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Giant right coronary artery cameral fistula with concomitant triple vessel coronary artery disease undergoing surgical repair – case report

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A 54-year-old Bangladeshi male presented with Class III NYHA symptoms and long standing right heart failure. He had been on ACE inhibitors and oral furosemide for 10 years after his initial symptoms. Detailed evaluation and cardiac catheterisation revealed multivessel CAD with a giant right coronary artery to coronary sinus fistula. He was subjected to multivessel coronary artery bypass surgery and surgical interruption of the fistula. The case is being presented for its unique nature and absolute rarity of a combination of adult congenital heart disease and concomitant coronary artery disease.

Results: 248 surgeries were performed because of native valve endocarditis. Early hospital mortality was 5.2% (13 patients). The main group of operative procedures included: aortic valve replacement – 132 (8 died), mitral valve replacement – 62 (0), aortic and mitral valve replacement – 40 (5). 60 surgeries were done due to prosthetic valve endocarditis, 10 patients died (16.6%). The use of mechanical prostheses was predominant. 10 patients suffered recurrent endocarditis (3.3%). In 51 patients (16.9%) abscesses and pseudoaneurysms were observed.

Conclusions: The most radical excision possible of infected tissue is needed in the surgery of infective endocarditis. Use of autopericardium is helpful in reconstruction of cardiac structures and isolation of valve prostheses from potentially infected surfaces. The main advances in surgery of complicated cases of native valve endocarditis and especially prosthetic endocarditis have been possible due to the procedure of translocation of valve prostheses into extra-annular positions (32 cases). It yields the advantages of isolation of valve prostheses from infected tissue, creates conditions for epithelization and direct action of antibiotic drugs on the infected areas, and fixation of the prostheses in intact tissues. Long-term follow-up is necessary for assessment of surgical procedures in infective endocarditis.

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Surgical treatment of infective endocarditis: ten years' experience (1997-2006)

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Background: Surgical treatment of native and prosthetic valve endocarditis is a serious problem of cardiac surgery.

Aim: The purpose of the report is to analyse and discuss surgical treatment of native and prosthetic valve endocarditis for a period of ten years.

Material and methods: During the period from 1997 to 2006, 1515 valve surgeries were performed. From these 308 (20.3%) were done due to infective endocarditis with mortality of 7.4% (23 patients). Especially valuable in setting up the diagnosis were bacteriological culturing (positive in 33.8%) and cardiac ultrasonic evaluation (both transthoracic and transoesophageal).

3

Haemodynamic parameters in patients with «critical» form of cor triatrium sinister according to echodoppler data

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Background: Cor triatrium (CT) sinister is an uncommon congenital cardiac anomaly characterized by the abnormal division of the left atrium into two chambers, a common pulmonary chamber, and the true left atrial chamber separated by a fibromuscular membrane.

Aim: The objective of this study was to assess the Echo possibility to determine the need for urgent surgical treatment in patients with «critical» form of CT.

Material and methods: From 1990 to 2006, 23 patients with CT underwent surgical intervention in the M.M. Amosov Institute of Cardiovascular Surgery. Their age ranged from 3 months to 25 years. The diagnosis of CT was characterized by the presence of membrane in the left atrium that divided the left atrium into two distinct chambers, the superior

chamber which receives the pulmonary veins and inferior chamber which contains the left atrial appendage and mitral valve. Isolated CT and CT with restrictive patent foramen ovale were found in 11 cases. Associated cardiac anomalies were present in 12 of the 23 patients and included secundum atrial septal defects (n=9), partial anomalous pulmonary venous connection (n=1), and ventricular septal defects (n=2). We estimated the size of the heart chambers, tricuspid insufficiency, and pulmonary hypertension.

Results: The degree of haemodynamic disturbance depended on the size of the fenestration (S) in M, which was identified only in 11 cases. PW-Doppler and colour flow examination helped to assess the location of the orifice in 21 patients. The average peak gradient (PG) across the orifice in M during CW-Doppler examination in 22 patients was 17.8 ± 7 mm Hg, and in S was 0.54 ± 0.27 cm². For evaluation of its area pressure half-time method was used. Systolic pulmonary pressure (PPA) was estimated from the peak tricuspid regurgitation velocity in all patients. Accordingly pulmonary hypertension was 100% or suprasystemic in 7 cases. These patients were referred to the group with «critical» form of CT, which was isolated in 4 cases, and associated with restrictive patent foramen ovale in three. We have compared the haemodynamic data in patients with «critical» form and more simple.

Conclusions: Patients with «critical» form of CT had small orifice in M ($S=0.3 \pm 0.12$) with more significant PG, hypoplastic left ventricle, more significant dilatation of the right chambers, severe tricuspid insufficiency, equal or suprasystemic PPA. These patients underwent surgical treatment.

IV or III, one aged 27, without IA, but with 29 mm aortic annulus and having lost almost all coaptation area). In two of them we exchanged non-coronary sinus with a teardrop shaped patch cut from appropriate size vascular prosthesis, and performed wedge plasty of remaining ones, narrowing the neo-sino prosthesis junction to appropriate diameter of chosen prosthesis size. In the next two patients we had to exchange non-coronary and right coronary sinuses with patches, with an intact left-coronary one. In all these patients aortic cusps were relatively unchanged, except mild symmetric enlargement. In the last two patients, with mild to moderate focal fibrosis of slightly asymmetric cusps, we exchanged non-coronary and right coronary sinuses with an intact left coronary one. In patients with exchanged right coronary sinus a button technique was used to reimplant the right coronary ostium.

Results: In the first four patients we achieved excellent early and mid-term results; only one has trivial insufficiency. In the last two, despite adequate static probe with saline, the result on TEE was inadequate, and considering that we did not see any obvious easy to repair and assuring good late result pathology we exchanged the aortic valve with mechanical in the first, and biological in the second aged 64 patient (patient's preference).

Conclusions: In suitable patients Urbanski's method is a very good kind of aortic valve sparing operation, particularly when there is no need for all three sinuses exchange, and cusps are relatively symmetrical and unchanged. In cases of moderate pathology of all three cusps a good result is less certain. In case of inadequate repair the aortic valve replacement is easy to perform.

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Early and mid-term results of aortic valve remodelling with dr Urbanski's separate patches technique

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Background: In 2005 Dr Urbanski from Bad Neustadt, Germany described a new kind of sparing aortic valve remodelling technique in 20 patients (Paul P. Urbański: Valve-sparing aortic root repair with patch technique. *Ann Thorac Surg* 2005; 80: 839-44). In July 2006 we introduced it in our institution.

Material and methods: So far 6 patients aged 27 to 64 with complicated aortic root pathology suitable for this kind of operation have been operated on. In 4 patients we achieved excellent early and mid-term results (3 with asymmetric sinuses of Valsalva aneurysms with IA grade

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The outcome of modified Blalock-Taussig shunt in patients with cyanotic congenital heart diseases

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Background: The aim of this study was to evaluate the outcome of modified Blalock-Taussig shunt (MBTS) in patients with cyanotic congenital heart diseases (CHD). The influence of perioperative variables on early mortality and necessity of re-operation was also analysed.

Material and methods: The medical records of 113 patients, who underwent 139 MBTSs (including 26 re-operations) from 1998 to 2005, were reviewed retrospectively. The age of children ranged from 1 day to 1325 days (median 12 days). Patient weight ranged from 1.6 kg to 13 kg (median 3.19 kg). Patients were divided into 5 groups according to CHD

diagnosis: ToF, SV+PA/PS, VSD+PA/PS, TGA+VSD+PA/PS, and other. The chosen pre, peri and postoperative variables were analysed.

Results: Arterial oxygen tension and saturation increased postoperatively in comparison to base values (respectively 30%, $p<0.0001$, and 36.2%, $p<0.0001$). Postoperative platelet (PLT) count decreased by 27% ($p<0.0001$). Children who required re-operation had more pronounced decrease of PLT postoperatively than the rest of patients (36.7% vs. 21.2%; $p=0.016$). Patients with SV required longer ventilatory support (2 days vs. 1 day; $p=0.003$). Children who died needed higher concentrations of inhaled oxygen (death 49.39% vs. survival 42.66%; $p=0.041$). No perioperative variable influenced early mortality. There were 15 early (10.8%) and 16 (11.5%) late deaths. Patients with SV had worse one-year survival (60% vs. 85%; $p=0.016$).

Conclusions: MBTS is still an important armamentarium in CHD treatment. The perioperative variables had no influence on early mortality and re-operations. However, the postoperative drop of PLT count among reoperated children may suggest thrombocyte activation at the site of anastomosis due to shear stress. Higher risk of death concerns SV patients.

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Early results and long-term follow-up after repair of total anomalous pulmonary venous connection during the first year of life

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Background: Total anomalous pulmonary venous connection (TAPVC) is a congenital heart disease with extremely unfavourable natural history. Without surgery the majority of affected children will die during the first year of life. In some variants, TAPVC represents a true surgical emergency in congenital heart surgery. Despite general improvements in preoperative, intraoperative and postoperative management strategies which have occurred over the last decade, repair of this lesion is still associated with significant mortality. We reviewed patients undergoing TAPVC repairs over a 7-year period at the Childrens' Cardiac Center and Institute of Cardiovascular Surgery.

Aim: The aim of this study was to evaluate the early results and long-term follow-up after the surgical repair of TAPVC during the first year of life.

Material and methods: Between January 2000 and August 2006, 70 patients with TAPVC were operated on in both

institutions. Of these, 56 patients were neonates and infants. All the patients with associated anomalies other than PDA and ASD were excluded from the study. According to the date of operation all the patients were divided in two groups. I group included 41 patients operated on during 2000-2004, II group – 15 patients operated on during 2005-2006. Mean age of the group I patients was 3.69 ± 3.01 months and of the group II patients 2.83 ± 2.27 months, mean body weight being 4.71 ± 1.5 kg and 4.42 ± 1.02 kg respectively.

Results: Main differences between patient groups were the diagnostic and management strategies. Angiography was used in 19 patients of group I for confirmation reasons whereas all the patients in group II were diagnosed only by echocardiography. Patients of group I were operated on only after maximal primary stabilization using conventional surgical techniques and usual ICU management. Since 2005 it has been our strategy to operate on all the patients emergently irrespectively of operative risk using own surgical modification for repair of TAPVC as well as optimized ICU protocols. Among the 41 patients in group I, 17 early deaths (41.5%) occurred compared with 1 of 15 (6.7%) patients of group II. Main death causes in group I were cardiac failure and pulmonary hypertensive crises (41%, $n=7$ and 29%, $n=5$ respectively). The only death in group II was caused by postoperative pulmonary venous obstruction. 87% ($n=33$) of the operative survivors were available for follow-up assessment. Median follow-up period was 21.6 months (range 5 to 81 months). 30 patients were in NYHA class I, 2 in NYHA class II, and one patient in NYHA III-IV. There were no late deaths or reoperations. Echocardiography performed at follow-up showed good ventricular function with no signs of residual pulmonary hypertension and pulmonary venous obstruction except for the 1 patient who is in NYHA class III-IV. His study showed decreased contractility of both ventricles with suprasystemic pulmonary hypertension and currently he awaits CT study to rule out pulmonary venous obstruction.

Conclusions: Recent advances in quality of diagnostic studies together with refinements in surgical techniques and perioperative management allowed significant decrease in operative mortality to occur. Long-term results after repair are excellent with normal haemodynamic state in most cases.

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A comparison of cardiac output measurement methods – thermodilution vs. transoesophageal echocardiographic methods using continuous and pulsed wave

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Background: An evaluation of possible replacement of the thermodilution method of cardiac output measurement by transoesophageal echocardiography (TEE) with measurement of cardiac output at the level of the aortic annulus using continuous wave and at the level of the left ventricular outflow tract (LVOT) using pulsed wave.

Material and methods: The study was carried out in 18 patients during off-pump coronary artery bypass grafting. Cardiac output was measured at the same time by all three methods – thermodilution and transoesophageal echocardiography using continuous and pulsed wave. The values of 82 measurement series were obtained. The examination of flow through the aortic valve and left ventricular outflow tract was performed in a deep transgastric projection using the Doppler technique.

Results: Differences between the cardiac output measured by thermodilution and by TEE using continuous wave (CO_{CW}): in 54 (66%) measurements the difference was less than 10%; in 61 (75%) measurements the difference was less than 12%; the greatest difference was 23%. Differences between the cardiac output measured by thermodilution and by TEE using pulsed wave (CO_{PW}): in 59 (72%) measurements the difference was less than 10%; in 63 (77%) measurements the difference was less than 12%; the greatest difference was 20%. Differences between the cardiac output measured by thermodilution and the mean cardiac output obtained in both echocardiographic methods: in 69 (84%) measurements the difference was less than 10%; in 72 (90%) measurements the difference was less than 12%; the greatest difference was 19%. Average value of cardiac output measured by thermodilution method – 4.34 l/min, measured by echocardiography using continuous wave – 4.37 l/min, using pulsed wave – 4.32 l/min, average cardiac output in both echocardiographic methods – 4.32 l/min.

Conclusions: The results of this study show that cardiac output measured by transoesophageal echocardiography using continuous and pulsed wave correlates positively with that measured by thermodilution method. When cardiac output measured by thermodilution was increasing or decreasing, also echocardiographic methods revealed similar changes. The average value of cardiac output calculated from both echocardiographic methods showed better correlation with the cardiac output measured by the thermodilution method.

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Changes in intraabdominal pressure as an early predictive parameter

of postoperative respiratory insufficiency in patients after extracorporeal circulation

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Background: Cardiosurgical procedures may result in many kinds of postoperative organ failure. Respiratory insufficiency is one of them. On the other hand, early diagnosis of postoperative complication is difficult and not very precise. It is well known that an increase in intraabdominal pressure (IAP) may result in respiratory, circulatory and splanchnic insufficiency. Thus, this measurement can be recognized as useful in the early diagnosis of postoperative respiratory insufficiency.

Aim: The aim of this study was to analyse the changes in intraabdominal pressure in patients with prolonged postoperative ventilation.

Material and methods: 40 adult patients undergoing various cardiosurgical procedures with extracorporeal circulation (ECC) under general anaesthesia were examined. Volume-controlled ventilation was used in all patients (tidal volume 5-7 ml kg⁻¹ and frequency 9-12/min). The patients were randomised into two groups: (A) patients whose were ventilated shorter than 18 hours and (B) patients whose were ventilated longer than 18 hours. The IAP was measured in the urinary bladder in 7 stages: (1) after the induction of anaesthesia before surgery, (2) after the initiation of ECC, (3) 10 minutes after heart-lung machine disconnection, (4) after procedure completion before sending the patient to the postoperative ward, (5) one hour after surgery, (6) 6 hours after surgery and (7) 18 hours after the procedure. Additionally, the peak respiratory pressure was measured. The Wilcoxon and Mann-Whitney test and Spearman correlation test were used for statistical analysis; $p < 0.05$ was considered as significant.

Results: the mean time of anaesthesia was 261.84 min \pm 29.27 (262.06 min \pm 29.17 in group A and 261 min \pm 28.08 in group B), surgery 198.68 min \pm 18.37 (195.51 min \pm 17.53 in group A and 209 min \pm 16.4 in group B), ECC 108.81 min \pm 27.84 (98.79 min \pm 21.87 in group A and 131.11 min \pm 19.11 in group B) and aorta clamping 60.76 min \pm 19.32 (54.79 min \pm 17.45 in group A and 80 min \pm 10.54 in group B). 31 patients underwent CABG and 9 valve replacement. 29 were in group A and 11 in group B. The IAP increased in group A from stage 3 to 6 and in group B from 3 to 7. The changes in IAP were significantly higher in group B from stage 4 to 7. Moreover, the postoperative peak respiratory pressures also were higher in group B. In this group there was a significant correlation between IAP and postoperative peak respiratory pressure in stages 4, 5 and 6 ($p = 0.014$, $R = 0.52$;

$p=0.002$, $R=0.87$; $p=0.028$, $R=0.72$, respectively). None of the patients had serious long-term complications.

Conclusions: (1) extracorporeal circulation results in increase of intraabdominal pressure, (2) changes in intraabdominal pressure correlated with postoperative peak respiratory pressure, (3) intraabdominal pressure is a good early diagnostic measurement in diagnosis of postoperative respiratory insufficiency.

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Balloon pulmonary valvuloplasty as an initial palliation for infants under 3 months of age with symptomatic tetralogy of Fallot

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Background: The optimal time of total correction of tetralogy of Fallot has not been determined yet. In our centre we perform total correction after 3 months of age. For symptomatic neonates and infants under 3 months we have been using systemic-to-pulmonary artery shunts. In 2005 we started to use balloon pulmonary valvuloplasty as an alternative to systemic-to-pulmonary artery shunts.

Aim: To evaluate the results of balloon valvuloplasty as palliation treatment of symptomatic tetralogy of Fallot before 3 months of age.

Material and methods: Balloon pulmonary valvuloplasty was performed in nine infants with symptomatic tetralogy of Fallot in the last 2 years. The mean age was 6.1 ± 5.2 weeks (range: 1-12 weeks) and the mean body weight was 4 ± 1.9 kg (range: 2.1-6 kg). Ductus arteriosus was patent in two patients. The mean diameter of the pulmonary annulus was 6.5 mm (range: 5.0-8.0 mm). The mean index of right ventricular outflow tract diastolic diameter was 21.2 ± 3 mm/m² (range: 18.7-24.2 mm/m²). We used introducer 6 Fr and 7 Fr balloon in all cases. Beta-blockade therapy prior to balloon dilatation was given to all patients, and was continued after the procedure.

Results: The procedure was accomplished without complications in all cases. After balloon dilatation, systemic oxygen saturation increased from a mean value of $61 \pm 12\%$ to $88 \pm 10\%$, $p < 0.001$. The mean follow-up was 7.8 ± 2.3 months (range: from 2 months to 11 months). Two patients had early recurrence of hypoxic spells and received modified Blalock-Taussig shunts in the 2nd and 4th weeks after balloon pulmonary valvuloplasty. Two patients had complete

repair after 8 and 11 months of the balloon pulmonary valvuloplasty. The remaining 5 patients are currently asymptomatic and await total repair.

Conclusions: Balloon dilatation of the pulmonary valve is a safe palliation procedure in patients with symptomatic tetralogy of Fallot, and has provided effective palliation in 77.8% of our cases. Balloon pulmonary valvuloplasty may be used as an alternative to systemic to pulmonary artery shunt in the newborn and infants with symptomatic tetralogy of Fallot.

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Extracorporeal membrane oxygenation by neonates, infants and children

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ECMO stands for extracorporeal membrane oxygenation. ECMO is temporary support of heart and lung function by partial cardiopulmonary bypass. It is used for patients who have reversible cardiopulmonary failure from pulmonary, cardiac or other disease. Blood is drained from the patient to an external pump which pushes the blood through a membrane gas exchanger and warmer and returns the blood to the patient's circulation. Various devices monitor pressure, flow and temperature of the ECMO blood and gas circuit, as well as physiological variables in the patient. ECMO can be veno-arterial (VA) or veno-venous (VV) cannulation. In veno-arterial cannulation blood is drained from the right atrium and is returned to the thoracic aorta. VA-ECMO provides cardiac as well as pulmonary support. In veno-venous cannulation, blood is drained from the right atrium and is returned to the right atrium through the end hole of the catheter, which is directed towards the tricuspid valve. VV-ECMO requires good cardiac function and avoids cannulation of the carotid artery. Initial settings are aimed at bypass of $\geq 50\%$ of cardiac output and are adjusted to maintain adequate oxygenation, blood pressure and acid-base status. With cardiac failure, VA-ECMO is the preferred method. Because of recirculation, VV-ECMO cannot usually support $> 50\%$ cardiac output, which may limit the ability to adequately oxygenate the patient. Patients on ECMO require frequent measurements of pH and blood gas tensions and various laboratory tests, as well as frequent transfusions with packed RBCs and platelets. The duration of ECMO treatment is usually limited to 7-10 days for neonatal re-

spiratory diseases, but longer treatment may be needed for newborns with diaphragmatic hernia and cardiac diseases and in older children.

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Leczenie operacyjne infekcyjnego zapalenia wsierdza (IZW) na protezie zastawkowej

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Wstęp: W zasadzie każdy chory z IZW może być kandydatem do leczenia operacyjnego. Ważki problem diagnostyczny i terapeutyczny dotyczy chorych z procesem zapalnym, rozwijającym się na uprzednio wszczepionej protezie zastawkowej. Najczęściej ostra dysfunkcja zastawki prowadzi do ciężkiej niewydolności serca, a reoperacja obciążona jest wysoką śmiertelnością.

Celem pracy jest ocena wczesnych wyników leczenia chirurgicznego IZW u pacjentów z procesem zapalnym na protezie zastawkowej.

Materiał i metody: Obserwacji poddano 50 chorych operowanych w Klinice Chirurgii Serca, Naczyń i Transplantologii IK CM UJ w latach 2000–2005: 32 mężczyzn i 18 kobiet (średni wiek pacjentów wynosił 51 lat).

Wyniki: U 21 (42%) pacjentów proces zapalny dotyczył sztucznej zastawki aortalnej (7 pacjentów – 14% – było po operacji wszczepienia zastawki biologicznej), u 25 (50%) chorych zmiany występowały na sztucznej zastawce mitralnej, u 4 (8%) pacjentów korekcji wymagały obie wcześniej operowane zastawki. Większość pacjentów była przyjęta do Kliniki w trybie pilnym, a w trybie natychmiastowym (w dniu przyjęcia) operowano 21 chorych (42%). U 16 chorych (32%) pierwsza wymiana zastawki również była przeprowadzona z powodu infekcyjnego zapalenia wsierdza (IZW). U 8 pacjentów (16%) była to trzecia lub kolejna wymiana protezy zastawkowej. Objawy wczesnego IZW (do 12 miesięcy od poprzedniej operacji) rozpoznano u 9 (18%) chorych. Śródoperacyjnie potwierdzono u wszystkich czynny proces zapalny na wszczepionej protezie zastawkowej – vegetacje (38 chorych – 76%), objawy ropnia okołozastawkowego (7 przypadków – 14%) bądź objawy przecieku okołozastawkowego (42 przypadki – 84%) oraz nieprawidłowej przetoki pomiędzy jamami serca (4 przypadki – 8%). W przebiegu pooperacyjnym dominującym powikłaniem był zespół małego rzutu serca, wymagający stosowania leków presyj-

nych w średnich i wysokich dawkach (48 chorych – 96%). Ponadto wystąpiły objawy niewydolności oddechowej (18 chorych – 36%), poważne zaburzenia rytmu serca (16 chorych – 32%) oraz objawy wstrząsu septycznego (8 chorych – 16%). W okresie pooperacyjnym zmarło 11 pacjentów (7 mężczyzn i 4 kobiety), co stanowi 21% operowanych z powodu infekcyjnego zapalenia wsierdza na protezie zastawkowej. Tak wysoka śmiertelność związana jest z ciężkością stanu ogólnego chorych przed zabiegiem. Ponadto na wysoki odsetek zgonów wpływała dysfunkcja wielonarządowa oraz występowanie większego ryzyka, powodowanego przeprowadzaniem kolejnej operacji serca.

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Cardiac remodelling in the rat infarct model after transplantation of stem cells

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Adult male Wistar rats (180-220 g) were subjected to coronary artery ligation to produce postmyocardial infarction rats (40). This study was conducted according to the recommendations of our local ethical committee. In brief, rats were anaesthetized (with pentobarbital, 60 mg/kg) and ventilated. Sham-operated animals were subjected to the same surgical operation without tightening the coronary ligature. Scar size was ~20% of the left ventricular free wall area, and necrosis was transmural. Prior to the beginning experiment all animals were divided into two groups. The first was left intact, the second simulated a myocardial infarction on an original technique. The second group of animals was divided into two subgroups by a method of random numbers. In two weeks rats of the second group were divided into two subgroups. Animals in the first subgroup did not undergo any treatment. In the second subgroup rats were introduced culture mesenchymal stem cells by puncture of a femoral vein. The first were tested in seven days after simulation of an infarct, the second in fourteen. Beforehand having registered FCC, stressful load was simulated by introduction of isopropyladrenaline solution. After that registration of FCC (frequency of cardiac cuttings) was retried. Further measurements were conducted every 3 minutes for 15 minutes. Upon termination of measurements the electrodes of a cardiograph were extracted; any damage of dermal integuments was handled using an antiseptic. For escaping a narcosis animal put in a warm, dry location with free access to water. For intact animal FCC in referen-

ce conditions made 485 ± 56.25 BPM (beats per minute). At simulation of a defeat of a myocardium this metric was descended up to 142.5 ± 78.9 BPM, and in two hours corresponded to 270 ± 100.25 BPM. For an intact animal datum level FCC made 485 ± 43.33 BPM. In one week after simulation of a myocardial infarction similar metric of activity of cardiovascular system was much higher – 541 ± 18.8 BPM, whereas the research of a base level FCC in two weeks after simulation of a myocardial infarction statistically significant ($p < 0.05$) differences in metrics of intact animals were not revealed – 502.5 ± 22.5 BPM. At simulation of stressful load for all groups of animals a positive chronotropic effect was observed. Thus the expressiveness of the latter essentially differed for the inspected groups of animals. So, for an intact animal to the first minute of load of isopropyladrenaline the absolute increase was about 32 BPM. Against a background of a high base level FCC of the second animal group, stress, the stipulated increase was 11 BPM. For the third animal group the similar metric has compounded 22 BPM. Already to the third minute of the experiment the lowering FCC for all groups of animals with stabilization at a level of 490–495 BPM was observed. In our research, the simulation of a myocardial infarction conjugated with the expressed lowering it contraction of the function. The tendency to restoring, however, was scheduled at the first hour after the indicated operation, which allows one to suspect presence of potent compensator mechanisms, both in the myocardium, and in the cardiovascular system as a whole. This position confirms, in our view, the response of the heart to a stressful load. For an animal inspected through one week after simulation of a myocardial infarction, a high datum level FCC, considerably exceeding those of intact animals, was scored. Stressful load has not revealed quality differences in the speaker of changes FCC, but quantitative differences in responses exist. It is possible to suspect what exactly are the indicated quantitative differences in responses of a myocardium to a stress and are manifestation of those destructive processes which promote development of secondary violations accompanying increase of lethal cases at intensive stressful load. The alignment of differences in responses to a stress between an intact animal and rats in two weeks after simulation of a myocardial infarction displays activation of compensator mechanisms of the cardiovascular system, directional on normalization of response of a myocardium to a stress, that, eventually, owes will be exhibited in relative restoring *жизнестойкости* of an organism. In the distant periods in the group with change of culture of mesenchymal cells the complete restoration of the function of the myocardium (by 3 weeks after transplantation) was observed. At research by load tests of authentic differences from intact animal was not observed. In the first subgroup with increase of periods after simulation of a myocardial infarction after about 2 weeks a deterioration of the function of the heart was observed. In 3 weeks stabilization it was at a pathological

level. Thus application of mesenchymal stem cells allows one to normalize cardiac activity after the transferred myocardial infarction.

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Chirurgiczne leczenie śluzaków serca – 25 lat doświadczeń własnych

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Wstęp: Śluzaki to najczęstsze (40–70%) pierwotne, niezłośliwe nowotwory serca. Podejrzenie obecności śluzaka w badaniu echokardiograficznym stanowi wskazanie do pilnego zabiegu chirurgicznego ze względu na ryzyko nagłej śmierci sercowej i możliwość powikłań zatorowych.

Cel pracy: Celem pracy jest analiza wczesnych wyników operacyjnego leczenia śluzaków serca na materiale własnym na przestrzeni ostatnich 25 lat.

Materiał: W tutejszym ośrodku, w latach 1980–2005, z powodu śluzaka operowano 130 pacjentów, w tym 90 (69%) kobiet. Średnia wieku wyniosła 54,5 roku (17–79 lat). Śluzak był zlokalizowany w lewym przedsionku u 119 pacjentów (91,5%), w prawym przedsionku u 9 (7%), w obu przedsionkach u 2 (1,5%).

Metody: Przeprowadzono retrospektywną analizę dokumentacji medycznej, obejmującą dane przed-, śród- i wczesne pooperacyjne. U wszystkich chorych wstępne rozpoznanie postawiono na podstawie przekłatkowego badania echokardiograficznego. Podstawę dla ostatecznego rozpoznania stanowiło badanie histopatologiczne. Wszyscy chorzy operowani byli w trybie pilnym z dostępu przez sternotomię pośrodkową, w krążeniu pozaustrojowym z zastosowaniem kardioplegii. W 21 (16,1%) przypadkach oprócz usunięcia guza wykonano dodatkowe procedury chirurgiczne: zamknięcie ASD (13), CABG (4), MVP (3), AVR (2), TVP (2), MVR (1). Dane opracowano z zastosowaniem metod statystycznych.

Wyniki: We wczesnym okresie pooperacyjnym zespół małego rzutu serca wystąpił u 21 pacjentów (16,5%), nadkomorowe zaburzenia rytmu u 4 (3,1%), zawał serca u 2 (1,5%). Retorakotomii, z powodu wysokiego drenażu, wymagało 2 (1,5%) chorych. We wczesnym okresie pooperacyjnym zmarło 5 osób (3,8%).

Wnioski: Stwierdzenie wewnątrzsercowej lokalizacji guza o typie śluzaka w badaniu echokardiograficznym wymaga niezwłocznego skierowania pacjenta do ośrodka

kardiochirurgicznego. Pilny zabieg operacyjny jest jedyną skuteczną metodą leczenia śluzaków serca. Wiąże się on z niską śmiertelnością i akceptowalną chorobowością okołoperacyjną.

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Stroke after coronary artery surgery with and without cardiopulmonary bypass

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Background: Stroke is a major complication of coronary surgery, with reported rates of 0.4% to 6%. Avoiding cardiopulmonary bypass (CPB) in coronary artery bypass grafting (CABG) is thought to reduce early mortality and morbidity.

Aim: The aim of this study was to compare incidence and outcome of stroke after on-pump and off-pump CABG (ONCAB vs. OPCAB).

Material and methods: From January 1999 to June 2005, 703 consecutive patients underwent isolated CABG in our institution. Before 2002, myocardial revascularization was performed off pump at the discretion of the operating surgeon. After this period our strategy was to plan starting the CABG without CPB in patients over 60 years. In accordance with our OPCAB policy our inclusion criterion was age over 60 years. ONCAB was performed in 289 patients and OPCAB in 414 patients. On- and off-pump patients were not sequential groups; however, the number of off-pump coronary artery bypass operations increased during this period. OPCAB patients were older, more likely to be hypertensive and to have previous strokes or transient ischaemic attacks, whereas incidence of unstable angina and previous MI were higher in the ONCAB group.

Results: The incidence of stroke was significantly higher in the ONCAB group compared with OPCAB patients (5.9% and 0.25%, respectively, $p=0.001$). In-hospital mortality (4.8% and 1.2%, respectively, $p=0.004$), renal failure (4.5% and 1.9%, respectively, $p=0.039$), wound infection (11.8% and 7%, respectively, $p=0.022$), acute heart failure (3.5% and 0.5%, respectively, $p=0.005$), need for intraaortic balloon pump (2.8% and 0%, respectively, $p=0.001$) and hospital stay (13.9 ± 8.2 and 12.3 ± 8.1 days, respectively, $p=0.015$) were all significantly greater in the ONCAB population.

Conclusions: Stroke is a devastating complication of coronary surgery. In this study OPCAB, compared with ONCAB surgery, reduced neurological and clinical morbidity, mortality as well as hospital stay.

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Sternal wound infection after cardiac surgery

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Background: In cardiac surgery, sternal wound infection following median sternotomy is a serious complication, associated with prolonged hospitalization, increased costs and morbidity.

Aim: The aim of this retrospective study was to investigate the sternal wound infection rate in patients undergoing open heart surgery.

Material and methods: Between October 2004 and August 2006, a total of 1134 consecutive adult patients underwent open-heart surgery in our institution. There were 871 patients (76.8%) who underwent coronary artery bypass grafting (CABG), 131 (11.5%) patients had valve surgery, 44 (3.9%) patients had combined CABG and valve replacement, while 88 (7.8%) patients underwent various other procedures. All statistical evaluations were performed with the SPSS version 11.

Results: Overall infection rate were 2.6% ($n=30$). Twenty-nine (2.55%) patients had superficial wound infection and 1 (0.09%) had deep wound infection. There was no significant difference in infection rate between groups depending on procedures. Thus, 2.3% ($n=20$) of patients were infected in the CABG group, 4.6% ($n=6$) in the valve group, 2.3% ($n=1$) in the combined CABG and valve surgery group, and 3.4% ($n=3$) in patients with various other procedures. A variety of causative organisms were found, with *Staphylococcus aureus* (20%) and *Staphylococcus epidermidis* (56.7%) dominating. The time interval from the operation to the diagnosis of sternal infection was 16.4 ± 7.1 days.

Conclusions: Wound infection is a common postoperative complication in cardiac surgery. In conclusion, despite acceptable overall sternal infection rate in our institution, we believe that detailed investigation of possible mechanisms for its reduction would provide better results.

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Preoperative increased C-reactive protein level and early outcome after coronary artery bypass grafting

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Background: It remains controversial whether elevated preoperative levels of C-reactive protein (CRP) can be treated as a predictor of outcome following cardiac surgery. The present study was intended to evaluate the correlation between preoperative CRP levels and early outcome after coronary artery bypass grafting (CABG).

Material and methods: 25 consecutive patients with preoperative CRP levels of 10 mg/L or higher, who underwent standard on-pump CABG procedure in the Department of Cardiac Surgery, Medical University of Lodz, in the second half of 2005, were included in the study group. The control group also consisted of 25 patients matched for age, gender and coronary artery disease severity, with normal preoperative CRP levels (up to 5 mg/L), operated on in the same period in our institution. The postoperative in-hospital course of the patients from the two groups was retrospectively analyzed.

Results: The mortality rate in the study group in comparison to the control group was 8% vs. 0% (ns). The morbidity rates in the two groups were as follows: intra-aortic balloon pump (IABP) support 12% vs. 4%, catecholamine support 52% vs. 28%, prolonged respiration 12% vs. 4%, atrial fibrillation 36% vs. 24% and stroke 4% vs. 4% (ns for all values). Mean intensive care unit (ICU) stay and mean postoperative in-hospital stay in the study group and in the control group were respectively: 3.7 ± 4.0 vs. 3.2 ± 2.9 and 11.6 ± 4.8 vs. 11.4 ± 3.1 (ns for both values).

Conclusions: Increased preoperative levels of CRP in the present material did not significantly influence early outcome after CABG.

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Surgical treatment of endocarditis in own material – early results

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Aim: The study's aim is to assess results of surgical treatment of infective endocarditis.

Material and methods: 16 patients (12 males, 4 females, mean age 49 years) underwent surgery from 2003 to 2007 for mitral, aortic and tricuspid valves. The main indications for surgery were heart failure, valve dysfunction, vegetations and persistent sepsis. 12.5%, 31.25% and 56.25% of patients were respectively in NYHA classes II, III, IV.

Results: Operative mortality was 0%, recurrent infection was recorded in 6.25%.

Conclusions: Haemodynamic status was a major predictor of in-hospital outcome. The type of pathogen did not appear to influence early and midterm outcome.

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Apico-aortic conduit off-pump as an alternative method of surgical treatment of critical aortic stenosis with porcelain aorta

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Background: Critical aortic stenosis with porcelain aorta is a particular surgical challenge. We present a case of surgical treatment of one patient with critical aortic stenosis by implantation of an apico-aortic conduit off pump. The patient presented for surgery was critically ill.

Results: The patient survived and next day after the operation was extubated.

Conclusions: For some patients, apico-aortic conduit is a good method of surgical treatment with good results.

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Ablacja cennym uzupełnieniem operacji zastawki mitralnej – doświadczenia własne

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W okresie od kwietnia 2005 r. do kwietnia 2007 r. w Klinice Kardiologii AM w Lublinie wykonano 30 zabiegów ablacji endokardialnej. Wskazaniem do operacji było napadowe lub utrwalone migotanie przedsionków u pacjentów poddanych operacyjnemu leczeniu wady mitralnej serca. Wada mitralna o etiologii reumatycznej lub degeneracyjnej występowała u 22 operowanych, a u 7 była konsekwencją choroby niedokrwiennej serca. U 8 pacjentów wadzie mitralnej towarzyszyła istotna niedomykalność zastawki trójdzielnej, wymagająca chirurgicznej korekcji. U 4 chorych dominującą wadą zastawkową było ciężkie zwężenie lewego ujścia tętniczego, a niedomykalność mitralna mia-

ła charakter wtórny bądź towarzyszący. 24 pacjentów miało utrwalone migotanie przedsionków, a u pozostałych 6 migotanie miało charakter napadowy. Technika zabiegu polegała na zastosowaniu prądu o częstotliwości radiowej i wykonaniu linii izolujących żyły płucne. Ablację wykonywano w obrębie lewego przedsionka. U 12 chorych wykonano plastykę zastawki mitralnej, a u 17 wszczepiono protezę zastawkową. U 9 chorych wykonano pomostowanie tętnic wieńcowych, a u 8 plastykę zastawki trójdzielnej. Protezę zastawki aortalnej wszczepiono u 5 chorych. U jednego usunięto elektrody stymulatora i u jednego zamknięto otwór międzyprzedsionkowy. Dwóch chorych wymagało po operacji kontrapulsacji wewnątrzortalnej. U żadnego z operowanych chorych nie obserwowano powikłań związanych z zabiegiem ablacji. Dwóch chorych zmarło z powodu zespołu małego rzutu, będącego następstwem zaawansowanej wady wielozastawkowej z towarzyszącą chorobą wieńcową. Siedmiu chorych (23%) nie miało nawrotu migotania w okresie pooperacyjnym. Spośród 23 chorych z nawrotem migotania przedsionków 21 wymagało kardiowersji elektrycznej, a 14 czasowej stymulacji serca. Rytm zatokowy w dniu wypisu miało 21 chorych (70%). Rytm zatokowy po 12 miesiącach obserwacji miało 10 z 12 przebadanych chorych (86%).

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Prognostic value of hemostasis for development of postpericardiotomy syndrome in patients after cardiac surgery

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Background: Local tissue injury leads to a systemic inflammatory response. One of the so-called acute phase responses is postpericardiotomy syndrome (PPS) induced by surgical trauma, reperfusion, endotoxemia and activation of contact system. Platelets and plasminogen activator inhibitor type I play a functional role in the local and systemic host response to trauma. But the state of hemostasis of patients with PPS is poorly understood.

Aim: The aim of this issue was to estimate prognostic value of hemostasis for development of postpericardiotomy syndrome in patients after cardiac surgery.

Material and methods: Patients (mean age 55.5 ± 1.5 years, NYHA class 2.0 ± 0.2) with coronary artery disease (CAD) ($n=18$) and rheumatic valve disease (VD) ($n=16$) were prospectively studied. They were treated with the same

protocol of bypass and received the same non-steroid anti-inflammatory drugs after operation. Antithrombotic treatment included oral anticoagulant (all VD pts and 72% of CAD pts) and aspirin from the 1st 6 hours after operation (all CAD pts). Plasminogen activity was measured by optic assay. Platelet aggregation was studied by turbidimetry with 2.5 mkM ADP. Pericardial and pleural effusion was assessed by echocardiography and rentgenography.

Results: PPS was revealed in 44% of CAD pts (gr. IA) and 50% of VD pts (gr. IB) (NS). At base platelets of gr. I were more functionally active ($p<0.05$) than those of gr. II (pts without PPS). There were no differences in plasminogen activity between groups ($p>0.05$) basely. Hemostasis changes on the 1st day after operation demonstrated significant depression of plasminogen activity in gr. I compared with gr. II ($74.1 \pm 3.9\%$ and $88.1 \pm 3.9\%$, resp. in gr. I and gr. II, $p=0.004$). Platelet aggregation on the 1st week after surgery stayed higher ($p<0.05$) in gr. I compared with gr. II. There were no differences between ischaemia (88.6 ± 9.9 min and 78.3 ± 12.2 min, resp. in gr. I and gr. II, $p=0.252$) and bypass (126.3 ± 11.5 min and 101.7 ± 14.6 min, resp. in gr. I and II, $p=0.091$) time in gr. I and gr. II. A good correlation was present between platelet function and plasminogen activity at first postoperative day and development of postpericardiotomy syndrome during the 1st week after cardiac surgery ($r=0.66$, $p=0.008$).
Conclusions: Plasminogen activity and platelet function are valuable prognostic criteria for development of postpericardiotomy syndrome in patients after cardiac surgery.

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Simultaneous pulmonary vein isolation and creation of cavo-tricuspid isthmus block in combination of atrial fibrillation and typical atrial flutter

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Background: Atrial fibrillation (AFib) and typical atrial flutter (AF) are two of the most widespread cardiac arrhythmias, registered in 1-3% of the population. In clinical practice often there is a combination of both types of arrhythmias in one patient. Radiofrequency catheter ablation (RCA) in the last decade became the therapy of choice in the treatment of typical AF. However, after creation of cavo-tricuspid block (CTB) in some of these patients the episodes of AFib are saved. Isolation of pulmonary veins (PV), as a method of radical treatment of AFib, is

presently actively studied, but does not result in a reduction of episodes of AF. Therefore development of methods of simultaneous treatment of these two types of cardiac rhythm is important.

Aim: To develop the method of RCA of paroxysmal and persistent forms of AF and AFib, using non-fluoroscopic three-dimensional system "Biotok 3 D", Russia, Tomsk and estimate the immediate and long-term results.

Materials and methods: We conducted the operation of isolation of PV in combination with creation of CTB in 24 patients. Men – 16; women – 8. Organic pathology marker of myocardium was found in 7 patients. All these patients had AFib and typical AF in anamnesis.

Results: The isolation of collectors of PV was attained in all 24 patients based on three-dimensional anatomic approach, and in 20 (83%) based on electro-physiological approach. Mean number of applications in one procedure was 98±23. Cooled electrodes were used. Power 30-35 W, duration of application 20-40 sec in one point. In the paroxysmal forms of AF the circular isolation of collectors was conducted, linear ablation from left PV to the mitral valve and along the roof of the atrium between PVs. In persistent forms a septal line was added from right PV to the mitral valve. Mean time of conducting the procedure was 196±34 min. Mean time of fluoroscopy was 30±13 min. Efficiency of the procedure was estimated after 3 months (blind period). Relapses of AFib in the period of follow-up (8±4 months) were found in 7 patients (29%). CTB was created in all patients. Relapses of AF did not occur in the follow-up period.

Complications: In one case there was a pericardium tamponade. Treatment – conservative.

Conclusions: The isolation of PV in combination with creation of CTB is indicated in pts with frequent episodes of Afib and AF. System "Biotok 3 D", Russia allows this procedure to be conducted using electrodes of a different configuration.

Aim: The aim of this study was to analyze right ventricular (RV) function in the mid-term period after the Senning operation using the tissue Doppler parameters and compare it with RV function of a normal population (control group).

Material and methods: From 1991 to 2006 167 patients with TGA underwent a successful Senning operation in our institution. The surgical technique remained mostly the same through the mentioned period and included the use of in-situ pericardium for construction of the route of pulmonary venous return to systemic RV. Out of 167 patients 75 (45%) patients undergo regular check-ups in our centre and were included in the study. That group was compared with the control group, which included healthy children from an age-matched group (57 children). All patients were assessed with tissue Doppler method at the mean of 8.7±3 years (range: from 6 months to 14.5 years) after Senning operation. RV systolic and diastolic function was evaluated with the following parameters: peak systolic velocity (Sm), peak early diastolic velocity (Em), peak late diastolic velocity (Am) and Em/Am ratio. Also, patients from the study group were divided into two groups according to the lengths of follow-up period after the Senning operation. Out of 75 patients, 26 (34.7%) had follow-up more than 5 years, and 49 (65.3%) had follow-up less than 5 years. These groups were compared with each other using the same tissue Doppler parameters.

Results: The parameters of RV systolic function (Sm) were decreased in the study group (7.5±1.4 sm/s) compared with the control group (11.3±1.6 sm/s), $p < 0.001$. But parameters of RV diastolic function (Em, Am, Em/Am ratio) in the study group did not differ from the control group. Em/Am ratio was 1.36±0.6 and 1.4±0.7, respectively. When comparing patients in the Senning group according to the length of the follow-up period, peak systolic velocity was 6.64±1.38 sm/s in patients with follow-up period more than 5 years and 7.86±1.31 sm/s in patients with follow-up period less than 5 years, $p < 0.01$. No difference was observed when comparing the parameters of RV diastolic function (Em, Am, Em/Am ratio). Despite the decrease of measured parameters of RV systolic function, no patient from the study has symptoms of RV failure. One child had permanent pacemaker implantation because of bradycardia. There were no late deaths.

Conclusions: Evaluation of RV function after the Senning operation using tissue Doppler measurements showed a decrease of RV systolic function compared to the normal population, as well as demonstrated that this decrease is time-related. Further follow-up is required to evaluate the clinical importance of monitoring RV function after the Senning operation using tissue Doppler parameters.

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The Senning operation: mid-term follow-up of right ventricle function using tissue Doppler

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Background: The Senning operation, which was the initial haemodynamic correction for the transposition of great arteries (TGA), is still used in the era of the arterial switch operation.

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On the question of the natural history of Marfan syndrome

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Background: Marfan syndrome is a heritable disorder of the connective tissue. The main features of Marfan syndrome involve disorders of the cardiovascular, ocular and skeletal systems. Prognosis is mainly determined by cardiovascular complications.

Aim: To study and to evaluate the natural history of cardiovascular manifestations of Marfan syndrome.

Material and methods: 59 non-operated on patients who attended our institute during the last 20 years were evaluated. In all cases Marfan syndrome was diagnosed according to the Gent criteria. This patients were not operated on for various reasons (22 cases had no cardiovascular manifestations, 12 patients refused operation, 9 were inoperable, 15 died in hospital, one women died in a maternity home). All patients were followed up with echocardiography.

Results: Mitral valve prolapse was diagnosed in 47 patients. In 2 patients from the group without cardiovascular manifestations mitral regurgitation developed during two years. Two patients died in our clinic because of mitral regurgitation and cardiac insufficiency. One patient also died in hospital from acute mitral regurgitation because of mitral valve chord rupture. 9 patients died from progressive aortic valve insufficiency during one year. All of them were inoperable (3 cases of cardiac cirrhosis, 2 – renal dysfunction, 4 – cardiomegaly with myocardial insufficiency). 4 patients died in hospital from heart failure because of progressive surgically untreated aortic valve insufficiency. In 15 patients there was dissection of the aorta (in 8 cases type I, in 5 type II, and only 2 cases of type III by the De Bakey classification of dissecting aortic aneurysms). 9 of them died in our clinic from ascending aorta rupture and heart tamponade. 6 patients with aorta dissection refused operation; 4 of them (with proximal dissection) died during two years. Only 2 patients (with distal dissection) survived more than 2 years. 6 patients had aortic valve insufficiency and non-dissecting ascending aorta aneurysm and refused operation. All of them died during three years (5 lethal cases from heart failure and 1 from ascending aorta rupture). One woman died in a maternity home on the fifth day after caesarean section from aorta rupture. In 1 case there was mesenteric superior artery dissection.

Conclusions: The natural history of Marfan syndrome is unfavourable because of cardiovascular complications, such as: progressive insufficiency of aortic valve, develo-

ping aortic aneurysms, dissections or rupture of the aorta, progressive mitral regurgitation. Morbidity and mortality are associated with aortic abnormalities rather than with mitral valve dysfunction. In patients with Marfan syndrome dissection can take place not only in the aorta but also in other arteries.

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Partial bypass from the left atrium to the descendant aorta in patients with coarctation of the aorta complex variants correction

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Background: During coarctation of the aorta (CoA) surgical treatment, different types of temporary blood shunting (TBS) are used in cases of poor collateral circulation. We shunt part of the arterial blood from the left atrium (LA) into the descendant aorta (DA) through the reservoir and heart pump machine (HLM).

Aim: To discuss the advisability of wider indications of this approach in cases with diminished collaterals and concomitant heart and brain lesions.

Material and methods: During 3874 CoA corrections TBS was used in 15 (0.4%) patients aged 11 to 45 years (mean 27+11 years). We accomplished TBS from LA to DA in cases of insufficient collaterals, which were observed in 4 patients. Other indications of this method were hypoplasia or calcinosis of the aortic arch (n=2), coarctation or re-coarctation with the aneurysm of the arch (n=2), anomalous origin of both subclavian arteries from poststenotic part of the aorta (n=1), encephalopathy (n=2), grave concomitant heart lesions (n=3). In all patients with special indications collateral circulation also was insufficient, or it was at the border of acceptable. Left thoracotomy in the IV intercostal space. After all preparatory steps for correction were done a full heparinization was performed (300 IU/kg). LA and DA were cannulated. Lines were connected with HLM reservoir (without oxygenator) and TBS was started: 15-30% of the circulating blood volume was shunted from LA to DA under the control of blood pressure in the radial artery, which was maintained at the level of 100-120 mm Hg. Then the aorta was cross-clamped and the lesion was corrected. After correction clamps from the aorta were removed, suture line anastomoses were controlled for bleeding and TBS was

stopped. Cannulas were removed, heparin was neutralized with protamine. TBS procedure lasted in general 60.9 ± 18 minutes, range 26 to 150 minutes.

Results: The method provides stable haemodynamics. There was no necessity of additional arterial blood pressure correction with vasodilators. Correction was performed with aortic grafting in the majority of cases, but in 7 cases end-to-end anastomosis was performed including patients of 41 and 44 years. There were no complications, no deaths.

Conclusions: TBS from LA into DA through HLM makes correction of the most complicated forms of coarctation lesions of the aortic arch and of the isthmus easier. It stabilizes haemodynamics in patients with minimal collaterals and concomitant heart lesions and with brain diseases.

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Treatment principles for patients with symptomatic myocardial bridges

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Background: The muscle overlying the intramyocardial segment of the epicardial coronary artery is termed a myocardial bridge and the artery coursing within the myocardium is called a tunneled artery. It is characterized by systolic compression of the tunneled segment, which remains clinically silent in the vast majority of cases. But the cases of symptomatic course of myocardial bridges, which is shown in angina pectoris, myocardial ischaemia, myocardial infarction and even sudden death, require immediate therapy. So far there are no developed algorithms of treatment of patients with this anomaly.

Aim: To determine the principles of treatment for patients with symptomatic myocardial bridges.

Material and methods: 43 patients (36 men, 7 women) with symptomatic myocardial bridges (MB) in the age from 18 to 56 (mean 37 ± 19) years were observed. All patients had angina pectoris. 22 (51.2%) patients had myocardial infarction. The following clinical studies have been done for all the patients: standard electrocardiogram in 12 leads, echocardiography and coronary angiography.

Results: The obtained data have shown that MB was settled down at the midportion of LAD in 41 (95.3%) patients and only in 1 (2.3%) above the diagonal branch of the left coronary artery, and above RCA also in 1 (2.3%) patient. The degree of systolic narrowing changed differently for each patient (from 30% to 100%), on the length of 22-30 mm.

The combination of MB with vasospasm has been noted in 7 (16.2%) patients. The tactic for patient care was based on the compression level for the tunneled part of the coronary arteries (CA), the presence of atherosclerotic plaque, accompanying heart pathology, and level of their conditions. In the studied group, 24 (55.8%) patients received conservative treatment. Three (6.9%) aged patients with large atherosclerotic plaques of a coronary artery above MB underwent coronary artery bypass grafting using the left internal mammary artery. Direct drug-eluting stent implantation of the tunneled artery was carried out for 15 patients (34.8%). One-stage defect correction and supracoronary myotomy in conditions of artificial blood circulation was performed in a 26-year-old woman, who had a combination of MB and a congenital heart disease. All the patients have significant improvement in state of their health independently of the chosen method of their treatment.

Conclusions: (1) The conservative therapy has to be prescribed at the level of slight compression of CA (<50%); (2) off-pump CABG is possible for cases refractory to medication and with compression of the tunneled CA for more than 50%; (3) the supracoronary myotomy or CABG is expedient at the combination of MB and accompanying heart pathology.

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History of cardiac surgery and of extracorporeal circulation in Ukraine

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The first successful operation on an open heart in Ukraine was performed by M.M. Amosov in 1958 using a heart-lung machine (HLM) of his own construction. The first preparatory stage of the development of cardiac surgery began in 1952 and was finished in 1957 by the creation of a heart-lung machine (HLM). The second stage – clinical mastering of the method (1958-1963) – was characterized by the choice of an optimal method of protection of the organism from hypoxia. The first series of successful operations were performed in 1960 in conditions of normothermic perfusions, and in 1961 in conditions of general hypothermia perfusion. In parallel during the same period operations in hyperbaric oxygen chamber were being elaborated and performed for the first time in USSR in 1963 under the guidance of M.M. Amosov. The triumph of this stage was the world's first implantation of a leaflet mitral valve prosthesis performed by M.M. Amosov in January 1963. In 1965 M.M. Amosov created the world's first antithrombotic type of mi-

tral valve prosthesis with its ring sown round by synthetic cloth. This idea is used up to the present time in all current types of heart valve prostheses, in order to prevent thromboembolic complications. It was one of the contributions of Ukraine to national and world cardiac surgery. The third stage of ECC history (1963-1974) can be considered as a stage of further improvement of technologies of operation provision, as cardiac surgery required principally new methods of organization of operation conduction and of the postoperative period. This stage of cardiac surgery history in Ukraine is characterized by the introduction of new clinical approaches, which gave the origin of a whole array of branches in clinical specialties: anaesthesiology, perfusiology, transfusiology, invasive cardiology. This third stage can be characterized as the stage of ECC technology standardization. The fourth stage, which began at the beginning of the 1990s, can be called a paradoxical period. It was a time of deep economic crisis; however, this period was accompanied by mastering of new operations and by steady improvement of their results, by expansion of the contingent of patients and by broadening methods of their treatment. From the first point of view, such a situation can be explained by the high capability of functioning of organizing principles of treatment and protocols invented in the middle of the 1980s. These methods remained effective even in conditions of their restricted provision. Further development of cardiac surgery in the current period has improved results of treatment of practically all kinds of cardiac surgical pathology which meet the requirements of a world level. 5381 cardiac operations were performed in 2006 with 2.4% mortality in the M.M. Amosov National Institute of Cardiovascular Surgery. The net cost of an average operation with ECC in the Institute is \$ 5000, which confirms the high economic and practical efficiency of the use of elaborated technologies. Over 120,000 cardiac operations were performed in Ukraine during the last 50 years.

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Perfluorocarbon (perftoran) myocardial protection in surgical treatment of combined mitral-aortic valve diseases

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Background: Operations of double valve replacement are time consuming and often they are performed against the background of poor state of the myocardium. Myocardium protection in these cases is of great importance.

Aim: To present analysis of different methods of myocardial protection during combined mitral-aortic valve (CMAV) correction in patients (pts) with the use of perftoran.

Material and methods: 1297 adult consecutive patients (pts) with CMAV disease were operated on from 01.01.1981 to 01.01.2006 in the National M.M. Amosov Institute of Cardiovascular Surgery of the Academy of Medical Sciences of Ukraine. Predominant genesis of CMAV disease was rheumatism. 31 pts (2.4%) were in NYHA class II, 317 (24.4%) pts were in class III and 949 (73.2%) pts in class IV. The average age was 46.4±8.1 (14-69) yrs. The following procedures were performed: mitral-aortic valve replacement (MAVR) (n=903); MVR + plastic procedure on aortic valve (n=194); AVR + plastic procedure on mitral valve (n=173); plastic procedure on both valves (n=27). Previous closed mitral commissurotomy was done in 110 (8.5%) pts, constrictive pericarditis in 101 (7.8%), thrombosis of left atrium in 75 (5.8%) pts. In the majority of cases monodisc type of valve was used, during the last period, bileaflet. Concomitant tricuspid valve disease was corrected by De Vega operation (plus tricuspid commissurotomy in cases of organic disease) in 258 (19.8%) pts. Systemic hypothermia to 27-32°C was used. In 1256 cases myocardial protection was achieved with the use of ante-retrograde St. Thomas solution cold blood cardioplegia (group A). In group B (n=41 pts) to the St. Thomas cardioplegic solution perftoran was added for better myocardial protection in doses 200-300 ml. Perftoran was added in quantity 100 ml to 300 ml to St. Thomas cardioplegic solution. In all groups (n=1297) cardiopulmonary bypass time was 141.4±29.2 minutes, and cross-clamping time 109.6±22.8 min.

Results: Hospital mortality was in group A 21.9% (n=276/1256) and in group B 4.8% (n=2/41) (p<0.05). Lethal heart failure was noted in group B in 0% of pts (n=0/41) and in group A in 2.5% (n=31/1256) (p<0.05).

Conclusions: Improved myocardial protection by the use of perftoran (group B) especially in cases with cardiomegaly and low left ventricle contractility gave better results during the hospital period and low risk of postoperative heart failure than in group A without the use of perftoran in cardioplegic solution.

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Estimation of oxygen transport adequacy in adult patients in early postoperative period

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Background: The absolute value of cardiac output or cardiac index (CI) is not always informative in the early postoperative period (EPP) since the level of total metabolic activity of the organism is variable and cannot be controlled directly.

Aim: Three types of system reactions to increase of metabolic demand in EPP are possible: too high, normal and low cardiac output (CO). To estimate CO adequacy without its measurement seems to be very important. The aim is to study the types of oxygen transport regulation and to create a method of estimation of its adequacy.

Material and methods: 719 observations collected in ICU during 1-2 days after heart valve replacement and/or CABG. 62 monitoring records of AP and heart rate registered during parallel perfusion and after CPB in ICU during 1-2 days after operations. Special methods of cluster and regression analysis were applied for data processing. Interactions of central and peripheral blood flow with relative functional autonomy of micro-vessel arterial network were simulated with cellular automaton mathematical model.

Results: There were recognized and studied three types of dependencies of oxygen consumption (IVO2) on its delivery (IDO2), $R=0.8...0.9$, $p<0.01...0.001$: $IVO2=0.578 \cdot IDO2 - 57.27$ – low cardiac output syndrome; $IVO2=0.456 \cdot IDO2 - 75.90$ – normal regulation; $IVO2=0.317 \cdot IDO2 - 64.05$ – heart hyper function, where $IDO2=Co2a \cdot CI$; $IVO2=(Co2a - Co2v) \cdot CI$, and $Co2a$, $Co2v$ – oxygen content in arterial (a) and venous (v) blood, CI – cardiac index. Dependencies represent the increase of oxygen delivery and consumption at increase of total metabolic demand. Along every dependency IVO2 IDO2 a linear correlation between $Co2a$ and $Co2v$ was observed ($R=0.52...0.82$, $p<0.01...0.001$): $Co2v=0.5358 \cdot Co2a + 1.5825$; $Co2v=0.7091 \cdot Co2a + 0.7003$; $Co2v=0.8648 \cdot Co2a - 0.3948$. At fixed $Co2a$ the minimal value of $Co2v$ was observed at low cardiac output, and maximal $Co2v$ at high CO. These differences are caused by shunt and nutritive (capillary) flow redistribution.

Conclusions: Too high CO causes an increase in the shunt fraction, can damage microcirculatory network and decrease the a-v gradient of blood oxygen content. Low CO activates the capillary flow redistribution and increases this gradient. The $Co2v$ ($Co2a$) dependencies can be used as nomograms for estimation of adequacy of cardiac output in the early postoperative period without the necessity of its control.

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Background: Complicated mitral valve diseases remain a difficult problem in surgery of acquired valve disease, especially of cases with a left ventriculomegaly and a giant left atrium.

Aim: To analyze possibilities of correction of the left parts of the heart by reduction of LA with preservation of MV apparatus during MVR.

Material and methods: During 1997-2006, 91 adult patients (pts) with mitral valve disease (MVD) and giant LA (diameter 60 mm and more) were operated on in the National M.M. Amosov Institute of Cardiovascular Surgery of the Academy of Medical Sciences of Ukraine (group A). Average age was 49.2 ± 5.6 yrs. 63 (68.9%) pts were in NYHA class IV and 28 (31.1%) in class III. Predominant aetiology in all pts was rheumatism. Monodisc (Allcarbon type) prostheses were used with orientation of the large margin to the posterior leaflet ($n=35$), bileaflet ($n=56$). LA plasty was performed by Kawazoe's method. Preservation of posterior leaflet (all pts) and translocation of anterior leaflet papillary muscles was performed together with MVR ($n=45$). Concomitant procedures: on aortic valve ($n=21$) and tricuspid valve ($n=9$). Combined ante-retrograde St. Thomas cardioplegia and moderate hypothermia ($27-32^{\circ}C$) were used. Cross-clamping time of aorta was 93.4 ± 11.2 minutes. Control group (group B $n=27$) – only MVR without preservation of MV and without reduction of LA was performed.

Results: There were 2 deaths during the hospital period (hospital mortality (HM) – 2.2%) (group A). The causes of deaths were heart failure (1), brain damage (1). There were no episodes of bleeding, thromboembolic events or prosthesis failure in hospital and in remote periods. During the remote period (average 5.3 ± 1.4 yrs) 83 pts were followed up. Sinus rhythm was preserved in 43 (43.4%) pts and there were no deaths or unsatisfactory results. Echo data for group A: end-systolic volume index (ESVI) (ml/m^2) – preoperative 62.8 ± 6.4 , postoperative (6-11 days) 54.4 ± 7.4 and in the remote periods 49.6 ± 5.2 ; diameter of LA (mm) – preoperative 62.4 ± 4.2 , postoperative 46.4 ± 4.2 , in the remote period 45.8 ± 3.6 . There were no hospital deaths in group B. Data of echo for group B: ESVI (ml/m^2) – preoperative 69.8 ± 7.4 , postoperative (6-11 days) 64.4 ± 7.4 and in the remote period 63.4 ± 6.4 ; diameter of LA (mm) – preoperative 67.4 ± 5.4 , postoperative 65.8 ± 7.4 , remote period 67.3 ± 5.6 . In group B there were episodes of thromboembolic events ($n=2$), heart failure ($n=2$), prosthesis failure (0). Sinus rhythm was preserved in 3 (11.1%) pts and there were two deaths, unsatisfactory results ($n=2$ – progressive heart failure).

Conclusions: Reconstruction of the left part of the heart for MVD by preservation of MV and LA plasty during MVR allowed improvement of indices of LV and LA mor-

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Complex reconstruction of left part of the heart in mitral valve diseases

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phometry and contractility during early and remote postoperative periods compared with group B. There were no specific complications in the postoperative period in group A.

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Combined mitral-aortic valve diseases: problems solved and unsolved

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Background: Double valve replacement remains a difficult task in cardiac surgery up to the present time.

Aim: To analyze the main problems in the surgery of combined mitral and aortic valve disease (CMAVD).

Material and methods: 1297 consecutive adult patients (pts) with CMAVD were operated on from 01.01.1981 to 01.01.2006 in the National M.M. Amosov Institute of Cardiovascular Surgery of the Academy of Medical Sciences of Ukraine. Predominant genesis of CMAVD was rheumatism. 31 (2.4%) pts were in NYHA class II, 317 (24.4%) pts were in class III and 949 (73.2%) pts in class IV. The average age was 46.4 ± 8.1 (14-69) yrs. The following procedures were performed: MVAR – mitral-aortic valve replacement (n=903); MVR + plastic procedure on AV (n=194); AVR + plastic procedure on MV (n=173); plastic procedure on both valves (n=27). Previous closed mitral commissurotomy (CMC) was done in 110 (8.5%) pts, constrictive pericarditis in 101 (7.8%), thrombosis of LA in 75 (5.8%) pts. In the majority of cases monodisc type of valve was used, during the last period, bileaflet. Concomitant tricuspid valve disease was corrected by De Vega's operation (plus tricuspid commissurotomy in cases of organic disease) in 258 (19.8%) pts. Preservation of MV's apparatus during MVR was performed in all cases of mitral incompetence, especially with $ESVI > 75$ ml/m². All operations were performed with CPB, moderate hypothermia (28-32°C); in the majority of cases combined ante-retrograde St. Thomas crystalloid cardioplegia was used.

Results: Hospital mortality (HM) in the last 6 years (2000-2005) was 7.1%. HM was higher for double valve replacement than in cases with plastic procedure on one valve. HM depends on the following main factors: NYHA class IV, small cavity of LV – end-systolic volume index of LV (ESVI) < 15 ml/m². (especially for combined MS + AS and the use of 29 mm prostheses), LV ejection fraction < 0.35 , systolic pressure in pulmonary artery > 90 mm Hg, massive thrombosis of LA (thrombotic masses more than 1/3 of

LA volume), constrictive pericarditis, previous CMC, calcification on both valves + 3, $ESVI > 110$ ml/m² (especially for combined MI + AI), organic tricuspid valve diseases, triple stenoses, cross-clamping time of the aorta more than 180 minutes.

Conclusions: Excellent results of CMAV's correction (HM less than 2%) were observed mainly in cases without complicated forms – in NYHA class II or III and the use of bileaflet mechanical valve (Saint Jude, Carbomedics, On-X, Edwards-MIRA). The combination of described risk factors increases HM.

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Diagnostics and treatment of aneurysms in the aorta coarctation correction zone

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Background: Aneurysms at the site of coarctation of the aorta repair is a relatively rare but life-threatening complication, which causes aorta rupture and death. The grave course of the disease and hopeless prognosis make it necessary to search for ways for timely diagnostics and treatment of this deadly dangerous complication.

Aim: To attract doctors' attention to the risk of aneurysm development in the aorta coarctation correction zone to their diagnostics and treatment.

Material and methods: The remote results of 4196 patients after aorta coarctation correction operated upon from 01.01.1960 to 01.01.2007 were studied. The management of aorta coarctation included the resection of the narrowing followed with the end-to-end anastomosis (2547 pts; 60.7%), aortoplasty with a patch (1161; 27.7%), graft replacement of the narrowed zone (207; 4.9%), shunting (61; 1.4%), Waldhausen operation (63; 1.5%), Blelock (11; .3%), and balloon dilatation of the narrowing (146; 3.5%). The aneurysms were diagnosed during the X-ray study, when the rounded shadow was visualized as left-contouring the aortic arch. The diagnosis was verified aortographically.

Results: Aneurysm formation in the aorta coarctation correction zone was found in 114 (2.7%) of operated on patients. Eighty-nine of these patients (78.1%) underwent operation; 25 patients (21.9%) refused the operative treatment on various grounds and all of them died within 7 years. The operations were carried out under conditions of distal

circulatory support with the help of passive bypass ascending-to-descending aortal shunt in 82 patients (92.1%); in 5 (5.6%) cases extracorporeal circulation was used, and 2 (2.3%) patients were operated on without support.

Conclusions: The obtained data allow us to conclude that in some cases aneurysms after the correction of aorta coarctation tend to develop aneurysms in the remote period threatening the patient's life. This needs lifelong regular medical check-up including roentgenography for timely diagnosis and treatment of this complication.

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Peculiarities of functioning of the immune system in patients with pathology of the myocardium

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Background: Among the immunological infringements in patients with chronic heart insufficiency (CHI) in patients with cardiomyopathy the reorganization of cellular-humoral part of immunity is observed (V. Serova, 2004). There is an opinion about possible cytokine-mediated mechanisms of progression of CHI that is based on research into activity of the effects of the tumour necrosis factor (TNF- α) and of other proinflammatory cytokines (Kan AP, Anker SD, 2000).

Aim: To study immune-metabolic processes in pathogenesis and progression of remodelling of myocardium in patients with cardiomyopathy.

Material and methods: We investigated the peculiarities in the functioning of the immune system in patients with dilated cardiomyopathy at the age of 43 ± 3.7 years old, EF – $28 \pm 1.9\%$ HF II-III FC. Gross infringements of mechanisms in the system of cellular-humoral immunity were found. T-cellular immunity was lowered, index T-helpers/T-suppressors was reduced. During the study of the functional condition of the immune system we took into account the totality of regulatory cells controlled by the immune response in patients: CD16+, CD3+, CD4+, CD8+, CD22+, CD25+ and CD95+.

Results: The research has shown a reduction in the functional activity of lymphocytes in patients. In patients with hypertrophic cardiomyopathy the definitions of the coefficient CD25+/CD95+ were estimated as more highly negative than in patients with dilated cardiomyopathy. The increase of apoptotic cells number by CD95+ – receptors reflected the infringement of apoptosis during the pro-

gression of cardiomyopathy. Content of proinflammatory cytokines in blood plasma was increased. The production of IL-6 and IL-8 increases considerably in acute and in chronic heart insufficiency irrespectively of class of failure. TNF- α concentration was lower than the level of method sensitivity. CD95+, TNF- α , IL-6, IL-8 promote the progression of immune-inflammatory activation information and progression of heart insufficiency. Because of proinflammatory cytokine activation, free radical generation of the myocardium is increased. Development of autoimmune and of metabolic processes is observed in patients with pathology of the myocardium. Changes of LPN, antioxidant activity, ceruloplasmin and CIK levels break the structure and function of cellular membranes, and cause destruction of cardiomyocytes.

Conclusions: In this study we shed light on questions about correlation of progression of pathological changes of the myocardium with immune-inflammatory misbalance in patients with cardiomyopathies.

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Our experience of pacing in cardiomyopathies

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Background: It has been clearly demonstrated that obstructive hypertrophic cardiomyopathy (OHCM) and cardiomyopathy in congestive heart failure (CHF) patients (pts) often go together with functional mitral regurgitation (FMR). DDD pacing in OHCM pts and cardiac resynchronization therapy in CHF pts demonstrate clinical improvement and decrease of FMR degree.

Aim: To study the electrophysiological mechanisms of DDD pacing in HOCCM and biventricular pacing (BiV) in CHF pts in haemodynamics improvement and FMR relief.

Material and methods: We studied 19 CHF pts (18 M, age from 18 to 78, LV EF $31.9 \pm 6.2\%$) and 36 HOCCM pts, who were treated with biventricular pacing. Pts were evaluated on the basis of ECG assessment of the QRS duration, and of echocardiographic determination of LV end-diastolic volume (EDV), of LV end-systolic volume (ESV), of LV ejection fraction (EF), interventricular delay (IVD) and degree of mitral regurgitation (MR) degree valuation. The criteria used were as follows: complete LBBB, LV EF $< 35\%$, QRS duration > 130 ms, IVA > 40 ms, NYHA class III or IV. 55 consecutive HOCCM pts (mean age 31.7 ± 3.2 yrs) were evaluated by

cardiac catheterization, by echocardiography and by endocardial mapping of LV excitation sequence in relation to His potential registered in the AV node region. 27 HOCM pts received permanent dual chamber pacemakers.

Results: After three months of BiV pacing in CHF group we observed reduction of QRS duration, ms (145+30 vs. 168+25 $p<0.1$), reduction of IVD (8+6.9 ms vs. 53.3+16.3 ms, $p<0.01$), LV EF (%) increase (31.9+6.2 vs. 25.8+5.3, $p<0.1$) with EDV (ml) reduction (258.8+94 vs. 286.1+96), ESV (ml) reduction (195+56 vs. 240+72, $p<0.1$), reduction of MR degree (1.3+0.8 vs. 2.8+0.7, $p<0.1$). Endocardial mapping indicated that the most significant SPG on LV OT (6.7+8.5 mm Hg, range from 30 to 180 mm Hg and mitral regurgitation were observed in HOCM pts with 15+5 ms LV apex excitation delay in relation to hypertrophied part of interventricular septum (IVS).

Conclusions: Intra- and interventricular dyssynchrony do contribute to origin of FMR in cardiomyopathy pts. The excitation delay of LV apex and papillary muscles relatively to LV OT is the decisive mechanism of the SPG and of MR development in HOCM pts. Synchronization of the basal and of apical myocardium loop contraction in BiV pacing reduces the size of the mitral valve fibrous ring, improves coaptation of the mitral valve, brings down mitral regurgitation, and meliorates systolic function of the left ventricle in patients with end-stage of heart failure.

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Experience in reconstructive surgery of left heart endocarditis

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Aim: Analysis of reconstructive surgery of left heart infective endocarditis (IE).

Material and methods: 1604 sequential operations were performed in left heart IE from 12.01.1990 to 31.10.2006 in the Amosov Institute of Cardiovascular Surgery. The average age of the patients was 36.8+6.3 (from 1 to 74 years old). 1299 (81%) of 1604 patients were male. Secondary IE was found in 1563 (97.4%) cases. According to the bacteriological studies the infectious agent was identified in 29.4% of cases, where Gram-positive cocci were prevalent – *Staphylococcus epidermalis* in 70.1% and *Aureus* in 10.4% of cases. *Enterococcus* – in 6.7% of cases. Isolate lesions of the aortic valve (AV) or mitral valve (MV) were observed in 886 (55.2%) and 406 (25.3%) cases accordingly; combined lesions of both left heart valves were observed in 312 (19.5%) cases. In the cases of domination of the AV lesions, replacement of the

aortic valve (RAV) was performed in 865 (97.6%) cases and aortic valve repair (AVR) in 21 (2.4%) cases. The technique of AVR included vegetation ablation, valve defect repair using autotissue, and annuloplasty. In the case of the isolate mitral valve lesion, replacement of mitral valve (RMV) was performed in 342 (84.2%) cases and mitral valve repair (MVR) in 64 (15.8%) cases. MVR included vegetation ablation, resection of the leaf segment, repair of the leaflet using the autopericardium, and annuloplasty. When both of the valves were affected, replacement of the mitral valve and the aortic valve (RMAV) was performed in 151 (48.4%) cases, and repair of the mitral valve and aortic valve replacements in 156 (50%) cases, repair of mitral and aortic valves in 5 (1.6%) cases. Valve repair included using the autopericardium patch performed within defects of the anterior leaf of MV, suturing of the punched leaflets, and repair of aortic-mitral fibrous junction abscess with autopericardium patch.

Results: Hospital mortality in the cases of isolated AV correction was as follows: RAV – 7.1% (61/865), AVR – 4.7% (1/21); in the cases of isolated MV correction: RMV – 4.9% (17/342), MVR – 1.6%(1/64); in the cases of AV and MV corrections: RMAV – 13.9% (21/151), in the cases of repair of MV and RAV – 5.8% (9/156), of repair of AV and MV – 0% (0/5). Total hospital mortality was 6.8% (110/1604). The frequency of IE recurrence after reconstructive surgery was 1.7% (4/234) of cases in comparison with the group of patients after valve replacement – 6.0% (76/1259) of cases.

Conclusions: 1. The frequency of infective endocarditis recurrence is lower in cases of reconstructive surgery of left heart IE than after valve replacement. 2. Valve repair methods of surgical treatment in left heart infective endocarditis promote good results in early and late postoperative periods.

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Chordal replacement in mitral valve repair

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Background: Mitral valve repair is preferred whenever feasible over valve replacement. Numerous classical methods well known as French correction are the gold standard techniques to repair mitral valve incompetence. Although these methods proved to be highly effective, in recent years there has been considerable progress in the development of multiple strategies, most promising of which is creation of artificial chordae.

Material and methods: From January 2000 to April 2007, 65 patients underwent mitral valve repair. In 11 of them with degenerative valve regurgitation the replacement of chor-

dae tendineae of anterior or posterior leaflet or both was the only isolated procedure. There were 7 males and 4 females with age ranging from 42 to 67 years. Preoperative mitral regurgitation was 4+ in 8, and 3+ in 3. The valve was exposed through superior-septal incision in 6, and through left atrium after extensive mobilization of interatrial groove in 5. The average number of used artificial chordae was 3. Concomitant ring annuloplasty was performed in 4.

Results: There was no postoperative death. Residual mitral regurgitation was evaluated as trivial in 2 patients. All patients were free from reoperation due to valve incompetence during follow-up of 6 years.

Conclusions: Chordal replacement with Gore-Tex sutures provides a secure method for correction of mitral regurgitation caused by prolapse of anterior or posterior leaflets or both.

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100 pulmonary embolectomies: Lviv experience

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Background: Acute massive pulmonary embolism still remains a life-threatening pathology with a high mortality rate. Although thrombolysis is effective in numerous cases recent refinements in cardiac anaesthesia, perfusion and technique explain the renaissance of interest in pulmonary embolectomy.

Material and methods: A retrospective review was performed of all 101 pulmonary embolectomies that were undertaken in one centre since 1980. There were 39 males and 62 females with age ranging from 17 to 79 years. The diagnosis was established on clinical findings, by means of echocardiography and angiography. In 96 cases the operation was performed with the aid of a heart-lung machine, in 5 patients through the main pulmonary artery branch on the beating heart. Actual operative protocol consists of rapid sternotomy, institution of cardiopulmonary bypass, removal of clots through 2 separate incisions on pulmonary trunk and on right pulmonary artery. We operate on a «warm beating» heart without aortic cross-clamping.

Results: Eighty-three (81.2%) patients survived and were discharged from the hospital.

Conclusions: Acute massive pulmonary embolism is an indication for thrombolysis or embolectomy. In our opinion urgent embolectomy is a must in patients with cardiogenic shock or right ventricular dysfunction evaluated by echocardiography.

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Pulmonary endarterectomy for extreme thromboembolic pulmonary hypertension

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Background: Pulmonary endarterectomy offers a possibility of cure for patients with chronic thromboembolic pulmonary hypertension. This procedure is technically demanding, and is associated with relatively higher mortality than routine open-heart operations.

Material and methods: We reviewed the outcomes of 58 patients who underwent pulmonary endarterectomy in Lviv centre since 1980 and found among them 10 patients with pulmonary systolic pressure greater than 100 mm Hg. There were 6 males and 4 females with age ranging from 35 to 67 years. The diagnosis was established by means of echocardiography, angiography and CT scan. Our operative protocol for this particular cohort consists of sternotomy, institution of cardiopulmonary bypass, extensive mobilization of vena cava superior, and removal of embolic material through incisions on the pulmonary trunk and on the right pulmonary artery. We try whenever possible to avoid or minimize the period of aortic cross-clamping and deep hypothermia with total circulatory arrest. We prefer to restore patency of pulmonary arteries in several periods of reduced perfusion.

Results: Among 10 patients who were operated on, 7 (70 per cent) survived and 6 were discharged from the hospital. Four patients died – 3 in OR, and one 4 hours after the procedure. The main cause of death was residual pulmonary hypertension and postoperative perfusion oedema.

Conclusions: Pulmonary endarterectomy remains the treatment of choice for patients with chronic thromboembolic pulmonary hypertension regardless of the level of pulmonary hypertension. High preoperative pulmonary resistance is associated with increased mortality and poor haemodynamic outcome.

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The role of prenatal diagnosis in treatment of neonates with critical congenital heart disease

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Background: Annually in Ukraine approximately 3-3.5 thousand neonates are born with congenital heart diseases (CHD). 35-40% of them are in critical condition soon after birth and need urgent medical care. Critical condition in neonates can be caused by certain cardiac anomalies with ductal-dependent pulmonary or systemic circulation or with severe congestive heart failure. These critical CHD are responsible for 20% of neonatal and 50% of infant deaths.

Aim: The main aim of the study was to analyze the experience of identifying critical CHD by prenatal echocardiography and the influence of prenatal diagnosis on the perinatal management and surgical outcome.

Material and methods: In our Centre, from 2004 to 2006 we performed fetal echocardiograms in 260 pregnant women. One hundred and ninety-four pregnant women (74.6%) were referred because of suspicion for CHD at general ultrasound screening and the rest 66 (25.4%) were referred based on general indication for fetal echocardiography. Mean age of pregnant women was 25.9 ± 5.0 years, from 16 to 38; mean gestation age – 27.0 ± 5.6 weeks, from 16 to 39. All transabdominal fetal echocardiograms were performed on SONOS 7500 (Philips Medical Systems, Andover, MA) by ultrasound transducer 4 or 8 MHz. Diagnosis of critical CHD was based on detecting the ductal-dependent pulmonary or systemic circulation and certain cardiac anomalies (for example, aortico-left ventricular tunnel (ALVT), total anomalous pulmonary venous connection (TAPVC), complete heart block (CHB) etc.) with a development of congestive heart failure in utero or soon after birth.

Results: Out of 260 fetal examinations, CHD was diagnosed in 83 cases (31.9%). Out of these 83 cases, critical CHD was diagnosed in 32 cases (38.6% of all CHD). Among 32 cases of prenatal diagnosis of suspected critical CHD we had: hypoplastic left heart syndrome (5), critical coarctation of the aorta (CoAo) (5), transposition of the great arteries (4), unbalanced AVSD (3), critical aortic stenosis (AS) (2), TAPVC (2), pulmonary atresia (PA) (2), CHB with CHD (2), Ebstein's anomaly with right ventricle outflow tract (RVOT) obstruction (2), single ventricle (SV) with truncus arteriosus (2), critical pulmonary stenosis (1), multiple rhabdomyomas with critical RVOT obstruction (1), aortico-left ventricular tunnel (ALVT) (1). In 3 cases the pregnancy was terminated and in 29 pregnancies delivery took place. According to our recommendation most neonates were born near the Centre and transported to the Centre on the 1st or 2nd day after birth. Postnatal critical CHD was confirmed in 24 (82.8%) cases. Four neonates were not treated because of severe CHD with poor prognosis or family refusal. The remaining 20 newborns were admitted to the intensive care unit. Thirteen of them were treated with infusion of prostaglandin E1. Out of 20 newborns 18 received invasive treatment. In 7 cases we performed emergent invasive procedures (5 balloon aortic or pulmonary valvulotomies) or surgical interventions (2 pacemaker implantations). In 11 cases, 3 arterial switch operations, 3 CoAo repairs, 1 tricuspid valvuloplasty

with RVOT reconstruction, 1 CoAo repair with pulmonary artery banding, 1 RVOT reconstruction, 1 ALVT repair and 1 aorto-pulmonary shunt were performed urgently in the early neonatal period (from 1 to 14 days). In 4 of them balloon atriostomies were done preoperatively. Two neonates did not receive surgical treatment. In 1 case of multiple rhabdomyomas with right ventricle outflow tract obstruction, the involution of rhabdomyomas resulted in decrease of RVOT obstruction without surgery. One death occurred preoperatively because of complex CHD (unbalanced AVSD, subvalvular AS and CoAo) and postnatal infection. Hospital mortality among 18 surgically treated neonates was 5.6% (1 patient). There was 1 early postoperative death in a patient with severe CHD (SV with malposition of the great arteries, CoAo and complete heart block).

Conclusions: CHD, causing the critical condition soon after birth, can be diagnosed with high accuracy (82.8%) by prenatal echocardiography. Prenatal diagnosis of critical CHD can optimize neonatal medical care and improve early postnatal management and outcome.

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Percutaneous balloon dilatation for critical aortic stenosis in infants: early and midterm results

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Background: Incidence of congenital aortic stenosis is about 3-5% of all patients with congenital heart disease (incidence of congenital heart disease is 5-7 per 1000 live births). Incidence of critical congenital aortic stenosis at the valve level is not well documented and probably is less than 3% of infants who have congenital heart disease requiring treatment in early infancy. In our Centre transcatheter balloon aortic valvuloplasty (BAVP) is the first-line treatment for critical aortic valve stenosis (AS). In Ukraine BAVP was first performed by Panichkin Y.V. in 1994.

Aim: The objective of this study was to review the outcome of balloon dilatation of critical aortic valve stenosis in patients younger than 6 months of age and to analyze the early and mid-term results.

Material and methods: Between January 1994 and January 2007, 56 neonates and infants underwent BAVP for critical aortic stenosis. The degree of residual aortic stenosis and insufficiency was assessed by Doppler echocardiography after intervention. Associated defects included endocardial fibroelastosis (11), mitral regurgitation (42), mitral

valve stenosis (6), aortic coarctation (5), patent ductus arteriosus (10), hypoplastic left ventricle (2). The procedures were performed through femoral artery approach.

Results: Of 56 patients, 51 (91%) patients survived the procedure and 5 (9%) patients died. After the procedure 10 (18%) patients had respiratory distress syndrome which required ventilator support, 8 (14%) received prostaglandins, and 28 (50%) received inotropic support. Predictors of death were young age and associated defects. The diameter of the aortic annulus ranged from 5 to 13.0 mm (mean, 7.2 mm), and the diameter of the balloon from 5 to 12 mm, resulting in a balloon-to-annulus diameter ratio (BAR) of 75-100%. The peak systolic gradient prior to dilatation ranged from 12 to 104 mm Hg (mean, 38.3 mm Hg); the mean gradient after dilatation was 25 mm Hg, $p < 0.01$. The mean left ventricular end-diastolic pressure immediately after dilatation was 11.2 mm Hg (ranged from 5 to 21 mm Hg) compared with 18.3 mm Hg prior to dilatation, $p < 0.01$. The mean left ventricular ejection fraction prior to dilatation was 40.3%, after dilatation 59.5%, $p < 0.01$. Mean follow-up was 29 months (range – from 2 months to 6 years). Late new-onset aortic regurgitation developed in 34 (60%), and was trivial in 4, mild in 25 and severe in 5 patients. The incidence of repeat interventions after balloon dilatation was high (63%). Reinterventions included repeat valvuloplasties, surgical valvulotomies, Ross procedures and aortic valve replacement.

Conclusions: BAVP is a minimally invasive procedure in the treatment of critical aortic valve stenosis. Despite its efficacy in decompression of failing left ventricle, BAVP remains a palliative procedure with high incidence of repeat interventions. The use of small balloons (<100% of the diameter of the aortic annulus) did not prevent the onset of late aortic regurgitation.

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Balloon atrial septostomy under echocardiographic control

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Background: The incidence of congenital heart disease (CHD) in different studies varies from about 4 to 10 per 1000 live births. The early survival of children with some complex cyanotic heart disease depends on the presence of an adequate atrial septal defect. Balloon atrial septostomy (BAS) is a palliative procedure that results in creating or widening the atrial septal defect, enabling better blood shunting and mixing at atrial level. Balloon atrial septosto-

my was first described by Rashkind and Miller in 1966 as a palliative procedure for transposition of the great arteries. Traditionally the procedure is performed in the catheterization laboratory under fluoroscopic guidance. In some cases the procedure can be done in the intensive care unit under echocardiography guidance. Balloon atrial septostomy under echocardiographic guidance was initially reported by Matsunaga et al. in 1981. In Ukraine, balloon atrial septostomy at bedside under echocardiographic control was first performed in 2006.

Aim: To analyze our experience of percutaneous balloon atrial septostomy under echocardiographic control in newborns with congenital heart diseases.

Material and methods: From 2004 to 2007, 182 balloon atrial septostomies (BAS) were performed, including 13 procedures under echocardiographic control and 169 by conventional fluoroscopic method (control group). Thirteen neonates aged 1-21 days with various cyanotic heart diseases underwent BAS under two-dimensional echocardiographic control in the cardiac catheterization laboratory or in intensive care units. This group included diagnoses as follow: 9 cases of transposition of the great arteries (TGA), 2 – tricuspid atresia, 1 – mitral atresia, 1 – mitral hypoplasia. The procedures were performed through the femoral venous approach. Septostomy catheters Z-5 were used. A standard ultrasound subcostal view was used to delineate the interatrial septum, to estimate interatrial communication and to guide the balloon catheter. One hundred and sixty-nine infants aged from 1 day up to 90 days underwent BAS in the cardiac catheterization laboratory under fluoroscopic guidance. This group included the following diagnoses: 130 – TGA, 11 – hypoplastic right heart, 6 – mitral atresia or hypoplasia, 3 – total anomalous pulmonary venous return, 6 – other CHD.

Results: Enlargement of the atrial septal defect was obtained in all patients, size increased from 3.61 ± 0.32 mm up to 7.9 ± 0.39 mm ($p < 0.05$) in the echocardiographic group and from 3.43 ± 0.43 mm up to 8.1 ± 0.33 mm ($p < 0.05$) in the control group. There was no significant difference in the results of BAS performed by two different methods. In all cases of TGA ($n=139$) increase of mean oxygen arterial saturation from $60.5 \pm 6.1\%$ to $81.6 \pm 3.2\%$ ($p < 0.05$) was obtained with no difference between groups. Positive clinical effect was obtained in all other cases as well. The tearing of the atrial septal defect was seen clearly during the procedure under the echocardiographic guide. There were no major complications or procedure-related deaths in the group of newborns who underwent balloon atrial septostomy under echocardiographic control. In the control group there was 1 procedure-related death as a result of cardiac perforation in a low body weight neonate with TGA.

Conclusions: BAS under 2D echocardiographic control can be performed successfully and safely in infants with cyanotic congenital heart disease in environments which are more appropriate for the patient: at bedside in the ICU

of the referral or primary centres. Echocardiographic monitoring is informative enough to perform the procedure. It provides important advantages, such as avoiding the transportation of severely ill children with heart disease and reducing the duration of the procedure. Despite the mentioned advantages of ultrasound BAS visualization, there were also some disadvantages, such as: problems of visualization of inferior cava and iliac veins, absence of information from angiography and full catheterization.

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Aortic valve replacement with pulmonary versus aortic homografts. Results after 23 years

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Aim: This study was undertaken to investigate the use of pulmonary homografts and to compare them with aortic homografts.

Material and methods: 655 patients (pts) received fresh homografts between January 1980 and December 2002. There were 38 pulmonary allografts and 617 aortic allografts implanted. During this time 139 pts (116 male and 23 female) with a mean age of 46.7 years (18-72) required reoperation. There were 135 (97.1%) aortic allografts and 4 (2.87%) pulmonary allografts.

Results: The mean durability for all 655 homografts was 12.4 years \pm 4.54 (1 month to 23 years). Mean durability for pulmonary homografts 15.7 years; for aortic homografts 12.1 years. The major cause of valve dysfunction and indication for reoperation was degeneration in 111 pts (79.8%) – 107 aortic and 4 pulmonary. Predominant aortic valve insufficiency was found in 87 pts – 85 aortic, 2 pulmonary; stenosis in 24 pts – 22 aortic, 2 pulmonary. Endocarditis occurred only in pts. who received aortic homografts – 21 pts (15.1%). Early endocarditis was diagnosed in 5 pts (3.59%); late endocarditis in 16 pts (11.5%). Additional causes for reoperation in 4 pts included ascending aortic aneurysm, mitral valve insufficiency and congestive cardiomyopathy.

Conclusions: 1. The results of the study suggest that the use of fresh pulmonary homograft might be the best choice. 2. Primary aortic valve replacement with homograft can give acceptable long-term results. 3. The major cause of homograft dysfunction and indication for reoperation was degeneration.

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Brain protection in surgical treatment of combined mitral-aortic valve diseases with neurological deficits

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Background: Neurological deficits in patients who have to have open heart surgery always requires prophylactic measures to avoid serious complications.

Aim: To present analysis of different methods of brain protection during combined mitral-aortic valve (CMAV) correction in patients (pts) with neurological deficits.

Material and methods: 1297 consecutive adult pts with CMAV were operated on from 01.01.1981 to 01.01.2006 in the National M.M. Amosov Institute of Cardiovascular Surgery of the Academy of Medical Sciences of Ukraine. Predominant genesis of CMAV disease was rheumatism. 31 pts (2.4%) were in NYHA class II, 317 (24.4%) pts were in class III and 949 (73.2%) pts in class IV. The average age was 46.4 ± 8.1 (14-69) yrs. The following procedures were performed: mitral-aortic valve replacement (MAVR) (n=903); MVR + plastic procedure on aortic valve (n=194); AVR + plastic procedure on mitral valve (n=173); plastic procedure on both valves (n=27). Previous closed mitral commissurotomy was done in 110 (8.5%) pts, constrictive pericarditis in 101 (7.8%), thrombosis of left atrium in 75 (5.8%) pts. Neurological deficits (brain cysts) before operation were found in 39 (3.0%) pts. In the majority of cases monodisc type of valve was used, during the last period, bileaflet. Concomitant tricuspid valve disease was corrected by De Vega's operation (plus tricuspid commissurotomy in cases of organic disease) in 258 (19.8%) pts. Systemic hypothermia to 27-32°C was used. In the majority of pts myocardial protection was achieved by the use of ante-retrograde St. Thomas solution cold cardioplegia. This cohort of pts we had divided into 2 groups: (group A) 14 pts were operated on using perfluorocarbon (perftoran) for brain protection after cross-clamping of aorta in doses 200-300 ml; (group B) 25 pts were operated on without the use of perftoran. In both groups cardiopulmonary bypass time was 141.4 ± 29.2 minutes and cross-clamping time was 109.6 ± 22.8 .

Results: Hospital mortality was respectively in group A 0.0% (n=0/14), and group B 16.0% (n=4/25). Lethal brain damage was the cause of death in group B (n=4/25). There were 5 temporary neurological events in the hospital period in both groups (n=5/39) and all of them were only in group B – 25.0% (n=5/25).

Conclusions: For improved brain protection in pts with neurological deficits by the use of perftoran for better oxy-

generation (group A) we obtained better results and lower risks in the hospital period than in the group without perfloran.

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Niedomykalność zastawki neoorty w długofalowej obserwacji po korekcji anatomicznej przełożenia wielkich pni tętniczych (TGA)

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Wstęp: Anatomiczna korekcja przełożenia wielkich pni tętniczych (ang. *arterial switch*) zastąpiła z czasem korekcję przedsionkową. W okresie od 1991 r. do 2007 r. w naszym ośrodku leczonych tą metodą było ponad 460 pacjentów. Całkowita pooperacyjna śmiertelność wynosiła początkowo 16%, ale wraz z nabieraniem doświadczenia w ostatnich latach spadła do 2% w prostych i do około 5% w złożonych postaciach tej wady.

Wzrastanie i funkcja zastawki aortalnej i płucnej mają wielkie znaczenie w ocenie późnych wyników leczenia TGA. Z piśmiennictwa wiadomo, że obserwuje się narastanie niedomykalności zastawki neoorty w kolejnych latach.

Cel: Celem badania była ocena niedomykalności zastawki neoorty w długofalowej obserwacji i poszukiwanie czynników predysponujących do jej narastania.

Materiał i metody: Badaniom poddano 180 pacjentów, bez wstępnej selekcji, którzy w latach 1992–2000 byli leczeni operacyjnie metodą korekcji anatomicznej TGA. Podzielono ich na 4 grupy: I – 112 dzieci z prostym przełożeniem wielkich pni naczyniowych (TGA), II – 46 pacjentów z przełożeniem i ubytkiem międzykomorowym (TGA+VSD), III – 11 dzieci z towarzyszącymi anomaliami łuku aorty (TGA+AAA), IV – 11 pacjentów po operacji dwuetapowej (*banding* tętnicy płucnej poprzedzający *switch*).

Pacjenci byli badani echokardiograficznie co najmniej dwukrotnie od operacji (5, 7, 9, 11, 13 lat od operacji). Obecność i wielkość niedomykalności zastawki neoorty była oceniana za pomocą kolorowego dopplera i klasyfikowana według czterostopniowej skali jako: 0/4 – nieobecna, 1/4 – śladowa, 2/4 – łagodna, 3/4 – umiarkowana, 4/4 – ciężka. Umiarkowana i ciężka niedomykalność była potwierdzana obecnością fali wstecznego przepływu w aorcie zstępującej. Analiza statystyczna była przeprowadzona przy użyciu programu Statistica 6.0. Wartość $p < 0,05$ uznano za statystycznie znamienne.

Wyniki: W badanej grupie po 5 latach od operacji 46 pacjentów (26%) miało śladową niedomykalność aortalną, 12 (7%) – umiarkowaną. Grupę pacjentów bez niedomykalności po 5 latach tworzyło 67% pacjentów, a po 13 latach – 38% ($r^2=0,77$; $p < 0,05$), grupę I – po 5 latach 72%, po 13 latach – 40% ($r^2=0,7$; $p < 0,05$). Niedomykalność neoorty narastała w kolejnych latach i po 5, 7, 9, 11, 13 latach wynosiła odpowiednio: w grupie I: 1/4 – 23%, 41%, 51%, 46%, 50%; 2/4 – 5%, 8%, 3%, 8%, 10%; w grupie II: 1/4 – 24%, 14%, 0%, 8%; 2/4 – 6%, 14%, 17%; w grupie III: 1/4 – 27%, 50%, 50%, 50%; 2/4 – 9%, 25%, 25%, 50%; w grupie IV: 1/4 – 55%, 70%; 2/4 – 18%. Tylko u jednego pacjenta z grupy IV, 7 lat po operacji, stwierdzono umiarkowaną niedomykalność, a po 11 latach – ciężką, przez co został on poddany operacji wymiany zastawki, zakończonej dobrym efektem. Z grupy pacjentów operowanych później niż w 2. miesiącu życia u 29% (6 z 21) wystąpiła niedomykalność neoorty co najmniej łagodna (2/4) w porównaniu z grupą chorych operowanych wcześniej niż w 2. miesiącu życia, w której wystąpiła u 9 ze 159 osób (6%). Wśród tych 15 pacjentów: 9 było z grupy IV, 4 z grupy II, 1 z III i 1 z I. Obecność ubytku międzykomorowego w naszej grupie nie okazała się czynnikiem predysponującym do narastania niedomykalności neoorty.

Wnioski: Niedomykalność zastawki neoorty narasta w kolejnych latach od korekcji anatomicznej przełożenia wielkich pni tętniczych. Czynnikiem ryzyka są: operacja dwuetapowa z wcześniejszym *bandingiem* tętnicy płucnej i późniejszy wiek korekcji (powyżej 2. miesiąca życia).

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Biodegradable rings in valve reconstruction

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Aim: Preliminary results of biodegradable ring application during reconstruction of AV valves are reported.

Material: In the period from 2005-06-01 to 2006-12-21, 18 children were operated on for severe insufficiency of AV valves: Ebstein's anomaly – 6p. TI -7p, MI -5p. Median age was 13.6 years (1.3-18.5 years).

Methods: Type of procedure depended on specific CHD including valve reconstruction using biodegradable ring. All patients were followed up by TTE at discharge and 1.6 and 12 months after the procedure.

Results: No early or late deaths were observed. ECC time was 93 min (37-230 min), aortic cross-clamp time was 49

min (0-120 min). Implanted ring diameters were from 18 to 34 mm. Follow-up time was 190 days (7-367 days). Tricuspid insufficiency fraction dropped ($p < 0.05$) from 39.2% (15.6-93%) to 11.1% (0-28.8%) at discharge and was respectively 14% (3-40.6%), 16.5% (7.5-29%) and 11.7% (5.8-22%) at 1.6 and 12 months after the operation. Mitral insufficiency fraction decreased ($p < 0.05$) from 67% (37.2-80%) to 9.5% (4.9-50%) at discharge and was respectively 8% (4.9-15%) and 13.7% (10.4-17%) at 1 and 6 months after the operation. No pressure gradient across corrected valve exceeded 10 mm Hg throughout the entire follow-up.

Conclusions: The implantation of biodegradable rings is safe. It enables easy reinforcement of the native annulus. Ring implantation decreases operation time. Early and short-term results are good in the context of corrected congenital heart defect spectrum.

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Surgical revascularization for acute myocardial infarction – own experience

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We present the clinical outcomes of coronary artery bypass grafting (CABG) for acute myocardial infarction in the Department of Cardiac Surgery, Medical University in Lublin. 73 patients (fifty-eight male and fifteen female) underwent CABG because of the recent onset of acute myocardial infarction in the period from February 2003 to August 2006. The mean age of these patients was 61.2 years for the whole group. Acute myocardial infarction was diagnosed by conventional electrocardiographic and enzyme criteria, and confirmed by coronary angiography that revealed occluded vessel(s) with a regional wall-motion abnormality on the left ventriculogram. Twenty patients (27.4%) had at least one myocardial infarct in the past, thirteen (17.8%) suffered from diabetes mellitus, twenty-two patients (30.1%) from hypertension, eight (10.95%) from chronic renal failure. Mean ejection fraction was 49.6% with range from 28 to 70%. The patients presented various clinical states: twelve patients (16.4%) were in cardiogenic shock, and twenty-four patients (32.8%) required preoperative intraaortic balloon pump (IABP) for stabilization. There were three patients (4.1%) with postinfarction ventricular septum perforation (VSD). The mean number of sclerotic changed coronary arteries was 3.32 with range from one to five. Twenty-seven patients (36.9%) were operated on within the first 7 days of the AMI, twenty patients (27.3%) in

the second week, eleven more (15%) in the third week, and fifteen (20.5%) between the twenty-third and thirty-second day after AMI. Seventy-one operations (97.3%) were performed with cardiopulmonary bypass. Two operations (2.7%) were performed by OPCAB. The mean number of grafts per patients was 2.97 (range 1-5), and the left internal thoracic artery (LITA) was used in 78.9% of operations. Operative mortality was 15.1%. Mean discharge from ward was 8.5 days with range from 6 to 14.

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Influence of the size of the left atrium on efficiency of RF ablation in patients with permanent AF undergoing concomitant mitral valve replacement

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Aim: Patients with mitral valve disease and suffering from atrial fibrillation (AF) always have enlargement of the left atrium (LA). We estimated the influence of LA size on ablation results after one year.

Material and methods: Fifty patients with mitral valve disease and permanent AF aged 61.9 ± 7.4 years (ranging from 50 to 76 years) underwent mitral valve replacement and left-sided radiofrequency ablation (RF). The left atrial diameter was measured in long axis parasternal view. The patients were divided into three groups according to the size of LA: group A, pts with mild dilated LA (4-5 cm); group B, pts with moderate dilated LA ($5 < LA \leq 6$ cm); group C, pts with gross dilated LA (> 6 cm).

Conclusions: 1. The average size of LA does not affect the efficiency of RF ablation. 2. The gross enlargement of LA is connected more frequently with ineffective ablation (but it is not statistically significant).

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Results of selective thrombolysis and continuous selective infusion of prostoglandin E1 in pulmonary embolism

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Pulmonary embolism (PE) is an emergency and a real threat to many lives. In spite of steady progress over the years in prevention, diagnostics and treatment, PE currently has third place as a cause of mortality after ischaemic heart disease and strokes. At the present time there is no consensus about method of choice for PE and discussion over the problem continues. There are reports on successful surgery; priority of either selective or systemic thrombolysis is yet to be proven. Postembolic pulmonary hypertension casts a shadow over seemingly successful treatment. Results of combined treatment of PE with selective thrombolysis and continuous infusion of prostaglandin E1 are presented in the research work. Along with standard methods, clinical investigation included pulmonary angiography, chest ECHO with Doppler and invasive monitoring of pulmonary artery pressure. Pulmonary angiography was carried out on admission and in proven PE an angiographic catheter was left in the pulmonary artery for infusion of thrombolytic agent and continuous infusion of prostaglandin E1. Control pulmonary angiography was carried out on the 2nd day of the treatment. According to the angiography data, 30.26% of the patients suffered from massive PE, 63.16% from submassive PE and 6.58% had embolism of small branches of the pulmonary artery. By a method of treatment all the patients were assigned into 2 groups. In group 1 (57.8% of patients) selective thrombolysis was carried out, while in group 2 (42.2%) it was combined with continuous infusion of prostaglandin E1. Combined treatment in group 2 showed better results: frequency of repeated thrombolysis was lower and normalization of pulmonary artery pressure was more complete (27.1±6.33 mm Hg after treatment in group 2 compared with 36.68±8.96 mm Hg after treatment in group 1). Clinical outcomes in group 1 were estimated as good in 21.73% of cases, satisfactory in 60.87% and poor in 17.39%, compared with 59.26% good, 40.74% satisfactory and no poor outcomes in group 2. It has been concluded that selective thrombolysis combined with selective continuous infusion of prostaglandin E1 is an effective and safe method of treatment of PE which can prevent development of postembolic pulmonary hypertension.

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Chirurgia wad zastawkowych w Krakowie – 28 lat doświadczeń

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Chirurgia wad zastawkowych wciąż plasuje się na drugim – po CABG – miejscu wśród przeprowadzanych operacji. W ostatnich latach w Polsce wykonuje się rocznie ok. 22 tys. operacji w CEC, w tym 3300–3400 operacji zastawek oraz ok. 1600 operacji skojarzonych z CABG. W Klinice Chirurgii Serca, Naczyń i Transplantologii IK CM UJ od 1979 r. do 2006 r. przeprowadzono 30 000 operacji w krążeniu pozaustrojowym, w tym 11 083 operacje zastawek serca (37%), a wśród nich 4830 zastawki mitralnej (M), 4899 zastawki aortalnej (A) i 1330 wielozastawkowych (MA). Odsetek operacji M obniżył się z 60–70% w latach 80. XX w. do ok. 30% w ostatnich latach.

Korekcji zastawki trójdzielnej wymagało 477 osób. Wykonano 1103 operacje skojarzone. Wiek chorych wynosił 6–87 lat, przy czym średni wzrósł z ok. 40 lat w 1980 r. do 71 lat obecnie. Proporcje płci były zbliżone. Najczęściej stosowano zastawki mechaniczne. Dużej grupie – 660 chorych – wszczepiono allogenne zastawki A. Ostatnio stosowane są bioprotezy nowej generacji; po raz pierwszy na świecie wszczepiono bioprotezę zastawki A bez użycia szwów. Operacja naprawcza zastawki M była możliwa u 10–15% chorych, lecz w 40% w grupie operacji skojarzonych, co wiąże się z dominującą niedokrwienną etiologią. Częstość zaburzeń rytmu (FA, VE) zmniejszyła się z 62% do 40%, podczas gdy częstość przedoperacyjnych powikłań zakrzepowo-zatorowych zmalała z 14% do 2–3%. Śmiertelność okołoperacyjna zmniejszyła się nawet dwukrotnie i wynosi po operacjach zastawki M 4,3–7%, A 4–5,6%, MA 8,4–10% i po operacjach skojarzonych 4,6–12,3%. Zespół małego rzutu serca obserwuje się w 25–30% przypadków. Częstość IZW utrzymuje się na względnie stałym poziomie (8%). Śmiertelność w tej grupie w przypadku lokalizacji na własnej zastawce jest zbliżona do ogólnej, natomiast w zakażeniach protezy wynosi ok. 16%.

Podczas 28 lat obserwacji ujawnił się szereg tendencji, wśród których należy wymienić: utrzymującą się liczbę operacji (odwrotnie niż w innych ośrodkach), zmianę proporcji ilości operacji zastawki M/A – zdecydowanie na korzyść tej ostatniej (dwukrotnie), wcześniejsze kierowanie chorych na operację, istotne „starzenie się” populacji. Obecnie ponad 1/3 operowanych liczy ponad 70 lat, a więcej niż 5% ponad 80 lat. Wiąże się z tym szereg problemów charakterystycznych dla starszego wieku i towarzyszących mu schorzeń, zwiększone ryzyko, konieczność przeprowadzania dodatkowych operacji (np. tętnic szyjnych, aorty brzusznej, kończyn) jednocześnie lub wieloetapowo, a także szczególne wymogi prowadzenia i rehabilitacji.

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Wykorzystanie terapii VAC System w leczeniu zapalenia śródpiersia i ropowicy skóry u pacjenta po operacji tętniaka aorty wstępującej

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Wstęp: Zakażenia rany i/lub śródpiersia występujące po zabiegach kardiochirurgicznych są bardzo istotnym problemem terapeutycznym, wpływającym niekorzystnie na wyniki oraz na koszty leczenia. Według różnych źródeł występują u 1–5% operowanych, zwłaszcza u pacjentów z cukrzycą, otyłością, starszych, z dodatnimi posiewami z nosogardzieli, z defektami odporności itp. Leczenie tych stanów opiera się na celowanej antybiotykoterapii dożylniej, opracowaniu chirurgicznym rany, stosowaniu środków bakteriobójczych miejscowo oraz w przypadku zapalenia śródpiersia – drenażu płuczącego.

Cel: W niniejszej pracy pragniemy przedstawić wynik zastosowania systemu do drenażu płuczącego VAC firmy ATS u chorego z zapaleniem śródpiersia i masywną ropowicą skóry klatki piersiowej.

Materiał i metody: Pacjent M.B., lat 53, był operowany w Klinice Chirurgii Serca, Naczyń i Transplantologii CM UJ z powodu tętniaka aorty wstępującej. W wywiadzie 10 miesięcy przed operacją wystąpił zastrzał i ropowica kończyny górnej lewej ze wstrząsem septycznym. Śródoperacyjnie stwierdzono masywne zrosty worka osierdziowego, które mogły świadczyć o toczeniu się procesu zapalnego również w śródpiersiu. W okresie bezpośrednio po operacji doszło do zapalenia śródpiersia i rozejścia się brzegów mostka. W 7. dobie po operacji wykonano ponowne zeszcienie mostka oraz założono drenaż płuczący. W ciągu następnych 7 dni doszło, pomimo celowanej antybiotykoterapii, do bardzo szybko postępującej ropowicy skóry, poszerzającej się z szybkością kilku cm/dobę. Naskórek i w dużej mierze skóra właściwa klatki piersiowej na ok. 2/3 przedniej powierzchni klatki piersiowej uległa martwicy. U pacjenta stwierdzono ciężki wstrząs septyczny. Zdecydowano o zastosowaniu systemu VAC. Śródoperacyjnie stwierdzono ponowne rozejście się brzegów mostka oraz cechy ropnego zapalenia śródpiersia. Martwicze i zmienione ropowiczko tkanki usunięto. Nie zamykano klatki piersiowej, stosując jedynie pokrycie rany za pomocą opatrunków systemu VAC i płukanie roztworem antyseptycznym. Ze względu na otwartą klatkę piersiową i duże dolegliwości bólowe pacjenta (rozległa rana) wdrożono sedację i wentylację mechaniczną. Po trzykrotnych zmianach opatrunków systemu

VAC, w 14. dobie stosowania terapii, ze względu na znaczną poprawę miejscową zdecydowano o zeszcieniu mostka oraz stwierdzono zahamowanie poszerzania się strefy ropowicy skóry. W 26. dobie terapii stwierdzono ziarninowanie tkanek, potwierdzono jałowość powłok klatki piersiowej i wykonano przeszczep skóry. W trakcie terapii stosowano, zgodnie z posiewami z krwi oraz z rany, antybiotyki. W 63. dobie po operacji pacjent został wypisany w stanie ogólnym dobrym do domu.

Wnioski: Terapia systemem VAC jest skutecznym sposobem leczenia ciężkich zakażeń ran pooperacyjnych i/lub zapaleń śródpiersia ze wstrząsem septycznym po operacjach kardiochirurgicznych.

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Reoperations of severe progressive mitral valve insufficiency after surgical correction of atrioventricular septal defect

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Background: Surgical correction of atrioventricular septal defect (AVSD) is one of the commonest cardiac operations performed in the early months of life. Reconstruction of the atrio-ventricular valves is often the most difficult part of the operation and in most cases the cause of the need for reoperation.

Aim: The aim of the study was to determine the outcomes of reoperations of severe progressive mitral valve (MV) insufficiency in patients with Down's syndrome and patients chromosomally normal (non-DS).

Material and methods: Between 1991 and 2006 we operated on 265 infants with complete form of AVSD, aged from 1 to 11 months (mean 4). Down's syndrome (DS) was diagnosed in 193 patients (72.8%). Overall hospital mortality was 9.8%; it was lower in DS patients (9.3%) than in non-DS patients (11.1%), $p=0.006$. Among 239 patients of both groups, who survived, 12 patients (4.5%) needed reoperation for severe progressive MV insufficiency. We used Student's and χ^2 tests.

Results: Reoperations in group I (DS) were performed in 5 patients (2.8%), 1 to 33 months (mean 18.8 months) after the primary operation, and were due to cleft of the anterior leaflet (4 patients) or torn anterior leaflet (1 patient); moreover in one patient Alfieri plasty was performed. In group II (non-DS) reoperations were performed in 7 patients (10.9%) ($p=0.003$ distinction between two groups), 7 days

to 35 months (mean 7.4 months, $p=0.001$ distinction between two groups) after the primary operation. Reoperations in group II were related to cleft of the anterior leaflet (5 patients) or to clefts of the posterior leaflet (1 patient) or to dilatation of the mitral annulus (1 patient). In this group 1 patient died (mortality $1/12=8\%$). Four patients needed a second reoperation of MV, which was performed with implantation of a mechanical valve. One patient from group I (second reoperation 2 months after the first reoperation) survived and three patients from group II (operated 12 days, 2 months and 5 months after the first reoperation) – all three died. Finally, we performed 16 reoperations in 12 (DS and non-DS) patients with overall hospital mortality $4/12=33\%$ in these patients, which concerned only non-DS patients.

Conclusions: Reoperations of MV in non-DS patients with AVSD were performed much more frequently and earlier after primary correction, compared to DS patients with AVSD. The former have higher risk of complications after mechanical MV implantation.

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Zastosowanie krążenia pozaustrojowego w operacjach tętniaków aorty w ośrodku olsztyńskim – doświadczenia własne

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Operacje tętniaków aorty to jedne z najtrudniejszych operacji wykonywanych w kardiologii. Wymagają one ogromnej wiedzy, doświadczenia i współpracy zespołu operacyjnego.

W zależności od rodzaju tętniaka w trakcie krążenia stosujemy umiarkowaną lub głęboką hipotermię, aż do całkowitego zatrzymania perfuzji w temperaturze $17-18^{\circ}\text{C}$. Na sukces w tego typu operacjach wpływ ma nie tylko dobre techniczne wykonanie operacji, ale także odpowiednie, zgodne z procedurą prowadzenie pacjenta podczas krążenia pozaustrojowego. Do najważniejszych należy utrzymanie odpowiedniego rzutu, ciśnienia tętniczego krwi, hematokrytu, gradientu chłodzenia i podgrzewania, monitorowanie temperatury pacjenta i utrzymanie odpowiednich parametrów gazometrycznych. Przy zastosowaniu zatrzymania krążenia w głębokiej hipotermii niezbędna jest ochrona narządowa, szczególnie dotycząca mózgu. Obłożenie głowy lodem, zminimalizowanie, a następnie zatrzymanie krążenia, a także perfundowanie tętnic dogłowych z jednoczesnym cią-

głym pomiarem saturacji mózgowej wydaje się niezbędne i może mieć decydujący wpływ na sukces operacji.

Na Oddziale Kardiologicznym Wojewódzkiego Szpitala Specjalistycznego w Olsztynie wykonano od początku jego działalności 25 operacji tętniaków aorty, w tym 10 operacji z zatrzymaniem krążenia. U 3 pacjentów dodatkowo ze względu na długość zabiegu zastosowano krążenie dogłowe.

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Wrapping operation in surgery of ascending aorta aneurysm

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Background: Operations for ascending aorta aneurysm (AAA) correction are complex, difficult and risky; not in all cases do they bring success.

Aim: To determine correction possibilities of AAA by using wrapping procedure of aorta with nylon tape.

Material and methods: During 1999-2006, 115 patients (pts) with aortic valve diseases (AVD) and AAA were operated on at the Institute. Patients' age was 51.2 ± 8.2 (21-67) yrs. 39 (33.9%) pts were in NYHA class III and 76 (66.1%) pts in class IV. There were the following lesions of the aortic valve: aortic stenosis ($n=85 - 73.9\%$), aortic incompetence ($n=20 - 16.5\%$), combined AVD ($n=10 - 9.6\%$). There were no pts with Marfan syndrome, cystomedionecrosis among aetiological causes of the pathology. The following operations were performed: (1) aortic valve replacement (AVR) + wrapping of AA with nylon tape (special technique) – 84 (63.5%) pts (group A); (2) AVR + resection of AA + wrapping of AA 16 (18.8%) pts (group B); (3) AVR + resection of AA + plasty of sinotubular junction (STJ) in the zone of noncoronary cusp + wrapping of AA 12 (14.1%) pts (group C); (4) AVR + plasty of STJ + wrapping of AA 3 (3.5%) pts (group D). In all cases after AVR nylon tape (width 1 cm) was used for wrapping of AA by 5-7 tours with fixation between them and in the proximal and distal parts of AA. Control group E: 27 pts with AAA performed only AVR. All operations were performed with CPB, moderate hypothermia ($28-32^{\circ}\text{C}$), retrograde St. Thomas crystalloid cardioplegia.

Results: There were no hospital deaths and none during the remote period (average 3.4 ± 0.7 yrs). No specific complications were observed during hospital and remote periods. Echo examination of AA diameter for group A: preoperative – 4.8 ± 0.6 cm, postoperative (6-7 day) – 4.3 ± 0.4 cm, remote period – 4.3 ± 0.3 cm; for group B: preoperative – 5.2 ± 0.4 cm, postoperative (6-7 day) – 4.1 ± 0.3 cm, remote period – 4.1 ± 0.3 cm; for group C: preoperative – 5.3 ± 0.6 cm, po-

stoperative (6-7 day) – 4.0 ± 0.4 cm, remote period – 4.0 ± 0.3 cm; for group D: preoperative – 5.2 ± 0.6 cm, postoperative (6-7 day) – 4.0 ± 0.3 cm, remote period – 4.1 ± 0.2 cm; for group E: preoperative – 5.7 ± 0.4 cm, postoperative (6-7 day) – 5.6 ± 0.4 cm, remote period – 6.0 ± 0.2 cm ($p<0.05$).

Conclusions: We recommend the safe and effective method of AA wrapping + complex reconstruction of AAA during AVR without prostheses of AA in pts without Marfan syndrome and cystomedionecrosis as aetiological causes. Wrapping of AA during AVR is a quite necessary procedure in pts with diameter of AA 5.0 cm and more.

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Aorto-saphenous vein-coronary vein bypass graft: a new gate in coronary bypass surgery

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A 52-year-old male patient presented to our clinic with dyspnoea and chest pain. On echocardiography ejection fraction was 45% with global hypokinetic movement. On coronary angiography there was 80% stenosis in both the left anterior descending and circumflex artery with 95% stenosis in the right coronary artery. The right coronary artery seemed very delicate and unypassable. On postoperative follow-up the patient developed recurrent ventricular fibrillation which demanded an emergency operation for revision of the coronary bypass. The right side of the heart was akinetic and we failed in weaning from the cardiopulmonary bypass machine. The right coronary artery was delicate and unypassable so we decided to perform an aorta to right coronary vein bypass with ligation of vein proximal to ligation site which created the chance of retrograde feeding of the right system without creation of an arteriovenous fistula. After that we succeeded in weaning with minimal inotropic support. Postoperative agitation ended with a tragedy of self extubation. We lost the patient without confirming our operation by angiography.

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Needle in the apex of the heart: an unusual iatrogenic complication

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A 72-year-old male patient presented to our clinic with the possibility of a needle forgotten in the apex of the heart. The patient had a history of coronary bypass graft and Bentall operation. One year ago at the postoperative follow-up there was no evidence of any needle or instrument left behind in the thoracic cage. One year later in the emergency room while the patient was being investigated for abdominal pain his lateral chest x-ray revealed a needle near the apex of the heart. The patient had no active complaint related to the left needle and on physical examination there were no significant findings. He was referred to our clinic for management and follow-up. The presence of the needle in the apex of the heart was confirmed by echocardiography and thorax CT. Surgical operation to remove the needle was advised but the patient refused it. Forgetting tools or sponges are rare complications of open cardiac surgery and diagnosed perioperatively or at early postoperative period. We report a patient with a needle forgotten in the apex of the heart with late presentation and without active complaint.

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Stab wound of the heart and a review of the importance of rapid surgical intervention

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We present a case of a 25-year-old man with cardiac injury secondary to a stab wound. The cardiac injury occurred secondary to the direct passage of a sharp object through the anterior wall of the left ventricle. Bullet injury of the heart is a common phenomenon in war surgery that could easily be missed if attention is paid only to the more obvious injuries, taking into consideration that in civil cardiac injury stab wound injury of the heart is more common. Rapid action and immediate surgical intervention increase the chance of saving the life of patients with penetrating heart and great vessel injury. Aggressive management is currently recognized to lead to more optimal results than conservative management. Cardiothoracic injury causes 25% of deaths immediately following trauma, and the majority of these fatalities involve either cardiac or great vessel injury. In our case rapid action gave us the chance to save the life of the patient.

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Emergency conversions to on-pump during beating heart myocardium revascularization

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Background: Nowadays, off-pump coronary artery bypass grafting (OPCAB) is a widespread method of ischemic heart disease (IHD) surgical treatment all around the world, providing stable results, low mortality rate and few complications. However, in some cases, there is a necessity to convert off-pump to on-pump. Such conversions are often connected with different perioperative complications, which do not enable the operation to be performed on a beating heart. Thus complications and mortality frequency in this group of patients are higher than in cases of beating heart elective operations.

Aim: To assess the results of isolated OPCAB for IHD patients in emergency conversion to on-pump, to reveal on-pump conversion criteria, and to distinguish perioperative risk factors.

Material and methods: From 2001 to 2006, 3344 isolated OPCAB with 1% mortality were performed in the National M. Amosov Institute of Cardiovascular Surgery of the Academy of Medical Sciences of Ukraine. In 83 (2.4%) cases, emergency conversion to on-pump was a necessity. We determined 2 groups of patients: 1st (n=22) – emergency conversions in emergency operations patients; 2nd (n=61) – emergency conversions in elective operations. There were no significant differences between groups. In the group of emergency OPCAB conversions to on-pump were more frequent (6.7% vs. 2.1% in the group of elective OPCAB, $p < 0.01$). Mortality of 83 investigated patients (general conversion group) was 16.8%; in the 1st group (emergency OPCAB) mortality was higher than in the 2nd (elective OPCAB) – 40.1% vs. 8.2%.

Results: The main reasons for conversion were poorly treated haemodynamic disorders with mean arterial pressure decrease lower than 50 mm Hg, and persistent arrhythmias, which appeared at different stages of operation. In both groups conversion to on-pump was needed at both stages: before coronary artery bypass grafting (CABG) stage and during CABG stage (46% vs. 53.1%), but before CABG stage conversion to on-pump frequency in the 1st group was higher – 55.5%. It resulted from the destabilization of the 1st group patients' condition, on account of which emergency operations were made. The high frequency of conversion to on-pump in the 2nd group during CABG stage (55.7%) can be explained by the importance of the coronary artery in myocardium blood supply or lack

of collateral circulation. Analysis of conversion to on-pump frequency in accordance of which artery was shunted showed that in both groups, while arteries of posterior and postero-diaphragmal area were shunting, conversions to on-pump were significantly higher (1st group – 41.2%, 2nd group – 38.6%). In cases of conversion to on-pump before CABG stage mortality in both groups was higher (1st group – 22.7%, 2nd group – 6.5% vs. 1st group – 13.6%, 2nd group – 3.2% during CABG stage). This can be explained by the fact that operations were made against the background of unstable angina, starting myocardial infarction (MI) and cardiogenic shock. The main cause of death in both groups was perioperative MI (42.8%). 3 patients died because of intracardiac arrhythmias in the postoperative period, 1 of respiratory failure and 1 of stroke. Cardiac insufficiency (CI) III occurred in 54.5% in the 1st group of patients and 34.4% in the 2nd. Intraaortic balloon counterpulsation (IABC) was used for coronary circulation support in 22 patients (26.5%). Thus in 15 patients we applied IABC during the operation, in 7 patients after the operation. Intraoperative use of IABC appeared to be more efficient and enabled us to decrease heart insufficiency development frequency and mortality. Preoperational indices analysis has not revealed sufficient predictors of conversion to on-pump surgery.

Conclusions: Emergency conversions to on-pump were frequently needed for patients with destabilization of condition (unstable angina, MI, cardiogenic shock). These patients had emergency operations and were accompanied by frequent heart failure III and high mortality. Necessity of conversion to on-pump criteria should be considered incurable decrease of mean arterial pressure lower than 50 mm Hg, and persistent arrhythmias, which result in haemodynamic disorders. Artery lesions of posterior and posterior diaphragmal heart area are the most haemodynamically important in prognosis for conversion to on-pump circumstances rise. High mortality in the group of patients with the need of conversion to on-pump in the majority of cases is caused by grave initial status (MI with evident haemodynamic disorders).

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Does off-pump technique decrease mortality after coronary artery bypass surgery and change influence of traditional risk factors?

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Background: Beating-heart surgery is becoming a common method of treatment of ischaemic heart disease. However, the effectiveness of this method has not been completely studied.

Aim: The goal of this study was to determine the influence of off-pump technique on changes of mortality and to determine the influence of different risk factors on the results of beating-heart CABG.

Material and methods: Between 01.01.1994 and 31.12.2006, 4184 CABG operations were performed. The analyzed material was divided in 2 groups. The first group included 683 operations performed during 1994-1999 on cardiopulmonary bypass (CPB). The second group included 3501 operations performed during 2000-2006. In the second group 3292 operations (94.1%) were performed on the beating heart without CPB. Both groups were comparable in relation to FC of stenocardia, number of placed grafts per patient, quantity of MI in history, preoperative LVEF; however, in the 2nd group there were significantly more aged persons, more women, more patients with grave concomitant diseases, with higher operative risk.

Results: There were 83 hospital deaths in the first group (12.1%) and 45 hospital deaths in the second group (1.3%). Mortality after off-pump operations was 0.7%. During 2000-2006 operative mortality for the whole group was 1.4% in women and 1.3% in men, while for beating-heart CABG mortality was 0.5% in women and 0.7% in men. In the presence of LVEF <40% mortality was 0.5% compared to 0.7% in cases of LVEF >40% in the beating heart group. In this group mortality was 0.5% in diabetic patients and 0.7% in patients without diabetes.

Conclusions: Off-pump technique allows one to achieve better results after CABG and decreases the influence of such risk factors as low LVEF, diabetes and female gender.

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Left ventricular aneurysm: a comparison of linear closure and endoventricular circular patch plasty

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Background: Acute myocardial infarction can result in the development of a dyskinetic or akinetic left ventricular aneurysm which may in turn cause congestive heart failure, ventricular arrhythmias, and the formation of mural thrombi.

Aim: The aim of our study was to compare clinical results of linear closure and of endoventricular circular patch plasty (EVCPP).

Material and methods: From a total of 679 patients operated on for postinfarction left ventricular aneurysms from 2000 to 2006, we reviewed retrospectively 150 patients. Eighty-two patients (66 males and 16 females) (Group A) were operated on with the conventional technique and 68 patients (63 males and 5 females) (Group B) with the endoventricular circular patch plasty technique. The two groups were matched with respect to age, comorbid risk factors, functional class, urgency of the operation and concomitant procedures. Mean age was 59±7. All patients presented with symptoms of heart failure and angina. The preoperative NYHA functional class was: I in 35 patients, II in 16 patients, III in 77 patients, and IV in 22 patients. The preoperative ejection fraction was 39±6.5% in Group A and 34±7.9% in Group B.

Results: Mean graft number was 2.4±0.4. In 59 (39.3%) patients mural thrombi were identified and surgically removed. The mean length of hospitalization was 7.4±2.9 days in Group A and 8.4±3.2 days in Group B. Hospital mortality in Group A was 4.9% and 2.9% in Group B. Improvements were observed in NYHA classes, left ventricular ejection fraction and end-diastolic and end-systolic volumes in both groups.

Conclusions: Ventricular function in patients with left ventricular aneurysm improved after both techniques. But we suggest that linear closure should be limited to small ventricular aneurysms and that large ventricular aneurysms extending into the septum should be treated by patch plasty.

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Acute pulmonary embolism – surgical treatment – our experience

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Background: In about 10% of patients with massive acute pulmonary embolism urgent surgical intervention is necessary. In this group of patients prompt diagnosis and surgical treatment is connected with acceptable mortality.

Aim: The aim of the study was to assess the results of surgical treatment of this group of patients operated on in our clinic.

Material and methods: We reviewed our experience with early open pulmonary embolectomy in patients with acute massive pulmonary embolism. Retrospective review of charts of 20 (15M, 5W) pts undergoing pulmonary embolectomy from January 2001 to 2007 was performed. Patients' age ranged from 22 to 71 (mean 52). In all pts the

diagnosis was confirmed by CT. Half of the patients were operated on in cardiogenic shock. Mean time from onset of symptoms to the operation was 2 days (12 hours – 5 days). Main symptoms were: dyspnoea (20 pts), syncope (4 pts), cardiac arrest (1 pt), haemoptysis (1 pt). History for lower leg thrombophlebitis was positive in 8 pts. Patients underwent open pulmonary embolectomy using cardiopulmonary bypass (CPB) in general hypothermia, using crystalloid or blood cardioplegia. Mean aortic cross clamp time was 35 minutes (14-73 min.). Mean CPB time was 72 (22-145 min.).

Results: Early postoperative period was complicated in 6 patients (30%) by low cardiac output syndrome and 3 (15%) patients died (1M and 2W). The mean stay in the intensive care unit was 84 hours; mean time of respirator therapy was 34 hours. There was no major bleeding requiring reoperation.

Conclusions: Early open pulmonary embolectomy using cardiopulmonary bypass is an acceptable form of treatment for acute massive pulmonary embolism. Spiral computerized tomography is an important diagnostic tool for diagnosis and warrants prompt implementation of surgical treatment.

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Operacje sposobem Bentalla-De Bono w materiale własnym

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Pomimo rozwoju kardiologii operacje tętniaków aorty wstępującej współistniejące z wadą zastawki aortalnej stanowią nadal duży problem operacyjny. Opisana w 1968 r. przez Bentalla i De Bono technika operacyjna wszczepienia protezy aorty wstępującej wraz ze sztuczną zastawką aortalną i przeszczepieniem ujść tętnic wieńcowych bok do boku uległa wielu modyfikacjom. W pracy pragniemy przedstawić własny materiał – chorych operowanych planowo i w trybie nagłym z powodu nierozwarstwionych i rozwarstwionych tętniaków ze współistniejącą wadą aortalną.

W latach 2003–2005 wykonano u 212 chorych operacje zmodyfikowanym sposobem Bentalla-De Bono. Operowano 175 mężczyzn i 37 kobiet. W 62 przypadkach (29,24%) tętniaki aorty były rozwarstwione, w tym 37 – I wg DeBakeya, a 25 – II. Operacje nagłe wykonano u 47 chorych (22,2%). U 15 chorych (7%) były to reoperacje. Zabiegi wykonywano w krążeniu pozaustrojowym, hipotermii ogólnej i kardioplegii krystalicznej, a w niektórych przypadkach krwistej.

Podczas operacji tętniaków rozwarstwionych stosowano hipotermię głęboką z zatrzymaniem krążenia pozaustrojowego od 26 do 88 minut. Chorym wszczepiano protezy aorty wstępującej wraz z wmontowaną sztuczną zastawką aortalną firmy St. Jude Medical w 210 przypadkach, a w 2 – Medtronic-Hall, wycinając tętniak i przeszczepiając ujścia tętnic wieńcowych do boku protezy. Procedury dodatkowe wykonywane u tych pacjentów to: pomosty wieńcowe u 34, wszczepienie sztucznej zastawki mitralnej u 2, płastyka mitralna u 2, zamknięcie DSA u 3, alloplastyka łuku aorty u 4 chorych. Powikłania pooperacyjne wynikały z ciężkości stanu pacjentów przed operacją, wstrząsu, tamponady, rozwarstwienia aorty. U 68 chorych stwierdzono zespół małego rzutu serca i to też, oprócz krwotoków, było główną przyczyną zgonów. Retorakotomię wykonano u 26 chorych (12,26%). Kontrpulsację wewnątrzortalną zastosowano u 5 pacjentów, a u 4 wszczepiono rozrusznik serca po zabiegu. Udary mózgu wystąpiły u 5 chorych. Wystąpiło 29 wczesnych zgonów (13,7%), w tym 19 chorych zmarło w przypadkach dramatycznych rozwarstwień i rozdarć aorty z tamponadą i wstrząsem. Wśród zmarłych pacjentów był 1 chory reoperowany po alloplastyce aorty wstępującej. W grupie 62 chorych z rozwarstwieniem aorty stwierdzono 19 zgonów (30,6%), natomiast w grupie bez rozwarstwienia wśród 150 chorych wystąpiło 10 zgonów (6,7%). Z naszych obserwacji wynika, że planowe operacje sposobem Bentalla-De Bono są obarczone znacznie mniejszym ryzykiem powikłań i zgonów niż operacje nagłe u chorych z rozwarstwieniem aorty. Szybsza diagnostyka tętniaków aorty i leczenie operacyjne na pewno zmniejszyłyby śmiertelność w tej grupie chorych.

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Surgery of ischaemic mitral regurgitation: different strategy – different result?

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Background: Surgical intervention is playing an increasingly important therapeutic role in management of patients with moderate or severe ischaemic mitral regurgitation. Ischaemia and dilated cardiomyopathy are important for long-term prognosis. Their mitral regurgitation (MR) is a result of left ventricular (LV) geometrical distortion. Different types of surgical techniques to mitral valve repair have been advocated, although clear superiority of either method has not been established.

Aim: The aim of our study was a review of results of various types of mitral valve repair, survival rate and dynamics in the functional condition of patients after surgical treatment of ischaemic mitral insufficiency in addition to CABG.

Material and methods: Using a retrospectively maintained database, patients undergoing mitral valve reconstruction (MVR) with different types of ring, semiring, band and subvalvular procedure were identified on the basis of preoperative MR 2 gr and more and no primary mitral pathology. Combined coronary artery bypass and mitral valve surgery for ischaemic mitral incompetence was performed on 466 consecutive patients between January 2001 and December 2006. The outcome in 209 of these patients (23 females, 186 males) who underwent mitral valve surgery was reviewed.

Results: Average patient age was 56.1 ± 7.8 years. All patients received the maximal medicamentous therapy, and were class III-IV on NYHA. Average left ventricular ejection fraction (LVEF) was $42.4 \pm 12.2\%$. Posterior xenopericardial annuloplasty was used in 95 pts (45%), an original open-ended rigid ring in 77 pts (35%), and in 9 pts a flexible xenopericardial closed ring was used. There were no differences between groups, in terms of age, ring size used, preoperative EF, LV size, MR grade, or New York Heart Association class. Mitral valve replacement was performed in 9 pts as primary or in cases of repair failure. The average number of distal anastomoses was 2.95 ± 1.03 (range: 1-6) and aortic cross-clamp time was 111 ± 35 min (range: 58-188 min). Requirement for IABP either before or during surgery affected 30 pts. The average risk of operation on EUROSCORE was 5.5 ± 2.84 (range 2-15). Operative mortality rate (<30 days or in-hospital) was 11.2%. On discharge, 81.2% of patients were in NYHA class I or II. Most patients on discharge show significant reduction of MR.

Mild mitral regurgitation on discharge occurred in 23 pts and moderate in 11 pts and was not related to the type of undersized annuloplasty. Predictive risk factors were preop severe mitral regurgitation ($p < 0.05$), poor LVEF ($p < 0.05$). 1-year follow-up was complete in 95% of cases. Recurrence of mitral insufficiency was predictive of deterioration of NYHA class ($p < 0.05$) and poor outcome ($p < 0.01$). The survival rate (including operative deaths) at 12 months was $85.3 \pm 13.1\%$, and event-free survival rate (no mortality, reoperation or angina) $74.2 \pm 6.2\%$.

Conclusions: The use of a nonflexible ring seems to significantly reduce the need for repeat surgical procedures. The type of undersized annuloplasty used did not influence outcome. More liberal use of mitral valve replacement in patients with severe dilated LV is advocated. The risk of recurrence of MR on follow-up was related to severe preoperative mitral regurgitation, poor LVEF, and was predictive of poor outcome. Further refinement and development of nonflexible ring systems and subvalvular procedure, aimed at LV restoration, deserve ongoing investigation.

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Coronary surgery in octogenarians

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Aim: The process of ageing of societies results in a constant increase of the average age of patients operated on. The ninth decade of life has become the threshold which brings about many debates. In Poland, this special group of heart surgery patients, though still limited, is continually increasing. The purpose of the article is to answer the question whether our queries concerning operative risk with those patients are justified.

Methodology and results: In 2006 there were 2391 heart surgeries performed at the Department of Cardiovascular Surgery and Transplantology, Collegium Medicum, Jagiellonian University in Cracow. This number comprised 45 patients at the age of ≥ 80 years. From the above group there were 40 patients selected with whom CABG surgery was performed. The control group comprised 120 patients operated on due to coronary disease in a comparable period of time. The following parameters were subject to comparative analysis: urgency of the surgery, intensification of lesions in coronary arteries, EUROscore index, comorbidities, artificial ventilation period, and the length of stay at the intensive care unit and at hospital, number of blood product transfusions, morbidity and early mortality. The mean age of patients in the examined group was 81.5 years (80-89), in the control group 69.7 years (50-79). In the study group there were more women (35% vs. 24%), the patients more frequently required urgent surgery (45% vs. 7.5%), and more advanced lesions in coronary arteries were observed: left main coronary stenosis 46.6% vs. 22.5% and higher EUROscore index 8.3 (SD 2.6) vs. 4.6 (SD 1.7). The mean number of coronary artery bypasses per patient was comparable between groups and amounted, respectively, to 2.6 in the examined group and 2.7 in the control group, whereas ITA was more rarely used in the study group (37.5% vs. 91.6%), which, among other things, was the result of the urgency of the surgery. In the examined group, blood products were used more frequently in the perioperative period: RBCC 2.8j vs. 1.8j/p and FFP 1.9j vs. 0.8j/p; longer periods of artificial ventilation were observed (20.7 hours vs. 11.9 hours), as well as longer duration of stay at ICU (3.75 days vs. 1.6 days) and at hospital (14.1 days vs. 8.9 days). Before the operation 25 patients (62.5%) were classified in class III or IV according to CCS. Angina was absent among 92% of those patients postoperatively. Early mortality in the examined group was 5%, in the control group 2.5%.

Conclusions: The risk of coronary surgery with patients after 80 years of life is increased. However, with regard to

the benefits of improved quality of life and the fact that for many of those patients it is a life-saving procedure, this risk proves to be acceptable.

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Gastrointestinal complications after cardiac operations with use of extracorporeal circulation

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Background: Gastrointestinal problems are an infrequent but serious consequence of cardiac that includes cardiopulmonary bypass. Predictors of the complications are not well developed, and the role of fundamental variables remains controversial. Between July 1998 and April 2007, 3533 patients underwent heart surgery with cardiopulmonary bypass. Among those 3533 patients 49 (1.4%) had gastrointestinal complications, mainly because of gastrointestinal bleeding due to gastritis, and nine of them required surgery. We present these nine patients who underwent surgical operations. The mortality in this group was 77.8% (seven of nine), and the course of death was multiorgan insufficiency.

Conclusions: Careful monitoring and physical examination of these high-risk patients following cardiac operations is required for early detection and effective treatment. Surgical treatment of patients with gastrointestinal complications involves high risk of death.

Aim: The aim of this study was to identify the location of the critical isthmuses of RAT and to evaluate the results of catheter ablations in these patients.

Material and methods: We looked at 32 consecutive (16 males, age 32±16 years) with RAT previously operated on for various CHD: atrial septal defect – 20; Ebstein's anomaly – 5; ventricular septal defect – 4; tetralogy of Fallot – 2; mitral insufficiency – 1. Activation mapping during RAT was performed to identify the location of the critical isthmus. Forty reentrant circuits were mapped in the right atrium, including peritricuspid (18/45%) and free wall (16/40%) circuits. Six patients (15%) had dual loop "figure 8" reentry circuit with one loop around the tricuspid annulus and another free wall atriotomy scar. In patients with scar related RAT radiofrequency (RF) energy was targeted to the narrowest segment of the circuit. In cases when tachycardia was terminated during the delivery of RF lesions extension of the lesion was performed until the achievement of complete conduction block. In patients with dual loop RAT RF energy was targeted initially to the cavotricuspid isthmus. When conduction block through the isthmus has been proved, ablation of the atriotomy scar related isthmus was attempted.

Results: Ablation in the group with only cavotricuspid isthmus related RAT was successfully performed in all cases. During follow-up (24±18 months) one patient had a recurrence. In the group with atriotomy scar related RAT overall success rate was 100%, but 3 (19%) patients underwent 2 ablation sessions. During follow-up (22±10 months) there was one case of a recurrence. All dual loop RAT were successfully ablated (one required a second procedure) without recurrences in the follow-up.

Conclusions: In patients with RAT after surgery for various CHD, scar related circuits occurred as often as cavotricuspid isthmus related circuits. All types of these tachycardias are amenable to curative RF catheter ablations.

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Reentrant atrial tachycardias after surgical correction of congenital heart disease: characteristics and outcome of catheter ablation

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Background: The most common form of reentrant atrial tachycardias (RAT) is cavotricuspid isthmus dependent atrial flutter. This may not be true of patients undergoing surgery for congenital heart disease (CHD).

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Tactics and result of traumatic thoracic aorta aneurysms surgical treatment

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Background: Traumatic rupture of the aorta causes immediate death because of exsanguination. However, 10-20% of victims survive the moment of trauma with future aneurysm formation.

Aim: To elaborate optimal tactics and to study results of surgical treatment of traumatic aneurysms of the thoracic aorta.

Material and methods: 57 consecutive patients with traumatic aneurysms of the thoracic aorta treated in the National M.M. Amosov Institute of Cardiovascular Surgery of the Academy of Medical Sciences of Ukraine in 1983-2007 were studied. Diagnosis of traumatic aneurysms of the thoracic aorta was established on the basis of case report history general clinical studies, echocardiography and X-ray investigations. Explorative thoracotomies were performed in 20 (35.1%) patients in other hospitals. 8 (14.0%) patients refused operations for different reasons and all of them died during 5 years after the diagnosis of traumatic aneurysm of the aorta was established. Among 49 patients operated on there were 40 (81.6%) men and 9 (18.4%) women. Patients' age ranged 18-62 years, mean 36.8 years. Location of the aneurysms was the following: aortic isthmus – 44 cases, ascending aorta – 5 cases. 6 (12.2%) patients were operated on urgently in the period 3 days – 2 months after the trauma, which was stipulated by the danger of traumatic aneurysm rupture. Our tactics of the performance of an urgent operation: to perform operations on the background of restorations of vitally important functions of main organs and systems and after wound healing in order to exclude infective complications. The remaining 43 (87.8%) operations were elective and they were fulfilled in the period 2 months – 32 years after the trauma. In 5 cases of ascending aorta lesion one patient had aortorrhaphy performed through the median sternotomy and 4 other patients had supracoronary grafting of ascending aorta using a vascular graft in conditions of extracorporeal circulation (in 1 of them with deep hypothermia and retrograde cerebral perfusion). In 44 (89.8%) patients with aneurysms located in the aortic isthmus operations were performed through the IV-V intercostal space with separate bronchial intubation by a double lumen Carlens tube. In 39 patients aortic grafting was performed using an 18-26 mm diameter vascular prosthesis, in 3 patients aortorrhaphy was performed, and in 2 patch aortoplasty. For the circulatory support a passive tubular shunt between ascending and descending aorta was used. In 3 patients because of truncus brachiocephalicus involvement into the pathological process extracorporeal circulation was used (right atrial – femoral artery cannulation was performed in 2 cases, femoral vein – femoral artery in 1). Duration of the aortic cross-clamping in cases where a tubular shunt was used ranged 35-78 minutes, mean 55 minutes. One patient was operated on with short-term (18 min) aortic cross-clamping.

Results: Hospital mortality equalled 4.1% – one patient died because of gastrointestinal bleeding, the second because of erosive bleeding from the descending aorta. Remote results were studied in all patients discharged from the clinic in the period 1-20 years, mean 54 month. All of them were in I-II functional class NYHA. There were no aneurysm recurrences.

Conclusions: Diagnosis of traumatic aneurysms of the aorta is an indication for operation. Urgent operations are performed after full recovery of vitally important functions of all organs and systems. In traumatic aneurysms of the descending aorta the optimal method of treatment is aortic grafting using a temporary shunt between ascending and descending aorta.

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Dissecting aneurysms of the aorta type A: methods and results of surgical treatment

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Background: One of the most complex problems of contemporary cardiovascular surgery is the problem of surgical treatment of dissecting aortic aneurysms. Dissection occurs in 5-20 cases per 1 mln of population per year.

Aim: Choice and improvement of dissecting aneurysms surgical treatment.

Material and methods: 256 consecutive patients with dissecting aneurysms of the aorta were treated in the National M.M. Amosov Institute of Cardiovascular Surgery of the Academy of Medical Sciences of Ukraine during 1983-2007. According to De Bekey's classification there were 135 (52.7%) cases with type I dissection and 121 (47.3%) with type II. There were 212 (82.8%) men and 44 (17.2%) women. 219 (85.5%) patients were in functional class IV NYHA, and 37 (14.5%) in class III NYHA. 161 (62.9%) patients were in acute and in subacute stage of the dissection and 95 (37.1%) in chronic. Causes of the dissection: atherosclerosis and hypertension, Marfan syndrome, cystic medionecrosis, two-leaflet aortic valve, trauma, other causes. Operations were conducted in conditions of extracorporeal circulation and 26-30°C hypothermia. Corrections of arch lesions (81 patients) were performed in conditions of a deep hypothermia (18-13°C) and retrograde cerebral perfusion. During 1994-2001 in 25 patients hypothermia was in the range 16-18°C, perfusion index 750-500 ml/min/m², pressure in SVC 15-25 mm Hg. In 2002-2007 (56 cases) patients were cooled down to 13-14°C, perfusion index equalled 250-500 ml/min/m² and blood pressure in SVC was maintained higher than 10-12 mm Hg. The following methods of operative interventions were applied: supracoronary grafting was performed in 155 patients, Bentall-De Bono operation in our modification in 97, other operations in 4.

Results: Hospital mortality equalled 51 (19.9%) patients, including 40 (24.8%) in the group of acute dissection, and 11 (11.6%) in the group of chronic dissection, including hospital mortality 24.6% in surgical correction of aorta arch aneurysms. Remote results were studied in 193 (94.1%) patients discharged from the clinic in the period 6 months – 15 years (mean 61 months). Good remote results were found in 127 (65.8%) patients, satisfactory in 29 (15.0%), unsatisfactory in 15 (7.8%). 22 (11.4%) patients died in the remote term.

Conclusions: Operative treatment of the type A dissecting aortic aneurysms is the only possible method to preserve patients' life.

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Extracardiac venous and arterial vascular anomalies: The role of multidetector computed tomography (MDCT) in surgical planning

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Background: Congenital anomalies of the thoracic vascular system are an important cause of morbidity and mortality in infants and children. The diagnosis of vascular anomalies in CHD remains problematic, and the clinical presentation can be various. Accurate visualization of the vascular anatomy in CHD is important for both optimal management and prognostic evaluation. Multidetector row computed tomography (MDCT) is a non-invasive and rapid technique used for evaluation of paediatric vascular diseases as an alternative to conventional angiography.

Aim: Our aim was to show the usefulness of MDCT for treatment planning of various congenital thoracic vascular anomalies in paediatric patients.

Material and methods: 13 infants and children (from 1 day to 10 months) with suspected thoracic vascular anomalies underwent MDCT (Somatom Sensation 16). Very brief sedation was used. Nonionic iodinated contrast material (300 mg/ml) was injected at a rate varying from 1.0 ml/sec to 2.5 ml/sec. The scan delay was determined using bolus tracking in the ascending aorta with a 6-second delay after trigger. Scans extended from just above the level of the thoracic inlet to the level of the diaphragm. Technical parameters used for CT examinations were as follows: detector collimation, 1.5 mm; slice thickness, 2 or 3 mm; Increment, 1 or 2 mm; Feed / Rotation, 18 mm/sec; gantry rotation time, 0.5 sec; 80-120 kVp and 20-100 mAs (according to age and weight of the child).

Results: Contrast-enhanced MDCT accurately demonstrated total anomalous pulmonary venous connections in 5 patients (supracardiac drainage n=4 and infracardiac or "infradiaphragmatic" drainage n=1), partial anomalous pulmonary venous return in 2 patients, double aortic arch in 1 patient, interrupted aortic arch in 2 patients, major aortopulmonary collateral arteries (MAPCAs) in 3 patients. The course, origin, and pulmonary connections of the MAPCAs were well demonstrated, with clear delineation of the spatial relationship of the MAPCAs to both adjacent vascular and nonvascular structures. In all cases, MDCT confirmed the presence or absence of central pulmonary arteries. The findings on computed tomography scan were confirmed at the time of surgery.

Conclusions: MDCT as a non-invasive technique provided an excellent evaluation of the vessel anatomy and mediastinal structures; and it was superior to echocardiography for detection of aortopulmonary collaterals and vessel abnormalities. Three-dimensional images allow excellent display of vascular anomalies and assist surgeons in procedure planning.

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Surgical treatment of chronic thromboembolic pulmonary hypertension – alternative to transplantation of heart-lungs complex

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Aim: The purpose of surgical treatment of patients with chronic thromboembolic pulmonary hypertension is thrombendarterectomy and correction of tricuspid valve insufficiency as main case of patient's decompensation.

Material and methods: Between 10 February 2003 and 25 December 2006, 35 patients underwent surgery for chronic thromboembolic pulmonary hypertension which developed as a result of pulmonary embolism. The age ranged from 38 to 61 years. The follow-up period from the first episode of embolism until the moment of operation ranged from 1 to 7 years. The level of pulmonary hypertension at the moment of operation was 60-155 mm Hg (85 mm Hg) or 55-130% (84%) from the systemic level. 30 patients were in NYHA class IV and 5 patients were in class III. 22 patients had ejection fraction less than 50%. All 35 patients under-

went thrombendarterectomy using bypass and deep hypothermia and in 8 cases under conditions of total circulatory arrest. After thrombendarterectomy in 5 cases we needed to repair lobar branches of the pulmonary artery using a pericardial patch. For tricuspid valve repair in 6 cases we performed annuloplasty by De Vega, in 25 cases we used for annuloplasty Carpentier rings and in 4 cases we used the Clover technique described by Alfieri.

Results: After thrombendarterectomy the pressure in the pulmonary artery decreased from 85 ± 9 to 38 ± 6 . 23 patients had moderate tricuspid valve insufficiency (+), 4 patients had mild insufficiency (++), 5 patients died (14.2%) in the early postoperative period. All survivals improved their functional class dramatically.

Conclusions: Surgical treatment in almost all cases of chronic thromboembolic pulmonary hypertension is an effective method and can be an alternative to heart-lung transplantation. Thrombendarterectomy cannot restore the function of gas exchange of the affected pulmonary tissue; however, recanalization of the embolic pulmonary branches and their collaterals allows decrease of pressure in the unaffected pulmonary arteries and improves gas exchange as well as protecting them from sclerosing. Reducing resistance of the pulmonary arteries results in normalization of the pressure and reduction of the right ventricle decompensation. Tricuspid annuloplasty in this operation is the final stage, and in the case of residual pulmonary hypertension saves the patient from high central venous pressure, and thus from decompensation during the postoperative period. Quality of life of such patients dramatically improved.

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Batista procedure – an alternative to heart transplantation?

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Aim: The physiologic principles underlying the Batista procedure are sound, according to the law of Laplace, mural tension = intracavitary pressure x radius/2 x wall thickness. Applied to the ventricle, this suggests that reduction of ventricle radius will diminish left ventricle wall tension, thereby decreasing myocardial oxygen consumption and increasing cardiac mechanical efficiency.

Material and methods: A total of 37 patients with the diagnosis of idiopathic dilatation cardiomyopathy underwent the Batista procedure. 34 male (91.9%), 3 female (8.1%), ave-

rage age 39 ± 13 (range from 16 to 66), ejection fraction range from 19% to 29%, all patients were in III-IV class of NYHA. The EDV average was 307 ± 48 ml. All patients had mitral and tricuspid insufficiency ranging from +2 to +4; 8 (21.6%) patients had atrium fibrillation, 5 patients (13.5%) had preoperation inotropic support (4-8 microg/kg/min).

Results: There were no operative deaths. Two (5.4%) patients required relisting for transplantation. Survival at 6 months was 86.5% (32 patients), and at 12 months 73.0% (27 patients). There were two in-hospital deaths (5.4%), and both occurred in patients with ejection fraction less than 20%. After six months there were 3 deaths (8.1%). Of the late deaths 3 were likely due to ventricular arrhythmias, and 2 were due to progression of CHF.

Conclusions: Batista procedure has an important place in the surgeon's armamentarium in the treatment of end-stage heart failure. It bridges the patient for transplantation and in some cases disqualifies the patient for transplantation; in this way, it makes it possible for a sizeable number of patients to avoid transplantation, saving transplantation for patients who failed to benefit from the Batista procedure.

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Long-term results of prosthetic valve replacement (PVR). Haemorrhagic and thromboembolic complications in patients receiving oral anticoagulants

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Background: Prosthetic valve replacement (PVR) remains one of the canons of heart valve defect therapy. In order to decrease the risk of thromboembolic complications, in a group of patients with prosthetic heart valves, oral anticoagulation treatment is essential.

Aim: 1. An assessment of the long-term results of PVR. Factual decline of complaints' level. 2. An evaluation of major haemorrhagic and thromboembolic complications requiring hospitalization in patients after PVR receiving oral anticoagulants. 3. An assessment of INR values rate within therapeutic range.

Material and methods: The analysis involved 225 patients who successfully underwent PVR in 2000 and subsequently were followed up over a mean period of 43.3 ± 9.2 months. Aortic, mitral, and double valve replacement was performed in 128 (56.7%), 70 (31.1%), 27 (12.1%) patients, respectively. Men, numbering 128, comprised 57.3% of the

group. The mean age of patients was 57.9 ± 18.8 years. Data assessed were: recurrence of symptoms, the rate of haemorrhagic and thromboembolic complications requiring hospitalization, frequency of INR rate measurements, percentage of results sited within recommended therapeutic range.

Results: Among 225 patients, 190 (84.4%) remained asymptomatic, 13 (5.8%) had recurrence of complaints, and 22 (9.8%) died. The most common cause of death was haemorrhagic stroke (6 patients). In the group of surviving patients the complaints according to NYHA scale level declined from 2.6 ± 0.9 before the operation to 1.2 ± 0.5 after PVR, $p < 0.0005$. Nevertheless, 14 (6.9%) patients who survived were hospitalized due to either haemorrhagic or thromboembolic complications, mainly haemorrhagic stroke (6 patients) and gastrointestinal bleeding (6 patients). The mean frequency of INR measurement was 3.4 ± 5.9 weeks. Among the total number of measured INR values 42.4% were within the therapeutic range.

Conclusions: 1. Prosthetic valve replacement is a successful method of treatment for heart valve defects. 2. Patients after heart valve replacement taking oral anticoagulants are exposed to a risk of haemorrhagic complications. Hemorrhagic stroke and gastrointestinal bleeding were the most common complications requiring hospitalization during the follow-up period. 3. In spite of risk of haemorrhagic complications, patients have difficulty in maintaining INR values within the therapeutic range.

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Disturbances of graft patency after off-pump myocardial revascularization: frequency in early and in remote postoperative periods

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Background: Excellent immediate results of off-pump CABG caused these operations to become widespread. The study of their results based on extensive statistics is of great value for practical medicine.

Aim: To study the frequency of functional disturbances of venous and of arterial grafts after off-pump myocardial revascularization, to find out possible causes of unsatisfactory results in early and in remote postoperative periods on the basis of repeated coronaro- and graftographies.

Material and methods: 3477 off-pump operations of coronary artery bypass grafting (CABG) were performed in

the National M.M. Amosov Institute of Cardiovascular Surgery AMS Ukraine during 2000-2006 with general mortality 1.23%. Unsatisfactory results were found in 126 patients (3.6%). Thirty-one (0.9%) patients died in the remote period, which makes total failures of 4.5%. All patients with unsatisfactory results were subjected to repeated coronarography and graftography (16 in early, 110 in the remote periods).

Results: Repeated study showed that during the first days after operation in 4 patients (25%) grafts were patent; in 16 patients (75%) there was infringement of their patency. In the remote period out of 110 repeatedly studied patients in 46 patients (41.8%) the grafts were patent. In 64 patients (58.2%) infringement of the patency of one or of several grafts was found.

Conclusions: Contemporary stabilizing devices permit complete revascularization of the myocardium to be performed off-pump. Frequency of graft patency infringement composed 1.7% out of 3434 discharged patients in different terms after operations and this does not differ from infringement quantity in cases operated upon on-pump.

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A new tactical decision to shorten ischaemic heart time and the time of extracorporeal circulation during surgical treatment of complicated forms of ischaemic heart disease

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Background: Surgical treatment of complicated and of combined forms of ischaemic heart disease (IHD) is accompanied with higher risk of complications and mortality.

Aim: To elaborate surgical treatment methods of complicated and of combined forms of IHD, which permit substantial decrease of ischaemic time of the heart, of the extracorporeal circulation time (ECC) and which improves conditions for myocardial protection.

Material and methods: our experience (3477 off-pump operations of CABG with mortality 1.23%) was used to elaborate operations for complicated and combined forms of IHD. The essence of the method: CABG is performed off-pump, correction of intracardiac pathology on-pump. In separate cases the whole operation can be performed off-pump. Combined method of surgical treatment was used in 126 patients with IHD, complicated by aneurysms of the

left ventricle (ALV, n=93), by postinfarction cardiomyopathy (n=4), by rupture of interventricular septum (RIVS, n=2); IHD combined with acquired heart lesions (AHL, n=27). The control group consisted of 89 patients with the same type of pathology, where the whole operation was performed in a standard way (with ECC and cardioplegia).

Results: There was no significant difference in preoperative signs between patient groups. Comparative analysis of operation volumes, of ECC time, and of the ischaemic heart time showed that in the group of IHD combined with valvular pathology operated on according to the classic method, mean quantity of grafts per patient equalled 1.6±0.1, and 2.8±0.3 with the combined method. Duration of ECC in cases of IHD combined with valvular pathology was 148±18.3 min., time of heart ischemia 109.7±13.1 min. In complicated forms of IHD these indices equalled 80.6±9 min. and 25.1±3.7 min. Decrease of the operation time permitted reduction of expenditures on medicaments and on blood components.

Conclusions: The elaborated method permitted shortening by 2-3 times duration of ECC and of ischaemic time of the heart, and lowering of expenditures on medicaments and blood components. Restoration of myocardium blood supply before intracardiac manipulations and effective delivery of cardioplegic solution to the myocardium permit the intracardiac part of the operation on the fibrillating heart to be performed with the minimal stress load on the heart. Preceding revascularization of the myocardium favoured quick restoration of adequate haemodynamics, and lowered risk of exacerbation of concomitant diseases.

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Surgical treatment of primary cardiac tumours

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Background: Primary cardiac tumours are uncommon, with prevalence of 0.0017-0.19% at autopsy. Cardiac surgeons do not face these clinical issues very often in their daily activity. In this study we presented our experience with a significant number of patients with cardiac tumour operated on in our department.

Material and methods: During 6 years, between 2000 and 2005, in the Department of Cardiac Surgery, First Chair of Cardiology and Cardiac Surgery, Medical University of Lodz, 5,619 open heart operations were performed. In this

group, there were 24 patients (9 men and 15 women, aged mean 56.9±11.5 years) operated on due to cardiac tumours, and those operations were 0.4% of all procedures. All the operations were performed using cardio-pulmonary bypass (CPB). The diagnostics of intracardiac tumours was based mainly on echocardiography. All patients older than 40 years underwent preoperative coronary angiography.

Results: In 22 cases (91.7%), the histopathological postoperative diagnosis was myxoma. In the remaining two cases the diagnosis was sarcoma and chondroma, respectively. In 22 (91.7%) patients, the tumour was localized in the left atrium and in 2 (8.3%) patients in the right atrium. In 21 cases the tumour was extirpated alone, in 2 patients it was excised together with a portion of the atrial septum, and in one patient it was necessary to replace the mitral valve. Additionally, two patients had simultaneous myocardial revascularization. There was no in-hospital mortality in this population.

Conclusions: The most frequent localization for primary cardiac tumours is the left atrium. The most prevalent primary cardiac tumour is myxoma. Clinical diagnosis of cardiac tumour is usually based on echocardiography. Precise diagnosis is possible not earlier than after postoperative histopathological examination. Surgical removal is the treatment of choice in primary cardiac tumours.

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Prognostic value of selected echocardiographic parameters in children with pulmonary hypertension

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Background: Pulmonary hypertension (PH), as a complication of congenital heart defect, still remains a significant clinical problem and is a significant cause of postoperative mortality in children with left to right shunts.

Aim: The aim of the study was to verify whether preoperative echocardiography examination enables prognosis of pulmonary hypertension in early and late postoperative periods.

Material and methods: The study population consisted of 191 children with preoperative echoardiographic diagnosis of PH who were operated on from 1 October to 31 December 2004 in the Dept. of Paediatric Cardiac Surgery in Poznan. There were 88 boys and 103 girls, mean age 4 months (3 days to 8 years). The population was divided into two groups: with (PH-1) and without (PH-0) symptoms

of postoperative PH (pulmAT was in PH-0: 62ms, in PH-1: 60ms, $p=0.1$). Patients with PH were classified according to presence (PHC-1) or absence (PHC-0) of PH crises (pulmAT was in PHC-0: 60ms, in PHC-1: 60ms, $p=0.1$). The latter group was further divided into two groups: patients treated with NO (NO-1) inhalation and treated conventionally (NO-0) (pulmAT was in NO-0: 65ms, in NO-1: 55ms, $p=0.06$). The selected echocardiographic parameters were analyzed in all groups. Preoperative and postoperative examinations in consecutive postoperative years were compared. As well as clinical data concerning patients, operative procedure and postoperative course were analyzed.

Conclusions: Echocardiographic examination does not enable prognosis of postoperative PH symptoms. It is impossible to foresee the magnitude of these symptoms in early postoperative symptoms.

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“Seek enough, but not too sick” – our experience in evaluation of potential candidates for heart transplantation (HTX)

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Background: The role of a transplant centre should be to verify the indication for HTX in potential candidates referred to the transplant centre from local hospitals.

Aim: Presentation of final evaluation of potential candidates for HTX.

Material and methods: 239 consecutive patients (213 M, 26 F; mean age: 47.2 years old) referred between 2003 and 2007 as potential candidates for HTX were analyzed. In evaluated patients, echocardiography, ergospirometry, 24-hour ECG Holter monitoring, right cardiac catheterization and coronary angiography were performed. When the whole diagnostic path was finished, the analyzed patients were divided into: group I – suitable for HTX; group II – “not sick enough”; group III – “too sick for HTX”.

Results: Group I group II group III n 86 90 63 % 36 38 26. In group III severe pulmonary hypertension was diagnosed in 78% of patients.

Conclusions: 1. Final evaluation in transplant centres is absolutely necessary before definite qualification for HTX. 2. Pulmonary hypertension is the main reason for disqualification of patients referred from local hospitals. 3. The key point is the adequate time of final evaluation and qualification for HTX.

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Acute myocardial infarction due to coronary embolization as the first manifestation of left atrial myxoma – a case report

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This report describes a 52-year-old woman with an inferior myocardial infarction due to a coronary artery embolus. Coronary angiography revealed occlusion of right coronary artery and echocardiographic findings showed a large left intraatrial tumour. The tumour was removed surgically and pathological findings confirmed the diagnosis of myxoma. Aetiology of the occlusion was closely related to the left atrial tumour. Myocardial infarction was the first manifestation of left atrial myxoma.

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Comparison of levosimendan with conventional inotropic support after arterial switch operation

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Background: Arterial switch operation is the procedure of choice in the treatment of transposition of the great arteries (TGA). Because of the high incidence of low cardiac output syndrome in the early postoperative period, different protocols for inotropic support have been developed to treat the failing myocardium. In 2006 we started to use levosimendan (calcium sensitizer) to prevent low cardiac output syndrome in the early postoperative period.

Aim: To compare two protocols of inotropic support after arterial switch operation.

Material and methods: Twenty-seven neonates with TGA were operated on in the Children's Cardiac Center From January 2006 to January 2007. All of them underwent arterial switch operation at the mean age of 10 ± 3 days. Depending on the inotropic strategy these patients were divided into two groups. group I included 13 patients in whom we used dobutamine (range: 2 to 7 mcg/kg/min) and dopamine (range: 3 to 5 mcg/kg/min) in the early postoperative period. For vasodilation nitroglycerin in dose 1-3 mcg/kg/min was admi-

nistered routinely. Group II included 14 patients. For inotropic support in these children we used 0.1-0.2 mcg/kg/min of levosimendan. For additional support we used dopamine. For vasodilation nitroglycerin in dose 1-3 mcg/kg/min was added if needed. Surgical technique, cardiopulmonary bypass management and myocardial protection were the same in both groups. Main haemodynamic parameters, ventilation time, and intensive care unit (ICU) stay time of the two groups were compared.

Results: Mean LA pressure in patients of group I was 3.5 mm Hg 24 hrs following surgery, 5.5 mm Hg after 48 hrs, 4.1 mm Hg after 72 hrs, compared to 5.4 mm Hg, 4.7 mm Hg, 4.2 mm Hg in patients of group II, respectively. Mean ejection fraction in patients of group I was 53.2% 24 hrs following surgery, 53% after 48 hrs and 55% after 72 hrs, compared with 51.4%, 59.3%, 65% in patients of group II, respectively. The results of the new protocol of inotropic support were shorter ICU stay (25.5 days in group I vs. 8.8 days in group II, $p < 0.001$) and shorter postoperative mechanical ventilation time (163 hrs in group I, vs. 52 hrs in group II, $p < 0.001$). In the group with levosimendan support only 6 patients required additional dopamine in dose 2 mcg/kg/min and 5 patients received nitroglycerin in dose 1-2 mcg/kg/min. Hospital mortality was 7.6% in group I and 0% in group II, $p = \text{NS}$.

Conclusions: With the use of levosimendan in the early postoperative period for prevention of the low cardiac output syndrome we obtained a tendency towards increase of the ejection fraction, shortening of mechanical ventilation time, lowering of inotrope doses and shortening of the ICU stay.

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Diagnosics and surgical tactics in atrial isomerism

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Background: Atrial isomerism is a congenital pathology of the heart which is very difficult to establish by diagnostic methods. Since it always appears with other anomalies, its presence can be assumed by observing typical combinations of visceral organ structure anomalies.

Aim: To establish morphological markers which are combined with atrium isomerism.

Material and methods: 61 patients with heart diseases associated with atrial isomerism were studied. Age of patients varied from 10 days to 11 years (mean 52 ± 43 months). Among them 40 (65.6%) patients had univentricular

atrioventricular communication and 21 (34.4%) patients had a biventricular heart. Comparative evaluation of anomalies' anatomical structural properties was performed by means of comparison of data obtained during echocardiography, angiography, intraoperative morphological findings and pathologic anatomical studies of specimens.

Results: Right-atrium isomerism was found in 29 (39.3%) patients. It was combined with univentricular heart in 19 (31.3%) cases and with biventricular heart in 5 (8.2%) cases. 37 (60.7%) patients had signs of left-atrium isomerism. Among them 21 (34.4%) patients had univentricular heart and 16 (48.5%) patients had biventricular heart. The conducted research gave the possibility to establish the complex of anatomical markers which determine the type of atrial isomerism. Presence of right-atrium bilaterality, total anomalous pulmonary vein drainage, absence of coronary sinus, presence of atrioventricular septal defect, of pulmonary stenosis or of atresia, of three lobes of both lungs, short main bronchi and asplenia – all these features evidenced right-atrium isomerism. Main signs of left-atrium isomerism included right-orientated axis of heart, bilateral left atrium, symmetrical drainage of pulmonary veins, azygous continuation of inferior vena cava, bilateral lungs with two lobes, long both main bronchi and polysplenia. Analysis of research data permitted us to determine a set of technical complexities which make it difficult to perform surgical procedures in patients with atrial isomerism. Here we included: 1) presence of two superior venae cavae with left isomerism; 2) drainage of additional left vena cava into the left atrium during repair of defects in cases of biventricular physiology of circulation 3) drainage of venae cavae into the left atrium during Fontan operation of univentricular heart; 4) obstruction of pulmonary veins in patients with total anomalous pulmonary vein drainage; 5) drainage of hepatic veins into the left atrium with left isomerism; 6) common atrioventricular valve insufficiency.

Conclusions: Our research showed the complexity of a syndrome which combines visceral heterotaxy and heart pathology. This complexity influences the results of surgical treatment and these results could be better today. Thorough precise diagnostics of the combination of lesions promotes adequate tactical decisions, and permits exclusion of the factor of unexpectedness during operation, allowing surgeons to perform non-standard intervention which will improve the results of surgical treatment.

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Surgical techniques alternative to traditional conduits in the treatment of congenital heart diseases

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Background: Homografts are thought to be the best conduits in treatment of complex CHD from a haemodynamic point of view. However, they have restricted time of durability and are not always disposable.

Aim: The purpose of the report is to estimate late results of alternative techniques compared with homografts.

Material and methods: Seven patients (aged from 1 year 8 month to 16 years, mean 8.25 years) underwent total correction of d-TGA with VSD and PS (5 cases) and DORV with PS (2 cases), using REV procedure. The monocusp was used in 2 cases. The conduit prepared from autopericardium was used in 36 cases with different lesions: tetralogy of Fallot (as parallel channel), atresia of pulmonary artery with VSD, DORV, d-TGA and l-TGA. 6 with monocusp and 7 with the pericardial valves. Combined conduit created from a "tongue" of the anterior wall of the pulmonary trunk and autopericardial piece was used in 6 cases. The control group included 23 cases of aortic homografts and 18 of pulmonary homografts, implanted under the same indications.

Results: Late results were studied in 3-12 years (mean 8 years 10 months) after REV procedures and in 7-25 years (mean 15.2 years) after implantation of autopericardial valveless and valve conduits. All patients apart from one were alive with good clinical state (I-II class NYHA). Systolic RV-PA gradient was 27.6 ± 4.07 mm mercury (compare with pulmonary homografts 30.5 ± 2.6 mm and aortic homografts 72.1 ± 6.02 mm mercury). Worse results were obtained in 15 patients with pericardial valve or monocusp: RV-PA gradient was 65.4 and 48.5 mm mercury correspondingly. No calcification was found. One patient in this subgroup died. In the control group among 23 cases of aortic homografts there were 4 reoperations with one death.

Conclusions: Valveless REV and autopericardial conduits are a good alternative to pulmonary and aortic valved homografts in patients with low resistance of pulmonary arteries.

Background: Management of pulmonary atresia with ventricular septal defect, hypoplastic pulmonary arteries with arborisation defects and major aortopulmonary collateral arteries (MAPCAs) presents a challenging surgical problem.

Aim: The purpose of this report is to demonstrate the results of multistage treatment and the progress toward reducing the number of stages.

Material and methods: Fifty-nine consecutive patients (aged from 8 days to 19 years, mean 5.8 years) had 3.1 collaterals per person. In 41 patients collaterals were the only blood supply sources of 11-20 lung segments. 53 patients had hypoplastic pulmonary arteries (10-50% to normal Nakata index). 39 patients underwent 60 unifocalization procedures, 19 cases – remodelling of the absent central PA, 8 cases – bilaterally. In 37 cases PA enlarging procedures were performed (central shunt – 12, outflow tract patch reconstruction – 14, conduit without VSD closure – 11). Now we have begun a new era: one-stage complete unifocalization with palliative conduit through middle sternotomy (4 successful cases).

Results: 8 (13.5%) patients died after preparatory operations. Cross-sectional area of the central PA after pulmonary artery enlargement procedures increased from $23.7 \pm 7.8\%$ to $88.2 \pm 30.5\%$ ($p < 0.05$). Ten (16.9%) patients failed to achieve minimum morphological requirements for repair. Thirty-one patients (52.5%) underwent total correction with use of perforated patch on VSD in doubtful cases. In 60% of patients a valved conduit was implanted. Postrepair peak systolic right/left ventricular pressure ratio ranged from 0.55 to 1.0. Nine patients await complete repair.

Conclusions: Surgical preparation of the pulmonary vascular bed allows total repair of this lesion to be performed in half of patients. Unifocalization procedures through middle sternotomy decrease the numbers of stages of surgical treatment.

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Management of pulmonary atresia with ventricular septal defect

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