ISSN 1234–950X
e-ISSN 1644–3276

ACTA ANGIOLOGICA

2021, Vol. 27, No. 2

POLISH JOURNAL OF VASCULAR DISEASES

JOURNAL OF POLISH SOCIETY FOR VASCULAR SURGERY

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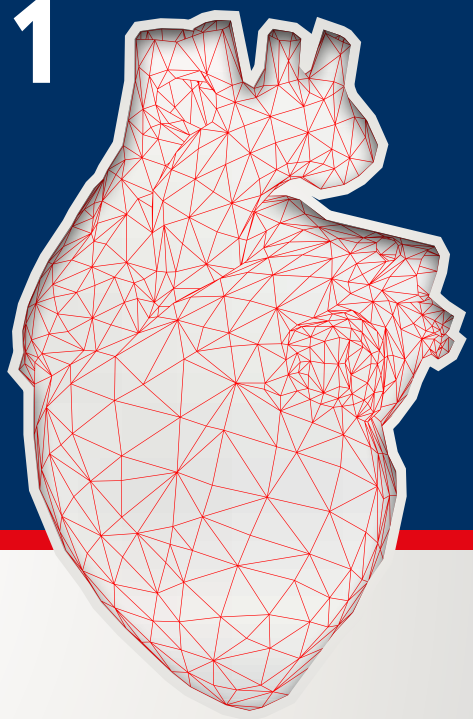

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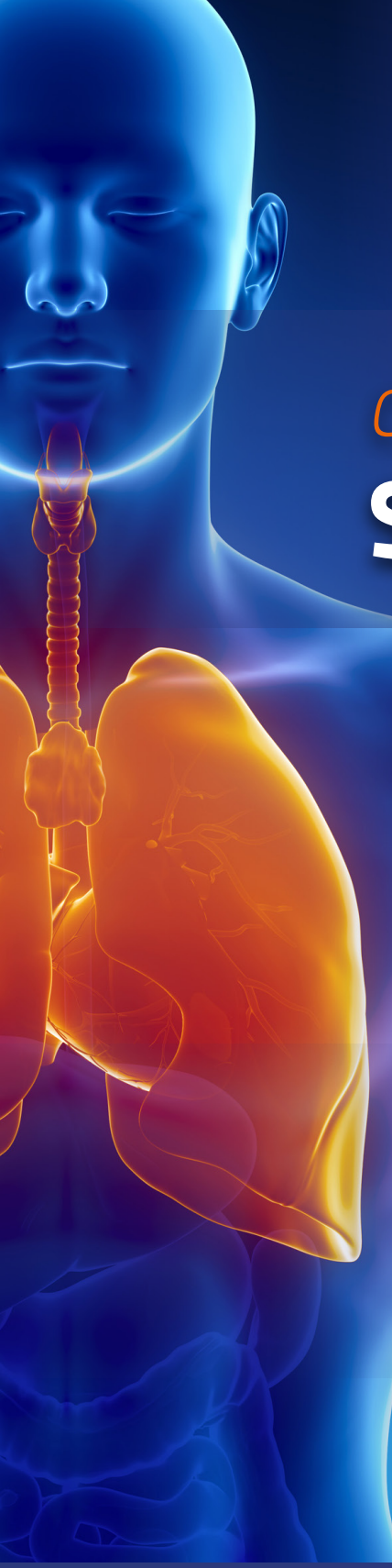

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ACTA ANGIOLOGICA

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JOURNAL OF POLISH SOCIETY FOR VASCULAR SURGERY

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ACTA
ANGIOLOGICA

2021, Vol. 27, No. 2

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COMMENTARY

Acta Angiol
Vol. 27, No. 2, pp. 37–40
Doi: 10.5603/AA.2021.0007

ISSN 1234–950X
e-ISSN 1644–3276

Commentary on the guidelines for the management of chronic venous disorders of the lower limbs: "Prevention of post-thrombotic syndrome" by Andrew Nicolaides et al.

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Commentary on the guidelines brilliantly developed by prof. Andrew Nicolaides and published in International Angiology in 2020 [1], should begin with the definition of post-thrombotic syndrome (PTS), which is a group of common clinical symptoms following deep vein thrombosis (DVT).

The signs and symptoms may come in various combinations, and they affect especially the lower limbs, but also, but much less frequently, the upper limbs. In most of the studies on PTS, the Villalta scale was used to establish the diagnosis (Table 1) [2].

The authors of this comment agree with Dr. Susan Kahn, who believes that it is still impossible to reliably predict, based on an individual assessment, who will develop and who will not develop post-thrombotic syndrome [3]. Therefore, it is important to know the factors that predispose patients to this condition, which is one of the most serious complications of DVT. Table 2 presents risk factors for post-thrombotic syndrome [4–7]. The risk factors of PTS are not yet well understood. Based on the existing evidence, known risk factors can be divided into 2 groups: 1. recognized or probable factors – whose significance has been confirmed or is suggested by the results of some studies, but further research is necessary to finally determine their role; 2. factors that most likely do not increase the risk of PTS — whose significance was excluded in the studies.

In addition, a recently published observational study identified factors that indicated a greater risk of developing venous ulcers in patients with a history of acute DVT.

Table 1. Clinical diagnosis of post-thrombotic syndrome — Villalta scale [2]

Severity of symptoms and signs	Absent	Mild	Moderate	Severe
Symptoms				
Pain	0	1	2	3
Cramps	0	1	2	3
Heaviness	0	1	2	3
Paresthesia	0	1	2	3
Pruritus	0	1	2	3
Signs				
Pretibial edema	0	1	2	3
Skin induration	0	1	2	3
Hyperpigmentation	0	1	2	3
Redness	0	1	2	3
Venous ectasia	0	1	2	3
Pain on calf compression	0	1	2	3
Venous ulcer	0	1	2	3

Diagnosis if > 5 points

It is also impossible to predict when PTS symptoms will appear; the syndrome has been observed many months to several years after the thrombotic episode. The most common symptoms are heaviness, pain, limb swelling, and often trophic changes and ulceration (Figs. 1, 2).

In the general population, DVT occurs in 1–3 out of 1000 people per year. Among these DVT patients,

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Table 2. Risk factor of post-thrombotic syndrome [4–7]

1) Present at the time of the onset of DVT
• Age (risk increases with age)
• BMI (increased BMI or obesity)
• Venous insufficiency before a DVT episode
• Proximal DVT (especially in the iliac or femoral veins)
2) Related to the treatment of acute DVT
• Inadequate anticoagulation therapy (e.g. percentage of time with INR below therapeutic range is > 50%) during the first 3 months of VKA treatment
3) Present after a DVT episode
• Recurrent DVT on the same side
• Persistent DVT symptoms one month after diagnosis
• Persistent thrombus found on ultrasound 3–6 months after DVT episode
• Increased level of D-dimer
Factors that do not increase the risk of PTS
• Gender
• Type of DVT episode (secondary v. idiopathic)
• Congenital thrombophilia
• Duration of anticoagulation therapy

BMI: body mass index; INR: international normalized ratio; VKA: vitamin K antagonist; PTS: post-thrombotic syndrome; DVT: deep-vein thrombosis

20–50% will develop PTS, and 6–10% will have severe PTS [4]. A good demographic and epidemiological example is the practice of family doctors, which in Poland provide care for about 2,000 patients on average, which means 2 patients with PTS annually in this population. The incidence of DVT is comparable in men and women, but depends on age. It is very rarely diagnosed before the age of 20, and after the age of 40, its incidence doubles with each decade. This means that most of the patients are rather elderly people (although often in working age) in whom the symptoms and ailments related to DVT will largely affect the quality of life, limit mobility and social activity, and generate huge expenses related to treatment, which are a heavy burden on the healthcare budget. Thus, protecting patients from the consequences of a lower limb thrombosis is important not only for the individual but for the entire system. Therefore, the importance of this document that contains the latest recommendations for the prevention of DVT should be appreciated.

Evidence is now available that there are many modifiable risk factors that can guide therapeutic strategies to reduce the risk of PTS. Two of them should be highlighted: prevention of venous thrombosis and, when PTS occurs, drug therapy that is appropriately selected and administered for a sufficiently long time.

The best way to prevent PTS is to avoid getting DVT by using appropriate anticoagulant prophylaxis when there is an increased risk of developing this disease. For example, hospitalization significantly increases the risk of venous thromboembolism (VTE) (4.5 cases/1,000

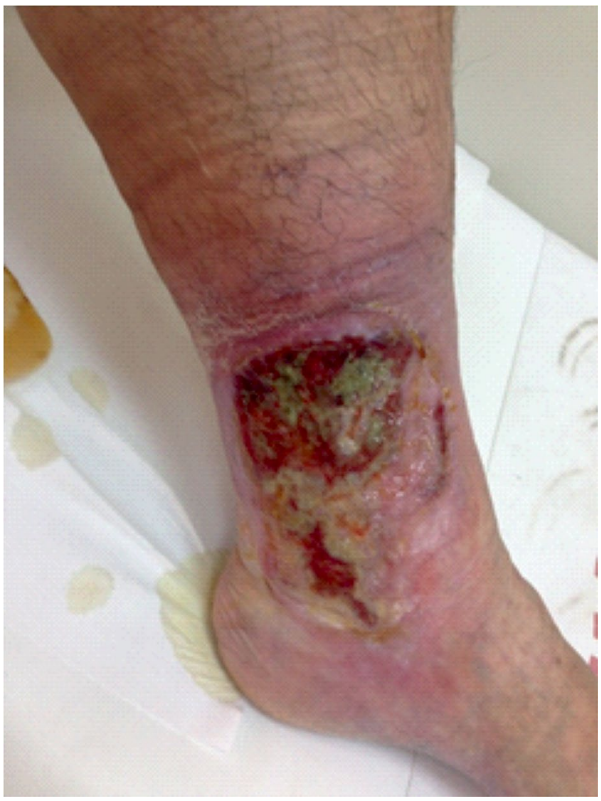

Figure 1. Ulceration in post-thrombotic syndrome

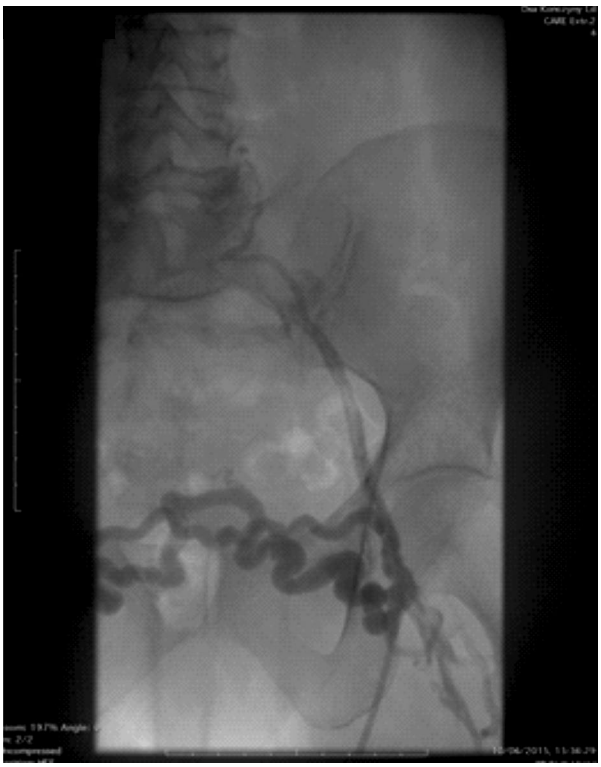

Figure 2. Venography with characteristic collateral circulation bypassing obstructed iliac system

hospital admissions) in patients treated conservatively, and this risk persists for 30 days after hospital discharge. It is also an important factor in increasing the thrombotic risk in cancer patients. Unfortunately, as shown by the results of the ENDORS trial, the use of thromboprophylaxis is far from satisfactory.

VTE risk scales for medical and surgical patients are well described and should be used to define indications for thromboprophylaxis. If thrombosis does occur in the context of PTS, the pathomechanism of its development (unprovoked or caused by a transient thrombotic risk factor) most likely does not play a role [8]. It should also be emphasized that PTS is a consequence of not only symptomatic DVT, but also asymptomatic. Considering the above, properly conducted thromboprophylaxis is of particular importance.

The choice of drugs and the management of patients with venous thrombosis can also have a huge impact on the development of PE. It has been proven that this is the case in patients treated with vitamin K antagonists (VKAs). The risk of developing post-thrombotic syndrome in this group of patients increases if the treatment of DVT during the first 3 months of VKA use is inappropriately conducted. Maintaining the international normalized ratio (INR) at the subtherapeutic level (< 2.0) for more than half of the treatment period increases the risk of PTS by 2.7 times [9]. Another study showed that when the subtherapeutic INR level is maintained for more than 20% of the treatment time, the odds ratio for PTS is 1.84 [95% confidence interval (CI) 1.13–3.01] [10]. Early and more extensive recanalization occurs when DVT is treated with anti-Xa anticoagulants such as low molecular weight heparin (LMWH) or rivaroxaban, which has the effect of reducing the incidence of PTS compared to anticoagulant treatment with VKA.

Currently, attention is being paid to strategies for determining the need and type of extended prophylaxis based on the balance of risk of recurrent DVT (residual thrombosis on ultrasound examination and assessment of D-dimer level in blood or risk scales, e.g. Vienna, HERDOO-2, DASH) versus the risk of bleeding.

It has been shown that recurrent thrombosis in the same limb increases the risk of PTS in various populations up to 10-fold, which is probably caused by further damage to the venous valves or intensification of blood flow disorders [11–14].

Indefinite anticoagulation treatment is recommended for the prevention of recurrent VTE in patients with a first episode of unprovoked proximal DVT of the lower limb or pulmonary embolism who are at low or moderate risk of hemorrhagic complications. If the risk of hemorrhagic complications is high or very high, it is advisable to limit the duration of anticoagulation therapy to 3 months or seek alternatives, such as sulodexide therapy. The study by Luzzi et al. [15] compared sulodexide with acetylsalicylic acid and standard treatment (compression therapy, regular exercise, control of risk factors and body weight) in the prevention of PTS. Over a 5-year follow-up, the risk of developing PTS was lower in the sulodexide group compared to standard therapy and acetylsalicylic acid use (12.7% vs. 18.23% vs. 23.5%, respectively; $p < 0.05$). Other advantages of sulodexide, which classic anticoagulants do not have, are the combination of venoactive and anticoagulant effects, and the prevention of DVT and its recurrence is the most important method of PTS prevention. In all patients treated with long-term anticoagulation, the indications for the continuation of this treatment should be periodically assessed (e.g. every 6–12 months) and further recommendations should be determined individually, after consultation with the patient (the importance of patient involvement in the treatment should be emphasized), taking into account both the risk of recurrence of thrombosis and the risk of bleeding complications [16].

Therefore, while encouraging you to read the guidelines "Management of chronic venous diseases of the lower extremities" by Andrew Nicolaides et al. [1], we would like to draw your attention to the chapter on the prevention of post-thrombotic syndrome, which in our opinion is the most important issue. The guidelines are based on the latest clinical trials and evidence-based medicine (EBM). They emphasize the role of properly used extended pharmacotherapy in the context of the risk of bleeding and the risk of recurrent DVT, which is also aimed at preventing PTS. The authors of this commentary fully support the expert position regarding the use of pharmacotherapy depending on the risk of recurrence and the risk of bleeding.

Patients at high risk of recurrence

1. If the risk of bleeding is low: any anticoagulant drug (VKA, rivaroxaban, apixaban) can be administered.
2. If the bleeding risk is moderate: apixaban.
3. If the risk of bleeding is high: low dose apixaban, sulodexide.

Patients at immediate risk of recurrence

1. If the risk of bleeding is assessed as low, any anticoagulant drug (VKA, rivaroxaban, apixaban) may be administered.
2. If the bleeding risk is moderate: apixaban.
3. If the risk of bleeding is high: low dose apixaban, sulodexide, aspirin.

Patients at low risk of recurrence

In patients with a low risk of recurrence, anticoagulants can be omitted, but if the patient prefers to continue with prophylaxis, the authors recommend aspirin or sulodexide.

Summary

According to the authors of the discussed document, one of the methods of preventing recurrence of thrombosis and the development of post-thrombotic syndrome is extended pharmacotherapy of DVT, based on the assessment of risks of disease recurrence and bleeding.

To reduce the number of relapses, extended VTE therapy with rivaroxaban, apixaban and sulodexide is recommended (evidence level A). In terms of the incidence of PTS in patients on these drugs, the scientific evidence is of lower quality (evidence level B) due to the lack of large randomized controlled trials.

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ORIGINAL PAPER

Acta Angiol
Vol. 27, No. 2, pp. 41–48
Doi: 10.5603/AA.2021.0011

ISSN 1234–950X
e-ISSN 1644–3276

The treatment of complex femoropopliteal atherosclerotic lesions: Conclusions from the unselected patient cohort

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Abstract

Introduction: *Endovascular techniques have revolutionized the treatment of lower extremity artery disease (LEAD). Despite this, the treatment of complex femoropopliteal lesions is a field of debate. This report summarizes the current experience in the treatment of complex femoropopliteal lesions in the author's center.*

Material and methods: *This is a retrospective, observational cohort study of patients with complex (TASC C and D) femoropopliteal lesions. The patients were treated using either endovascular procedure or surgical bypass. Details of the procedure, complications, mortality and amputation rate, primary and secondary patency rates, and reinterventions were analyzed.*

Results: *The study included 201 patients. One hundred thirty patients received endovascular treatment (ET), whereas in 67 a femoropopliteal bypass (FB) was implanted. The hybrid approach was utilized in 4 patients. ET was preferred in primary (88.5% vs. 47.8%, $p < 0.001$), shorter (25 vs. 30 cm, $p < 0.02$), TASC C lesions (63.1% vs. 40.3%, $p < 0.003$). Complications were more common in FB group (26.9% vs. 13.8%, $p < 0.03$). Reinterventions were similar. The postoperative stay was shorter in the ET group (1 vs. 6 days, $p < 0.001$). Primary and secondary patency rates for autologous vein reconstruction were insignificantly higher than for ET. Primary and secondary patency in patients with synthetic bypass was significantly inferior to autologous vein conduit (AVC) and endovascular procedure. The limb salvage at 3 years was highest in the ET group (94.1%) and the difference was significant ($p < 0.04$, and $p < 0.001$ for AVC and synthetic bypass, respectively).*

Conclusions: *ET is preferred in primary and shorter lesions and is related to the shorter postoperative stay. It carries a lower risk of major amputation than surgery. Autologous vein conduit provides highest primary and secondary patency rates. Both treatment options (surgery and endovascular) should be considered in patients with long femoropopliteal lesions to assure the optimal outcome.*

Key words: limb ischemia, TASC classification, endovascular, surgery, results

Acta Angiol 2021; 27, 2: 41–48

Introduction

Though endovascular techniques revolutionized the treatment of lower extremities artery disease (LEAD), long superficial femoral/popliteal artery (SFA/PA) lesions are still recognized as a field of controversy [1]. Some data indicate that the endovascular approach produces less durable results compared to surgical treatment [2, 3]. Many new endovascular technologies emerged in recent years and gained wide acceptance, including

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Table 1. Factors affecting the allocation of patients to the particular treatment group

Surgical bypass	Endovascular procedure
Failed endovascular attempt	Primary intervention
Occlusion after the second endovascular treatment	None/mild calcifications
Severe calcifications	Lack of adequate greater saphenous vein
Perceived low endovascular treatment durability	High-risk surgery (ASA 4)
Uncooperative patient	High risk of infection
Low-risk surgery (ASA 1–3)	

laser excision, mechanical debulking, and drug-coated balloons/stents [4–10]. Also, the experience in the endovascular treatment of long femoropopliteal lesions has grown. Despite the progress in endovascular treatment, many surgeons consider long lesions an indication to surgical management [10, 11]. On the other hand, a physician trained in both operative and endovascular techniques may offer well-tailored, individualized therapy to the patients [12]. In this study, contemporary practice in the treatment of complex femoropopliteal lesions in the author's center is evaluated.

Material and methods

This study was conducted on a cohort of LEAD patients with complex femoropopliteal lesions, successfully revascularized in the authors' center [13]. All patients gave fully informed consent to the offered procedure and were treated according to the Helsinki Declaration. The medical records of all patients with LEAD treated at the author's center between NOV. 2011 and MAR. 2017 were reviewed. Those with complex, femoropopliteal lesions were identified. The following preprocedural data were collected: demography, comorbidities, vascular treatment history, lesion extent, and ischemia severity. Digital subtraction angiography (DSA) and angio-CT images were analyzed to assign the adequate TASC class of the lesion. The outflow compromise was classified according to the number of significantly stenosed/occluded tibial vessels: 0 – no significant stenosis/occlusion observed, 1 – one artery significantly stenosed/occluded, 2 – two arteries significantly stenosed/occluded, 3 – three arteries significantly stenosed/occluded. This classification is reciprocal to the previously published and emphasizes the extent of the disease (the more arteries are involved, the higher is the score) [13]. The treatment plan was individually adjusted, considering the factors listed in Table 1. In complex situations, both treatment options were presented to the patient's decision. The endovascular procedure was conducted according to a standardized protocol. Following local anesthesia (1% lidocaine), the contralateral femoral artery was punctured (preferentially). Angiography confirmed the adequate qualification. At the beginning of the procedure, 50 IU per kilogram of unfractionated heparin (UFH) was administered. After crossing the aortic bifurcation, the operator inserted a 45–55 cm long 6 Fr straight or contralateral sheath (Flexor™, COOK, Bloomington, IN, USA). Then J-wire was exchanged to 0.035" hydrophilic, curved guidewire (ZIPwire™ Boston Scientific, Marlborough, MA, USA or AqWire™, EV3, North Plymouth, MN, USA). A diagnostic 4 Fr catheter (vertebral or modified Bernstein in most cases) was inserted. The subintimal loop technique was utilized to cross the lesion. If the passage was difficult, stiffer 0.014" and 0.018" guidewires (Astato 20 and 30, Asahi Intecc Co. LTD, Japan, or Spartacore, Abbott Vascular, Abbott Park, IL, USA) were utilized. In the case of reentry problems, a collateral-through reentry technique was employed to facilitate the procedure. Reentry devices were not utilized due to the reimbursement restrictions. After the lesion was crossed, it was dilated using a plain angioplasty balloon (in most cases Admiral Xtreme®, Medtronic, Dublin, Ireland). Aggressive dilatation was avoided (the maximal balloon diameter matched the size of the artery below the lesion). If the angioplasty was not sufficient in TASC C lesions, or a TASC D lesion was treated, self-expandable, nitinol stents were always implanted. The maximal oversize was one millimeter, but in the last two years, oversizing was generally avoided. No drug-coated devices were used due to reimbursement restrictions. After the procedure completion, the puncture site was secured by prolonged (6 hours) local compression or closure device (StarClose SE® or Perclose Proglide®, Abbott Vascular, Abbot Park, IL, USA). All patients were prescribed a lifelong statin and acetylsalicylic acid (ASA) (75 mg, once daily) as well as clopidogrel (75mg once daily) for 8 weeks following the procedure.

Patients assigned to surgery had ipsilateral great saphenous vein (GSV) duplex ultrasound (DUS) assessment before the surgery. Veins over 3 mm in diameter, without signs of previous thrombosis or significant focal dilatations/stenoses, were considered suitable. If only

a portion of the vein was adequate for the reconstruction, a combined vein/prosthetic bypass was created. The contralateral GSV was harvested in one patient. If the vein was unsuitable, a synthetic e-PTFE or reinforced e-PTFE bypass (Atrium, Getinge AB, Göteborg, Sweden) was inserted. Following the exposure of the common femoral and popliteal arteries and harvesting of GSV, a bolus of intravenous 50 IU per kilogram of heparin was administered. Then, the bypass was implanted in the conventional end-to-side manner, using continuous polypropylene sutures (Prolene®, Ethicon, Bridgewater, NJ, USA, or Surgilene®, Medtronic, Dublin, Ireland). During the postoperative period, the patients were daily evaluated until discharge. Patients with GSV bypass were prescribed lifetime statins and ASA (75 mg once daily). Those with artificial bypass or redo surgery were recommended a lifelong antithrombotic treatment (warfarin or acenocoumarol in a dose maintaining INR between 2 and 3). Further follow-up comprised of clinical assessment in the outpatient clinic according to the following schedule: 2–3 weeks, then 3, 6, 12 months, and then at 6–9 months intervals. The patients were instructed to report immediately if a sudden deficit of the perfusion occurred (signs of acute limb ischemia or limited walking capacity). During ambulatory visits, details on walking distance, capillary refill, and peripheral pulses were collected. Arterial duplex ultrasound was performed: routinely at 6–12 months interval and if perfusion deficit occurred.

Definitions: The primary patency was defined as the time of freedom from an occlusion/binary restenosis in the endovascular group and freedom from occlusion/binary stenosis of bypass or its anastomoses. The secondary patency was defined as the time of freedom from a definite target lesion occlusion or a definite bypass occlusion. Binary stenosis/restenosis was defined as a narrowing of the vessel, resulting in a blood-flow speed increase of at least 2.5 times the speed above the stenosis, measured in DUS or over 50% stenosis in the previously treated vessel segment revealed in angio-CT.

Statistics

The following parameters were evaluated: demography, comorbidities, ischemia severity, lesion details, procedures, the hospital stay, periprocedural complications, hospital, and follow-up mortality and amputations, primary and secondary patency rates and reinterventions. Numeric and nominal data were evaluated (mean, median, percentage) and compared using adequate statistical tests (Mann-Whitney test, 2 test, Fisher exact test). The distribution of numeric data was assessed using the Shapiro-Wilk test for normality. Primary and secondary patency, as well as limb salvage, were assessed using Kaplan-Maier survival analysis. The analysis of the impact of Rutherford's class, the presence of critical limb ischemia, previous vascular procedures, lesion length, TASC classification, outflow compromise, and complications on the primary and secondary patency was carried out. A relation of the following factors to limb loss was evaluated: age, sex, the critical limb ischemia, Rutherford class, previous vascular procedures, the lesion length, TASC II class, outflow compromise, smoking status, and complications. All analyses were accomplished using Fisher exact, χ^2, and Mann-Whitney tests. The logistic regression model was used to analyze factors correlating with limb survival. The multivariate Cox regression model was used to assess predictor variables for time-dependent outcomes. All multivariate tests were performed using MedCalc Statistical Software version 16.4.3. A p value < 0.05 was considered significant.

Results

Two hundred one patients with long lesions in the femoropopliteal segment (TASC II C and D) treated between N0V.2011 and MAR.2017 were evaluated. One hundred thirty patients received the endovascular procedure, whereas 67 patients were operated (femoropopliteal, below the knee bypasses). In 4 patients, a hybrid procedure was performed. During the analyzed period, an increasing number of endovascular procedures occurred ($p = < 0.001$, χ^2 test for trend). Details of demography, comorbidities, and lesions are presented in Table 2. Some significant differences between treatment groups were identified (hybrid procedures were excluded due to a small number of patients). The prevalence of renal insufficiency and stroke was higher in the endovascular group (EG) (7.7% vs. 0%, $p = 0.017$, and 10% vs. 0%, $p = 0.005$, Fisher exact test), whereas Rutherford 6 ischemia class and previous vascular interventions were more frequent in the surgical bypass group (SB) (25.4% vs. 6.2%, $p < 0.001$ and 52.2% vs. 11.5%, $p < 0.001$, respectively, χ^2 test). The lesions in the FB group were longer (30 vs. 25 cm, $p = 0.015$, Mann-Whitney test), and more severe (type D 59.7% vs. 36.9%, $p < 0.0024$, χ^2 test). Outflow compromise was similar in both groups.

Twelve patients (9.2%) with TASC C lesions received plain angioplasty. Angioplasty with stent implantation was recorded in 118 patients (90.8%). Iliac Complete™ (Medtronic, Dublin, Ireland) and Innova™ (Boston Scientific, Marlborough, MA, USA) were most frequently utilized [71.4%, (142 stents) and 14.1% (28 stents), respectively]. In the FB group, the prosthetic graft was utilized in 42 patients (62.7%), whereas 25 patients received GSV bypass (37.3%). The complications occurred in 36 patients (17.9%). No death was

Table 2. Demography, Rutherford classification, comorbidities and lesion characteristics (only significant differences presented)

	All# % (n)	Endovascular treatment % (n)	Surgical bypass % (n)	p
n	201	130	67	
Age (SD) years	66 (9.2)	66.2 (9.3)	65.5 (9.1)	ns
Sex (%)	73.1	72.3	89.6	< 0.006**
BMI (range)	26 (18–40)	26 (18–40)	28 (18–35)	ns
CAD (%)	32.3	36.9	25.4	ns
Hypertension (%)	61.7	64.6	59.7	ns
DM (%)	37.3	42.3	29.9	ns
AF (%)	7.5	9.2	4.5	ns
COPD (%)	9	9.2	9	ns
Hyperlipidemia (%)	3	2.3	4,5	ns
CRF (%)	5	7.7	0	0.017***
CHF (%)	5.5	6.2	4.5	ns
Stroke (%)	6.5	10	0	0.005***
Cancer (%)	3	3.1	1.5	ns
Hypothyroidism (%)	3.5	3.8	3	ns
Smoker (%)	79.3	76.8	80.6	ns
CLI (%)	64.2	62,3	68.7	ns
Rutherford 3 (%)	35.3	37.7	31.3	ns
Rutherford 4 (%)	25.9	26.9	20.9	ns
Rutherford 5 (%)	26.4	29.2	22.4	ns
Rutherford 6 (%)	12.4	6.2	25.4	< 0.001**
Primary intervention (%)	74.1	88.5	47.8	0.0**
Lesion Length (cm)	27	25	30	0.015*
TASC C	54.2	63.1	40.3	< 0.003**
TASC D	45.8	36.9	59.7	
Outflow compromise				
0	39.3	40.8	37,3	ns
1	26.9	28.5	20.9	ns
2	25.9	23.8	29.6	ns
3	8	6.9	9	ns

including 4 hybrid procedures; !p calculated for endovascular treatment and surgical bypass groups; * Mann-Whitney test; ** χ^2 test; *** Fisher exact test
AF: atrial fibrillation; BMI: body mass index; CAD: coronary artery disease; CHF: chronic heart failure; CLI: critical limb ischemia; COPD: chronic obstructive pulmonary disease; CRF: chronic renal failure; DM: diabetes

recorded during the periprocedural period. The median postprocedural hospital stay was shorter for endovascular patients (1 vs. 6 days, p < 0.001, Mann-Whitney test). Thirty patients (14,9%) were lost to follow-up. The median follow-up was 26 months (range 1–69 months). The mortality rate at follow-up was 9.9% (17 patients) (Table 3.). The causes of death were not related to the vascular procedure: cardiac – 9 patients, advanced cancer – 4 patients, infections, and multiorgan failure – 4 other patients.

Primary patency rate after 12, 24, and 36 months were 55.3%, 43.8%, and 37.6%, respectively. Detailed analysis revealed that primary patency was highest for autologous reconstruction (70.8%, 70.8%, and 60.7% at 12, 24, 36 months, respectively). Results for EG were inferior (59.8%, 46.2%, and 38.1% at 12, 24, 36 months, respectively), but the difference was not significant (p=0.17, log-rank test). Prosthetic reconstruction produced the worst results (35%, 21.3%, and 21.3% at 12, 24, 36 months, respectively) that were inferior

Table 3. The treatment outcomes summary

	All[#] (%)	Endovascular treatment (%)	Surgical bypass (%)	p[!]
Postprocedural stay median (days)	1 (1–77)	1 (1–32)	6 (4–77)	< 0.001*
Complications	17.9	13.8	26.9	< 0.03**
Lost to follow-up	14.9	15.4	14.9	ns
Median follow-up in months	26	24	34	0.02*
Occlusion/restenosis at follow-up[+]	52.2	45.8	63.6	0.02**
Reinterventions	28.9	23	38.1	0.03**
Death	9.9	9.1	12.3	ns
Limb salvage	86.2	94.6	70	< 0.001**

[#]including 4 hybrid procedures; !p calculated for endovascular treatment and surgical bypass groups; * Mann-Whitney test; ** χ^2 test, [#] including 4 hybrid procedures; [+] at least one incident of occlusion/restenosis

to both autologous graft and endovascular treatment (both p < 0,001, log-rank test). Only complications and grade 3 outflow compromise affected primary patency in multivariate analysis (HR 2.53, 95% CI 1.5–4.29, p < 0.001, and HR 2.59, 95% CI 1.16–5.78, p = 0.02, respectively, Cox proportional hazard regression).

Secondary patency rates after 12, 24, and 36 months were 66.7%, 53.6%, and 41.7%, respectively. The following results were recorded for autologous reconstruction: 74%, 74%, and 68.7% at 12, 24, and 36 months, respectively. Corresponding numbers for EG were 75.7%, 64%, and 54.9% at 12, 24, and 36 months, respectively). The difference was not significant (p = 0.42, log-rank test). Results of prosthetic reconstruction were disappointing (45.3%, 27.3%, and 27.3% at 12, 24, and 36 months, respectively), and significantly inferior to both autologous graft and endovascular treatment (p < 0.005, p < 0.001, respectively, log-rank test). Complications (HR 2.78, 95% CI 1.59–4.86, p < 0.001, Cox proportional hazard regression) and grade 3 outflow compromise (HR 2.48, 95% CI 1.07–5.72, p = 0.03, Cox proportional hazard regression) increased the risk of secondary patency loss. In contrast, primary intervention (HR 0.51, 95% CI 0.29–0.91, p = 0.02, Cox proportional hazard regression) was protective. Reinterventions occurred in 28.9% (52 patients).

Amputation free survival for the whole studied population at 12, 24, and 36 months was 89%, 86.6%, and 86.6%, respectively. The limb survival in the autologous reconstruction patients was 90.6% at 12, 24, and 36 months. Corresponding numbers for EG were 95,4% at 12, and 94,1% at 24 and 36 months, respectively). The difference was significant (p < 0.04, log-rank test). Results of prosthetic reconstruction were inferior to both autologous graft and endovascular treatment (70.4% at 12 months and 63.7% at 24 and 36 months, respectively), and significantly inferior to both (p < 0.008 and p < 0.001, respectively, log-rank test)

Endovascular treatment decreased the risk of limb loss (HR = 0.28, 95% CI 0.14–0.56, p<0.001, log-rank test). Significant relation between major amputation and the following factors was identified in the univariate analysis: CLI (p < 0.001, χ^2 test), type of lesion: primary vs. recurrent (p = 0.009, χ^2 test), TASC class (p = 0.03, χ^2 test), outflow compromise (p = 0.04, χ^2 test), prosthetic bypass (p < 0.001, χ^2 test), and complications (p = 0.009, χ^2 test). After multivariate analysis, synthetic bypass (OR 14.18, 95% CI 3.372.4–59.62, p < 0.001, logistic regression), complications (OR 3.51, 95% CI 1.08–11.46, p < 0.04, logistic regression), and noncritical ischemia (OR 0.06, 95% CI 0.007–0.58, p < 0.01, logistic regression) occurred significant (Table 4).

Discussion

Complex femoropopliteal lesions were considered an indication to surgical treatment for a long time. However, a significant treatment shift towards endovascular management is observed recently [14, 15]. The growing experience, new devices and technics, and patient's expectations are changing the landscape of treatment in this challenging area of vascular practice. The material presented above confirms this trend. Endovascular treatment is the first choice therapy in most patients with complex femoropopliteal lesions or burdened with high surgical risk. A femoropopliteal bypass is still an essential tool in the treatment of patients with unfavorable anatomy or expected low endovascular procedure durability. Nowadays, patients are referred to the vascular surgeon late, after previous, often multiple endovascular interventions, with significant

Table 4. The impact of selected factors on major amputations in the univariate and multiple regression analysis (an analysis of 176 patients)

	test	p
Sex	χ^2test	ns
Age	Mann-Whitney test	ns
Critical limb ischemia	χ^2test	**< 0.001***
Type of lesion (primary vs. recurrent)	χ^2test	**0.009**
Lesion length	Mann-Whitney test	ns
TASC class	χ^2test	**0.03**
Outflow compromise	χ^2test	**0.04**
Smoking	χ^2test	ns
Synthetic bypass	χ^2test	**< 0.001***
Complications	χ^2test	< 0.001*

* significant factors in the multiple regression analysis

outflow compromise. They frequently suffer from limb-threatening ischemia. All these factors increase the complexity of the surgical intervention. This trend, observed by others, was also clearly discernible in the material presented above [13]. Bypass patients suffered from more advanced (Rutherford 6) critical limb ischemia, had longer and more complex lesions than in the endovascular group. These factors adversely affect the durability of the procedure and increase the risk of treatment failure and limb loss [16–18]. Presented results, even though almost 2/3 of patients suffered from critical limb ischemia, and no drug-coated technology was utilized (national healthcare provider reimbursement restrictions) are encouraging. Treatment outcomes – 54.9% secondary patency rate and 76.1% amputation-free survival at 36 months follow-up – are similar to the results from other centers. Drug-eluting techniques will probably improve the outcomes in the future [19, 20]. Although autologous conduits yield the best primary and secondary patency rates, a frequent lack of suitable vein decreases the value of the surgical treatment [21]. In this series, 37% of patients qualified to surgical management had suitable GSV. Frequent prosthetic graft use negatively affected the limb salvage in the surgical treatment arm.

It must be underlined that prosthetic reconstruction is strongly related to limb loss in multivariate analysis. Possibly, collaterals ligation and formation of a scar in the area of surgical access alter the development of collateral circulation and impair blood supply to the foot in case of bypass occlusion. Endovascular procedures leave the collaterals intact in most cases and allow sufficient flow to develop. I believe the reduction in the amputation rate is the key argument in the debate on the optimal treatment of patients with long femoropopliteal lesions.

Significant outflow compromise (grade 3) negatively affected both the primary and secondary patency rates in the presented material. The impact of run-off compromise on the durability of vascular treatment in the femoropopliteal area remains unclear. Published results regarding operative as well as endovascular therapy are conflicting [22–26]. Regarding the results presented above, it seems reasonable to establish patency of at least one tibial artery during the procedure. The strength of this study is that it describes an unselected, "real-world" patient cohort. The only inclusion criteria were anatomic suitability (TASC C and D lesions) and immediate postprocedural success. No exclusions regarding the extent of the disease, the severity of ischemia (Rutherford 3–6), comorbidities, etc., gave a unique insight into the problem of vascular treatment in this demanding cohort of patients. The paradigm of patient-oriented therapy is appreciated. Despite the lack of randomization and possible selection bias, this study is an important voice in the ongoing debate on the best treatment strategy in patients with complex femoropopliteal lesions.

Limitations

A portion of patients (approximately 15%) was lost to follow-up in this study. It is a common situation in studies concerning limb ischemia [11]. The major reason, given during phone contacts, was a disregard of medical advice due to procedure success and lack of ischemia symptoms. Probably, a better education focusing on the impact of the follow-up on the long-term outcome would decrease the number of patients lost to follow-up.

Conclusions

Vascular bypass and endoluminal techniques play complementary roles in the treatment of complex femoropopliteal lesions. The patients with primary, type TASC C lesions are preferentially treated using endovascular techniques. Surgical bypass is preferred in more complex cases and secondary interventions. The results of prosthetic reconstruction yields inferior results to the autologous vein conduit and endovascular management. The endovascular treatment carries a lower risk of major amputation than the surgery. Grade 3 outflow compromise and complications negatively affect the durability of the procedure. The results presented above support the "endovascular first" strategy in the treatment of complex femoropopliteal lesions.

Conflict of interest

Educational grants from Medtronic, Boston Scientific, Cordis.

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VIA MEDICA

ORIGINAL PAPER

Acta Angiol
Vol. 27, No. 2, pp. 49–52
Doi: 10.5603/AA.2021.0009

ISSN 1234–950X
e-ISSN 1644–3276

Serum peroxiredoxin-1 in patients undergoing carotid endarterectomy: A short report

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Abstract

Introduction: *Endarterectomy of the internal carotid artery (CEA) plays an important role in the prevention of cerebral ischemic stroke; however, this surgical procedure may cause neurological complications. The aim of this study was to evaluate changes in serum levels of the oxidative stress marker peroxiredoxin-1 (PRDX1) in patients undergoing CEA.*

Material and methods: *Twenty-four patients undergoing endarterectomy for critical stenosis of the internal carotid artery participated in the study. Blood for testing was collected before CEA and twice after surgery. PRDX1 was determined by ELISA.*

Results: *The timing of blood sampling did not affect PRDX1 levels ($p > 0.05$). There was no statistically significant difference in serum PRDX1 levels between male and female groups and depending on the age of the patients ($p > 0.05$).*

Conclusion: *PRDX1 cannot be considered as a marker of neurological complications after CEA.*

Key words: brain ischemia-reperfusion injury, carotid endarterectomy, peroxiredoxin-1

Acta Angiol 2021; 27, 2: 49–52

Introduction

Stroke is the second leading cause of death worldwide and the leading cause of disability, with increasing prevalence in developing countries. An important cause of cerebral ischemic stroke is stenosis of the internal carotid artery. Secondary prevention of ischemic stroke includes carotid endarterectomy (CEA). The above surgical treatment can prevent cerebral ischemic stroke, but it also causes surgical complications [1–4].

The literature suggests that CEA may cause brain damage due to ischemia and reperfusion as well as postoperative hyperperfusion syndrome. The mechanism leading to cerebral hyperperfusion syndrome is unknown; it may be related to increased regional cerebral blood flow secondary to loss of cerebrovascular autoregulation. Cerebral damage due to ischemia and reperfusion has been observed in both experimental and clinical studies [5, 6].

Peroxiredoxins (PRDXs) are among the antioxidant enzymes involved in superoxide reduction to balance cellular levels of hydrogen peroxide (H_2O_2), which is essential for cell signaling and metabolism and acts as a regulator of redox signaling. In mammals, there

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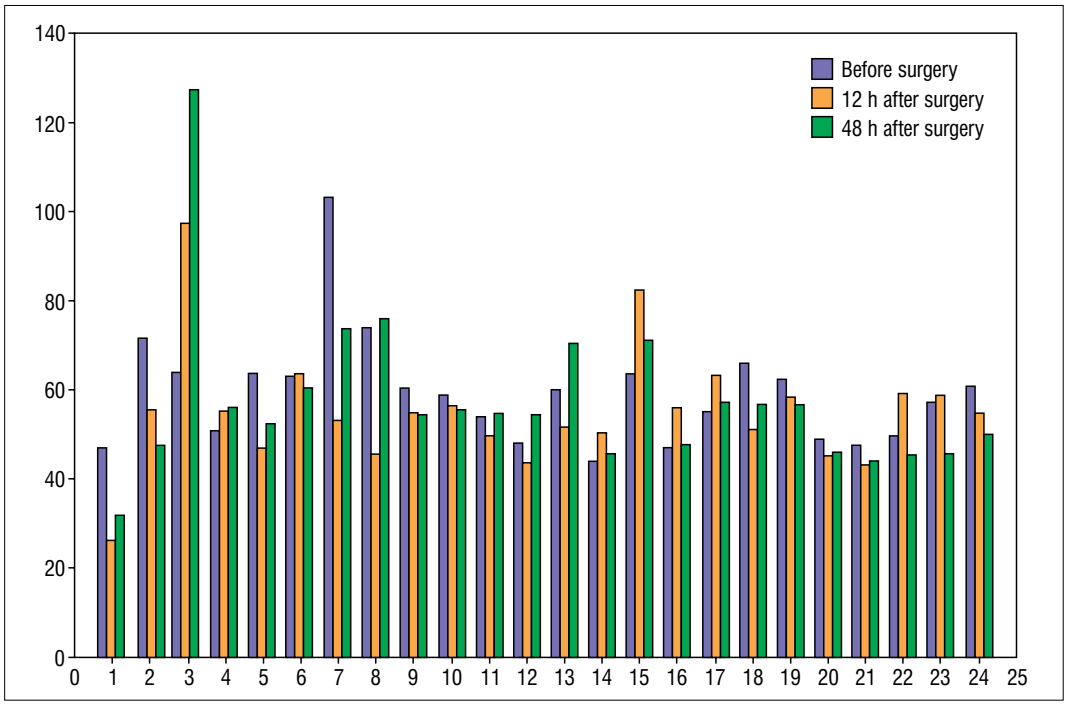

Figure 1. Serum PRDX1 [pg/mL] in patients

are six isoenzymes (PRDX1-6), classified as typical 2-Cys, atypical 2-Cys, or 1-Cys PRDXs. In addition to their superoxide scavenging activity, PRDXs are also involved in the regulation of various cell signaling pathways. Experimental studies indicate a protective role of PRDXs in various neurological diseases associated with oxidative stress and inflammation. There is also evidence suggesting a potential benefit of PRDXs in some human neurological diseases [7, 8]. PRDXs are released extracellularly from ischemic cells and initiate inflammation, leading to macrophage activation and a damaging cytokine response [9, 10].

The purpose of this study was to evaluate serum levels of PRDX1 in patients as a potential marker of CEA-induced neurological complications.

Material and methods

The study included patients hospitalized in the Department of Vascular Surgery and Angiology in Lublin. Patients were qualified for CEA because of critical stenosis of the internal carotid artery found on Doppler examination. Twenty-four patients (16 men, 8 women) participated in the study. The mean age of the patients was 71 years (55–88 years). Six patients had a history of ischemic stroke, while 4 patients had a history of transient cerebral ischemia.

Blood samples from the antecubital vein were collected: within 24 hours before CEA surgery [A], 12 hours after surgery [B], and 48 hours after surgery [C]. Serum PRDX1 levels were measured using a commercially available immunoassay Human PRDX1 (Peroxiredoxin-1) ELISA Kit; Wuhan Fine Biotech Co., Ltd., China).

For statistical analysis ANOVA test and Student's t-test were used. PRDX1 levels were determined in pg/mL. Values of $p < 0.05$ were taken as statistically significant.

The study was approved by the Bioethics Committee of the Medical University of Lublin.

Results

Serum PRDX1 levels in patients are presented in Figure 1.

Average PRDX1 level before CEA was 59.35 SD 12.45 pg/mL, 12 hours after surgery was 55.22 SD 13.44 pg/mL, and 48 hours after CEA was 57, 69 SD 18.06 pg/mL. ANOVA showed that the time of blood sample collection for testing did not affect PRDX1 levels ($p = 0.62$). However, there was a tendency for the level of the studied parameter to decrease 12 hours after surgery.

There was no statistically significant difference in serum PRDX1 levels between male and female groups and depending on the age of the patients ($p > 0.05$).

Discussion

A multicenter magnetic resonance imaging study reported 43.3% preoperative silent ischemic lesions and 9.2% new silent lesions after CEA [11]. Perioperative cerebral ischemic lesions on diffusion weighted imaging (DWI) after CEA are associated with a higher likelihood of recurrent cerebrovascular incidents. In patients undergoing CEA, symptom onset and elevated inflammatory markers are associated with a higher likelihood of lesions on perioperative DWI [12].

According to Shichita et al. [13], the onset of inflammatory process after ischemia is an important step in the progression of ischemia-reperfusion brain injury. The authors demonstrated that PRDXs family proteins released extracellularly from necrotic brain cells increase the expression of inflammatory cytokines through activation of Toll-like receptors 2 (TLR2) and TLR4, causing neuronal cell death, despite the fact that intracellular PRDXs exhibit neuroprotective effects. Intracellular release of PRDXs was observed 12 h after the onset of ischemic stroke, and neutralization of extracellular PRDXs by antibodies inhibited inflammatory cytokine expression and infarct volume growth. Brea et al. [14] found that PRDX1 expression was 10-fold stronger in ischemic stroke patients than in healthy subjects.

In the study conducted by Liu et al. [15], by using a mouse model of ischemia-reperfusion injury, the authors found that PRDX1 expression was up-regulated during ischemia-reperfusion injury in a time-dependent manner. Additionally, PRDX1-knockout mice showed reduced infarction area and alleviated neuropathological scores with decreased brain water contents. Furthermore, cell death and inflammatory response in mice with cerebral ischemia-reperfusion injury were markedly attenuated by PRDX1 knockout. The authors concluded that PRDX1 contributed to cerebral stroke by interacting with TLR4, providing an effective therapeutic approach for cerebral ischemia-reperfusion injury.

PRDX1 induces free radical scavenging. Based on their study, Tao et al. [16] conclude that nitrosative stress during ischemia activates E6AP E3 ubiquitin ligase, which ubiquitinates PRDX1 and subsequently exacerbates brain damage. Therefore, targeting the PRDX1 antioxidant defense pathway may represent a novel treatment strategy to protect the neurovascular system in stroke.

According to Richard et al. [17] accurately determining time-of-onset of cerebral infarction is important to clearly identify patients who could benefit from reperfusion therapies. The authors assessed the kinetics of PRDX1, a protein involved in oxidative stress during the acute phase of ischemia, and its ability to determine stroke onset in a population of patients with known onset of less than 24 hours and in a control group. PRDX1 levels were significantly higher in stroke patients compared to controls. PRDX1 levels were also higher in blood samples withdrawn before vs. after 3 hours following stroke onset, and before vs. after 6 hours. The authors suggest that PRDX1 levels could be the basis of a new method using biomarkers for determining cerebral infarction onset.

In our study, the change in serum PRDX1 levels could reflect the ischemia-reperfusion syndrome caused by CEA. However, this study showed that CEA had no significant effect on the serum PRDX1 levels of patients, which indicates that PRDX1 cannot be considered as a marker of neurological complications after CEA.

Conflict of interest

None.

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VIA MEDICA

REVIEW

Acta Angiol
Vol. 27, No. 2, pp. 53–56
Doi: 10.5603/AA.2021.0008

ISSN 1234–950X
e-ISSN 1644–3276

Head and neck lymphoedema

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Abstract

Lymphoedema is a common condition of tissue swelling and fluid retention due to improper tissue drainage and a sign of lymphatic system dysfunction. It may occur on the trunk, limbs and in the head and neck region – head and neck cancer. Head and neck lymphoedema is a common complication of ENT procedures. The research reveals that up to 50% of patients with head and neck cancer develop head and neck lymphoedema. The lack of appropriate diagnostics and treatment of lymphoedema leads to serious complications, longer hospitalization and much higher costs of treatment. Head and neck lymphoedema significantly increases the level of frustration in patients, especially those with cancer who experience greater stress and anxiety as a result of uncertain prognosis. Therefore, it is advisable to broaden the research on HNL diagnosis and treatment. This review presents symptoms, current diagnostic strategies, treatment and recommendations in head and neck lymphoedema.

Key words: head and neck cancer, head and neck lymphoedema, complete decongestive therapy

Acta Angiol 2021; 27, 2: 53–56

Introduction

Lymphoedema is a condition of tissue swelling and fluid retention due to improper tissue drainage and a sign of lymphatic system dysfunction. We can divide this condition into primary and secondary. Primary lymphoedema is caused by congenital defects of the lymphatic system, while secondary lesions are acquired impairments [1]. Chronic lymph stasis leads to inflammation with the increased proliferation of fibroblasts and connective tissue. Lymphoedema can cover various areas of the body and is very often a serious complication of cancer treatment. It may occur on the trunk, limbs and in the head and neck region – head and neck cancer (HNC) [1].

The most common causes of lymphoedema are the removal of lymph nodes, radiotherapy, pre- or postoperative chemotherapy, injuries and infections (filariasis) [2–4]. Obesity is very often indicated as a significant risk factor for HNL; however, this mechanism has not yet been elucidated [5]. Recent results have also shown the polymorphism in many genes that may be associated with lymphoedema, particularly in patients treated for breast cancer [6, 7]. According to Wolff et al. [8] and Tribius et al. [9], HNL may be a complication of the treatment with cisplatin and radiotherapy, although the relationship between HNL and cisplatin has not been confirmed.

HNC constitutes 3–5% of all neoplasms [10]. The research reveals that up to 50% of patients with HNC develop HNL [11–14]. According to Deng et al. [15], HNL was found in 75.3% of patients with HNC, including 9.8% with external oedema, 39.4% with internal oedema and 50.8% with mixed oedema. However, there are not many works that thoroughly discuss this issue.

Symptoms

Progressive lymphoedema is manifested by a feeling of compression, initially without damage to the organ/tissue functions. This effect is not only aesthetic but also functional. We divide postoperative lymphoedema

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into early and late. Early (acute) lymphoedema is the result of lymph nodes removal and usually resolves after a few days or weeks. It seems that this is the effect of regeneration of the lymphatic vessels, which later in some individuals degenerate for various reasons and permanent lymphoedema develops. Delays can last from several weeks to many years. Significant lymphoedema of the face, mouth and neck can impair the ability to talk, hear, eat and breathe. In advanced cases, dyspnoea in the course of HNL may require tracheotomy [16]. Patients after laryngectomy often have a difficulty in swallowing and breathing or require voice rehabilitation due to HNL. Lymphoedema of internal organs seems to be unique for HNL. In cases of limb oedema, the lesions affect the skin and subcutaneous tissue.

After interventions in the area of the throat and larynx, intraoral oedema often occurs, which impairs the process of swallowing [17, 18] and may sometimes require gastrostomy to feed the patient. Dysphagia in the advanced stage of HNL leads to a significant reduction in the quality of life [18, 19].

In addition to collecting lymph, the lymphatic system is a part of the immune system, which is responsible for the transport of cells, and therefore, apart from oedema, the local immune system is also impaired. Patients with HNL are exposed to frequent bacterial and fungal infections.

The psychological effect also seems to be important because patients with cancer and the accompanying growing lymphoedema of the face and neck more often manifest the symptoms of depression [20]. The treatment of HNL is necessary due to the impairment of the function of tissues and organs, as well as a significant reduction in the quality of life [20, 21].

The symptoms are divided according to MDACC (M.D. Anderson Cancer Centre Head and Neck Lymphedema Program) into mild to moderate HNL (visible swelling under the chin or on the face, including the eyes and mouth, the feeling of compression and limitation of movement) and into moderate to severe HNL (hard oedema, damage to sight/hearing, problems with swallowing/breathing/eating/speaking, chronic ear pain) [22].

The prevention of HNL after surgery is very important also to prevent infections, because lymph stasis impairs local antimicrobial defence. It is also recommended to raise the head above the level of the body, especially during sleep; proper hydration of the skin is also advisable.

Diagnostics

Diagnosis is usually made based on medical history and physical examination. In addition, imaging studies showing the abnormal lymph flow, and local accumulation of fluid such as lymphoscintigraphy, computed tomography, magnetic resonance imaging, near-infrared fluorescence imaging (NIRF) and ultrasound examination [17] can be performed. The measurements of neck circumference and distances between anatomic points are often used to assess HNL. HNL is evaluated using ISL classification (Table 1).

Internal oedema of the mucous membrane and soft tissues of the throat and larynx found in the endoscopic examination is assessed according to the Patterson scale.

Bioelectrical impedance measurements can also be used.

Treatment

In order to avoid the complication of connective and fat tissue proliferation, the treatment of HNL should be implemented as soon as possible after making a diagnosis. Complete decongestive therapy (CDT) is the gold standard for the treatment of lymphoedema. This method, which is applied by therapists, consists of lymphatic drainage, compression therapy, physical exercises, skin hygiene education and avoiding infection. Manual lymph drainage (MLD), that is a part of CDT, is a method originally created for the treatment of chronic sinusitis [23, 24]. The technique had been improved for many years, until finally Foldi and Asdonk developed a scheme included in CDT.

In some cases, surgical treatment is required. Liposuction is performed in order to remove the accumulating lymph and adipose tissue [25] or to create lympho-venous anastomoses, especially as a prevention of oedema or treatment of the early stages [26]. It is also possible to perform tissue transplantation from other parts of the body [27]. Surgical treatment is implemented if CDT therapy is ineffective or when severe breathing or swallowing disorders occur.

According to Piso et al. [17] and Brad et al. [29], postoperative oedema significantly reduced following MLD, which was confirmed by Szolnoky et al. [30].

Conclusions

Despite the constantly increasing head and neck cancer incidence, the patients' life span prolongs. Although aggressive therapy performed in patients with local progression of the tumour allows for full recovery, it leads to early and late iatrogenic complications [10, 31].

The number of indications for ENT procedures is also increasing, and surgery has become safer than before.

HNL is a common complication of ENT procedures. The lack of appropriate diagnostics and treatment of

lymphoedema leads to serious complications, longer hospitalization and much higher costs of treatment [30]. HNL significantly increases the level of frustration in patients, especially those with cancer who experience greater stress and anxiety as a result of uncertain prognosis [32–35]. Therefore, it is advisable to broaden the research on HNL diagnosis and treatment.

Conflict of interest

None.

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VIA MEDICA

YOUNG VASCULAR SURGEONS OR DOCTORS

Acta Angiol
Vol. 27, No. 2, pp. 57–60
Doi: 10.5603/AA.2021.0010

ISSN 1234–950X
e-ISSN 1644–3276

Postoperative endoleak after EVAR and effective endovascular reintervention. The case of the 64-year-old male with abdominal aortic aneurysm with concomitant common iliac artery aneurysm

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Abstract

Endovascular aneurysm repair (EVAR) is a widely accepted alternative for open surgical repair (OSR) in the treatment of an abdominal aortic aneurysm (AAA). Meta-analyses of randomized controlled trials revealed significantly lower short-term mortality after EVAR procedure than OSR. From a technical point of view, proper sizing and selection of the stent-graft is very important. Most instructions for use (IFUs) of the current endografts recommend 10–20% oversizing concerning the preoperative aortic diameter. It can prevent endoleaks or subsequent complications such as displacement of the leg to the abdominal aneurysmal sac. In this paper, we present a case of a 64-year-old male with a history of abdominal aortic aneurysm with concomitant common iliac artery (CIA) aneurysm. The patient underwent endovascular implantation of bifurcated stent-graft with extension to the right common iliac artery. He was admitted to the Department of Vascular Surgery due to increasing pain in the right-lower abdomen. The analysis of the imaging examination and the symptoms of an increasing lower limb ischaemia caused by deformation of the stent-graft allowed deciding for an endovascular intervention involving the implantation of the iliac side branch device (IBD). Postoperative angiography confirmed the correct location of the IBD with proper blood flow. After five days the patient was discharged home.

Key words: EVAR, iliac side branch device, endoleak, common iliac artery aneurysm

Acta Angiol 2021; 27, 2: 57–60

Introduction

National health services screening programs report that 0.8% of examined men had an AAA measuring between 3.00 cm and 5.49 cm and were currently under surveillance. Less than 0.1% men had larger aneurysms – over 5.5 cm. [1]. For more than two decades EVAR has been a valuable alternative for open surgery in the management of AAA. Over the last years, the treatment of AAA and/or iliac artery aneurysm has undergone many modifications and improvements. Complications after EVAR can be serious, and sometimes require immediate diagnosis and interventions [2]. The most common complication of stent-graft placement is endoleak [3]. Al-Juburi et al. [4] reported that endoleak was responsible for 66% of EVAR reinterventions in

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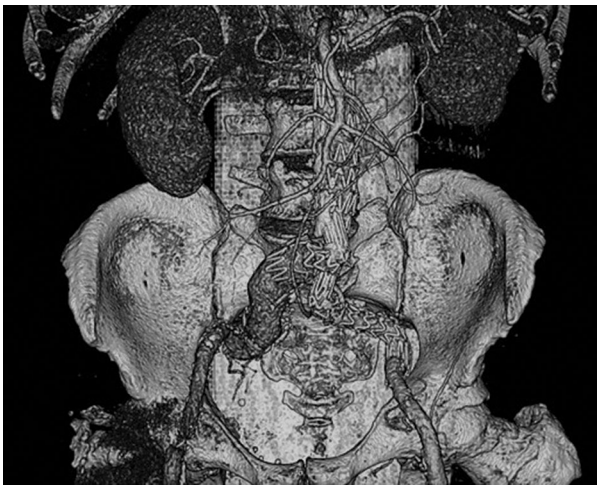

Figure 1. Angio-CT showing migration of the stent-graft

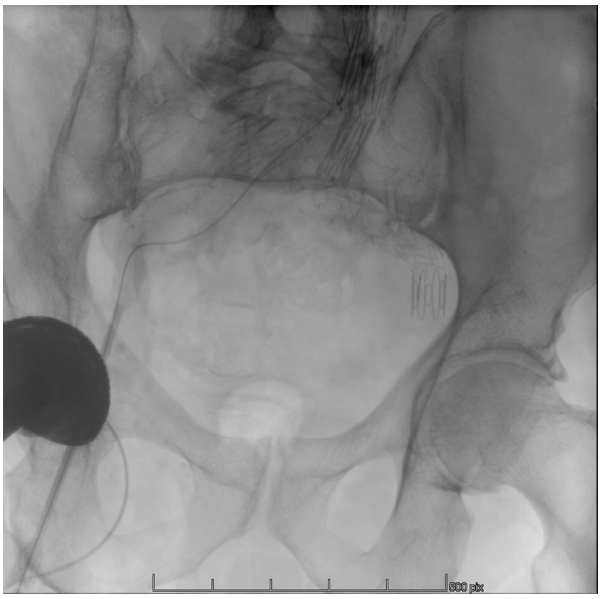

Figure 2. Catheterisation of right iliac axis

their results. From a technical point of view, proper sizing and selection of the stent-graft is very important. Depending of the anatomy of AAA and involvement of iliac arteries, several options of endovascular aortoiliac repair are available including: implantation of extension to external iliac artery with optional coil embolization of hypogastric artery or implantation of iliac side branch device or iliac branch endoprosthesis (IBD/IBE).

Case study

The case of 64-year-old man with a history of chronic obstructive pulmonary disease, hypertension and right hip replacement surgery (in 2009) is presented. In 2016 patient underwent implantation of bifurcated stent-graft with extension to the right common iliac artery because of AAA – with concomitant common iliac artery (CIA) aneurysm. He was admitted to the Department of Vascular Surgery due to increasing pain in the right-lower abdomen. Preoperative workup including a computed tomography angiography (angio-CT) showed migration of the stent-graft (Fig. 1). Imaging test also revealed stent-graft kinking that caused a flow restriction and lumen stenosis. Decision about treatment method was made after analysis of the imaging examination and the exacerbation of chronic lower limb ischaemia. Patient was qualified for the endovascular intervention involving the implantation of the Zenith® Branch Endovascular Graft-Iliac Bifurcation to the right external iliac artery with the branch to the right internal iliac artery. Vascular access was obtained through the left brachial artery (Fig. 2). Postoperative angiography confirmed the correct placement of the IBD with proper blood flow (Fig. 3). On the fifth day after the endovascular procedure, the patient

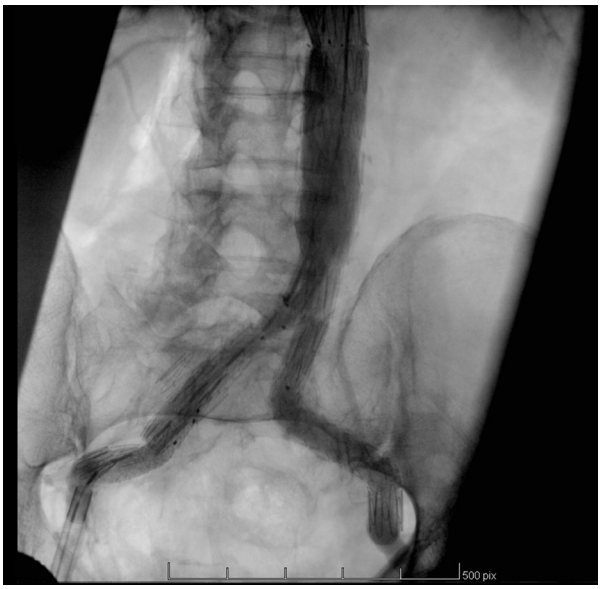

Figure 3. Angiography after implantation of IBD. Confirmation of the optimization of the blood flow and correct position of the IBD

was discharged home in good general condition with recommendations for regular controls in the outpatient vascular surgery clinic.

Discussion

Meta-analyses of randomized controlled trials comparing endovascular aneurysm repair (EVAR) with open surgical repair (OSR) revealed significantly lower short-

term mortality after EVAR procedure than OSR [5–9]. Complication rates after EVAR reach 30% while late complications occur in 3% of cases [10, 11]. Moreover, systematic follow-up of patients after EVAR is equally important, what allows immediate detection and intervention in case of complications. The highest rate of the reinterventions after EVAR was reported during the first 6 months, with further reinterventions peak after 2 years. The critical factors which increase graft-related complication are: larger initial aneurysm diameter and older age of the patient [12]. Most instructions for use (IFUs) of the current endografts recommend 10–20% oversizing for the preoperative aortic diameter [13]. Conrad et al. [15] found that AAA sac size more than 5.5 cm and preprocedural coil embolization of the hypogastric or inferior mesenteric artery were predictors of endoleaks requiring reintervention. In the presented case, dislocation of the right iliac extension was caused by type III of endoleak. It could be caused by the defect of the extension leg, incorrect fixation in the common iliac artery or increasing of the diameter of the AAA [16]. The methods of reintervention after stent-graft migration include: implantation of an iliac side branch device, hypogastric coiling or open repair (OR) [17]. Verzini et al. [18] revealed no significant differences in reintervention rates at one-year after IBD implantation in comparison with hypogastric artery coiling, whereas iliac endoleak in log-term follow-up was present in 19% of patients after coiling and only in 4% of patients after IBD placement. Donas et al. [19] found that the lower invasiveness of the procedure and better intraoperative and postoperative outcomes justify the use of IBD rather than OR for patients with suitable anatomy. Moreover, the infrequent occurrence of buttock claudication and pelvic ischaemia bring a strong argument for the use of IBD.

Based on a presented case it is possible to state the following conclusions:

- Endoleaks are the most common complications after EVAR They can be successfully treated by endovascular methods.
- Implantation of IBD is an effective method of reintervention caused by the endoleak with better postoperative outcomes than OR.

Conflict of interest

None.

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AUTHORS GUIDELINES

PURPOSE AND SCOPE

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– wiele wskazań[1] i rekomendacji[2,3,4,5]

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B – Przedłużona profilaktyka nawrotu ŻChZZ po incydencie zatorowości płucnej**,[3]

Przewlekła Niewydolność Żylna (PNŻ)

B – Leczenie objawowe PNŻ (ból, obrzęk)***,[4]

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CZERWONE KAPSUŁKI 100% ORIGINAL

VDF/09.2021/rekl-chir

* International Angiology rekomenduje sulodeksyd w połączeniu z kompresjoterapią przez okres 2 lat po incydencie ZŻG (GRADE A). ** U pacjentów bez choroby nowotworowej, którzy przebyli incydent zatorowości płucnej i odmawiają przyjmowania lub nie tolerują żadnej formy doustnych leków przeciwkrzepliwych. *** Leczenie skojarzone z terapią uciskową. **1.** Charakterystyka Produktu Leczniczego Vessel Due F. **2.** Nicolaides et al. Management of chronic venous disorders of the lower limbs. Guidelines According to Scientific Evidence. Part II International Angiology 2020 Jun; 39(3):175-240. **3.** Konstantinides et al. 2019 ESC Guidelines for the diagnosis and management of acute pulmonary embolism developed in collaboration with the European Respiratory Society (ERS). European Heart Journal 2020 Jan 21; 41(4):543-603. **4.** Gloviczki et al. The care of patients with varicose veins and associated chronic venous diseases: clinical practice guidelines of the Society for Vascular Surgery and the American Venous Forum. J. Vasc. Surg. 2011 May; 53(5 Suppl):2S-48S. **5.** Nicolaides et al. Management of chronic venous disorders of the lower limbs. Guidelines According to Scientific Evidence PART. International Angiology 2018 Jun; 37(3):181-254.

VESSEL DUE F® 250 LSU, kapsułki miękkie SKŁAD: 1 kapsułka zawiera: 250 LSU sulodeksydu (Sulodexidum), 0,26 mg etylu parahydroksybenzoesan sodowy, 0,13 mg propylu parahydroksybenzoesan sodowy, sodu laurylosarkozynian, krzemionka koloidalna uwodniona, triacetyna, żelatyna, glicerol, tytanu dwutlenek (E 171), żelaza tlenek czerwony (E 172). POSTAĆ FARMACEUTYCZNA: Ceglastoczerwone, owalne kapsułki miękkie. WSKAZANIA TERAPEUTYCZNE: Prod. lecz. jest wskazany do stosowania u dorosłych. Leczenie objawowe pierwotnej i wtórnej przewlekłej niewydolności żylnej. Leczenie owrzodzeń żylnych podudzi jako uzupełnienie terapii miejscowej. Leczenie objawowe przewlekłej obturacyjnej choroby tętnic kończyn dolnych o umiarkowanym nasileniu (II stopień klasyfikacji Fontaine`a). Przedłużona wtórna profilaktyka żylnej choroby zakrzepowo-zatorowej u pacjentów, którzy zakończyli standardowe leczenie przeciwzakrzepowe (3 do 12 miesięcy) z powodu zakrzepicy żył głębokich lub zatorowości płucnej. Leczenie twardych wysięków u pacjentów z nieproliferacyjną łagodną do umiarkowanej retinopatią cukrzycową. DAWKOWANIE I SPOSÓB PODAWANIA: Leczenie objawowe pierwotnej i wtórnej przewlekłej niewydolności żylnej: 2 kaps. (500 LSU) 2 razy na dobę między posiłkami. Leczenie owrzodzeń żylnych podudzi jako uzupełnienie terapii miejscowej: 1 amp. (600 LSU) raz na dobę domięśniowo przez 20 dni, następnie 2 kaps. (500 LSU) dwa razy na dobę między posiłkami przez 30-70 dni. Leczenie objawowe przewlekłej obturacyjnej choroby tętnic kończyn dolnych o umiarkowanym nasileniu (II stopień klasyfikacji Fontaine`a): 1 amp. (600 LSU) raz na dobę domięśniowo prze 20 dni, następnie 2 kaps. (500 LSU) dwa razy na dobę między posiłkami przez 6 miesięcy. Przedłużona wtórna profilaktyka żylnej choroby zakrzepowo-zatorowej u pacjentów, którzy zakończyli standardowe leczenie przeciwzakrzepowe (3 do 12 miesięcy) z powodu zakrzepicy żył głębokich lub zatorowości płucnej: 2 kaps. (500 LSU) 2 razy na dobę między posiłkami. Leczenie twardych wysięków u pacjentów z nieproliferacyjną łagodną do umiarkowanej retinopatią cukrzycową: 1 kaps. (250 LSU) 2 razy na dobę między posiłkami. Nie określono dotychczas bezpieczeństwa stosowania ani skuteczności prod. lecz. Vessel Due F u dzieci i młodzieży. Nie ma dostępnych danych. PRZECIWWSKAZANIA: Nadwrażliwość na substancję czynną lub na którąkolwiek substancję pomocniczą, heparynę lub leki heparynopodobne. Jednoczesne stosowanie heparyny lub doustnych antykoagulantów. Skaza krwotoczna i choroby przebiegające z krwawieniami. SPECJALNE OSTRZEŻENIA I ŚRODKI OSTROŻNOŚCI DOTYCZĄCE STOSOWANIA: W związku z niewielką toksycznością prod. lecz. nie zaleca się szczególnych środków ostrożności w czasie jego stosowania. Podczas jednoczesnego podawania innych leków przeciwzakrzepowych niezbędna jest jednak regularna kontrola parametrów krzepnięcia krwi. Prod. lecz. zawiera etylu parahydroksybenzoesan sodowy oraz propylu parahydroksybenzoesan sodowy i dlatego może powodować reakcje alergiczne (możliwe reakcje typu późnego). Prod. lecz. zawiera mniej niż 1 mmol (23 mg) sodu w kaps., to znaczy lek uznaje się za „wolny od sodu". DZIAŁANIA NIEPOŻĄDANE: Częstość występowania działań niepożądanych szacowano następująco: często (≥1/100 <1/10); niezbyt często (≥1/1 000 <1/100); rzadko (≥1/10 000 <1/1 000); bardzo rzadko (<1/10 000), nieznana (częstość nie może być określona na podstawie dostępnych danych): Działania niepożądane, które wystąpiły w trakcie badań klinicznych (uczestniczyło w nich w sumie 3258 pacjentów). Bardzo rzadko: krwawienie w obrębie żołądka, obrzęki obwodowe, utrata przytomności. Niezbyt często: uczucie dyskomfortu w obrębie jamy brzusznej, dyspepsja, wzdęcia, wymioty, ból w miejscu podania (w przypadku r-ru do wstrzyk.), krwiak w miejscu podania (w przypadku r-ru do wstrzyk.), ból głowy, wyprysk, rumień, pokrzywka. Często: zawroty głowy, ból w nadbrzuszu, biegunka, ból żołądka, nudności, wysypka; Działania niepożądane, które obserwowano po wprowadzeniu leku na rynek: Bardzo rzadko: po zastosowaniu leku w postaci kaps. – niedokrwistość, ból brzucha, zaburzenia żołądkowo-jelitowe, smołowate stolce, zaburzenia metabolizmu białek osocza krwi, obrzęk i rumień w obrębie genitaliów, zbyt częste miesiączkowanie, obrzęk naczynioruchowy, wybroczyny. PODMIOT ODPOWIEDZIALNY: ALFASIGMA S.p.A., Via Ragazzi del '99, n. 5 40133 Bologna (BO) Włochy. POZWOLENIE NA DOPUSZCZENIE DO OBROTU (wydane przez MZ): R/0396. Kategoria dostępności: Rp.

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