den langzeitverlauf hat die gleichzeitige verletzung der arteria hepatica dextra ?	1990-2002	54- BDD	
A Paczyński , T Koziarski, E Stanowski, J Krupa [17].	Damage to extrahepatic bile ducts during laparoscopic cholecystectomy--own experience	1991-2000	6873- LCh 9- IBDD	
Mohammad Ibrahim Khalil, Haridas Saha, Azmal Kader Chowdhury, Imarat Hossain [18].	Bile duct injuries following laparoscopic cholecystectomy	2013-2015	336- LCh 2- BDD	0,6%
V.F. Kulikovskiy, A.L. Yarosh, A. Karpachev, Coman A.V. Soloshenko, S.B. Nikolaev, E.P. Bitenskaya, N.A. Linkov [19].	Bile leakage after cholecystectomy. Experience with minimally invasive treatment methods	2010-2016	5038- LCh 31- BDD	0,6%

Table 1.
Literature data

G E Chinnery , JEJ Krige , PC Bornman , M M Bernon , S Al - Harethi , S Hofmeyr , M A Banderker , S Burmeister , S R Thomson [20].	Endoscopic management of bile leaks after laparoscopic cholecystectomy	1991-2011	113- BDD	
J.M. Kurbanov [21].	Experience in surgical treatment of complications of laparoscopic colicystectomy	2003-2012	421- LCh 3- BDD	0,7%
Sitnikov V.A., Styazhkina S.N., Ibragimova D.R., Kasimova [22]	Iatrogeny as a cause of postcholecystectomy syndrome	1978-2018	87-BDD	

*LCh** - laparoscopic cholecystectomy

*IBDD** - iatrogenic bile duct damage

*BDD** - bile duct damage

The technical reasons contributing to iatrogenic injuries during cholecystectomy include: Features of the anatomy of the extrahepatic biliary tract; factors complicating the performance of cholecystectomy; violation of the technique of performing operations on the biliary tract. In the anatomy of the biliary tract, there is a wide variety of anatomical options. A practical surgeon is obliged to remember these options, to be able to understand them in a timely manner during the operation and to avoid possible complications. On average, in every fifth to sixth operated patient, the surgeon may encounter difficulties in identifying the place of fusion of the cystic and hepatic ducts (VN Chernyshev, 2001). And this is one of the reasons for the high frequency of iatrogenic injuries of the bile ducts. [22]

Also the risk factors for damage to the biliary tract include old age (increases the risk of damage by 2.5 times), female sex (increases the risk by 26%), late hospitalization of patients [22].

The Laparoscopic damage to the bile ducts has rather large consequences. In recent years, the introduction of new technologies has again made the issue of compliance with the principles of safe surgery and prevention of complications urgent.

Prevention of bile duct injury during and after laparoscopic cholecystectomy

The prevention of damage to the bile ducts is a complex of measures (techniques, diagnostic methods) carried out directly during the performance of laparoscopic cholecystectomy and aimed at preventing damage to the bile ducts. It is based on strict adherence to the principles of a safe technique for performing endoscopic interventions, the correct sequence of the stages of laparoscopic cholecystectomy, taking into account the peculiarities of anatomy and pathological changes, and an understanding of the mechanisms of complications [25].

The risk of complications dictates the need for a complex of preventive measures to prevent complications and optimize intraoperative processes. Safe laparoscopic cholecystectomy involves understanding anatomic landmarks, these include: Calot's triangle, Callo's lymph node, Rouvier's groove, umbilical fissure with the round ligament lying in it, the fourth segment of the liver, pericholedochial venous plexuses [26].

The main requirement when performing laparoscopic cholecystectomy is a thorough preparation of tissues in the area of the Calot triangle and the lower third of the gallbladder bed, as well as conversion or "change of hand" after "idle time" when manipulating the gallbladder neck for more than 30-40 minutes. An important factor in the analysis of the technique and interpretation of the intraoperative situation is the video recording of the entire operation with the subsequent discord of errors and possible shortcomings. If the listed requirements are met, the risk of postoperative complications will be minimized [7].

Intraoperative ultrasound is a screening method for laparoscopic operations, playing the role of the surgeon's "hand", and allows to reduce the number of intraoperative complications. The use of IOUS is advisable in cases of an unclear topographic picture, with various anatomical variants of the bile ducts and great vessels. The high resolution of IOUS in determining structures both in hepaticoholedochus and outside it proves the effectiveness of this diagnostic method, and speaks of the advisability of using echography during laparoscopic and traditional operations [27].

Fluorescence cholangiography significantly reduces the time to reach the "safety critical" in LCE and avoids damage to the bile ducts compared to standard laparoscopy. PC can be successfully used to assess the patency of the IVS in certain situations (suspicion of transient choledocholithiasis, signs of parenchymal jaundice in combination with cholelithiasis, for example, jaundice in liver cirrhosis or chronic hepatitis) [28].

The classification of bile duct injury after laparoscopic cholecystectomy

Currently, there are many classifications of damage to the bile ducts. Abroad, the Bismuth classification (Fig. 1) is especially popular, which classifies damage to the extrahepatic ducts according to the level of their damage [26].

However, most of the developed classifications do not determine the choice of surgery, which significantly reduces their value for a practical surgeon. The classification developed by E.I. Halperin, according to the type of damage, according to the author himself, makes it possible to fill this gap [26].

In 1986 E.I. Galperin et al. Proposed a classification for determining the type of damage and narrowing of the bile ducts, which is very close to the classifications of N. Bismuth and S. Strasberg. V.N. Chernyshev and V.E. Romanov (2001) combined the classification of N. Bismuth and S. Strasberg into a single one (Fig. 1), which they used in their studies [29].

Type I - stricture of hepaticoholedochus with the presence of its unaffected area below the confluence of the hepatic ducts more than 2 cm long;

Type II - stricture of hepaticoholedochus with a free area of the common hepatic duct less than 2 cm long;

Type III - complete cicatricial damage to the common hepatic duct with a free zone of confluence of the lobar hepatic ducts;

V type - complete cicatricial obliteration of the common hepatic duct with the transition to the lobar hepatic ducts;

Type V - high or low cicatricial stricture of the hepatic choleculu with atypical anatomy of the biliary tract.

In 2002 E.I. Galperin published a refined classification of postoperative cicatricial strictures of the hepatic ducts.

The Stewart-Way classification included both complex lesions of the biliary tract and vascular lesions. Based on the Stewart-Way classification (Fig. 2), bile duct trauma is divided into four classes:

Class I injuries occur when the common hepatic duct is mistaken for the cystic duct, but the error is recognized before the common hepatic duct is divided.

Class II injuries involve damage to the common hepatic duct due to clamps or cauterization used too close to the duct. This often happens when vision is limited due to inflammation or bleeding.

Class III injury, the most common type, occurs when the common bile duct is mistaken for the cystic duct. The common duct is transected and the variable portion, including the junction of the cystic and common ducts, is excised or removed.

Class IV injuries involve damage to the right hepatic duct, either because this structure is mistaken for the cystic duct or because it is damaged during dissection [13].

The intraoperative signs of damage to the bile ducts can be: the appearance of bile in the operating field, with an unclear source of bile leakage, the appearance of additional tubular structures in the area of the Calot triangle, expansion of the alleged cystic duct stump during the operation. Any suspicion of injury requires intraoperative cholangiography or conversion. Each removed (gallbladder) should be carefully examined for additional tubular structures before surgery is completed [30].

Bile leakage can sometimes be associated with unrepaired biliary hypertension caused by choledocholithiasis, stenosis of the large duodenal papilla.

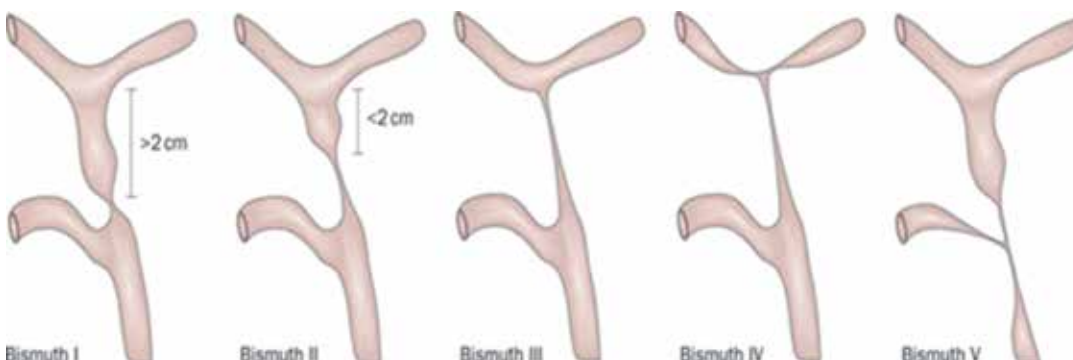
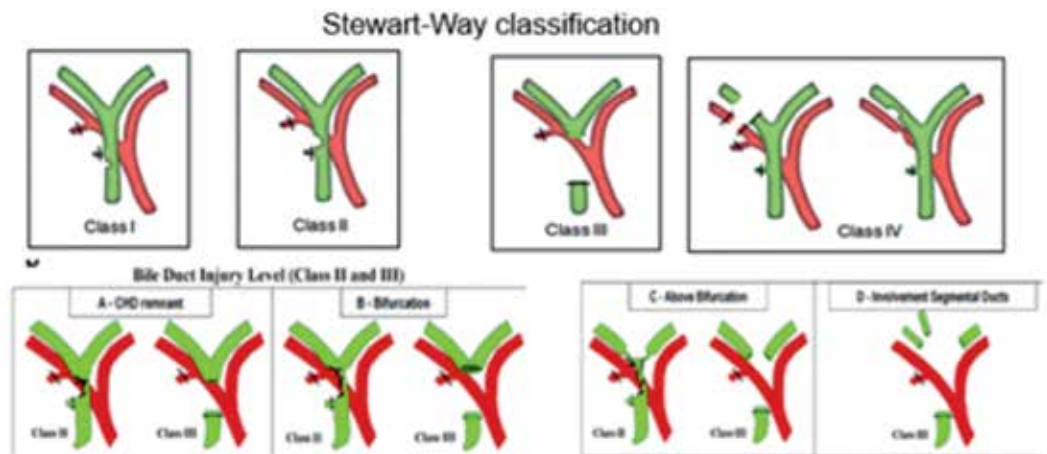


Figure 1.
Anatomical types or classification

Type	Characteristic of strictures
+2	Medium and low - common hepatic duct (AKI) more than 2 cm
+1	High - TPI is 1 - 2 cm
0	Bifurcation - OPP is 0-1 cm
-1	Transbifurcation - the connection of the lobar hepatic ducts (PP) is preserved
-2	Ductal - lobe PP are disjointed
-3	Segmental - lobar RA (more often right) cicatricial changes, preserved segmental RA

Table 2.
Classification of postoperative cicatricial strictures of the bile ducts (E.I. Galperin, 2002)

Figure 2.
Diagnosis of injuries of the bile ducts after laparoscopic cholecystectomy during surgery



Less than 50% of duct injuries are detected intraoperatively, usually due to bile leakage [31].

Intraoperative recognition usually requires immediate surgical intervention as this gives the best results; however, during surgery, <25–30% of bile duct lesions are recognized, and not all surgeons perform intraoperative cholangiography. If the surgeon is inexperienced, an intra-abdominal drain should be placed and the patient immediately transferred to a large hepatobiliary center [32].

Intraoperative ultrasonography (IUS) visualizes the transverse and the longitudinal planes of not only the biliary structures, but also the portal vein, as well as the hepatic arteries by introducing a linear ultrasound probe [33].

If in open cholecystectomy the main mechanisms of trauma are transection, excision and ligation, then in laparoscopic cholecystectomy clipping and diathermic necrosis of the bile duct wall are added to them [34,35]. Currently, monopolar electrocoagulation remains the main type of dissection in laparoscopic cholecystectomy [36].

Surgical tactics for detecting damage to the bile duct during surgery

In case of intraoperative detection of damage to the bile ducts, it is necessary to immediately perform corrective surgery or, if reconstructive surgery is impossible, external drainage is performed [24].

As a rule, with small marginal lesions, plastic closure of the duct at the site of injury with interrupted sutures with absorbable atraumatic sutures (vicryl, polysorb 4-0) is sufficient in combination with external drainage of the bile ducts through the cystic duct stump or, most often, using a T-shaped drainage. In the case of a dislocation of the clip and the failure of the cystic duct stump in the absence of hypertension in the biliary system and obstructions to the main bile outflow, sanitation of the abdominal cavity and reclipping can be performed with relaparoscopy. With complete confidence in

parietal or complete clipping of the bile duct without violating the integrity of its wall, relaparoscopy with the removal of the clip and external drainage of the biliary tract through the cystic duct cult is also advisable [25].

If a traumatic injury to the bile ducts is detected (during the transection or excision of a segment), 3 options for subsequent actions are possible: external drainage of the biliary system, performing a restorative (biliary-biliary anastomosis end-to-end, prosthetics of the defect) or reconstructive surgery (biliodiagnostic anastomosis). Surgeons with little experience, in our opinion, should confine themselves to external drainage of the biliary tract, and drain or bandage the distal common bile duct to avoid leakage of pancreatic juice into the abdominal cavity. Subsequently, the patient should be transferred to a specialized department to perform reconstructive surgery [31].

In case of damage to the bile ducts, in many cases, the operation of choice is the imposition of a biliodiagnostic anastomosis according to Roux, hepaticojejunostomy with transhepatic frame drainage according to Pradery-Smith or Goetze-Saypol-Kurian, and hepaticojejunostomy according to Nerr-Couinaud. The frequency of good and satisfactory results in the treatment of patients with biliary tract injury when using biliodigestive anastomoses ranges from 46 to 94%. Restoration of the common bile duct on a T-shaped drainage of the “end-to-end” type in 50-60% of cases leads to unsatisfactory results [37].

For restoration or reconstruction of damaged bile ducts, the optimal period should be considered 3-5 days, surgical reconstruction in the volume of the Roux loop is accompanied by success in more than 90% of observations within the next 5 years after surgery [38].

With an average level of damage, the incision is extended in the direction of the left lobar duct. In cases of high lesions for access to the left lobar

Injury (1)	Localization (L)	Experience surgeon	Recommended operation
Intersection, Excision	Intra- and extrahepatic	XC (SS)	Reconstructive
	Extrahepatic	X(S)	Drainage of the main bile ducts as the first stage of the operation *
Partial (edge) thermal, clipping	Intrahepatic	X (S)	Reconstructive, usually on a frame drainage
		XC (SS)	Reconstructive, usually on a frame drainage
		X (S)	Drainage connection to the damage site *

Table 3. Classification of “fresh” injuries of the main bile ducts (PLC-ILS), which determines the choice of surgery (E.I. Galperin, A.Yu. Chevokin, 2010)

duct, it is necessary to bring down and dissect the portal plate according to the Hepp-Couinaud technique [25].

In the surgical treatment of high lesions of hepaticoholedochus (from “0” to “-3”) with the involvement of confluence, planar resection of the parenchyma of the hepatic hilum is performed, the unification of the lobar ducts into one trunk, followed by the formation of a bihepaticojejunostomy [12].

Based on the analysis of the experience of surgical treatment of patients with iatrogenic injuries of the biliary tract, it was shown that hepaticojejunostomy was resorted to with high injuries and strictures of the bile ducts and the length of the duct stump at least 30 mm, with high injuries and the residual length of the extrahepatic bile ducts less than 10 mm used hepaticojejunostomy with transhepatic frame drainage according to Pradery-Smith or Goetze-Saupol-Kurian, which allowed the authors to achieve positive results in more than 80% of cases [39].

In case of biliary tract injuries of type IY according to Bismuth, it is possible to use two variants of the operation: the first is the formation of anastomosis separately with each of the lobar ducts, the second is a single anastomosis with a fork formed by stitching the adjacent walls of the lobar ducts according to the method of Shalimov A [25].

In 2009 E.I. Galperin and A. Yu. Chevokin proposed the classification of ILS “fresh” lesions. In 2010, it was supplemented with the heading “Surgeon’s Experience” - the classification of PLC – ILS [29].

Diagnosis of damage to the bile ducts in the postoperative period and surgical tactics

Postoperative diagnosis is based on the clinical picture (manifested in the form of three possible options: bile outflow syndromes, obstruction syndromes or a combination of obstruction and bile outflow), laboratory test results (serum bilirubin level, transaminases, shift of the leukocyte formula to the left, etc.). non-invasive (ultrasound, CT, cholespintigraphy, fistulography through a safety drainage or drainage of the common bile duct) and invasive (retrograde cholecystopancreatography;

percutaneous transhepatic cholangiohepatography and laparoscopy) instrumental methods [31].

Symptoms will be nonspecific and may include fever, pain, and mild hyperbilirubinemia (2.5 mg / dL) due to biloma or biliary peritonitis. Bile leakage may be suspected if bile is produced by percutaneous abdominal drainage or abdominal drainage from cholecystectomy. In the case of injuries associated with occlusion of the common bile duct without intraperitoneal bile flow, the main symptoms will be jaundice with or without abdominal pain [40].

In severe early postoperative cases, patients present with sepsis due to cholangitis or fluid accumulation in the abdomen. If a bile leak is suspected, ultrasound and / or computed tomography of the abdomen will reveal peritoneal fluid, biloma, or abscess. In case of accumulation of perihepatic fluid, drainage can be applied percutaneously. Generally, broad-spectrum parenteral antibiotics are given against common biliary tract pathogens. When percutaneous drainage is applied and ongoing biliary drainage is observed, active bile flow is confirmed [40].

Damage to the bile ducts after laparoscopic cholecystectomy is recognized by the release of bile into the abdominal cavity, which causes peritonitis and creates a favorable environment for bacterial reproduction [26]

Bile leakage, jaundice, biliary peritonitis are the diagnostic triad of damage to the extrahepatic ducts in the postoperative period. Surgical tactics in this case are built after a complete diagnosis of the anatomic structure of the bile ducts, the level and nature of the damage [26].

Radiological examination determines the damage to the bile ducts and its severity, its length and severity, for planning therapeutic treatment. Abdominal ultrasound is the first diagnostic tool to detect any liver congestion, common bile duct dilatation, and any associated vascular lesions [41].

Computed tomography of the abdomen is the primary test that detects the possible presence of focal intra- or focal lesions, accumulation of perihepatic fluid, ascites, obstruction of the biliary tract with upstream dilation, or long-term consequences of prolonged bile stricture such as croupous atrophy of the liver or signs of secondary biliary cirrho-

sis. Computed tomography can also identify any associated vascular lesion, such as the right hepatic artery [42].

Magnetic resonance cholangiopancreatography (MRCP) is the gold standard for the complete morphological assessment of the biliary tract because it offers detailed information about the integrity of the biliary tract [43]. Magnetic resonance cholangiopancreatography can also be performed with a contrast medium (a gadolinium-based contrast medium, gadoxetic acid and its salt, gadoxetate disodium), and it is much more informative in bile leakage than conventional magnetic resonance cholangiopancreatography [44]. The use of contrast media during magnetic resonance cholangiopancreatography allows active bile leakage to be detected by direct contrast imaging, extravasation of material in the fluid collection in addition to demonstrating the anatomical location of the leak and the type of bile duct injury. In the same way, hepatobiliary scintigraphy can confirm the presence of an active bile duct with progressive accumulation of the radioactive tracer within the abdominal cavity, but this test is much less reliable [45].

If bile leakage occurs in the postoperative period, the tactics of treatment depend on the adequacy of the outflow of bile from the abdominal cavity and the cause of complications. If earlier, with bile leakage, many surgeons performed relaparotomy, in recent years, laparoscopic interventions have been performed, during which the source of bile leakage is eliminated (clipping of the bile ducts in the bed of the bladder or the cystic duct stump) or is limited to sanitation of the abdominal cavity and its additional drainage [31].

Reconstructive surgery of damaged bile ducts is performed no earlier than 2 months later. It is more difficult and more difficult to perform biliodigestive anastomosis in patients with complete external biliary fistulas, especially with high confluence and resolution [46].

Damage to the aberrant gallbladder is one of the rarest type of iatrogenism in laparoscopic cholecystectomy, manifested by bile leakage of varying intensity. In most cases, these complications regress on their own, which is associated with the small diameter of the aberrant duct, which is quickly obliterated. Reoperations (suturing the stump of the duct or its restoration on a T-shaped drainage) are required only in cases of a long-term functioning bile fistula or the development of complications against the background of bile leakage [46].

Performing retrograde transpapillary stenting contributes to effective cessation of bile leakage and refusal to perform repeated surgical interven-

tions in case of failure of the cystic duct stump, in case of bile outflow from the gallbladder bed, as well as in case of marginal damage to the extrahepatic bile ducts [47].

Liver resection for bile duct injuries after laparoscopic cholecystectomy

Liver resection is not required for isolated damage to the bile duct [48]. However, the presence of vascular damage worsens the clinical course of the patient, due to the development of complications such as liver necrosis and bile duct stricture [16,49,50]. Because the right hepatic artery runs close and parallel to the cystic duct, it is more vulnerable to injury [51,52] and can be easily ligated if the structures in the Calot triangle are not well defined [53]. Although occlusion of the right hepatic artery is usually well tolerated, as collateral arteries from the diaphragm and retroperitoneal space support the liver [16,54]. The development of intrahepatic abscess [18], ischemic necrosis of the right lobe of the liver [16], recurrent cholangitis and subsequent secondary biliary cirrhosis [16], as well as liver atrophy, require liver resection for successful treatment. The incidence of liver necrosis in patients with damage to the bile duct and arteries with or without abscess formation reaches 75%. Nearly half of these patients who underwent bilioenteric anastomosis to treat a damaged bile duct developed postoperative biliary leakage due to primary hepaticojejunostomy [55] or late ischemic peripheral bile duct stenosis [55]. Thus, patients with confirmed damage to the bile duct should be examined for concomitant hepatic artery damage, and if present, comprehensive treatment should be undertaken immediately [56]. Combined damage to the bile ducts and hepatic artery requires different types of liver resections to treat mainly secondary biliary cirrhosis [57].

Morbidity and mortality in bile duct injuries after laparoscopic cholecystectomy

In the postoperative period after Y-shaped hepaticojejunostomy according to Ruu, 80% of patients developed cholangitis and 20% jaundice. All were re-operated. The average follow-up period after surgery was 49 + 40 months. In the postoperative period, 16% of patients underwent another 2-3 surgical interventions, with a good result achieved in 89% of those operated [58].

The quality of life after the formation of a biliary anastomosis for iatrogenic damage to the biliary tract received disappointing results - their quality of life was significantly reduced ($p < 0.05$). With complete intersection of the duct, in contrast to the marginal wound, poor long-term results of reconstruc-

tive operations were explained by impaired blood supply to the biliary tract and the development of ischemia, which apparently contributed to their postoperative scarring. The indicators of the quality of life of patients with biliodigestive anastomosis superimposed on the duodenum were significantly reduced. After the formation of the Roux-en-Y biliary anastomosis with the hepatic transhepatic drainage, the patients showed decreased indicators of physical functioning, pain intensity, vital activity, general health and role functioning, due to the general physical condition. It is noteworthy that low indicators of the quality of life of the operated patients were characteristic of this group during the period of hepatic transhepatic drainage functioning. After hepaticojejunostomy according to Brown with a "plug" according to Shalimov, the indicators of role functioning and vital activity were reduced on hepatic transhepatic drainage [59].

Combined injuries of the bile ducts and blood vessels account for more than half of the unsatisfactory treatment results and mortality. When the operation is performed by a surgeon who does not have sufficient experience in hepatobiliary surgery, mortality rises to 30%. At the same time, if the operation is performed in a specialized center, the successful result is recorded in 90% [60,61,62,63]. The effectiveness of the radiological approach with

transhepatic stenting of the damaged bile duct is estimated at 40-85% [64].

After repeated operations in the long-term period, cicatricial strictures on the biliary tract develop in 20-30% of cases, and biliary cirrhosis and portal hypertension develop against the background of chronic cholangitis – complications leading to disability [65,66].

The immediate and long-term results of treatment of injuries of the main bile ducts (IVS) are unsatisfactory: the immediate mortality rate is 8-10%, and in the later stages 13-17% [67,68].

Conclusion

The analysis of the literature showed that the prevention, timely diagnosis and treatment of damage to the bile ducts during and after laparoscopic cholecystectomy remains an unresolved issue. Timely diagnosis of damage to the bile ducts and surgical tactics at different stages give good long-term results. In the absence of experience in reconstructive operations, the intervention must be limited to external drainage of the ducts with the subsequent referral of the patient to a specialized hospital. Reconstructive and restorative surgeries for gallbladder injuries should be performed using precision techniques with the presence of atraumatic absorbable suture materials.

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TYPES OF CORRECTION OF THE SUPRACARDIAC FORM OF PARTIAL ABNORMAL DRAINAGE OF THE PULMONARY VEINS. WARDEN PROCEDURE

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Conflict of interest

The authors declare that they have no conflicts of interest

Keywords

abnormal drainage of the pulmonary veins, Warden procedure, technique of operation

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Abstract

The article describes the types of correction of the supracardiac form of abnormal drainage of the pulmonary veins. One of the methods of correcting this defect is the Warden operation, which includes: after sternotomy, connection of artificial circulation, cardioplegia, the superior vena cava is cut off, the proximal end is sutured. Next, a right atriotomy is performed, an anastomosis is formed using an autopericardial patch between the abnormal drainage and the left atrium through the ASD. Then an anastomosis is formed between the auricle of the right atrium and the distal end of the superior vena cava. As a result, blood from the abnormal pulmonary veins begins to drain into the left atrium through the ASD.

Өкпе көктамырларының толық емес аномальды дренажының супракардиальдық формаларын емдеудің түлері. Warden процедурасы

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Түйін сөздер

өкпе көктамырларының аномальды дренажы, Warden процедурасы, ота техникасы

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Аңдатпа

Мақалада өкпе веналарының аномальды дренажының супракардиальды формаларын коррекциялау түрлері сипатталған. Бұл ақауды түзету әдістерінің бірі – Warden отасы, ол мына процестерді қамтиды: стернотомиядан кейін жасанды қан айналымының қосылуы, кардиоплегия, жоғарғы көктамыр қуысы кесіледі, проксималды ұшы тігіледі. Одан кейін оң жақ атриотомия жасалады, жүрекше аралық қалқа ақауы арқылы аномальды дренаж мен сол жақ жүрекше арасындағы аутоперикардты жамау көмегімен анастомоз қалыптасады. Содан кейін оң жақ жүрекшенің құлақшасы мен жоғарғы қуыс көктамырының дистальды ұшы арасында анастомоз пайда болады. Нәтижесінде қан өкпенің аномальды көктамырларынан жүрекше аралық қалқа ақауы арқылы сол жақ жүрекшеге келе бастайды.

Виды коррекции супракардиальной формы частичного аномального дренажа легочных вен. Процедура Warden

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Авторы заявляют об отсутствии конфликта интересов

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Аннотация

В статье описаны виды коррекции супракардиальной формы аномального дренажа легочных вен. Одним из методов коррекции этого порока является операция Warden, которая включает в себя: после стернотомии, подключения искусственного кровообращения, кардиоплегии выполняют отсечение верхней полой вены, проксимальный конец ушивают. Далее проводят правую атриотомию, формируют соустье с помощью заплаты из аутоперикарда между аномальным дренажом и левым предсердием через ДМПП. Затем формируют анастомоз между ушком правого предсердия и дистальным концом верхней полой вены. В результате кровь от аномальных легочных вен начинает дренироваться в левое предсердие через ДМПП.

Ключевые слова

аномальный дренаж легочных вен, процедура Warden, техника операции

Introduction

Partial anomalous pulmonary venous drainage (PAPVD) is a rare congenital cardiac defect with the incidence of 0.4%–0.7% and is associated with sinus venosus atrial septal defect (ASD). While most cases are asymptomatic, a patient can present with pulmonary hypertension (PH) and it can be difficult to diagnose. Here, we discuss the case of a young female with PH where thorough investigations lead to a correct diagnosis of PAPVD and ultimately a timely intervention.

PAPDV is an abnormality in which some, but not all, pulmonary veins connect to the right atrium or its tributaries. According to autopsy, the incidence is 0.7% of the population. PAPDV can be combined with other congenital heart defects, most often with an atrial septal defect. Patients with Turner syndrome have a high risk of developing this heart disease.

The first description of vice belongs to Winslow J. (1739). Then, in 1820, Meckel described a case of partial abnormal flow of several pulmonary veins into the superior vena cava. In 1949, Dotter et al made the first report on the diagnosis of cardiac catheterization. The first documented treatment was in 1953, and in 1956 in the Mayo Clinic, for the first time, the correction of PAPVD in the left brachiocephalic vein and other forms was performed.

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The hemodynamic and clinical manifestations of PAPVD correspond to those in atrial septal defect. The degree of hemodynamic change depends on the number of abnormally connected pulmonary veins. The pulmonary veins can flow into the SVC, into the place of the SVC and brachiocephalic vein fusion above or directly into the azygos vein.

Types of research for PAPVD include: magnetic resonance imaging, CT angiography (the most informative research methods), echocardiography (transthoracic, transesophageal), cardiac catheterization, plain chest X-ray, electrocardiography.

Warden procedure

Clinical case. An 18-year-old female patient was admitted with complaints of general weakness, fatigue, palpitations, recurrent heart pains and frequent colds. CHD was diagnosed in childhood. On echocardiography on admission: right atrium: 4.9x5.4 cm, right ventricle: end diastolic size 4.6 cm, medium pressure 30 mmHg., tricuspid valvae: ring diameter 3.9 cm dilated, regurgitation 1-2. Features: valves are compacted, mobile. V. contracta 0.47 cm. EV LV - 71%. In the atrial septum, there is an upper defect without an upper edge. The two right pulmonary veins drain into the vena cava superior with one collector.

ECG: Sinus rhythm, incomplete blockade of the right branch of the His bundle, right ventricle hypertrophy.

Pulmonary angiography from the trunk of the pulmonary artery. Pulmonary artery trunk tonometry.

When angiocardiography reveals from left atrium: The trunk and branches are moderately expanded. The parenchymal phase of both lungs is uniform - reinforced on both sides. With angiocardiography from the left pulmonary artery: the left collector of the pulmonary veins is drained into the left atrium, there is an intensive discharge of contrasting blood from the left atrium to the right atrium due to ASD. With angiocardiography from the right pulmonary artery: the right collector of the pulmonary veins is drained at the mouth of the superior vena cava on the border with the right atrium.

Operation protocol

Longitudinal sternotomy. The heart is enlarged due to the right sections. The vena cava superior is highlighted and the confluence of the left pulmonary veins below v.azygos is noted. The aorta and vena cava were cannulated. Cardio-pulmonary bypass started. Clamp on the aorta. Farmaco-cold cardioplegia in the aortic root. Opened right atrium. During revision of the interatrial septum, the superior sinus venosus defect is determined. V. Azygos is bandaged, stitched and crossed for vena cava superior mobility. The intersection of the vena cava superior above the level of the superior abnormally inflowing pulmonary vein. The cardiac part of the transected vena cava superior was closed with an autopericardial patch, and the main part of the vena cava superior was anastomosed with the right atrial appendage with a 6/0 prolene suture. Further, the collector of abnormally draining pulmonary veins was moved into the left atrial cavity with simultaneous closure of the sinusvenosus defect. The next step was the de Vega tricuspid valvae annuloplasty. The hydraulic test of the tricuspid valve showed satisfactory closing function. Drainage tubes into the right pleural cavity and behind the sternum.

The patient was transferred to the specialized department on the 1st day after the surgery. Drainage tubes were removed on the 2nd day after surgery.

Discharge condition:

As a result of the treatment, the patient's condition improved significantly. Pain in the region of the heart was not observed; physical activity, appetite, general condition returned to normal. Body temperature is normal. The skin and visible mucous membranes are clean, of normal color. Vesicular breathing above the lungs. Breath rate 19 per minute. The heart sounds are clear, the rhythm is correct, there are no noises. Heart rate 96 beats per minute. Blood pressure 110/70 mmHg.

Status localis: The postoperative wound healed by primary intention. The patient was discharged in satisfactory condition on the 21st day after the surgery.

Discussion

First described by Winslow in 1739 [2], PAPVD is a rare congenital cardiac defect which is more common in females with an incidence of 0,4%–

0,7% in autopsy series [3]; this may overestimate the clinical significance because most cases are asymptomatic. It is different from total anomalous pulmonary venous drainage in which all or most pulmonary veins drain into the right side of the heart. In PAPVD, usually a single pulmonary vein is anomalous, but there can be some exceptions like in our patient wherein two right-sided pulmonary veins were draining into right atrium. The etiology is unknown, but it represents the persistence of embryonic anastomosis between the systemic and pulmonary vein plexus, resulting in one or more anomalously connecting pulmonary veins. Patients with Turner syndrome, in particular, are at increased risk for PAPVD [4].

The most common ASD associated with PAPVD is sinus venosus type of ASD (80%–90% of cases). In about 10% of cases, the ASD is of secundum type. Normally, each PV contributes an average of 25% of the total pulmonary blood flow; however, when a PV connects anomalously to the RA or SVC, blood is preferentially shunted to this anomalous vein because of the lower RA pressure, compared with LA pressure, producing significant volume overload. This is especially true in the presence of systemic hypertension, mitral valve disease, or left ventricular dysfunction, which increases LA pressures. The clinical evidence may not be apparent until the patient reaches middle age. Some authors have suggested that this defect becomes clinically significant when 50% or more of the pulmonary veins anomalously return.

Adult patient may present with dyspnea and occasionally palpitations. Physical examination findings can reveal signs of the right-sided heart failure. The diagnosis can be confirmed with transesophageal echocardiogram [5], but all the pulmonary veins may not be identified, especially in adults. Cardiovascular magnetic resonance imaging (MRI) is rapidly becoming the procedure of choice to diagnose and characterize congenital heart disease, including PAPVD. MRI also provides additional information including quantitation of heart chamber volumes, ventricular mass, and blood flow through the great vessels, especially when other modalities such as echocardiography yield equivocal findings [6,7,8]. Several techniques used in MRI are particularly useful in the diagnosis of PAPVD; these include cardiac MRI which provides enhanced visualization of the pulmonary vasculature including the anomalous pulmonary veins and phase velocity mapping which directly measure the shunt volume ($Q_p:Q_s$) non-invasively. Contrast-enhanced computed tomography scanning is an alternative imaging modality that can help in preoperative planning [9].

Figure 1.

The release of the right atrial appendage trabeculae



Figure 2. Anastomosis between right atrium appendage and vena cava superior in process



Figure 3. Final look of the anastomosis between right atrium appendage and vena cava superior



Medical therapy is indicated for patients with heart failure or arrhythmias, but the definite treatment is surgical repair, especially when the Qp:Qs is >2, 1:1. For the PAPVD to the vena cava superior, the repair techniques may include internal patch technique with or without vena cava superior enlargement, or the caval division technique with atriocaval anastomosis known as Warden technique [10,11]. Patients with internal patch technique must be observed for obstruction of the vena cava superior with vena cava superior syndrome, obstruction of the pulmonary veins, sick sinus syndrome, and

supraventricular tachyarrhythmias [12]. The perioperative mortality rate is comparable to that for ASD repair (<0,1%). Prognosis is excellent if surgical repair is done early [13], but it becomes more guarded if the lesion is undetected for a long period.

Conclusion

The advantages of the Warden procedure over the classical operation make it the method of choice for the treatment of the supracardiac form of the partial abnormal drainage of the right pulmonary veins in vena cava superior.

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Conflict of interest
 The authors declare that they have no
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surgical treatment of peripheral
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 surgical treatment of patients
 with lower limb arteries

SURGICAL TREATMENT OF ARTERIAL ANEURYSMS OF THE LOWER LIMB

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Abstract

Peripheral artery aneurysms are dangerous with possible complications such as ruptures, bleeding, thromboembolism in the distal bed with subsequent tissue ischemia, neurological disorders due to pressure of closely located nerve trunks.

One of the most common causes of peripheral artery aneurysms is trauma. Special attention should be paid to a significant increase in the number of iatrogenic injuries. From 2000 to 2019, 46 patients were operated on the arteries of the lower extremities. Operations of various types of reconstructions were performed. The total age of the patients ranged from 30 to 76 years, the average age of the patients was 43.3 ± 6.5 years.

A total of 6 (9.2%) patients were operated on with combined aneurysmal lesion of the femoral and popliteal arteries. In the postoperative period, 91.5% of patients with peripheral artery aneurysm had positive clinical results. 4 (8.5%) developed complications. Long-term results were tracked in the period from 3 months to 3 years. A clinical examination was performed, supplemented by ultrasound control. 2 cases of thrombosis in the distal anastomosis were identified, which were restored after reconstruction of the distal anastomosis.

Objective: to improve the diagnosis and results of surgical treatment of patients with lower limb arteries.

Аяқ артерияларының аневризмасын хирургиялық емдеу

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Түйін сөздер

перифериялық артерия
 аневризмасын хирургиялық
 емдеу, жалпы сан
 артериясының аневризмасы,
 тізеасты артериясы, аяқ
 артериясының аневризмасы
 бар науқастарды
 диагностикалау және
 хирургиялық емдеу нәтижелері

Аңдатпа

Перифериялық артериялардың аневризмасы жарылулар, қан кетулер, кейіннен ишемия орын алуы мүмкін тіндердің дисталды өзегінің тромбозы, неврологиялық бұзылыстар, жақын орналасқан жүйке діңдерінің қысымының салдары секілді ықтимал асқынуларымен қауіпті.

Жарақаттар – перифериялық артериялар аневризмасының ең жиі тараған себептерінің бірі. Ятрогенді жарақаттар санының едәуір өсуіне ерекше назар аудару қажет. 2000-2019 жылдар аралығында 46 науқастың аяқ артериясына ота жасалды. Реконструктивті оталардың алуан түрлері орындалды. Науқастардың жалпы жасы 30-70 жас аралығын құрады, науқастардың орташа жасы $43,3 \pm 6,5$ жасты құрады.

Сан және тізеасты артерияларының жанамалас аневризмалық зақымдалуы бар барлық науқастардың 6-на (9,2%) ота жасалды. Отадан кейінгі жақын кезеңде перифериялық артериялардың аневризмасы бар науқастардың 91,5%-ында оң клиникалық нәтижелер анықталды. 4 (8,5%) науқаста асқынулардың дамуы байқалды. Ұзақ мерзімді нәтижелер 3 айдан 3 жылға дейінгі мерзімде бақыланды. Ультрадыбыстық бақылаумен толықтырылған клиникалық тексеру жүргізілді. Дисталды анастомоздың реконструкциясынан кейінгі дисталды анастомоздардағы тромбоздың 2 жағдайы анықталды.

Хирургическое лечение аневризм артерий нижних конечностей

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Аннотация

Аневризмы периферических артерий опасны возможными осложнениями такими, как разрывы, кровотечения, тромбозы в дистальном русле с последующей ишемией тканей, неврологические расстройства, вследствие давления близко расположенных нервных стволов.

Одной из наиболее распространенных причин развития аневризм периферических артерий являются травмы. Особое внимание необходимо уделить значительному увеличению количества ятрогенных травм. С 2000 года по 2019 год оперированы 46 больных на артерии нижних конечностей. Были выполнены операции различных видов реконструкций. Общий возраст пациентов составил от 30 до 76 лет, средний возраст пациентов составил $43,3 \pm 6,5$ лет.

Всего с сочетанным аневризматическим поражением бедренной и подколенной артерии оперированы 6 (9,2%) больных. Ближайших в послеоперационном периоде у больных с аневризмой периферических артерий выявлены положительные клинические результатов у 91.5%. У 4(8.5%) развивались осложнения. Отдаленные результаты прослежены в срок от 3 месяцев до 3 лет. Проводилось клиническое обследование, дополненное ультразвуковым контролем. Выявлены 2 случая тромбоза в дистальном анастомозе, которые были восстановлены после реконструкции дистального анастомоза.

Конфликт интересов

Авторы заявляют об отсутствии конфликта интересов

Ключевые слова

хирургическое лечение аневризм периферической артерии, аневризмы общей бедренной артерии, подколенной артерии, диагностика и результаты хирургического лечения больных с артериями нижних конечностей

Relevance

Peripheral artery aneurysms are dangerous with possible complications such as ruptures, bleeding, thromboembolism in the distal bed with subsequent tissue ischemia, neurological disorders due to pressure of closely located nerve trunks.

One of the most common causes of peripheral artery aneurysms is trauma. Special attention should be paid to a significant increase in the number of iatrogenic injuries. Peripheral artery aneurysms can be an independent disease or a consequence of an artery injury. Ultrasound duplex scanning is recognized as the «gold standard» for the diagnosis of this disease, since this method is used to visualize not only the aneurysm itself, but also the presence or absence of parietal blood clots, as well as the possibility of assessing the inflow and outflow routes [1,2,3]. In recent years, there has been a tendency to increase the number of patients with this pathology. The incidence of peripheral aneurysms ranges from 3.4 to 6.7% [4,5,]. The best option for surgical treatment is an aneurysm resection with prosthetics, which provides better patency of shunts in the long term compared to shunting and ligation of the aneurysm[6]. Despite the relative rarity, peripheral artery aneurysms are a formidable pathology that poses a real threat to the loss of a limb and even the life of the patient [7]. Only at the end of the XX century developing endovascular methods have brought novelty to aneurysm surgery[8]. However, open reconstructive operations have not lost their relevance and need to be improved taking into account modern diagnostic and technical capabilities [9,10,11,12,13].

Material and methods

In the Department of Vascular Surgery of the National Scientific Center of Surgery named after A. N. Syzganov, from 2000 to 2019, 46 patients with arterial aneurysms of the lower extremities were operated on. Of these, 5 patients underwent surgery for distal anastomosis aneurysm after ABS and ABP. The total age of the patients ranged from 30 to 76 years, the average age of the patients was 43.3 ± 6.5 years.

A total of 6 (9.2%) patients were operated on with a combined aneurysmal lesion of the femoral and popliteal arteries.

Characteristics of patients with atherosclerotic femoral artery aneurysm

The main complaints of patients with femoral artery aneurysm were about a pulsating formation in the aneurysm area (12 (41.3%) patients complained).

The distribution of patients by gender and age shows a clear predominance of male patients - 35 men (76%) and 11 women (24%). With NAA, men - 1 (2%), women - 4 (8%). The etiological factor of peripheral artery aneurysm development was atherosclerotic in 41 (89%) and nonspecific inflammation in 5 (10%) patients.

Complaints about the presence of intermittent lameness associated with ischemia of the affected limb were presented by 25 (55%) patients. 7 (15%) patients had pain at rest and 2 (4.5%) had trophic disorders in the foot area, which corresponded to the 4th degree of ischemia. Only 12 (26%) patients had an asymptomatic aneurysm, which is slightly

Figure 1.

Is a schematic image of the MSCT. In the middle third of the thigh on the right, there is an arterio-venous junction between the superficial femoral vein and the artery, with a diameter of 2.6 mm. Also at this level, the presence of an aneurysmal sac, 85x63x78 mm in size, partially thrombosed, is determined on the medial surface. The width of the leg is 8.2 mm.



more than in patients with popliteal artery aneurysm (15.8%).

Features of the anamnesis of the disease. We found that the duration of the disease affected the presence of multiple aneurysms, the size of aneurysms, and the clinical picture.

Characteristics of patients with atherosclerotic popliteal artery aneurysm

The main complaints of patients with popliteal artery aneurysm: patients with popliteal artery aneurysm most often complained of the presence of a tumor-like, pulsating formation and local pain of varying intensity in the popliteal fossa, which was noted in 6 (12%) patients. Surgical interventions were performed in all 46 patients with arterial aneurysms of the lower extremities using various surgical techniques.

Performing reconstruction on the arteries is the only way to preserve the main blood circulation in the area of distal localization of the aneurysm.

Reconstructive surgery was performed in all cases, the most common type of surgery was resection of an aneurysm with a lateral suture (28 cases (60%)), and resection of an artery aneurysm with an autovenous patch was performed in

10 cases (22%), with autovenous prosthetics - 6 (15%), resection of an aneurysm of an end - to-end artery-3(8%).

The results of surgical treatment depend on the concomitant diseases. The best long-term results are observed in patients with asymptomatic aneurysms. There is evidence that surgical treatment of asymptomatic aneurysms is significantly better than symptomatic aneurysms [12].

Thus, to date, there is no clear algorithm for surgical treatment of arterial aneurysms of the lower extremities with femoral and popliteal aneurysms, which leads in a large number of cases to the development of complications (rupture, thrombosis, thromboembolism). In addition, despite the development of a large number of different types of treatment of patients with this disease, there is no single tactic for treating patients with femoral and popliteal aneurysms, depending on their localization, prevalence and severity of hemodynamic disorders.

A clinical example of a patient

Patient, 26 years old, with a diagnosis of Post-traumatic false aneurysm of the superficial femoral artery of the middle third of the right thigh with the formation of an arteriovenous fistula.

Table 1.
Distribution of patients depending on localization

№	Localization of aneurysm	Quantities	%
1	Arteria iliaca externa	2	4%
2	Arteria femoralis	21	46%
3	Arteria profunda femoris	2	4%
4	Surface of the femoral artery	10	22%
5	Arteria poplitea	6	12%
6	Aneurysm of distal anastomosis after bifurcation aorto-femoral shunting (BAFSH) and bifurcation aorto-femoral prosthetics (BAFPR)	5	12%
	Total	46	100%

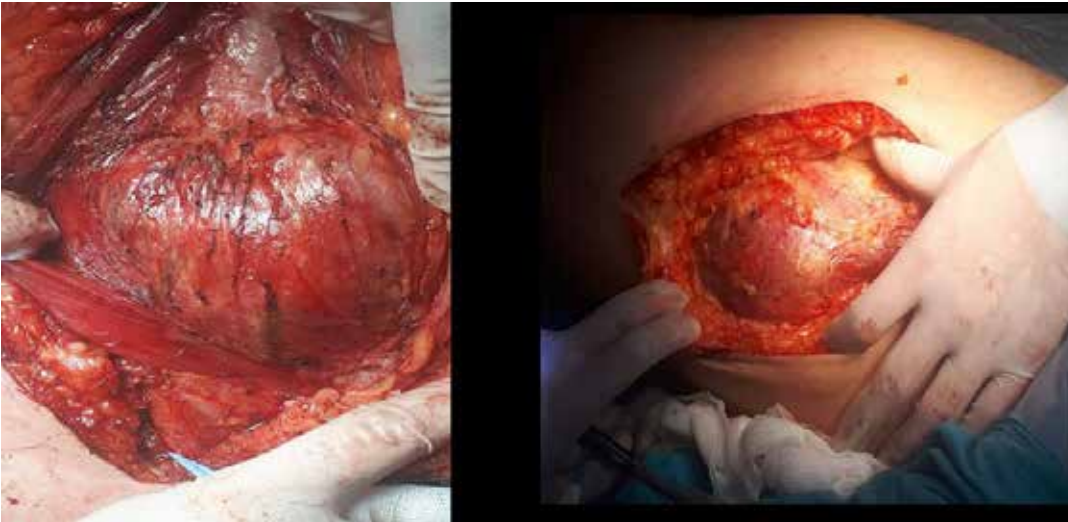


Figure 2. Is a schematic image. Tumor-like formation in the medial surface of the middle third of the thigh on the right, measuring 10*8 cm



Figure 3. Schematic image. Resection of a false aneurysm of the superficial femoral artery on the right with autovenous prosthetics

I received complaints: according to the patient, in 2010 he received a knife wound in the middle third of the medial surface of the thigh on the right. The ambulance team was taken to the hospital. Primary surgical treatment of the wound was performed, recommendations were given (there is no discharge on the hands). After that, the patient did not go to the doctors, the wound healed by primary tension. In dynamics, a tumor-like formation appeared on the site of the postoperative scar. No further treatment was carried out, the formation increased in size in dynamics, and therefore the patient applied to the A. N. Syzganov National Scientific Center.

Computed tomography (12.07.2019):

Conclusion: the condition after superficial femoral artery (SFA) bypass surgery on the right, the CT picture is more consistent with shunt occlusion. The CT picture may correspond to an arteriovenous junction between the superficial femoral vein and the artery. Results of the study: on CT angiography of the abdominal aorta and vessels of the lower extremities after intravenous bolus contrast enhancement (Ultravist 370-120 ml) in the axial, sagittal and coronal projections of the aorta at the bifurcation level-18.8 mm – In the middle third of the thigh on the right, there is an arteriovenous junction between the superficial femoral vein and the artery, with a diameter of 2.9

mm. The femoral-femoral shunt on the right is not visualized.

The course of the operation: an incision was made at the level of the middle third of the thigh 20 cm above the aneurysmal expansion, the superficially femoral artery was isolated, an arterial clamp was applied above and below the aneurysm on the superficially femoral artery (SFA). During the revision, there is an aneurysm measuring 20.0 x 15.0 cm. Due to the pronounced inflammatory process, disturbed anatomy, inflammatory tissue changes, an aneurysmal sac is isolated, which actively pulsates during revision and is tightly soldered to the surrounding tissues when isolated, the aneurysmal sac is excised with the aneurysm wall. The aneurysm cavity was opened. Organized thrombomasses were removed from the cavity. The affected area of the aneurysmal sac defect was removed, an arteriovenous fistula is noted on the posterior surface. Given this circumstance, the aneurysmal sac is stitched, bandaged. Above 5 cm of the aneurysmal sac, a Crawford clamp is applied to the PBA, the distal part is stitched, bandaged. There are conditions for proximal anastomosis. Below 4 cm of the aneurysmal sac, a Crawford clamp is applied to the PBA, the proximal part is stitched, bandaged. There are conditions for the imposition of distal anastomosis. It was decided to perform femoral-femoral

Figure 4.

Schematic representation. Posttraumatic aneurysm of the popliteal artery on the left. Operation: resection of the left popliteal artery aneurysm with uncoupling of the arteriovenous fistula



autovenous prosthetics. A proximal end - to-end anastomosis was applied, and a distal end - to-end anastomosis was formed. Pulsating blood flow was obtained, distal pulsation is good.

Assessment of the immediate and long-term results of surgical treatment

A retrospective analysis of the results of the examination of 46 patients with peripheral artery aneurysm (PAA), as well as data on the effectiveness of their surgical treatment, allowed us to characterize in a new aspect the value of diagnostic tests aimed at determining the functional significance of reconstructive operations on vessels with preservation of the main circulation in the area of distal localization of the aneurysm.

We evaluated the immediate and long-term results of surgical treatment by preserving the main blood circulation in the area of the distal localization of the aneurysm.

In total, 4 (8.5%) of all 46 operated patients developed surgical complications in the immediate postoperative period. Analyzing, we came to the conclusion that good and satisfactory results were obtained in 91.5%.

Postoperative complications are presented after aneurysm resection and reconstruction on n\k vessels, mainly with the diagnoses of post-traumatic false aneurysm, post-injection false aneurysm, the occurrence of hematomas that have a risk of

infection of the surrounding tissues with possible generalization, edema of the surrounding tissues with the development of lymphorrhea, suppuration after surgical wounds and shunt thrombosis.

When analyzing the long-term results of APA treatment in patients who underwent reconstructive surgery, limb ischemia was detected in 5 cases, the condition of these patients is considered satisfactory. After conservative treatment of limb ischemia, there are tendencies to regression.

Thrombosis of distal anastomoses was detected in 2 cases. In one case, the amputation of the n\k was performed, and in the other case, a thromboectomy was performed and blood flow was restored.

Relapse of an aneurysm of anastomosis - in 1 case, in which a false aneurysm was excised by alloprosthetics with a synthetic prosthesis.

Thus, in the immediate postoperative period, 91.5% of patients with PAA had positive clinical results after the operations performed by us. 4 (8.5%) developed complications.

Performing reconstruction on the arteries is the only way to preserve the main blood circulation in the area of distal localization of the aneurysm.

Long-term results were tracked in the period from 3 months to 3 years. A clinical examination was performed, supplemented by ultrasound control. The results of the research methods were compared with the initial ones performed in the early postoper-

Table 2.

Surgical complications of the postoperative period in patients with peripheral artery aneurysm

Complication	quantities
Lymphorrhea	2
Bleeding	1
Shunt thrombosis	2
Total	5

ative period. When analyzing the results of the long-term postoperative period, the following data were obtained: no mechanical damage to the implant was detected, the formation of anastomotic aneurysms was not detected, the patency of all vascular structures except for 2 cases caused by thrombosis of the distal anastomosis, after reconstruction in the distal anastomosis, blood flow was restored.

The main risk factors for the complicated course of the immediate postoperative period in patients with peripheral artery aneurysms were: age over 60 years-55%; diabetes mellitus-10%; medium and large aneurysm size -10%; arteriosclerosis-21%; nonspecific aortoarthritis (NAA) - 1%; arterial hypertension -3%.

Conclusion

The problem of surgical treatment of peripheral artery aneurysms with different etiology.

Patients with pulsating hematomas and false aneurysms of the arteries of the lower extremities were analyzed. From 2000 to 2019, aged 40 to 76 years. In patients, the cause of pathology was mainly post-traumatic false aneurysm, post-injection false aneurysm, aneurysm of distal anastomosis after aortobedial bifurcation bypass surgery (ABBS) and aortobedial bifurcation prosthetics (ABBP).

To reduce the risk of aneurysm formation after ABBS and ABBS, the formation of a distal anastomosis is recommended during femoral artery prosthetics in order to prevent anastomosis failure, this method was used by us in 5 cases. To strengthen the distal anastomosis during prosthetics, it is proposed to use a segment of a vascular prosthesis with a length of 20 mm. Before removing the clamp from the aorta, the segment of the prosthesis is moved along the entire length of the vascular prosthesis towards the formed anastomosis in such a way that the segment of the prosthesis annularly covers the entire area of the anastomosis along the perimeter.

The proposed method, with its simplicity of execution, reliably ensures the tightness of the anastomosis and significantly reduces the risk of false aneurysms.

It is defined as one of the most complex areas of surgery. Recently, aneurysms of peripheral arteries of various arterial basins, their defeat, the choice of reconstruction tactics to prevent complications in the distal basin, improving the results of surgical treatment in patients by optimizing the diagnostic process, the choice of safe surgical tactics are the subjects of discussion in domestic and foreign literature. Frequent topics of discussion in the literature:

1. Study of the frequency of occurrence of peripheral artery aneurysms with different etiology

2. Diagnosis of patients with peripheral artery aneurysm.

3. Development of optimal tactics for the treatment of patients with peripheral artery aneurysms

4. Assessment of immediate and long-term results.

Conclusion:

The problem of surgical treatment of peripheral artery aneurysms with different etiology.

Patients with pulsating hematomas and false aneurysms of the arteries of the lower extremities were analyzed. From 2000 to 2019, aged 40 to 76 years. In patients, the cause of pathology was mainly post-traumatic false aneurysm, post-injection false aneurysm, aneurysm of distal anastomosis after aortobedial bifurcation bypass surgery (ABBS) and aortobedial bifurcation prosthetics (ABBS).

To reduce the risk of aneurysm formation after ABBS and ABBS, the formation of a distal anastomosis is recommended during femoral artery prosthetics in order to prevent anastomosis failure, this method was used by us in 5 cases. To strengthen the distal anastomosis during prosthetics, it is proposed to use a segment of a vascular prosthesis with a length of 20 mm. Conclusions:

– The most frequent cases of aneurysm development were atherosclerosis in 25 (55%) in the first place, post-infectious false aneurysm was noted in 2 (4%) patients, after invasive endovascular interventions and post-traumatic false aneurysm in 14 (30%). Also after ABBS and ABB 5 (11%).

– Distribution of patients depending on arterial basins.

– Ultrasound, MSCT, angiography allow you to objectively assess hemodynamics and determine treatment tactics.

– The method of choice is reconstructive plastic surgery to eliminate an aneurysm with the restoration of the main blood flow.

Recommendations:

– Taken into account, when identifying clinical manifestations of pulsating formation and circulatory disorders in one arterial pool, a thorough examination is necessary. Ultrasound duplex scanning, angiography, MSCT are performed if arteriovenous forms of peripheral arteries are suspected.

– Alternatively, preference in choosing reconstructive or organ-bearing surgery in patients with peripheral artery aneurysms will restore blood flow to the distal basin.

– Monitoring of the state of restored blood flow in arterial pools with the use of vascular ultrasound 2 times a year, mandatory visualization of proximal and distal anastomoses.

– All types of operations aimed at restoring blood flow have an equal right to use. The choice of a particular method depends on the size of the aneurysm, the condition of the vessels outside the aneurysm, the size of the defect formed after radical resection of the aneurysm sac.

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PREDICTORS OF STROKE DEVELOPMENT AFTER CAROTID REVASCULARIZATION. REVIEW

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Abstract

Stroke is one of the leading causes of death and disability. According to the WHO, mortality due to stroke and other cerebrovascular diseases ranks second after cardiovascular disease. Timely revascularization of the carotid arteries has been shown to be effective in reducing the risk of cerebrovascular accident in patients with symptomatic carotid stenosis of atherosclerotic genesis. However, despite the high efficiency, there are risks of ischemic stroke in the postoperative and long-term period. This review presents statistical data on recurrent strokes and predictors of stroke development after carotid endarterectomy and carotid artery stenting.

Ұйқы артериясын ревазуларизациялаудан кейін инсульт дамуының предикторлары. Әдебиет шолуы.

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Аңдатпа

Инсульт – өлім мен мүгедектіктің негізгі себептерінің бірі. ДДҰ мәліметтері бойынша, инсульт пен цереброваскулярлық басқа аурулардан болатын өлім-жітім жүрек-қан тамырлары ауруларынан кейін екінші орында. Каротид артерияларының уақытылы ревазуларизациясы атеросклеротикалық генездің каротидті симптоматикалық стенозы бар емделушілерде цереброваскулярлық апат қаупін төмендетуде тиімді екені дәлелденді. Алайда, жоғары тиімділікке қарамастан, операциядан кейінгі және ұзақ мерзімді кезеңде ишемиялық инсульт қаупі бар. Бұл шолу каротидтық эндартерэктомия мен ұйқы артериясын стенттеуден кейінгі қайталанатын инсульт пен инсульттің дамуының болжаушылары туралы статистикалық деректерді ұсынады.

Предикторы развития инсульта после ревазуларизации сонных артерий. Обзор литературы.

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Аннотация

Инсульт является одной из лидирующих причин смертности и инвалидности. По данным ВОЗ, смертность по причине инсульта и других цереброваскулярных заболеваний занимает 2 место после сердечно-сосудистой патологии. Своевременная ревазуларизация сонных артерий доказала свою эффективность в снижении риска возникновения нарушения мозгового кровообращения у пациентов с симптомными стенозами сонных артерий атеросклеротического генеза. Однако, несмотря на высокую эффективность, существуют риски развития ишемического инсульта в послеоперационном и отдаленном периоде. В данном обзоре представлены статистические данные повторных инсультов и предикторов развития инсульта после каротидной эндартерэктомии и стентирования сонных артерий.

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Conflict of interest
The authors declare that they have no conflicts of interest

Keywords

Ischemic stroke, stroke predictors, carotid endarterectomy, carotid artery stenting, restenosis

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Конфликт интересов

Авторы заявляют об отсутствии конфликта интересов

Ключевые слова

Ишемический инсульт, предикторы инсульта, каротидная эндартерэктомия, стентирование сонных артерий, рестеноз

Introduction

Stroke is the result of deterioration in the blood supply to the brain. This condition occurs when there is a violation of the patency or integrity of the arteries that feed the brain (internal carotid and vertebral arteries). In other words, a stroke is an acute violation of cerebral circulation, accompanied by a sudden dysfunction of the brain [1]. This is always a complication of acute or chronic diseases. Most of all, the vessels of the brain suffer from atherosclerosis, arterial hypertension, and diabetes mellitus, especially when they are combined. Therefore, it is these extremely common diseases that are most often complicated by stroke. It turns out that our brain is so sensitive to the insufficient blood supply that areas deprived of a normal blood supply die within a few minutes [1].

Atherosclerosis is an inflammatory process that affects medium and large vessels in the circulatory system [2,3]. Early atherosclerotic changes develop already in childhood and adolescence as a result of exposure to several risk factors [4,5]. These include smoking, physical inactivity, unhealthy diet, harmful use of alcohol, hypertension, diabetes, elevated blood lipids, obesity, poverty and low educational status, advanced age, male gender, genetic predisposition, and psychological factors.

Carotid stenosis is a narrowing of the lumen of the carotid artery. The most common cause of narrowing is atherosclerotic plaque. Unique hemodynamics in carotid artery bifurcation predisposes this area to atherosclerosis [6]. Most patients have light to medium plaques, while some develop full stenosis up to complete closure (occlusion) of the arterial lumen. A small percentage of plaque may rupture and embolize, occluding intracranial arteries (causing transient ischemic attack or stroke) or occluding retinal arteries (for causing amaurosis fugax or retinal stroke).

Often, carotid stenosis is detected when there are significant neurological symptoms, or a transient ischemic attack (TIA) or ischemic stroke (symptomatic stenosis) develops, creating a high risk of death.

In most cases, carotid stenosis occurs when an ischemic stroke or TIA has occurred. Moreover, such patients have a high risk of recurrent strokes. When assessing the risk of recurrent stroke during the year in these patients, it was found that the presence of atherosclerosis of the carotid arteries increases the risk of stroke by 2 times, all other things being equal (blood pressure, high grade of LDL, the presence of diabetes, etc.).

Statistics on the development of recurrent stroke

A meta-analysis of 13 studies obtained from different stroke registries found a cumulative risk of stroke recurrence of 3.1% (OR 95% CI, 1.7-4.4%)

within 30 days, 11.1% (OR 95% CI, 9.0-13.3%) within 1 year, 26.4% (OR 95% CI, 20.1-32.8%) after 5 years and 39.2% OR (95% CI, 27, 2-51.2%) within 10 years [7].

In North Dublin, a study by Callaly et al. the cumulative rate of stroke recurrence for 2 years was 10.8%, and the mortality rate was 38.6% [8]. Also, according to the MONICA stroke registry in northern Sweden, out of 6,700 patients with ischemic or hemorrhagic stroke from 1995 to 2008, the cumulative risk of recurrence was 6% within 1 year, 16% within 5 years, and 25% within 10 years [9]. It is worth noting that approximately 62% of all recurrent strokes after hemorrhagic stroke were ischemic.

In the 2016 REGARDS study, approximately 10% of participants with prior stroke experienced a recurrent stroke during a median follow-up of 6-8 years [10].

Social predictors of stroke

Social predictors, such as income distribution or educational level, indirectly affect the health of the cardiovascular system in particular and the health of a person in general. These determinants determine the set of socio-economic positions in the hierarchy of power, prestige, and access to resources. Several structural mechanisms are responsible for the formation of a particular person's social status, including the public administration system, the education system, labor market structures, and the presence or absence of a mechanism for redistributing income within the social security system. Social stratification forms the individual health status of an individual, as well as cerebrovascular diseases outcomes, are determined by social stratification by influencing the behavioral and metabolic risks of cardiovascular diseases, socio-psychological status, living conditions, and health care system [11,12].

According to a study by Eshak ES et al. adverse working conditions, including job loss and unemployment, were associated with the risk of stroke. The cohort included 21,902 Japanese males and 19,826 females, with a follow-up period of 19 years. Job loss (change in job status within the first 5 years after placement) was associated with a greater than 50% increase in the incidence of stroke and a 2-fold increase in stroke mortality (over the follow-up period) [13].

A meta-analysis by Kivimäki M. et al. results from 24 cohort studies from the United States, Europe, and Australia found a dose-dependent effect on the relationship between working hours (more than 40 hours per week) on increased stroke incidents [14].

The ARIC (Atherosclerosis Risk in Communities) study presented an interesting observation that

people with little social relationships (i.e., fewer family members, friends, and neighbors) had a 44% higher risk of stroke over 18.6 years. even after accounting for demographic and other relevant risk factors [15].

Findings from the MESA trial have documented associations between other psychosocial factors, including depressive symptoms, chronic stress and hostility, and incident, with participants in the highest-rated versus lowest-rated category with a 1.5-2-fold increase in the risk of stroke (median follow-up 8.5 years).

Predictors of stroke after carotid endarterectomy (CEA)

ECST (European Carotid Surgery Trial) reported various features that were associated with an increased risk of perioperative stroke, including (1) female gender (10.4% versus 5.8%, $p = 0.0001$); (2) peripheral arterial disease (12.0% versus 6.1%, $p = 0.0001$); (3) systolic blood pressure (<120 mm Hg 3.4%; 121-159 6.5%; 160-180 7.7%; > 180 mm Hg 13.0%, $p = 0.04$); and (4) the focus of the previous lesion in symptomatic stenosis (retina [3.2%], stroke in the hemisphere [6.3%], TIA in the hemisphere [9.1%], $p = 0.006$) [16].

NASCET also reported clinical / visual features associated with a significant increase in stroke rate after CEA, including (1) events in the hemisphere versus retina (6.3% versus 2.7%; OR 2.3, 95% CI 1.1- 5.0); (2) FEA left or right (6.7% versus 3.0%; OR 2.3, 95% CI 1.4-3.6); (3) contralateral occlusion (9.4% vs. 4.4%; OR 2.2, 95% CI 1.1-4.5); (4) ipsilateral infarction on CT / MR (6.3% versus 3.5%; OR 1.8, 95% CI 1.2e2.8); and (5) irregular (unstable) AS plaque (5.5% versus 3.7%; OR 1.5, 95% CI 1.1e2.3) [17].

A meta-analysis of 170 studies (over 70,000 patients) revealed that contralateral occlusion in patients was associated with a high risk of procedural stroke after CEA, but this does not apply to carotid artery stenting [18].

Predictors of stroke after carotid artery stenting

In the CAVATAS (Carotid and Vertebral Artery Transluminal Angioplasty Study) study, an increase in stenosis length was an independent risk factor for procedural stroke/death. A pooled analysis from EVA-3S, SPACE, and ICSS found that performing CAS in the first 7 days after symptom onset was associated with a threefold increased risk of death/stroke (compared to CEA) (9.4% vs. 2.8%; OR 3.4, OR 95% CI 1.01-11.8 [19] As a result of a special analysis of the data by the ICSS study, it was found that patients with CAS who had an age-related change in the white matter of the brain (ARWMC), assessed as 7 points or more on the preoperative

CT / MRI scans faced an increased risk of perioperative stroke compared with patients whose ARWMC score was <7 (HR 2.76, 95% CI 1.17-6.51, $p = 0.021$). However, for patients receiving CEA, there were no associations between ARWMC scores and perioperative stroke (HR 1.18, 0.4e3.55, $p = 0.76$) [20]. Recently CREST reported that the incidence of postoperative stroke was significantly higher after CAS in patients with lesion length > 13 mm and sequential lesions distant from the main ICA stenosis [21]. In addition to the generally accepted calculation methods for predicting ischemic stroke after cerebral revascularization, there are dissertations and publications of scientific interest in the public domain. So, in the work of Dyuba D.Sh. et al. demonstrated the role of C-reactive protein, homocysteine, and the main indicators of the blood lipid spectrum as markers of stroke severity in patients in the prognosis of management after carotid endarterectomy. The importance of correcting these indicators has been demonstrated [22]. Also, a group of authors led by Barabash L.S. a method was developed for predicting the risk of developing adverse cardiovascular events within a year after carotid endarterectomy in patients with multifocal atherosclerosis, including the identification and scoring of unfavorable risk factors for cardiovascular diseases, characterized in that as unfavorable risk factors for cardiovascular diseases are determined the level of interleukin-12 in the preoperative period, the presence of dyslipidemia in the anamnesis and hemorrhages in the atherosclerotic plaque, as well as the presence of an atherosclerotic plaque in the carotid arteries of more than 2 cm, and if they are present, the following weight coefficients are assigned: 30.3 points at the level of interleukin-12 preoperative period more than 102.15 ng / ml; 24.1 points with a history of dyslipidemia; 23.4 points if the length of the atherosclerotic plaque in the carotid arteries is more than 2 cm; 22.2 points for hemorrhage in an atherosclerotic plaque, and the probable risk (Y) is assessed based on the formula: $Y = X1 + X2 + X3 + X4$, where X1 is the weight coefficient of interleukin-12, X2 is the weight coefficient of dyslipidemia, X3 is the weight coefficient the length of the atherosclerotic plaque, X4 is the weight coefficient of the presence of hemorrhage in the atherosclerotic plaque, the prognosis is carried out on the basis of comparing the obtained Y value with the risk scale of the development of an unfavorable prognosis one year after carotid endarterectomy, where 0-20 points is a low risk, 21-40 points is a lower risk average, 41-60 points - average risk, 61-80 points - risk above average, 81-100 points - high risk. The method makes it possible to predict the risk of adverse cardiovascular events in patients

with multifocal atherosclerosis within a year after carotid endarterectomy [23]. Thus, given the high risk of stroke and mortality, especially the first 30 days after undergoing vascular interventions, there is a need to develop methods for predicting and preventing adverse outcomes from the cardiovascular system.

Conclusion

At the moment, there are generally accepted prognostic criteria for the risk of ischemic stroke

after interventions on the carotid arteries. However, in Kazakhstan, algorithms, approaches and methods of rehabilitation of patients after carotid interventions have not been developed.

Thus, the development of preventive measures not only reduce the risk of restenosis and other undesirable consequences, but also contribute to an increase in economic and social efficiency due to a decrease in the cost of care, social services, an improvement in the quality of life, and a decrease in disability.

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EVALUATION OF THE EFFECTIVENESS OF A CLOSED CIRCUIT IN COMPARISON WITH AN OPEN CIRCUIT OF CARDIOPULMONARY BYPASS

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Conflict of interest

The authors declare that they have no conflicts of interest

Abstract

Objective is to evaluate the effectiveness of closed-loop surgeries with the planned duration of cardiopulmonary bypass more than 2 hours in the immediate postoperative period.

Materials and methods. A study was carried out in the clinic over 10 patients (average age 47-56 years) with Diagnoses: Ascending aortic aneurysm, FC 3 aortic valve insufficiency, who underwent surgery for ascending aorta replacement, aortic valve replacement with coronary artery reimplantation. The patients were divided into 2 groups, the 1st group (5 patients) is the control group using an open cardiopulmonary bypass circuit, the 2nd group (5 patients) is the patients using a closed cardiopulmonary bypass circuit. The total time of cardiopulmonary bypass in both groups was 125-187 minutes.

Results. In the 2nd study group, drainage blood loss significantly decreased, on average 60-100 ml compared to the control group, where the average drainage loss was 600-1500 ml. The need for blood transfusion was 5.1% in the 2nd group, compared with 43.4% in the control group. In the study group 2, the number of platelets in the postoperative period in patients was higher than in the control group.

Conclusion. This study shows that a closed circuit, compared to an open one, allows complex heart surgeries with a planned duration of extracorporeal circulation of more than 2-3 hours.

Keywords

cardiopulmonary bypass, evaluation

Жасанды қан айналымының ашық схемасымен салыстырғандағы түйықталған контурдың тиімділігін бағалау

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Аңдатпа

Зерттеудің мақсаты - отадан кейінгі кезеңде жоспарланған жасанды қан айналымының ұзақтығы 2 сағаттан асатын, жабық контур арқылы операциялардың тиімділігін бағалау.

Зерттеу материалдары мен әдістері. Клиникада жүргізілген зерттеуге мынадай диагноздар қойылған 10 науқас (орта есеппен 47-56 жас) қатысты: өрлеме қолқаның аневризмасы, өрлеме қолқаны протездеу операциялары жасалған ФК 3 аорталық қақпақшасының жеткіліксіздігі, коронарлық артериялардың реимплантациясы бар қолқалық қақпақша. Науқастар 2 топқа бөлінді, 1-топ (5 науқас) – ашық жасанды қанайналым контуры пайдаланылған бақылау тобы, 2-топ (5 науқас) – жабық жасанды қанайналым контуры пайдаланылған науқастар. Екі топтағы жасанды қан айналымының жалпы уақыты 125-187 минутты құрады.

Нәтижелері. 2-топта бақылау тобымен салыстырғанда орташа 60-100 мл, қанның дренаждық шығындары едәуір төмендеді, мұнда орташа дренаждық шығындар 600-1500 мл. Бақылау тобындағы 43,4%-бен салыстырғанда, 2-науқастарда тромбоциттер саны бақылау тобына қарағанда жоғары болды.

Қорытынды. Бұл зерттеу жабық контурдың ашық контурмен салыстырғанда жоспарланған жасанды қан айналымының ұзақтығы 2-3 сағаттан асатын күрделі жүрек операцияларына мүмкіндік беретінін көрсетеді.

Түйін сөздер

жасанды қанайналым, бағалау

Оценка эффективности закрытого контура в сравнении с открытым контуром искусственного кровообращения

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Аннотация

Цель исследования - оценить эффективность операций с закрытым контуром, с планируемой длительностью искусственного кровообращения более 2-х часов, в ближайшем послеоперационном периоде.

Материалы и методы исследования. В клинике проведено исследование, в которое включили 10 пациентов (возраст в среднем 47-56 лет) с диагнозами: Аневризма восходящей аорты, недостаточность аортального клапана ФК 3, которым выполнены операции протезирование восходящей аорты, аортального клапана с реимплантацией коронарных артерий. Пациенты были разделены на 2 группы, 1-ая группа (5 пациентов) пациенты – это контрольная группа, с использованием открытого контура искусственного кровообращения, 2-ая группа (5 пациента) – это пациенты с использованием закрытого контура искусственного кровообращения. Общее время искусственного кровообращения в обеих группах составило 125-187 мин.

Результаты. Во 2-ой исследуемой группе значительно снизились дренажные потери крови, в среднем 60-100 мл по сравнению с контрольной группой, где в среднем дренажные потери 600-1500 мл. Потребности в переливании крови 5,1% во 2-ой группе, по сравнению с 43,4% в контрольной. В исследуемой 2-ой группы количество тромбоцитов в послеоперационном периоде у пациентов было выше, чем в контрольной группе.

Заключение. Это исследование показывает, что закрытый контур в сравнении с открытым, позволяет проводить сложные операции на сердце с планируемой длительностью искусственного кровообращения более 2-3 час.

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Конфликт интересов

Авторы заявляют об отсутствии конфликта интересов

Ключевые слова

искусственное кровообращение, оценка

Introduction

The closed circuit technique is that during artificial blood circulation from the right sections of the venous line enters a soft airless reservoir of the type of hemocon V 1600 ml, then through the line, which is connected through a centrifugal pump, is supplied to the oxygenator and through the arterial line to the aorta. Coronary, additional, left-hand suction is connected to a solid reservoir with a filter (V 3L) and is connected to a soft reservoir through a 1/4 "line. The flexible reservoir is installed vertically on the holder, the inlet of the venous line, the inlet of the perfusate coming from the coronary, additional left suction, the outlet to the line with a centrifugal pump to the oxygenator, the arterial line, the aorta are located at the bottom of the soft reservoir. When air enters the soft reservoir through the venous lines, they are removed through the line connected to the coronary suction, on which there are valve adapters located in the upper section of the soft reservoir. Air ingress is practically impossible [1,2,3].

At present, the issues of coagulopathy during cardiac surgery with the planned duration of artificial circulation of more than 2 hours are still becoming relevant, since this method is based on the blood flow outside the body along non-biological surfaces. Using the closed circuit method, which avoids contact of the perfusate with external air and excludes mechanical trauma to the blood in the centrifugal pump, which makes it possible to perform cardiac surgery in patients with a high risk of coagulopathy in the immediate postoperative pe-

riod and surgery with the planned duration of cardiopulmonary bypass [4,5,6,7,8,9].

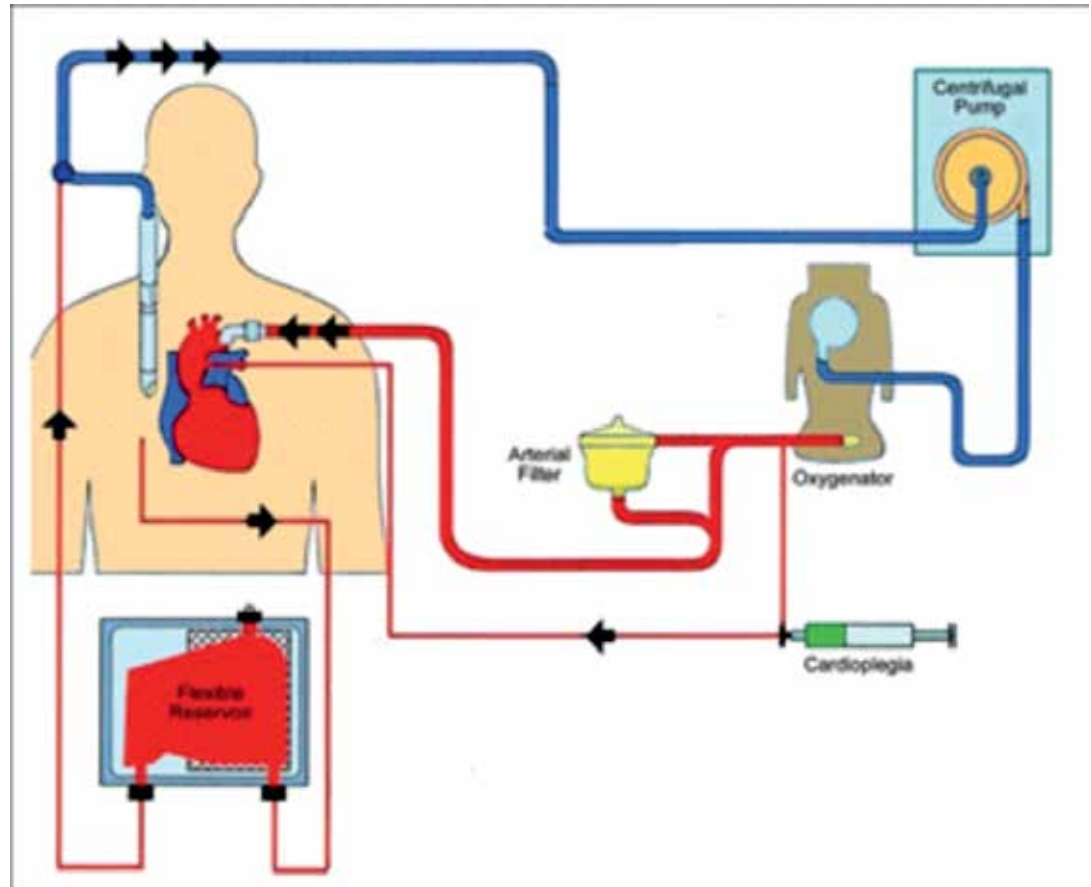
Materials and methods

In the clinic of JSC "National Scientific Center of Surgery named after A.N. Syzganov" a study was conducted, which included 10 patients (average age 47-56 years) with Diagnoses: Aneurysm of the ascending aorta, aortic valve insufficiency FC 3. Patients were divided into 2 groups, the 1st group (5 patients) patients are the control group, using an open circuit of artificial blood circulation, the 2nd group (5 patients) - these are patients using a closed circuit of artificial blood circulation. The average time of cardiopulmonary bypass in both groups is 125-187 minutes.

Results

A comparison of the two groups revealed a significant decrease in hemoglobin, hematocrit, erythrocytes after surgery with an open circuit of artificial circulation. Blood loss after sternum closure up to 12 hours after surgery in the control group and the comparison group was $900 \text{ ml} \pm 78$ and 200 ± 74 . The hematocrit level (1 hour after surgery) in the control group and the comparison group was 27 ± 3.25 and 35 ± 3.89 . The hemoglobin level (1 hour after surgery) in the control group and in the comparison group was $103 \text{ g/l} \pm 10.55$ versus $115 \text{ g/l} \pm 13.16$. The level of erythrocytes (1 hour after surgery) in the control group and in the comparison group was $3.4 \times 10^{12} / \text{l} \pm 0.35$ and $4.3 \times 10^{12} / \text{l} \pm 0.52$. The level of platelets (1 hour after surgery) in

Figure 1.
Connection scheme for closed cardiopulmonary bypass (Raed A., 2012)



the control group and in the comparison group was $126 \times 10^9 \text{ l} \pm 10.0$ and $234 \times 10^9 \text{ l} \pm 12.4$. The creatinine level (1 hour after surgery) in the control group and in the comparison group was $0.272 \text{ mg / dL} \pm 72$ and $0.275 \text{ mg / dL} \pm 71$. The urea level (1 hour after surgery) in the control group and in the comparison group was $34.5 \text{ mg / dL} \pm 7.2$ and $37.7 \text{ mg / dL} \pm 9.5$. Control laboratory tests: (16 hours after surgery) the hematocrit level in the control group and in the comparison group was 37 ± 3.2 and 44 ± 3.6 ; the hemoglobin level in the control group and in the comparison group was $105 \text{ g / l} \pm 10.2$ and $115 \text{ g / l} \pm 12.4$; the level of erythrocytes in the control group and in the comparison group was 3.74×10^{12} and $4.4 \times 10^{12} \pm 0.446$; the level of creatinine in the control group and in the comparison group was $1.030 \text{ mg / dl} \pm 0.192$ and $1.034 \text{ mg / dl} \pm 0.213$; the level of urea in the control group and in the comparison group was $32.3 \text{ mg / dl} \pm 9$ and $38.5 \text{ mg / dl} \pm 10$; the level of leukocytes in the control group and in the comparison group was $11.8 \times 10^9 \text{ l} \pm 2.3$ and $8 \times 10^9 \text{ l} \pm 10.3$; the level of platelets in the control group and in the comparison group was $220 \times 10^9 \text{ l} \pm 7.9$ and $278 \times 10^9 \text{ l} \pm 13.1$. Transfusion of erythrocyte mass and fresh frozen plasma, platelet suspension was performed in the immediate postoperative period for all 5 patients from the control group, and in the 2nd experimental group 2 patients underwent trans-

fusion of erythrocyte mass associated with blood hemodilution in the postoperative period. There was no lethality in both groups. In the 2nd study group, drainage blood loss significantly decreased, on average 60-100 ml compared to the control group, where the average drainage loss was 600-1500 ml. The need for transfusion of blood components was 5.1% in the 2nd group, compared with 43.4% in the control group.

Conclusion

The closed circuit technique allows avoiding contact of perfusate in a soft reservoir (hemocon) with external air, which is more physiological and less traumatic for blood cells, in contrast to oxygenators with a solid reservoir, as well as using a centrifugal pump that pumps perfusate into the oxygenator. arterial line, the aorta without mechanical clamping, which protects the blood from injury, in contrast to the clamping mechanical pump, which helps to prevent postoperative complications (hemolysis, hepatic, renal, pulmonary failure, reduction of the general inflammatory response, etc.). Reduces the risks of postoperative bleeding, reduces the need for transfusion of blood and its components, which allows complex heart surgeries with the planned duration of cardiopulmonary bypass more than 2-3 hours [4,5,9,10].

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 conflicts of interest

Keywords

patella, dislocation, arthroscopy,
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надколенник, вывих,
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OUR EXPERIENCE IN TREATING PATELLAR DISLOCATION USING A MINIMALLY INVASIVE METHOD

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Abstract

This article summarizes a little experience in the treatment of patellar dislocations by the arthroscopic method. In total, from 2018 to 2021, we performed 450 arthroscopic operations on the knee joint, of which the stabilization of the patella in case of dislocation was 7. Thus: in the case of primary traumatic dislocation, we performed 4 operations, with the usual - 3. e carrying out arthroscopy, which allows you to restore the biomechanical axis with the elimination of patellar dislocation simultaneously or sequentially at the stage of treatment, allows you to get positive results.

Пателлярлы дислокацияны аз инвазиялық әдістермен емдеудегі тәжірибеміз

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Аңдатпа

Бұл мақалада пателлярлық дислокацияны артроскопиялық әдіспен емдеудің аз тәжірибесі жинақталған. Барлығы 2018 жылдан 2021 жылға дейін біз тізе буынына 450 артроскопиялық операция жасадық, оның ішінде дислокация жағдайында пателла тұрақтылығы 7 құрайды. Осылайша: бастапқы травматикалық дислокация кезінде біз 4 операция жасадық, әдеттегідей - 3. Пателланың дислокациясын минималді инвазиялық әдіспен жою үшін, артроскопия әдісін жүргізу арқылы емдеу, оң нәтиже алуға мүмкіндік береді деп санаймыз.

Наш опыт лечения вывиха надколенника малоинвазивным методом

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Аннотация

В настоящей статье обобщен небольшой опыт лечения вывихов надколенника артроскопическим методом. Всего с 2018 по 2021 год нами на коленном суставе выполнено 450 артроскопических операций, из них стабилизация надколенника при вывихе составляла 7. Таким образом: при первичном травматическом вывихе нами выполнено 4 операции, при привычном - 3. Мы считаем оправданными устранение вывиха надколенника малоинвазивным методом т.е. проведением артроскопии, что позволяет восстановить биомеханическую ось с устранением вывиха надколенника одновременно или последовательно на этапе лечения позволяет получить положительные результаты.

Relevance

In the structure of traumatological diseases, patellar dislocations account for 0.3-0.7% of all dislocations [1]. The most common cause of patellar dislocation is trauma (falling to the knee, hitting a straightened leg in the knee area), less common dislocations occur. Patellar dislocations occur as a result of indirect trauma in patients, predominantly young from 16 to 40 years old (81%), more often in women (70%) with anatomical structural features of the femoral-patellar joint, and are accompanied by damage to the medial supporting ligament and articular surfaces of the medial patellar facet and the lateral femoral condyle, with the possibility of the formation of free bone-cartilaginous intra-articular bodies, leading to pain syndrome, dysfunction of the knee joint, instability of the patella. The modern classification distinguishes between acute dislocation or primary traumatic, repeated dislocation or recurrence of acute, habitual dislocation or chronic instability of the patella. According to the degree of displacement of the patella, subluxation and dislocation are distinguished, and according to localization - external, internal and torsion. The factors predisposing patellar dislocation are: valgus deformity of the knee joints, dysplasia of the lateral condyle of the thigh, anatomical shape of the patella (type 3-5 according to Viberg), lateroposition of the tibial tuberosity, hypotrophy of the quadriceps muscle. Diagnosis of patellar dislocation consists of the following data: anamnesis, diagnostic puncture, radiography of the knee joint in frontal and lateral projections and radiography of both patellofemoral joints, MRI (signs of transchondral fracture and chondropathy of the lateral condyle of the thigh and patella), diagnostic arthroscopy (typical

picture). Conservative treatment of patients with acute traumatic external dislocations of the patella, according to the literature, allows obtaining positive results only in 30-36% of patients, while in the rest of patients this method of treatment entails the development of chronic subluxation and habitual dislocation of the patella. An effective method of treating patients with patellar dislocations is its arthroscopically controlled stabilization [2-10].

Materials and methods

In total, from 2018 to 2021, we performed 450 arthroscopic operations on the knee joint, of which 7 (3.9%) of the patella were stabilized in case of dislocation. Thus: in the case of primary traumatic dislocation, we performed 4 operations, with the usual - 3. In the postoperative period, the limb was temporarily immobilized with a posterior plaster cast for up to 7 days, then a brace was worn for 6 weeks with flexion limited to 90°, physical activity and sports were limited to 3 months. The complex of treatment includes anesthetic and anti-inflammatory therapy, a course of chondroprotectors (local and intra-articular), a medical gymnast, physiotherapy, massage.

Surgery progress: timeout: after the patient has been verified, the operating field is marked, the composition of the operating team is according to the approved plan. Operation: under aseptic conditions, under a tourniquet in the middle third of the left thigh, from two punctures on the sides of the patella's own ligament, two ports were installed into the cavity of the left knee joint.

The joint is flushed. With the help of 30 optics, a revision of the knee joint was performed. Under load, the patella moves freely onto the lateral surface of the knee joint. Vaporization of the knee joint

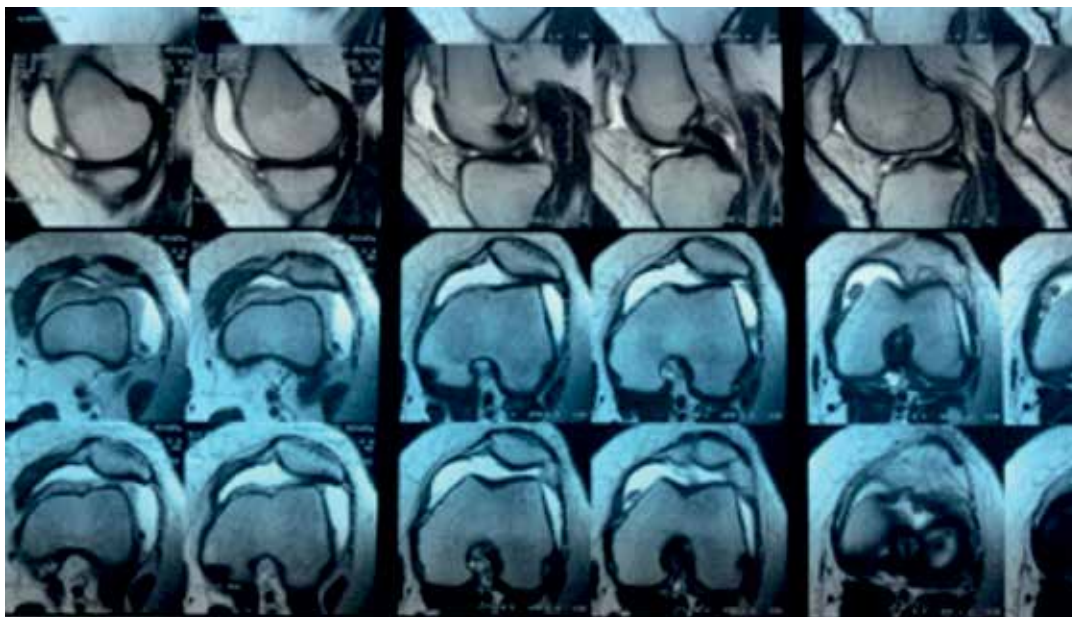


Figure 1.
Description is provided in
the text

Figure 2.
Description is provided in
the text



was performed. From an additional 2.5 cm incision along the anterior - inner surface of the upper third of the leg, the tendon m was isolated. Gr. With the help of an open extractor, an autograft with a length of about 18.0 cm was taken. A ligament of \varnothing 6.0

mm was formed. On the upper-inner edge of the patella, along the lateral surface, a 2.0 cm long, 0.5 cm deep and wide groove is formed. In the upper and lower corners of the groove in the frontal plane, 2 lavsan loops are drawn transosseally through the patella. The tendon autograft is laid in the groove and fixed with loops. Further, in the inner supracondylar zone, a \varnothing 6.0 canal and a depth of 7.0 cm was formed. The autograft was carried out under the fascia of the thigh from the patella and inserted into the formed canal. Fixed with Interference Screw 7x25 mm. Movement in the knee joint was fully restored. The symptoms of patellar instability were eliminated. Postoperative wounds were sutured in layers. Iodine, aseptic dressings. Immobilization of the limb with a posterior plaster splint. Counting material and tools.

Conclusion

Thus, we believe that the elimination of the patellar dislocation by a minimally invasive method is justified, i.e. by performing arthroscopy, which allows to restore the biomechanical axis with the elimination of the patellar dislocation simultaneously or sequentially at the stage of treatment, which allows to obtain positive results.

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HEART RATE CONTROL USING IMPLANTABLE DEVICES. WHAT WE HAVE ACHIEVED AND WHAT ELSE IS WAITING IN MODERN ARHYTHMOLOGY? REVIEW

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Abstract

Ambulatory cardiac monitoring is a rapidly expanding field of functional diagnostics. Today, the main direction of cardiac monitoring is outpatient monitoring of the electrocardiogram, an important diagnostic tool that is used daily by doctors in many specialties. Therefore, both wearable and subcutaneous technologies of electrocardiographic monitoring are now widely used. A number of devices can be placed under the patient's skin and have the ability to wirelessly transmit data to home transmitters, which, in turn, then transmit data to the doctor via cloud interfaces, so that, they allow remote monitoring and monitoring of the patient's condition. Such systems are widely used in various countries of the world, approved in the USA, and are also used for remote monitoring of patients in Europe and Kazakhstan, where their implementation is gaining momentum. This review presents the technical aspects of subcutaneous monitoring, provides a schematic representation of the operation of systems existing on the market, discusses the advantages of this method, as well as the disadvantages of existing implantable cardiac monitors. The issues of the future development of this technology and indications for the use of existing devices approved by the professional cardiological communities are considered.

Имплантацияланатын құрылғылар көмегімен жүрек ырғағын бақылау. Заманауи аритмологияда неге қол жеткіздік және алда не күтіп тұр? Әдебиет шолуы

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Аңдатпа

Жүректің амбулаторлық мониторингі - бұл функционалды диагностиканың жылдам дамып келе жатқан саласы. Бүгінгі таңда жүрек мониторингінің негізгі бағыты - электрокардиограмманы (ЭКГ) амбулаторлық мониторинг жасау - бұл көптеген сала дәрігерлерінің күнделікті қолданатын маңызды диагностикалық құралы. Сондықтан қазіргі кезде электрокардиографиялық бақылаудың тері сыртынан денеге тағатын да, тері асты технологиялары да кеңінен таралған. Бірқатар құрылғыларды науқастың терісінің астына қоюға болады және деректерді үйдегі таратқыштарға сымсыз жіберу мүмкіндігі бар, олар өз кезегінде бұлтты интерфейс арқылы дәрігерге мәлімет береді, яғни олар науқастың жағдайын қашықтықтан бақылауға және қадағалауға мүмкіндік береді. Мұндай жүйелер АҚШ-та мақұлданған, сондай-ақ әлемнің әр түрлі елдерінде кеңінен қолданылады, сонымен қатар олар Еуропа мен Қазақстанда да науқастарды қашықтықтан бақылау үшін қолданылады.

Әдеби шолу электрокардиограмманы тері астылық бақылаудың техникалық аспектілерін ұсынады, клиникалық қолданыста бар жүйелердің жұмысынан схемалық көрініс береді, осы әдістің артықшылықтарын, сонымен қатар тәжірибелік қолданыстағы имплантацияланатын жүрек мониторларының кемшіліктерін талқылайды. Кәсіби кардиологиялық қауымдастықтар мақұлдаған осы технологияның келешектегі даму мәселелері мен қолданыстағы құрылғыларды қолдануға көрсеткіштер қарастырылады.

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Conflict of interest

The authors declare that they have no conflicts of interest

Keywords

ambulatory cardiac monitoring, insertable cardiac monitors, implantable cardiomonitors, palpitations, stroke, syncope, atrial fibrillation, telemedicine.

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амбулаторлық кардиологиялық бақылау, тері астындағы жүрек мониторлары, имплантацияланатын жүрек мониторлары, жүрек соғысы, инсульт, синкопе, жүрекше фибрилляциясы, телемедицина

Контроль ритма сердца с помощью имплантируемых устройств. Чего мы достигли и что еще предстоит в современной аритмологии? Обзор литературы

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Конфликт интересов

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Ключевые слова

амбулаторный кардиомониторинг, подкожные кардиомониторы, имплантируемые кардиомониторы, сердцебиение, инсульт, обморок, фибрилляция предсердий, телемедицина

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Аннотация

Амбулаторный кардиомониторинг – это быстро расширяющаяся область функциональной диагностики. На сегодняшний день основным направлением кардиомониторинга является амбулаторное мониторирование электрокардиограммы (ЭКГ) – это важный диагностический инструмент, который ежедневно используется врачами многих специальностей. Поэтому в настоящее время широко распространены как носимые, так и подкожные технологии электрокардиографического мониторинга. Ряд устройств могут помещаться под кожу пациента и обладают возможностями беспроводной передачи данных на домашние передатчики, которые, в свою очередь, передают данные врачу через облачные интерфейсы, то есть позволяют дистанционно наблюдать за пациентом и контролировать его состояние. Такие системы широко используются в различных странах мира, одобрены в США, а также применяются для дистанционного наблюдения за больными в Европе и Казахстане, где их внедрение набирает обороты.

В обзоре представлены технические аспекты подкожного мониторинга, дано схематичное представление о работе существующих в клинической практике систем, рассматриваются вопросы преимуществ данного метода, а также недостатки существующих в клинической практике имплантируемых кардиомониторов. Рассматриваются вопросы перспективного развития данной технологии и показаний к применению существующих устройств, одобренных профессиональными кардиологическими сообществами.

Introduction

Currently available ECG monitoring technologies include both “wearable” and subcutaneous ECG recorders and the most successful choice of a device for a particular patient is associated with the frequency with which relapses of the patient’s symptoms are expected [1]. Thus, several clinical studies have shown that performing a routine ECG helps to clarify the genesis of syncope only in 2–11% of cases [2]. According to a comparative study, which compared the results of implantable cardiac monitors (ICM) and Holter ECG monitoring technology (HM ECG), modern ICMs transmit up to 98% of arrhythmia episodes during the entire period of their operation, and the loss of single episodes occur only in case of repetition of several arrhythmic episodes during the day [3]. An isolated HM ECG for 24 hours makes it possible to determine the cause of cardiac arrhythmias in 2–20% of cases [2, 4]. To clarify the cause of syncope, the most effective is a rotary table test (tilt test), it allows you to understand the cause of syncope, according to different authors, in 11–87% of cases, and in 76% of cases - to change the therapy in connection with this [2, 5, 6]. At the same time, in only 4% of patients, a complex of neurological examination, including examination by a specialist doctor and computed tomography of the brain, helps in establishing the cause of syncope [6]. Evaluation of ICM data helps in making a diagnosis in 87–90% of patients with syncope and allows a comprehensive assessment of the effectiveness of ablation

for atrial fibrillation [2, 5, 7]. Application ICM is also important for patients with syncope not of a cardiogenic nature, but with cardiogenic transient ischemic attacks; the proportion of such patients is up to 58% in the structure of the causes of death from strokes [2, 8, 9]. Semi-annual mortality rate in these patients exceeds 10% [2, 10]. At the same time, it is the genesis of syncope and the difference between cardiogenic and non-cardiogenic syncope that determines the patient’s treatment tactics and prognosis [9]. Recording an ECG at the time of rare episodes of syncope is a difficult task, but with longer periods of monitoring it is quite feasible: for example, according to some studies, the number of recorded episodes of arrhythmia reaches 50% only during 365 days of continuous observation with using ICM [11, 12].

Currently, there are complex ICM test systems on the international market that allow for long-term, long-term monitoring and recording of arrhythmia episodes. They have been tested in clinical trials and have been approved by the FDA and EMEA for clinical use. At the moment, such test systems are produced by four manufacturers of medical equipment: St. Jude Medical, Boston Scientific, Medtronic and Biotronik [13]. The data obtained in clinical studies on the use of diagnostic implantable arrhythmia fixation systems in patients at risk of fatal arrhythmias suggest that the instrumental systems of these manufacturers are quite effective in preventing sudden cardiac death [13]. For example, in the ALTITUDE study, it was shown that

the survival rate of patients implanted whose devices transmitted information to remote networks was associated with a relative reduction in the risk of death by 50% [13]. Implantable cardiac devices with remote functionality provide an unprecedented opportunity to ensure daily monitoring of patients and are one of the most advanced medical technologies in cardiology [13].

Outpatient management of patients with ICM, defibrillators and pacemakers, the so-called outpatient cardiac monitoring, provides an innovative solution to the burden of doctors and hospital resources to obtain information about possible deviations in heart rate in patients [13]. Automated and remote transfer of data from the implant to the data control center allows you to quickly respond to the patient's condition: the doctor is informed via messengers, mail and telephone notifications about life-threatening situations in the patient or about violations in the operation of the device [13]. This approach allows you to bring the diagnostic system in arrhythmology to a new level. The trend for the introduction of ICM into widespread clinical practice is redefining the standard of management of patients with arrhythmias [13].

This review focuses on the current state of the art of insertion methods, areas of application and advantages of subcutaneous ICM over HM ECG, the prospects for their use and limitations. The aim is to highlight the diversity of modern ICM technologies and their advantages, to give an idea of the potential of future developments in the field of cardiac monitoring.

Technical capabilities of receiving and storing heart rate data

The basis for the transition from ECG monitoring with cutaneous electrodes to monitoring implantable devices were studies that showed that the ECG voltage measured by electrodes on the skin should be identical to the ECG voltage in the underlying subcutaneous areas [14]. So, R. Arzbaecher et al. showed that cutaneous and subcutaneous ECGs coincided in amplitude and morphology [14]. Typically, potential maps of the body surface show gradients of several hundred microvolts per centimeter in the areas of the chest just above the heart; in this way, a pair of electrodes with a distance of 3 or 4 cm, if correctly positioned and oriented to the chest, can easily record 1 MV R-waves during sinus rhythm [14]. The potential gradients on the chest form a two-dimensional vector field, and two pairs of electrodes at the corners of the sensor form two ECG outputs, which measure two orthogonal components of this vector [14]. An example of a suitable combination of two conclusions: the sum of squares is independent of the direction of the surface po-

tential gradient vector and allows automatic detection of the R-wave, regardless of the orientation of the device, a change in the patient's posture, or even a change in the direction of cardiac activation [14]. To demonstrate that high quality ECG recordings can be obtained from closely spaced bipolar pairs, R. Arzbaecher et al. studied 60 patients with ICD implanted and recordings from multielectrode precordial matrices during sinus rhythm and during induced episodes of ventricular fibrillation as part of a standard defibrillator testing protocol [14]. In these patients, the mean R-wave amplitude was 1.4 mV (range 0.3–2.7) in sinus rhythm and 0.8 mV (range 0.3–2.0) with ventricular fibrillation [14]. Arzbaecher R. et al. observed in these experiments that precordial locations, which are reflected by large R-waves during sinus rhythm, as a rule, give large deviations in ventricular fibrillation [14]. This is an important observation, since the optimal implantation site can be determined by simply displaying R-waves against the background of sinus rhythm, without the need to induce ventricular fibrillation [14]. In this study, the clarity and amplitude of deviations in both sinus rhythm and episodes of ventricular fibrillation were such that the proper level of reliability could be expected from most of the processing algorithms [14]. In modern ICM, R-waves are identified using an adaptive threshold detector, and R-R interval series are compared to programmed detection thresholds. If the sequence of interval measurements satisfies the trigger criteria, then the contents of the circular buffer are selected as significant for storage and transferred to permanent storage [14]. Further development of technologies for installing ICM made it possible to achieve their stable position, in which a week after implantation the amplitude of the R wave of 0.75 ± 0.39 mV is recorded, and it remains stable throughout the observation period [15].

Diagram of the device of modern instrument complexes of various devices implantable heart monitors

The system usually consists of 4 main components [16]:

1. An implantable cardiac monitor is an implant, in fact, a disposable electronic sensor, implanted into the subcutaneous tissue in the area above the heart. The device is equipped with contacts, for most monitors - two, which are electrodes-detectors of electromagnetic waves recorded as an ECG curve - "subcutaneous ECG" of the patient. The data are recorded continuously, however, only up to 55 minutes of records are stored in the device's memory, while modern devices store only "fragments" of ECG curves that correspond to the device's settings for storing anomalous episodes.

These are either automatically saved episodes, or several minutes of ECG recorded after activation of the recording by the patient himself through the PCM remote control (provided that such a remote control is available in the manufacturer's instrument complex). The parameters of the start of the recording of an arrhythmia episode in the device memory are determined by the physician adjusting the implanted sensor through a special part of the device complex - the programmer.

2. Programmer is a stationary device that is used to set the operating parameters of a sensor implanted in a patient using wireless communication [13]. The programmer has a screen for displaying image of the patient's ECG data coming from the implanted sensor directly or through the transmitter (depends on the manufacturer's instrumentation). It is possible to print ECGs from it, information about the patient's ECG episodes can be stored in the memory of the programmer. The programmer is a part of the instrumentation system used by medical personnel in a medical hospital. One programmer serves several patients of a given hospital. The programmer is also used to adjust the location and orientation of the implant, optimize the signal amplitude, as well as to set the parameters of the event trigger and data storage for each device [14].

3. Patient assistant - remote control for the implant, which is also called the activation unit. This is a device with replaceable batteries for wireless communication with the implant. It allows a short segment of data to be captured at the press of a button, which is useful for documenting rhythms associated with dizziness or chest flutter [14]. Some PCMs contain a uniaxial accelerometer, which perceives the characteristic signature of a patient falling and can transmit data based on this trigger [14].

4. Patient monitor - a device designed to receive information from the implant, temporarily store it in a limited volume and transmit data to the dedicated servers of the company-developer of the instrument complex. Depending on the manufacturer and device settings, transmission from the implant to the monitor can be automatic or can be induced from the control panel by the patient. The data transmission channels from the monitor itself to the servers of the developer company differ for the instrument complexes existing on the market. This can be a wired telephone or cellular connection, and the storage servers can be cloud-based or fixed. Usually this part of the system is located in the patient's bedroom, since wireless data transmission requires a distance between the implant and the monitor no more than 3-10 m. The interaction of the patient with the monitor includes the initial setup procedure, performing the data collection requested by

the doctor and responses to the doctor-specified notifications displayed on the monitor screen.

Modern technology of data transmission in systems implantable heart monitors for medical monitoring

When the ICM is working, the perceived ECG is cycled through a circular buffer (memory circuit) for about 10 minutes [14]. Episodes identified by the CM as arrhythmic can be transferred wirelessly (Wi-Fi or Bluetooth) to a large memory storage, patient monitor. Setting of data transmission parameters is possible for devices existing on the market only with the help of an external programmer supplied by the manufacturer [14]. Among the systems existing on the market, there are those in which the transfer of data from the implant to the patient's bedside monitor can occur only through the implementation of a number of actions by the patient - this is called "inductive monitoring" [13]. A significant barrier in the provision of medical care, both for clinicians and patients, is non-compliance by patients with the requirements for their participation in the daily process of data transfer [13]. In instrument complexes with a more modern model of data transfer, automated, no special actions from the patient are required for data transfer. This fact increases the diagnostic value of these instrumental models [13]. But even such systems of cardiac monitoring, in which the transmission, collection, safety of data depend on the patient's compliance, nevertheless have advantages over the absence of such a diagnostic capability and standard HM, as shown in a number of studies [13]. Currently released ICMs have up to 55 min of working memory before events begin to be overwritten or lost [14]. It is obvious that ICM with automatic remote transmission of key results have a significant advantage over HM ECG technology, while the patient lives in a region that allows remote data download [10]. Most of the ICMs existing in clinical practice transfer data to their processing center, but the system for tracking the accumulated data is organized differently for different manufacturing companies. Data processing is carried out, as a rule, once, and the information received is analyzed for a certain, sometimes quite long, a period of time, which allows a time pause between the recorded and transmitted arrhythmic episode and the adoption of a medical decision in relation to the patient. Remote control of actual patient data with timely data transmission to the doctor is possible and has already been partially implemented, and in this sense, the leading monitors on the market are ICM St. Jude Medical, which uses the system of wireless data collection, cloud storage and automated data analysis - Merlin.net® [13]. This approach, as shown by the study

of S.-Y. Ooi et al., Allows the transmission of up to 93% of the ECG episodes of each patient daily [15]. Clinical studies have already confirmed that the transition to such a model of "remote" observation from the model

"Per visit" assessment of patient data when visiting a clinic is justified both from the point of view of the benefit for the patient and from the point of view of health care economics [13, 15–18]. However, the limitation of devices existing on the market is the delay in data transmission up to a day when the episodes are recognized as non-threatening, and from 3–10 to 5 minutes - when the life-threatening episodes are detected. A prospect for the further development of the technical capabilities of the ICM is the mode of transferring data on life-threatening episodes in real time, with the possibility of an ambulance leaving at the location of the patient when he develops life-threatening arrhythmias.

Method of implantation of cardiac monitors

The procedure for implantation of most ICMs existing in practice is quite simple and can be performed on an outpatient basis, in about 9-15 minutes with local anesthesia [2, 14, 19–21]. The introduction of the Reveal® LINQ™ ICM is permissible in the patient's bed, which eliminates the cost of carrying out the procedure in the operating room [10, 19].

The conditions of asepsis must be observed, and local anesthesia is preliminarily performed [2]. Usually, the implant is placed in the subcutaneous tissue above the heart region. The guidelines for installation in the normal position of the heart (left) are: the upper border - the first rib on the left, the lower one - the fourth rib on the left, the right extreme border - the parasternal line, the left border - the left midclavicular line [2]. Searching for the right one the position of the implant is aimed at achieving the greatest amplitude of the R wave or the QRS complex of the cardiogram, which from peak to peak should be at least 0.3–10 mV, while the P and T waves should differ as much as possible in amplitude from R wave [2].

Early ICM required a surgical pocket between the cutaneous and muscle layers of the same size and shape as the device, about 2 cm [10, 14]. The operation itself to install the implant was performed through a two-centimeter skin incision, and the sensor was sutured to the underlying tissues [2]. An excessively large pocket disrupted tissue-PCM contact and decreased signal detection [10]. More modern devices are introduced using the "injection" technique. The advantages of "injectable" ICM are that this method of administration not only reduces the volume of trauma, but also provides better contact of the ICM with tissues. The Reveal® LINQ v device

(Medtronic, USA) is preloaded into an insertion instrument that is used to deliver it subcutaneously through a small puncture (less than 1 cm), which can then be closed with surgical glue, surgical tape, sutures or staples [19]. The BioMonitor 2® device (Biotronik, Germany) is introduced in a similar way [10]. But even with newer PCMs, the operator must take care not to rotate the insert tool, thereby inadvertently creating a pocket larger than necessary and impairing tissue contact [10].

The miniaturization of the device and the simplification of the implantation procedure contribute to an increase in the use of ICM [10, 19–23]. After the device is inserted and sewn into the "pocket", the parameters of the arrhythmia trigger and recording are programmed on the programmer by the doctor, and the data download from the ICM usually begins after a period of "settling" of the implant for several weeks, when the "pocket" "Around the monitor heals [14].

Overall Clinical Value of Cardiac Monitoring with an Implantable Cardiac Monitor

The clinical benefit of such a diagnostic intervention as ICM placement can be determined not only by whether an anomaly is detected, but also by whether ICM placement has a positive effect on patient treatment and prognosis, quality and duration of life [10, 22–25]. One example is the documentation of paroxysmal AF in a patient with cryptogenic stroke, which led to the initiation of oral anticoagulant therapy [10, 24, 25]. In addition, the results of ICM work can be "expected" (for example, search for the cause of fainting based on the correlation of symptoms with arrhythmia) or "unexpected" (for example, detection of a previously unknown paroxysmal form of AF in a patient under observation for any other reason that triggers the onset of prophylactic anticoagulation) [10, 22, 26]. In any case, it can be argued that patients only benefit from the intervention - setting the ICM [10, 22, 23–27].

Despite some drawbacks, subcutaneous monitors are quite effective for detecting negative non-perfusion phenomena (asystole, brady- or tachycardia) affecting the ECG. However, such devices have begun to appear that make it possible to determine ST segment deviations, which is undoubtedly important for patients with high risks of recurrent acute coronary events [27]. As described above, the subcutaneous ECG signal recorded by the electrodes facing the skin surface is similar to those recorded from the body surface above the electrodes, both in morphology and in amplitude [10]. ICM, in comparison with devices for HM, do not cause discomfort to the patient in the process of diagnosis, meet the requirements for sensitivity and specificity in the diagnosis of arrhythmias, but the existing

devices do not have 100% sensitivity and specificity [14]. On the other hand, current generation built-in PCMs provide 3-year monitoring and rarely give skin irritations [1, 19, 20]. To minimize the negative cosmetic consequences when installing the device along the left axillary line, a group of scientists (G. Miracapillo et al.) Successfully tested the placement of ICM in the left axillary region [28].

Automatic remote loading of data - a valuable feature in many cases - is present in some wearable devices, but they have been compared with ICM for sensitivity and specificity of arrhythmia detections only with traditional approaches, including HM ECG rather than ICM [29, 30].

Disadvantages and limitations of using an implantable cardiac monitor

Certain technical features can reduce the efficiency of ICM data collection. Important among them are the problems of oversensing and undersensing [10]. In order to minimize the overall volume of the device, and hence the surgical problems with implantation and scar size, modern monitors have only two electrodes and an elongated shape that provides maximum separation of the electrodes [14]. Unfortunately, this makes the ECG signal very sensitive to the position of the device in the chest, changes in the patient's posture and changes in the direction of cardiac activation that can occur during an arrhythmic episode [14]. Therefore, subcutaneous ICMs are characterized by "false alarms" caused by both signal loss and external interference [14].

Inadequate detection of arrhythmias due to physiological and nonphysiological circumstances increases the time it takes to view episodes by the doctor and can reduce the effectiveness of diagnosis due to the limited storage time of episodes in the device, since in this case less important events or "noise" can be recorded in place of more important data [10]. Primary nonphysiological reasons for inadequate detection of bradycardia and pauses include lack of sensitivity due to loss of electrode contact with surrounding tissues or sudden drop in R-wave amplitude (eg, pericardial effusion) or oversensitivity due to myopotential noise or electromagnetic interference [10]. Physiological reasons for inadequate detection of bradycardia and pauses may be associated with insufficient sensitivity of the ICM to such arrhythmias [10]. In the latter case, the problem is most likely associated with a change in the R-wave vector [10]. Currently available subcutaneous monitors record data from one pair of electrodes and cannot provide a reliable signal during normal postural changes or changes in the direction of cardiac activation, such as the development of polymorphic ventricular tachycardia or ventricular fibrillation [14]. The narrow bandwidth of the re-

coding prevents detailed analysis of the waveform morphology to assess ischemia; there is no scheme for detecting or eliminating rhythm peaks or defibrillation artifact, and a single ECG channel limits diagnostic capabilities [14]. In syncope, when the patient is unconscious after a fall, activation of the data recording by the user (patient) is not possible [14]. Therefore, unfortunately, modern ICM cannot be considered absolutely reliable devices for detecting episodes of cardiac arrest [14].

Finally, ICM, in contrast to externally wearable loop recorders, require an invasive procedure, which inevitably increases the risk of infection, hematoma, and pain associated with the procedure [10, 19–21]. For example, in the controlled trial Cryptogenic Stroke and Underground AF (CRYSTAL AF), which evaluated long-term ICM monitoring for AF after cryptogenic stroke using Reveal® XT™ ICM (Medtronic, Minneapolis, Minnesota, USA), 5 of 208 (2.4%) ICMs were removed due to infection at the injection site or pocket erosion [10]. Unfortunately, local inflammatory reactions caused by the implantation procedure, even when miniature devices are installed, are observed in 0.8-1.6% of patients, and serious adverse events - in 0.7-1.7% of patients from 100 [19–21]. In this regard, an interesting solution proposed by Medtronic and tested in a clinical trial by K.G. Tarakji et al., - insertion of the ICM into a special absorbable antibacterial "pocket" [23].

The small size of the ICM facilitates implantation, but complicates the removal of the device: years after implantation, very small devices are difficult to detect and release from the surrounding tissues [10, 20, 21]. As a consequence, the explantation procedure may take longer than the implantation procedure, and the wound after removal of the ICM may be larger than that required for implantation. Finally, a cosmetic defect associated with the implantation and explantation procedure can become a problem for the patient [10]. It is especially important to take this into account when a patient has a tendency to form keloid scars.

Economic problems that remain in some regions can adversely affect the development of ICM technology and at the same time, some technological factors can also negatively affect the enthusiasm for the use of ICM among healthcare providers [10]. For example, the availability of the data transmission network in the patient's place of residence, the fear of exposure to the patient's body of magnetic fields, or restrictions on patients undergoing examinations on magnetic tomographs of a certain power after the installation of a ICM that does not have the appropriate technical characteristics. Although most of the latest models of ICM are allowed to be used for MRI on devices with a power of up to 3 Tesla (T) and even for individual

devices - up to 10 T, the old-style ICM is not recommended for patients exposed to strong magnetic fields (more than 3 –10 T) or high-frequency electrical systems [3, 5, 20].

A limitation for some ICM systems is the requirement for the patient's cognitive functions, which must be sufficiently preserved mentally, educated and motivated to use the remote monitoring function and the bedside monitor, as well as the ICM remote control - "patient assistant" [10].

Implantable cardiac monitors have another serious drawback - their functions are limited to diagnostic purposes. Thus, the development of remote monitoring applications for pacemakers and especially implantable cardioverter defibrillators may reduce the role of monitoring devices exclusively in the future.

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Conclusions

Ambulatory cardiac monitoring is an expanding field of cardiology, which in the coming years is likely to go beyond conventional ECG and blood pressure recordings, including going beyond the capabilities of HM ECG and will include the assessment of other potentially valuable clinical parameters (for example, assessment of hemodynamics, recognition of ischemia, metabolic changes, assessment of the risk of arrhythmia). ICM is a time-tested technology that has shown positive results of application and has further development prospects, improving the technical characteristics of devices and, at the same time, expanding the indications for their use, worthy of widespread introduction into clinical practice.

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МАСТЕР-КЛАСС «ALMATY ENDOFEST 2021»

В АО «ННЦХ имени А.Н. Сызганова» 20-21 августа 2021 года проведен образовательный мастер-класс «Almaty Endofest 2021» с участием приглашенного эксперта Смирнова А.А., к.м.н., заведующего эндоскопическим отделением НИИ хирургии и неотложной медицины им. акад. И.П. Павлова, г. Санкт-Петербург, Россия. Мероприятие прошло в гибридном (онлайн и офлайн) формате.

Специалисты ННЦХ имени А.Н. Сызганова совместно со Смирновым А.А. провели ряд эндоскопических операций, за ходом всех операций участники мастер-класса наблюдали по онлайн-трансляции из операционной.

Смирновым А.А. и зав. отделением эндоскопии Эбдірашевym Е.Б. были прочитаны доклады на актуальные темы.

Во второй день мастер-класса участники осваивали новые методики на био-моделях: стентирование, лигирование и клипирование.

Спонсорами мероприятия выступили – PENTAX Medical Europe GmbH, ООО «Эндо Старс», ТОО «ФармГранд», ERBE Elektromedizin GmbH, Германия (официальный представитель в РК ТОО - «МЕДЭКС Плюс»).



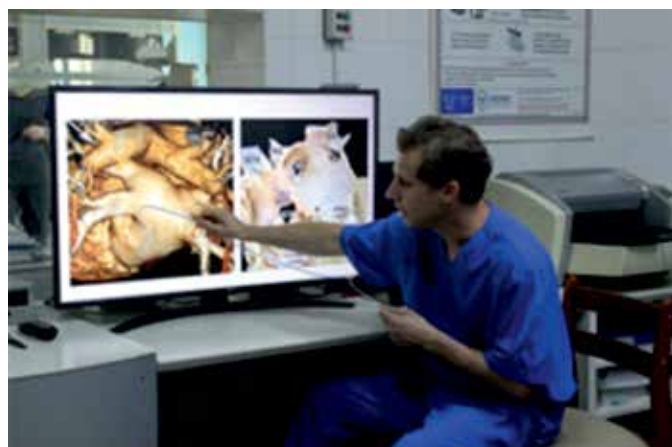
МАСТЕР-КЛАСС НА ТЕМУ: «ОБУЧЕНИЕ МАНИПУЛЯЦИЯМ АБЛАЦИОННОГО КАТЕТЕРА НА 3D МОДЕЛИ СЕРДЦА С ПОМОЩЬЮ НАВИГАЦИОННОЙ СИСТЕМЫ CARTO 3»

На базе АО «Национальный научный центр хирургии им. А.Н. Сызганова» в период с 26 по 28 августа 2021 г проведен мастер-класс на тему: «Обучение манипуляциям абляционного катетера на 3D модели сердца с помощью навигационной системы CARTO 3» с правом доступа на территорию АО «Национальный научный центр хирургии им. А.Н. Сызганова» для проктора, 4 представителей компании и 4 врачей-аритмологов из клиник «Научно-исследовательский институт кардиологии и внутренних болезней» г. Алматы и АО «Центр сердца г. Шымкент».

Программа курса включала уникальную технологию обучения манипуляциям катетером на 3D модели сердца с использованием электрофизиологической нефлюороскопической навигационной системы CARTO 3.

Целью данного мастер-класса явилось повышение уровня профессионального мастерства врачей-аритмологов в лечении сложных аритмий методом радиочастотной катетерной абляции, содействие безопасному и эффективному использованию медицинских технологий и методов лечения путем демонстрации медицинским работникам методов применения продукции «Джонсон & Джонсон».

В качестве проктора выступил Цыганов Алексей Владимирович – сердечно-сосудистый хирург из Первого МГМУ имени И.М.Сеченова, член Европейского общества кардиологов (European Society of Cardiology - ESC) и Европейской ассоциации сердечного ритма (European Heart Rhythm Association – EHRA).



Гальперин Эдуард Израилевич. К 90-летнему юбилею

Эдуард Израилевич Гальперин – это имя неразрывно связано с развитием гепатопанкреатобилиарной хирургии, не только с определением показаний к вмешательствам, техникой их выполнения, но и различными аспектами общей патологии, затрагивающими функцию печени, желчных протоков и поджелудочной железы, отражающими системный подход к решению задач.

Эдуард Израилевич родился в Москве 10 августа 1931 года в семье Берты Борисовны и Израила Наумовича. Его счастливое детство в кругу любящих родителей и многочисленных родственников резко оборвалось войной. В конце 1943 года для 12-летнего подростка предстояли новые испытания. Нам не дано предугадать, что потеряла техническая мысль, но увлечение биологией в старших классах определило дальнейший путь в 1 Московский медицинский институт имени И.М. Сеченова, который Эдуард Израилевич с отличием окончил в 1955 году. Заветная мечта стать хирургом, обучение в субординатуре факультетской хирургической клиники им. Н.Н. Бурденко и ординатуре Института Скорой медицинской помощи им. Н.В. Склифосовского явились вехами, определившими дальнейший путь в профессии. Самостоятельную работу будущий профессор начал в качестве врача выездной бригады скорой помощи Института им. Н.В. Склифосовского, а затем врача-хирурга. Именно здесь произошла встреча Э.И. Гальперина с главным Учителем его жизни – академиком Б.А. Петровым. Незаурядная личность Бориса Александровича, возможность общения с выдающимися хирургами П.Н. Андросовым, Д.А. Араповым, работа в операционной, где еще сохранился дух великого С.С. Юдина, способствовали наилучшему проявлению присущих Э.И. Гальперину качеств: трудолюбия, любознательности, большой работоспособности и широкой эрудиции, желания познать новое, умение внимательно относиться к мнению оппонента, ответственности в принятии нестандартных решений. Вот краткий итог этого периода жизни: в 33 года он уже заведует хирургическим отделением, в котором работают маститые хирурги, успешно защищены кандидатская и в 36 лет - докторская диссертации, посвященные диагностике и лечению портальной гипертензии и хирургии желчных протоков, выходят первые монографии.

С 1970 по 1979 г. Э.И. Гальперин работает в должности заведующего отделом трансплантации печени в Институте Трансплантологии и Искусственных органов, где после многолетних экспериментальных исследований вместе с академиком В.И. Шумаковым проводит первую в мире пересадку левой доли печени в гетеротопическую позицию, приоритет признан за рубежом. Исследования по методу забора левой классической доли печени положили начало развитию родственной трансплантации печени от живого донора и имели большое значение для развития пересадки пече-



ни в педиатрии. В связи с существующим в те годы законодательством, не признающим смерть мозга, решение проблемы трансплантации печени не могло иметь продолжения, и Эдуард Израилевич приступает к поиску способа повышения функциональной активности печени с помощью веществ, полученных из регенерирующей печени. Глубокий анализ исследований изложен в монографиях «Печеночная недостаточность» и «Трансплантация печени». С 1980 г. по настоящее время трудовая деятельность профессора Э.И. Гальперина связана с Alma mater – первым ММИ, первой ММА, а затем с Первым МГМУ им. И.М. Сеченова, где он работал в должности заведующего отделом хирургии печени, руководителя курса хирургической гепатологии факультета последипломного профессионального обучения врачей. Сейчас Эдуард Израилевич является Почетным профессором Сеченовского Университета, профессором кафедры госпитальной хирургии Института клинической медицины Первого МГМУ им. И.М. Сеченова. Им созданы хирургические классификации рубцовых стриктур и «свежих» повреждений желчных протоков, механической желтухи и хронического панкреатита, которыми успешно пользуются хирурги нашей страны. Разработана методика резекции печени, направленная на снижение кровопотери и профилактику внутрипеченочного метастазирования, изолированная резекция головки поджелудочной железы и концепция максимально корригирующих вмешательств при хроническом панкреатите, новый метод интраоперационной химиотерапии при злокачественных поражениях печени. Внедрены методы миниинвазивной и агрессивной хирургии при заболеланиях печени и поджелудочной железы, методы коррекции инсулиновой недостаточности. Результаты работ изложены в многочисленных статьях, докладах на конгрессах, монографиях: «Заболелания желчных путей после холецистэктомии», «Нестандартные ситуации при операциях на желчных путях», «Рубцовые стриктуры желчных протоков». Э.И. Гальперин являлся редактором учебных изданий: «Руководство по хирургии желчных путей», «Курс лекций по гепатопанкреатобилиарной хирургии».

Заслугой Э.И. Гальперина является способность создать команду профессионалов, которые объединены общей идеей, каждый является полноправным членом коллектива и вносит свою посильную лепту в общее дело, реализуясь в личностном и профессиональном аспектах.

26 лет назад Э.И. Гальперин стал инициатором создания и Президентом Международной общественной организации «Ассоциация хирургов-гепатологов», которая объединила хирургов России и стран СНГ, а также журнала «Анналы хирургической гепатологии», главным редактором которого Эдуард Израилевич был в течение 20 лет.

Коллектив ННЦХ им. А.Н. Сызганова, редакционная коллегия журнала «Вестник хирургии Казахстана» желает Эдуард Израилевичу крепкого здоровья и активного долголетия!

Памяти профессора Тлеуф Базаркана Досумбековича

18 августа 2021 года ушёл из жизни видный ученый, известный хирург, доктор медицинских наук, профессор Тлеуф Б. Д.

Тлеуф Б.Д. родился 6 августа 1939 г. в д. Пастуханово, Челябинской области. После окончания средней школы в 1957 г., он по конкурсу поступил в Свердловский государственный медицинский институт, который закончил в 1963 г. По направлению ВУЗа до 1967 г. работал врачом-хирургом МСЧ в г. Верхняя Салда (РСФСР). Далее в связи с переездом в Алма-Ату, в 1967 принят на должность научного сотрудника КазНИИОиР, где принимал активное участие в разработке проблем эпидемиологии злокачественных опухолей в Казахстане. В 1971 г. под руководством проф. Нугманова С.Н., в Онкоцентре г. Москвы защитил кандидатскую диссертацию.

С 1972 по 1974 г. г. по направлению Минздрава СССР он работал врачом-хирургом в Республиканском госпитале г. Аден (НДРЙ), оказывал медицинскую помощь местному населению и дипломатическим работникам.

В 1975 году он был принят по конкурсу на должность ассистента кафедры онкологии АГМИ. В 1976-1982 г.г. работал доцентом кафедры хирургии АГИУВ.

С 1982 по 1987 г. Тлеуф Б.Д., работая в должности Главного хирурга Минздрава КазССР внёс значительный вклад в организацию и совершенствование хирургической помощи населению республики.

В 1986 году по конкурсу он был принят на должность заведующего кафедрой хирургии АГИУВ. Откуда в 1989 г. направлен в целевую докторантуру во Всесоюзный центр лазерной медицины (г. Москва). Под руководством проф. О.К. Скобелкина в 1991 г. защитил докторскую диссертацию на тему: «Лазерный механический шов в желудочно-кишечной хирургии».

В дальнейшем до выхода на пенсию в 2001 г. он занимал должность профессора кафедры хирургии АГИУВ.

На счету профессора Тлеуф Б.Д. тысячи сложнейших операций и спасённых жизней. Он пользовался заслуженным признанием коллег и многочисленных пациентов.

В течение 25 лет работы на кафедре хирургии АГИУВ профессор Тлеуф Б.Д. щедро передавал знания и накопленный опыт коллегам: врачам-хирургам Казахстана и других союзных республик.

С 2001 по 2016 г. г. профессор Тлеуф Б.Д., будучи на пенсии, продолжал активную хирургическую деятельность в условиях частной клиники «Гиппократ» г. Костаная, помогая прак-



тическим врачам в освоении последних достижений современной медицинской науки и практики.

Тлеуф Б.Д. – автор более 130 научных работ по различным проблемам онкологии и хирургии. Им опубликованы монографии: «Асқынған бауыр циррозынын кешенді емдеу» (1996 г.), «Лазер в желудочно-кишечной хирургии» (1991 г.) и три методических рекомендации. Он являлся автором трёх изобретений и 10-ти рационализаторских предложений. Под его научным руководством была защищена кандидатская диссертация.

Тлеуф Б.Д. в течение ряда лет был членом редколлегии журнала «Здравоохранение Казахстана» и председателем Научного общества хирургов г. Алма-Аты и Алма-Атинской области.

Профессор Тлеуф Б.Д. – был действительным членом Ассоциации им. Н.И. Пирогова с 1992 г. и Международной ассоциации хирургов с 2000 г.

За заслуги в области хирургии он был награждён государственными знаками отличия Минздрава СССР «Отличник здравоохранения» (1980 г.) и Агентства по здравоохранению РК «Қазақстан Республикасы денсаулық сақтау ісінің үздігіне» (1999 г.).

За вклад и заслуги в медицине профессор Тлеуф Б.Д. был награжден Золотой медалью А. Н. Сызганова (2017 г.), Юбилейной медалью за вклад в развитие АГИУВ (2013 г.) и Юбилейной медалью ЦГКБ г. Алматы (2014 г.).

В период работы, в практическом здравоохранении Костанайской области он был награждён грамотами акимата «За многолетний добросовестный труд в системе здравоохранения (2009 г.) и «За заслуги в развитии здравоохранения области (2016 г.)».

Безвременно ушедший из жизни профессор Тлеуф Б.Д. был профессиональным хирургом, учёным, примерным семьянином, отличным товарищем, надёжным коллегой и другом.

Медицинское сообщество выражает глубокое соболезнование семье, родным и близким профессора Тлеуф Б.Д. Коллеги и ученики сохраняют его наследие и продолжают его благородное дело.

Коллектив Национального научного центра хирургии им. А.Н. Сызганова глубоко скорбит по поводу кончины талантливого хирурга, известного ученого-педагога, профессора Тлеуф Базаркана Досумбековича. Сотрудники Центра приносят глубокие соболезнования родным и близким.

**Коллектив Национального научного центра хирургии им. А.Н. Сызганова,
редакционная коллегия журнала «Вестник хирургии Казахстана»,
профессор Ибадильдин А.С., к.м.н. Ибадильдина С.А.**

ТРЕБОВАНИЯ ДЛЯ АВТОРОВ ЖУРНАЛА «ВЕСТНИК ХИРУРГИИ КАЗАХСТАНА»

Уважаемые авторы!

С 1 апреля 2018 года все статьи на публикацию принимаются на государственном или русском языках с обязательным переводом всей статьи на английский язык. Статьи без версии на английском языке будут отклонены.

Также учитывая требования Консультативной Комиссией (CSAB) Scopus об интернационализации авторов и аудиторией редколлегия журналов рекомендуют публиковать статьи в соавторстве с учеными дальнего и ближнего зарубежья.

В журнале публикуются научные статьи и заметки, экспресс-сообщения о результатах исследований в различных областях естественно-технических и общественных наук.

Решение о публикации принимается редакционной коллегией журнала после рецензирования, учитывая научную значимость и актуальность представленных материалов. Статьи, отклоненные редакционной коллегией, повторно не принимаются и не рассматриваются. Рукописи, оформленные не по правилам, возвращаются авторам без рассмотрения.

Рукопись направляется на отзыв члену редколлегии и одному из указанных рецензентов; в спорных случаях по усмотрению редколлегии привлекаются дополнительные рецензенты; на основании экспертных заключений редколлегия определяет дальнейшую судьбу рукописи: принятие к публикации в представленном виде, необходимость доработки или отклонение. В случае необходимости рукопись направляется авторам на доработку по замечаниям рецензентов и редакторов, после чего она повторно рецензируется, и редколлегия вновь решает вопрос о приемлемости рукописи для публикации. Переработанная рукопись должна быть возвращена в редакцию в течение месяца после получения авторами отзывов; в противном случае рукопись рассматривается как вновь поступившая. Рукопись, получившая недостаточно высокие оценки при рецензировании, отклоняется как не соответствующая уровню или профилю публикаций журнала.

Авторы несут ответственность за достоверность и значимость научных результатов и актуальность научного содержания работ. Не допускается **ПЛАГИАТ** – умышленно совершаемое физическим лицом незаконное использование чужого творческого труда, с доведением до других лиц ложных сведений о себе как о действительном авторе.

Редакция принимает на рассмотрение рукописи только на английском языке, присланные через официальный сайт журнала www.vhk.kz.

Материал статьи – абстракт на казахском, русском и английском языках, список литературы, рисунки, подписи к рисункам и таблицы, оформляется одним файлом; дополнительно каждый рисунок оформляется в виде отдельного файла. Если пересылаемый материал велик по объему, следует использовать программы для архивирования. Все страницы рукописи, в том числе таблицы, список литературы, рисунки и подписи к ним, следует пронумеровать.

Представленные для опубликования материалы должны удовлетворять следующим требованиям:

1. Содержать результаты оригинальных научных исследований по актуальным проблемам в области физики, математики, механики, информатики, биологии, медицины, геологии, химии, экологии, общественных и гуманитарных наук, ранее не опубликованные и не предназначенные к публикации в других изданиях. Статья сопровождается разрешением на опубликование от учреждения, в котором выполнено исследование.
2. Размер статьи 7-10 страниц (статьи обзорного характера – 15-20 стр.), включая аннотацию в начале статьи перед основным текстом, которая должна отражать цель работы, метод или методологию проведения работы, результаты работы, область применения результатов, выводы (**аннотация** не менее **20** предложений (150×300 слов) - (на английском языке) через 1 компьютерный интервал), таблицы, рисунки, список литературы (через 1 компьютерный интервал, размер шрифта – 14), напечатанных в редакторе Word, шрифтом Times New Roman, поля – верхнее и нижнее – 2 см, левое – 3 см, правое – 1,5 см. Количество рисунков – 5-10.

Структура должна соответствовать международной формуле IMRAD, где I – introduction (вступление), M – Methods (методы), R – Results (исследование), A – и, D – conclusion+ discussion (заключение, обсуждение результатов и выводы).

Название • Отображает суть работы • Краткое • Без аббревиатур.

Необходимо официально закрепить название организации на английском и сокращение

Резюме • Структурировано • Без аббревиатур • Передает структуру статьи – Зачем (актуальность) – Какими методами? – Что получено – Как это изменило картину знаний. Именно его читают в первую очередь, только хорошее резюме может привлечь внимание!

Вступление • Актуальность работы • Какая задача поставлена • Почему

Методы • Перечисление • Если известные - дать ссылку • Если модифицировали – указать как • Описывать так что бы могли повторить • Статистика!

Результаты • Допускается не хронологическое, а логическое повествование • Основные, а не все что были сделаны •

Иллюстрируются минимально необходимыми сводными данными (исходные могут быть в дополнительных материалах)

Обсуждения • Не повторять результаты • Сопоставить полученные данные с имеющимися • Обсудить возможные причины и следствия

Функции списка литературы: • Аргументировать идею • Сопоставить с существующими аналогами • Обозначить место данного исследования • Избежать плагиата • Для журнала и ученого = признание • Часто указаны только собственные работы или очень старые (самоцитирование допускается только 10-15% от общего списка литературы) • Кочующие ошибки

Различайте • Ссылки • Список литературы • Библиография
Что могут цитировать • Книги, (монографии, главы) • Статьи научных журналов • Материалы конференций • Патенты • Диссертации • Неопубликованные данные • СМИ • Веб ресурсы (протоколы, веб странички) Источник должен быть надежным и легко доступным.

Статья начинается на английском языке. В начале, посередине страницы, идет название статьи прописными жирными буквами, название статьи должно быть коротким и емким, согласно проведенного анализа около 30-40 символов на английском языке.

Далее на следующей строчке – инициалы и фамилии авторов обычным жирным шрифтом, затем на следующей строчке – название организации(ий), в которой выполнена работа, город, страна, затем на новой строчке – адреса E-mail авторов. С красной строки идут ключевые слова (**Key words**), а на новой строчке – сама аннотация (**Abstract** – не менее **150** и более **300 слов**).

Далее, после отбивки одной строки, начинается на русском языке. В начале статьи вверху слева следует указать индекс **УДК, МРНТИ**.

Затем, посередине страницы, пишется: 1) название статьи; 2) авторы; 3) название организации; с красной строки – **Ключевые слова**, затем – **Аннотация** (оформление шрифтов, как на английском языке).

Отбиваем одну строку и начинается сама **статья**. Следом за статьей идет список **Литературы**. Ссылки на литературные источники даются цифрами в прямых скобках по мере упоминания (не менее 20).

Для каждой статьи обязателен DOI (Digital Object Identifier) - это цифровой идентификатор документа. DOI выполняет функцию гиперссылки, которая всегда помогает найти нужный документ, даже если сайт, где он находился ранее, был впоследствии изменен. Благодаря этому индексу поиск научной информации в Интернете стал проще и эффективнее. Каждое издание, журнал размещает на своих веб-страницах в интернете, как текущие, так и архивные номера, и материалы. Таким образом, в открытом доступе можно увидеть резюме, которые включают в себя название статьи, фамилию, имя, отчество автора, аннотацию и ключевые слова, место выполнения работы, а также выходные данные опубликованных статей (название журнала, год издания, том, номер, страница).

Список литературы оформляется следующим образом:

В ссылках на книги указывается ISBN (10- или 13-значный). Сокращаются названия только тех журналов, которые указаны: http://images.webofknowledge.com/WOK46/help/WOS/0-9_abrvjt.html.

Для всех ссылок на статьи, опубликованные в международных рецензируемых журналах следует указывать DOI (Digital Object Identifier). DOI указываются в PDF версии статьи и/или на основной интернет-странице статьи, также можно воспользоваться системой поиска CrossRef: <http://www.crossref.org/guestquery/>. Ниже приводятся примеры оформления ссылок:

Статья в международном журнале:

1. Campry TS, Anders T. (1987) SNAP receptors implicated in vesicle targeting and fusion, *Environ Pollut*, 43:195-207. DOI: 10.1016/0269-7491(87)90156-4 (in Eng)

Статья в русскоязычном журнале, не имеющая англоязычной версии:

2. Ivanova TV, Samoilova NF (2009) *Electrochemical Energetics [Elektrohimicheskaya energetika]* 9:188-189. (In Russian)

Книги:

Timrat TA (2008) *Soil pollution: origins, monitoring and remediation*, second edition. Springer, Germany. ISBN: 978-3-540-70777-6

Материалы конференции:

Monin S.A. (2012) Treatment techniques of oil-contaminated soil and water aquifers. *Proceedings of International Conference on Water Resources and Arid Environment*, Riyadh, Saudi Arabia. P.123.

Патенты:

Barin AB, Mukamedzhan NT (2000) A method for determination of 1,1-dimethylhydrazine and nitrosodimethylamine [Metodopredeleniya 1,1-dimetilgidrazina initrosodimetilamina]. Preliminary Patent of the Republic of Kazakhstan [Predvaritelnyi patent Respubliki Kazakhstan]. (In Russian)

Стандарты, ГОСТы:

RMG 61-2003. Indexes of accuracy, precision, validity of the methods of quantitative chemical analysis, methods of evaluation [GSI.Pokazatelitochnosti, pravilnosti, retsizionnosti metodik kolichestvennogo himicheskogo analiza. Metodyotsenki]. Moscow, Russia, 2003. (In Russian)

На сайте <http://www.translit.ru/> можно бесплатно воспользоваться программой транслитерации Русского текста в латиницу, используя различные системы. Программа очень простая, ее легко использовать для готовых ссылок. К примеру, выбрав вариант системы Библиотеки Конгресса США (LC), мы получаем изображение всех буквенных соответствий. Вставляем в специальное поле весь текст библиографии на русском языке и нажимаем кнопку «в транслит».

В конце статьи дается резюме на казахском языке. Оформляется аналогично русскому варианту. Посередине страницы пишется: 1) название статьи; 2) авторы; 3) название организации; с красной строки – **Өзекті сөздер**, после – **Аннотация**.

Последняя страница подписывается всеми авторами, ставится дата.

3. Статьи публикуются только на английском языке.

4. В случае переработки статьи по просьбе редакционной коллегии журнала датой поступления считается дата получения редакцией окончательного варианта. Если статья отклонена, редакция сохраняет за собой право не вести дискуссию по мотивам отклонения.