THROMBOEMBOLIC COMPLICATIONS IN PATIENTS USING PHARMACOLOGICAL ANTITHROMBOTIC PROPHYLAXIS AND OPERATED ON FOR ARTERIAL OCCLUSIVE DISEASE IN THE AORTO-ILIAC SEGMENT

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ABSTRACT

Objectives: This prospective, non-randomised study was aimed at the assessment of prevalence of thromboembolic events in vascular patients routinely receiving antithrombotic prophylaxis following surgical revascularisation of the lower extremities.

Material and methods: This study included 105 patients operated on for aortoiliac occlusive disease. Postoperatively all patients received pharmacological antithrombotic prophylaxis with low-molecular-weight heparin. Sonographic examination of the veins of low extremities was routinely performed three times: one day before the surgery, on the discharge day and 30 days after hospital discharge.

Results: Thromboembolic complications were found in 21 patients (19.05%), including 18 patients with deep venous thrombosis and 3 with pulmonary embolism. Thromboembolic events were more prevalent in older patients (68.22 vs. 62.65 years), those with necrotic lesions of the limbs, with lower preoperative concentration of hemoglobin (7.89 vs. 8.61 mmol/l), higher of fibrinogen (455 vs. 357 mg/dl) and of platelet count (334 vs. 250 × 10^9/l). Other risk factor comprised the number of transfused packed red blood cell units (3.39 vs. 1.45 units) and plasma units (1.61 vs. 0.39 units), and the length of stay in the intensive care unit (4.78 vs. 2.24 days).

Conclusions: Vascular patients develop thromboembolism very often, despite pharmacological prophylaxis. Thus, routine scanning for deep vein thrombosis before hospital discharge in order to exclude thrombosis should be considered in this group. Also, an extended post-discharge thromboprophylaxis in these patients should be considered.

Key words: vascular surgery, aorto-iliac impatency, thromboembolic complications, Doppler ultrasonography, antithrombotic prophylaxis, low-molecular-weight heparins.

INTRODUCTION

So far, generally accepted indications have been developed with regard to applying antithrombotic prophylaxis in patients hospitalised in internal medicine wards, as well as in patients undergoing surgical treatment in general surgery, gastroenterology, orthopaedics, gynaecology, and oncology wards. Patients undergoing large abdominal operations as well as alloplastic knee and hip joint replacement are recommended to continue the antithrombotic prophylaxis for a period of 14-28 days following the surgery, regardless of whether the patients stay on hospital wards or at home. This indication derives from the observation of increased frequency of thromboembolic complications developing in this patient group in the early post-operative period [1-6].

As far as antithrombotic prophylaxis is concerned vascular surgery seems to be an exception. This state of affairs may be surprising, as in the vast majority of cases the patients operated on may be included in the moderate or high risk group in terms of developing thromboembolic complications (TC) [7, 8]. The most important risk

factors for TC development in this patient group include: advanced age, surgery duration exceeding 2-3 hours in most cases, intraoperative limb ischaemia, revascularisation syndrome, considerable blood loss, need of packed red blood cells (PRBCs) and plasma transfusions, increased hypercoagulable state, vein injuries, history of thromboembolic episodes, limb oedema inhibiting venous outflow, and the lengthy period of immobilisation, which is on the one hand connected with the extent of the surgery, and on the other with the difficulty in obtaining access to rehabilitation procedures [9-11].

Databases make available only 23 prospective studies regarding the frequency of thromboembolic complications in vascular patients [12]. Out of this number, 10 studies pertained to procedures in the aorto-iliac-femoral section, 7 – the femoropopliteal section, and 6 – amputations. Only 7 of the studies were randomised.

The small number of research studies and the considerable diversity of the results have contributed to a limited impact of the recommendations regarding application of antithrombotic prophylaxis in vascular patients, contained in the 9th edition of Antithrombotic Guidelines issued by the ACCP (American College of Chest Physicians) [13]. According to them, major vascular operations should be considered high-risk procedures in terms of developing thromboembolic complications. However, due to doubts regarding the research methodology, the recommendation for the routine application of antithrombotic prophylaxis has been specified as 1C level recommendation. Recommendations concerning the antithrombotic prophylaxis in the vascular surgery category that involves a small risk in terms of developing thromboembolic complications, such as varicose surgery and arteriovenous fistulas for dialysis, are even less well supported, and therefore the recommendation level in this case is 2B [13].

The purpose of the research study was to specify the nature and frequency of thromboembolic complications found in patients undergoing large abdominal operations, who routinely apply pharmacological antithrombotic prophylaxis.

MATERIAL AND METHODS

The prospective, non-randomised research study involved 105 patients with arterial occlusive disease in the aorto-iliac segment, undergoing surgical treatment in the Department of General and Vascular Surgery, Poznan University of Medical Sciences, from 1 October 2012 to 12 December 2013. All the patients showed the symptoms of atherosclerotic lower limb ischaemia, category 3-6 according to Rutherford classification. The studied population included 20 women and 85 men. The characteristics of the patients involved in the research study are shown in Tables 1 and 2.

The exclusion criteria for the study were as follows: no consent given to participation in the study or to applying antithrombotic prophylaxis using low-molecular weight heparin, urgent surgical procedures, history of heparin-induced thrombocytopenia, long-term antithrombotic drug administration, the patient leaving the hospital without undergoing a duplex ultrasound scanning (DUS) test, patient's death for reasons other than pulmonary embolism before performing a DUS test of the venous system, and the patient's general status with a low chance to survive at least one month.

The interview and physical examination were performed on the day of the patients' admission to the vascular surgery ward. Blood for lab tests was drawn from fasting patients in the morning. Lab tests were performed in the laboratory of the Przemienienia Pańskiego University Hospital in Poznań.

Lower extremity veins were examined by means of DUS, in accordance with the recommendations of the Polish Society of Phlebology [14]. The examinations were performed by two vascular surgeons with considerable diagnostic experience. The DUS scan of the veins was routinely performed three times, i.e. one day before the surgery, on the discharge day, and 30 days after hospital discharge. Additional tests were performed in cases of clinical symptoms that might have meant occurrence of deep vein thrombosis or superficial thrombophlebitis.

All the patients underwent implantation of Dacron aortobifemoral prosthesis, by transabdominal access and median incision. Data regarding the process of the surgical procedure (kind of procedure, way of fixing the prosthesis, the operation process) were obtained from surgical procedure descriptions. Information on the surgical procedure duration, the blood loss volume, and the number of transfused PRBCs and plasma units were obtained from anaesthesiological reports.

Information on the duration of the patients' stay in intensive care units (ICUs) and surgical wards was received from the hospital dedicated "Eskulap" software.

Further treatment process, taking into account any complications and any need to perform subsequent procedures, was determined on the basis of the medical documentation, paying particular attention to any observations made by doctors and nurses, and results of diagnostic imaging and lab tests, as well as surgical procedures descriptions.

Antithrombotic prophylaxis

All of the patients participating in the study applied pharmacological antithrombotic prophylaxis, in accordance with the schedule adopted in the Department of General and Vascular Surgery. The patients were administered dalteparin (5000 IU) or 40 mg enoxaparin subcutaneously. The first dose was administered 6 hours after the end

Table 1. Patient data and lab test results in the pre-operative period

Parameters	Min.	Max.	Mean	Median	Standard deviation
age [years]	45	83	63.88	63	7.85
height [m]	1.5	1.94	1.69	1.61	0.08
weight [kg]	44	132	73.72	74	15.15
BMI [kg/m^2]	15.22	37.75	25.47	25.82	4.18
ejection fraction [%]	25	65	53.09	50	7.77
haemoglobin [mmol/l]	4.7	11.7	8.45	8.5	1.18
haematocrit [l/l]	0.25	0.57	0.4	0.41	0.05
creatinine [µmol/l]	47.8	222.4	90.1	85.2	31.5
urea [mmol/l]	2.14	17.93	5.84	5.15	3.01
AlAT [U/l]	8	121	30.69	23.5	22.5
AspAT [U/l]	11	275	29.4	21	34.44
APTT [s]	11.9	70.3	33.12	32.2	6.48
INR	0.9	2.1	1.01	1	0.13
thrombocytes [10^9/l]	102	576	268.34	251	97
fibrinogen [mg/dl]	190.5	706.5	379	352	117.34
total cholesterol [mmol/l]	1.94	11.7	4.73	4.74	1.45
LDL [mmol/l]	0.8	5.3	2.83	2.7	1.1
HDL [mmol/l]	0.33	2.57	1.15	1.09	0.39
triglycerides [mmol/l]	0.46	6.02	1.62	1.28	0.97

Table 2. Frequency of risk factors for developing atherosclerosis and thromboembolism in patients included in the study

Risk factor	Frequency	
	number of patients	%
tobacco smoking	52	49.52
angina pectoris	31	29.52
post-infarction patient	29	27.62
hypertension	68	64.76
cerebral ischaemia symptoms	13	12.38
diabetes	20	19.05
chronic obstructive pulmonary disease	7	6.67
renal failure	4	3.81
neoplastic disease	8	7.61
necrotic lesions in limbs	35	34.62
deep vein valvular incompetence	3	2.86
saphenous vein valvular incompetence	13	12.38
presence of fibrous thrombus in deep veins	4	3.81
presence of fibrous thrombus in superficial veins	1	0.96
antiplatelet drugs (ASA) intake	84	83.81
statins intake	75	77.14
diuretics intake	48	47.62

of the operation, and subsequent doses were given every 24 hours. The medication was continued until the end of hospitalisation, periodically checking the platelet count.

Routine compress therapy was not applied. Only in some cases of patients with extensive varicose veins in lower limbs or crural ulceration, compression therapy was applied using highly flexible elastic bandage.

Each patient staying in the intensive care unit applied isometric exercises. After transferral to the surgical ward, intensive locomotor rehabilitation was applied so as to mobilise the patients as quickly as possible.

Statistics

The computations were performed using the following software: Statistica 10 (StatSoft) and StatXact (Cytel). A significance level of $p < 0.05$ was adopted. In order to compare the variables measured in the ordinal or interval scale to the lack of normality of distribution, the Mann-Whitney or Kruskal-Wallis test was used. To compare the variables measured in the interval scale, showing a distribution compliant with the normal one and equal variances, Student's *t*-test for independent samples was applied, and in the case of lack of homogeneity of variance, the test with independent variance estimation was used (Cochran-Cox test). To examine the correlation between the variables measured in the nominal scale, the χ^2 test with Yates' correction was used, and also the Fisher-Freeman-Halton test.

Table 3. Parameters characterising the surgical operation and post-operative period in hospital

Parameters	Min.	Max.	Mean	Median	Standard deviation
surgery duration [minutes]	100	660	207.65	200	85.83
loss of blood [ml]	100	11 000	713.81	400	1264.24
PRBC transfusion [units]	0	26	2.2	2	3.66
blood plasma transfusion [units]	0	12	0.69	0	2
stay in the intensive care unit [days]	0	41	3.42	2	6.05
stay on surgery ward [days]	0	23	6.52	6	3.64

RESULTS

Data on the surgical procedure duration, the intraoperative blood loss volume, the number of transfused PRBCs and plasma units, as well as the length of stay in ICUs and then in surgical wards, are presented in Table 3.

During the stay in the hospital, adverse events were found in 63 patients (60%); however, in the case of 51 persons (48.57%) they were unrelated to thromboembolism (Table 4).

Venous thrombosis was diagnosed in 10 patients (9.52%). Nine cases of deep vein thrombosis were detected, of which eight were new episodes of the disease. In one case it was a further development of the condition already existing in the pre-operative period, at least three months before the operation, since the time of coronary artery bypass surgery. In the case of this patient, thrombus previously found only in intramuscular blood vessels of the soleus muscle advanced to the posterior tibial veins and the popliteal vein. In another patient, superficial thrombophlebitis was diagnosed, without progression to the superficial veins.

Pulmonary embolism was detected in two patients (1.9%). In both cases the pulmonary embolism was accompanied by deep vein thrombosis. One patient died as a result of cardiorespiratory failure in the course of massive pulmonary embolism.

Adverse events within 30 days of hospital discharge was observed in 17 patients (17.17%) (Table 5). Deep vein thrombosis was diagnosed in eight patients (8.08%). In seven cases these were new events, whereas in one case there was a progression of distal thrombosis involving only calf veins to the popliteal and femoral vein.

Pulmonary embolism developed in one patient (1.01%). The DUS examination showed peripheral deep vein thrombosis. The patient was scheduled for non-invasive treatment.

Table 4. Kind and frequency of complications and undesirable events during hospitalisation

Kind of complication	Frequency	
	number of patients	%
lower limb ischaemia	15	14.29
thromboembolic complications	12	11.43
bleeding	9	8.57
wound healing by secondary intention	8	7.6
acute renal failure	3	2.86
pneumonia	3	2.85
death	3	2.85
cerebral stroke	2	1.9
intestine injury/gangrene	2	1.9
spinal cord ischaemia	1	0.95
cerebral stroke	1	0.95
ureter injury	1	0.95
vein injury	1	0.95
clostridium infection	1	0.95
cardiac infarction	1	0.95

Table 5. Kind and frequency of complications and undesirable events within 30 days of hospital discharge

Kind of complication	Frequency	
	number of patients	%
thromboembolic complications	9	9.09
wound healing by secondary intention	5	5.05
toe/foot gangrene	3	3.03

Specifying the correlation between venous thrombosis occurrences and other studied parameters

In relation to the risk factors, venous thrombosis was found significantly more often in patients with necrotic lesions of the lower limbs preoperatively (37.5% vs. 9.23%; $p = 0.0007$).

Other risk factors found in preoperatively did not correlate with the prevalence of TC (Table 6).

The taking of antiplatelet drugs ($p = 0.83$), statins ($p = 0.82$), and diuretics ($p = 0.47$) proved to be irrelevant.

Table 6. Correlation between thromboembolic complications (TC) and other disease occurrences

Concomitant diseases	Yes		No		*p*
	number of patients	% of patients with TC	number of patients	% of patients with TC	
angina pectoris	29	7 (20.69%)	69	12 (17.39%)	0.7
hypertension	68	11 (16.18%)	23	7 (23.33%)	0.39
post-infarction patient	28	7 (25%)	70	11 (15.71%)	0.28
post-cerebral stroke patient	12	4 (33.33%)	87	15 (17.24%)	0.57
diabetes	16	2 (12.5%)	82	16 (19.51%)	1.0
neoplastic disease	8	2 (25%)	90	16 (17.78%)	0.38
venous thromboembolism	8	1 (12.5%)	90	17 (18.89%)	0.63

With regard to the results of the pre-operative lab tests and the data describing the surgical procedures, a significant correlation was found between TC development and age, haemoglobin and fibrinogen concentrations, platelet count and the number of transfused PRBCs units, as well as the length of stay in the intensive care unit (Table 7).

DISCUSSION

We can distinguish at least three reasons for the lack of unambiguous recommendations to implement antithrombotic prophylaxis in vascular patients. These are: the conviction held by many vascular surgeons that patients are sufficiently secured against TC in the perioperative period due to the routine administration of unfractionated heparin and antiplatelet drugs, fear of increased risk of haemorrhage complications in the early postoperative period, and the lack of unambiguous research results specifying the actual frequency and extensiveness of thrombotic processes in patients undergoing vascular surgery.

Thromboembolic complications were found in 19.05% of the research subjects, despite the routine application of pharmacological antithrombotic prophylaxis. Two thirds of the venous thrombosis and pulmonary embolism cases occurred during the hospitalisation. The other events took place within 30 days of the hospital discharge.

The frequency of TC development specified by us falls within the middle range described in the earlier research papers specifying the interval from 0% to 42%. This considerable scattering of the results is due to, among others, including inhomogeneous patient groups in the studies, taking into account different TC risk factors, and applying various research methodologies.

Satiani, examining 69 patients following surgical procedures in the aorto-femoral segment, did not observe a single case of TC [15, 16]. However, this could be connected with the research methodology – scintigraphy following the administration of iodine 125 marked fibrinogen, where the results were verified by means of impedance plethysmography. Application of the aforementioned methods is connected with the possibility of receiving a large percentage of false negative results.

In Saarinen's research paper analysing the statistical data from the FINNVASC database, the frequency of TC was determined to be 0.45%. This study did not use any test aimed at detection of the deep vein thrombosis [17]. Since detection of deep vein thrombosis exclusively on the basis of clinical data is connected with sensitivity of 47% and specificity of 23% [15], it may be supposed that a large part of thromboembolic complications were not diagnosed and recorded.

In 10 research papers regarding surgical procedures in the aorto-iliac-femoral segment, the TC frequency was determined to be 2-27%. The lowest frequency of thrombosis was observed by Killewich, at 2% in both study groups with and without pharmacological antithrombotic prophylaxis [18]. However, in his research he totally ignored the diagnostics of crural veins, which, according to our observations, constituted the most frequent location of thrombotic lesions. Thus, the numbers provided by Killewich should rather be considered to describe the frequency of proximal thrombosis – this value is similar to the one obtained in our analysis.

As for the other research paper authors applying various forms of prophylaxis, Farkas determined the TC frequency as 4.2% and 10.6% depending on administration of, respectively, unfractionated heparin and low-molecular weight heparin [19], whereas in the case of Fletcher and Batiste, applying unfractionated heparin and compress therapy, the TC frequency was 11.5% [20].

In the case of surgical procedures in the aorto-iliac-femoral segment without applying antithrombotic prophylaxis, the frequency of venous thrombosis was greater than in the case of patients applying the prophylaxis, and amounted to: 18% in Olin's paper [21], 20% in Angelides's paper [22], and 27% in Harstruck's and Greenfield's paper [23].

As opposed to the aforementioned research papers, the highest frequency of TC occurrences was found by Hamer and it amounted to 42% in the case of patients operated on in the femoropopliteal segment [24]. Among

Table 7. Correlation between thrombosis occurrences and the tested parameters

Risk factor	Without TC	TC occurrence	*p*
age [years]	62.65 ±7.86	68.22 ±6.58	0.003
BMI [kg/m^2]	25.62 ±4.24	25.32 ±4.16	0.8
ejection fraction [%]	53.06 ±8.03	54.16 ±7.12	0.8
haemoglobin [mmol/l]	8.61 ±1.12	7.89 ±1.38	0.03
haematocrit [l/l]	0.41 ±0.05	0.38 ±0.06	0.07
creatinine [µmol/l]	86.62 ±29.16	95.23 ±35.75	0.36
urea [mmol/l]	5.38 ±2.48	6.35 ±3.2	0.19
SGPT [U/l]	31.75 ±22.6	28.5 ±25.58	0.54
SGOT [U/l]	27.89 ±27.13	33.12 ±3.61	0.92
APTT [s]	32.85 ±7.01	33.12 ±3.61	0.38
INR	1.02 ±0.15	1.0 ±0.07	0.85
fibrinogen [mg/dl]	357.33 ±102.93	455.69 ±142.94	0.002
thrombocytes [10^9/l]	250.97 ±80.06	334.61 ±132.12	0.005
total cholesterol [mmol/l]	4.82 ±1.52	4.57 ±1.35	0.48
HDL [mmol/l]	1.18 ±0.39	1.06 ±0.34	0.49
LDL [mmol/l]	2.84 ±1.15	2.92 ±1.14	0.79
triglycerides [mmol/l]	1.71 ±1.04	1.33 ±0.6	0.19
surgery duration [minutes]	202.31 ±75.8	231.07 ±129.13	0.24
loss of blood [ml]	952.78 ±1521.07	653.75 ±1230.54	0.43
PRBC transfusion [units]	1.45 ±2.09	3.39 ±3.87	0.04
blood plasma transfusion [units]	0.39 ±1.26	1.61 ±3.23	0.08
stay in ICU [days]	2.24 ±3.04	4.78 ±9.16	0.02
stay in surgery ward [days]	6.05 ±2.59	7.78 ±5.15	0.31
Caprini score	4.5	5.0	0.12

TC – thromboembolic complications

the researchers conducting prospective studies, he was the only one to apply phlebography in diagnostics. Regardless of the fact that the study included only patients who did not apply any form of prophylaxis, this high result may derive from using the most sensitive diagnostic method [15, 25]. However, due to the arduousness connected with performing the phlebography, in the event of symptoms suggesting venous thrombosis development, usually only one limb was subjected to examination. Phlebography of the other limb, without clinical symptoms, was performed only in 27% of the cases [26]. Limiting the diagnostics to one limb is not only non-compliant with the currently binding recommendations [14], but also it is additionally connected with a high probability that any thrombotic lesions will not be detected in the other limb. Yeager examined venous thrombosis frequency in stumps of amputated lower extremities [27]. He observed concurrent occurrence of thrombosis in the other, "healthy" limb in as many as 55% of the patients with thrombus in the veins of the amputated limb.

In our research study, the thrombotic lesions in the vast majority of the cases were located in the intramuscular veins of the soleus muscle and venters of the gastrocnemius muscle. Out of the 21 cases of TC, 10 cases of deep vein thrombosis were diagnosed during hospitalisation, in the vast majority of the cases in asymptomatic patients.

The earlier research papers provide various data regarding prevalence of deep vein thrombosis in particular locations. In the research study done by Hollyoak, thrombosis in 80% pertained to the peripheral veins, and in 20% – the veins of the femoropopliteal segment [28]. In other studies the above ratio moved gradually in the proximal direction, amounting to, respectively, for the distal and proximal section, 78% and 22% [21], 67% and 33% [22], and 52% and 48% [29]. Fletcher and Batiste observed proximal thrombosis in as many as 80% of patients with TC [20], whereas Killewich detected the presence of thrombus only in proximal veins [18]. However, according to the examination report, during a DUS scan he did not assess the lower leg veins.

Since asymptomatic thrombosis in intramuscular veins of the calf was prevailing in our findings, doubts may arise as to its clinical significance, and consequently the advisability of implementing an adequate antithrombotic therapy. According to the latest Polish guidelines of 2012 regarding the prevention and treatment of thromboembolism, accidental detection of asymptomatic deep vein thrombosis in the calf does not constitute an unambiguous indication for implementing antithrombotic therapy [30]. However, the question is whether surgical patients following a large vascular surgery fulfil the criterion. Even if we assume that the presence of thrombus in this location is connected with a relatively low risk of pulmonary embolism development, it has been reported that it is possible for distal thrombosis to progress to a proximal form [31, 32]. We observed this phenomenon in two patients. Other authors reported similar observations. The frequency of this process is variously assessed, starting from 20% [21, 33], through 33% [22] (based on phlebography), 36% [19] (based on DUS and phlebography), and up to 54.5% [20] (based on DUS scan).

In our research study, we observed a correlation between TC occurrence and other factors. With regard to the values specified in the pre-operative period, the correlation regarded age, necrotic lesions in limbs, concentration of haemoglobin and fibrinogen, and platelet count. Regarding the parameters connected with the peri- and post-operative periods, the correlation concerned the number of transfused PRBC units as well as the length of stay in the intensive care unit.

Patient immobilisation is commonly considered to be the potential factor for thrombosis and/or pulmonary embolism development. This parameter is not always equivalent to the patients' inability to move. Some authors define it as limiting the painless walking distance to below 50 m. However, in the case of vascular patients, this factor occurs in principle only in the pre-operative period, and following a successful revascularisation it subsides in the post-operative period [12].

Based on our results, it may be proposed that the definition of immobilisation should also, or even first and foremost, account for any presence of necrotic lesions in limbs. Their clearing and healing may be a factor significantly hindering mobilisation of patients in the post-operative period.

It is unclear whether there is a connection between a history of thrombotic episodes and TC development in the post-operative period. Our study did not show any correlation between them. However, it is generally assumed that the presence of residual thrombus constitutes a risk factor for another thrombotic episode development [13, 32]. Afraid of an increased risk of thrombotic complications, Passman excluded from his study patients with old fibrous thrombus in lower limb veins, and patients with confirmed coagulation disorders [29]. Hollyoak, in turn, did not observe new thrombus forming in patients with residual thrombus in lower limb veins [28]. However, it would be inappropriate to draw any conclusions from this fact, as the old post-thrombotic lesions were found in one patient only.

Our study did not show any impact of gender on TC prevalence. Saarinen's observations claim the opposite. Taking into account the large population of vascular patients recorded in the FINNVASC database, thrombosis was diagnosed in 0.45% of the patients operated on. Out of this number, 63% were men and 37% were women. No correlation was found between the post-operative thrombosis development and concomitant diseases, revascularisation location (abdominal cavity, lower extremities), and the nature of the procedure (primary, secondary or urgent reconstruction, reoperation) [17].

The research paper of de Maistre, the most similar to ours in terms of methodology, shows a correlation between thromboembolic complication development and the mere fact of PRBC and plasma transfusion [34]. Our study did not analyse this aspect, concentrating rather on the significance of the number of transfused units of blood derivatives. We found that the risk of TC increased proportionally to the number of transfused PRBCs units.

CONCLUSIONS

Despite the routine application of pharmacological antithrombotic prophylaxis, the population of patients undergoing large revascularisation procedures in the aorto-ilio-femoral segment bear a considerable risk of developing thromboembolic complications, among which the peripheral form of deep vein thrombosis prevails.

In two thirds of the cases, the thromboembolic complications developed during hospitalisation, when applying antithrombotic prophylaxis. The remaining third of the cases occurred in the post-hospitalisation period. The vast majority of the thrombosis episodes were asymptomatic.

We found a correlation between the occurrence of thromboembolic complications and the patients' age, necrotic lesions in limbs, concentration of haemoglobin and fibrinogen, and platelet count in the pre-operative period, as well as the number of transfused PRBC units and the length of stay in ICUs.

In view of the above, it needs to be considered whether it is advisable to apply, before hospital discharge, routine DUS tests of the venous system in all patients who have undergone large vascular operations, so as to detect any asymptomatic cases of venous thrombosis, and whether it is advisable to extend application of antithrombotic prophylaxis in vascular patients after hospital discharge.

The Institutional Review Board at the Poznań University of Medical Sciences granted consent no. 1083/13 to the research study.

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