



Appearance of femoropopliteal segment aneurysms in patients with abdominal aortic aneurysm

Pojava aneurizmi femoropoplitealnog segmenta kod bolesnika sa aneurizmom abdominalne aorte

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Abstract

Background/Aim. To promote better treatment outcome, as well as economic benefit it is very important to find out patients with simultaneous occurrence of both aortic and arterial aneurysms. The aim of this prospective study was to determine the frequency and factors affecting femoropopliteal (F-P) segment aneurysms appearance in patients with abdominal aortic aneurysms (AAA). **Methods.** This study included 70 patients who had underwent elective or urgent surgery of AAA from January 1, 2006 to December 31, 2007. After ultrasonographic examination of F-P segment, all the patients were divided into two groups – those with adjunctive F-P segment aneurysm (n = 20) and the group of 50 patients with no adjunctive F-P segment aneurysm. In both groups demographic characteristics (gender, age), risk factors (diabetes mellitus, elevated serum levels of cholesterol and triglycerides, arterial hypertension, smoking, obesity) and cardiovascular comorbidity (cerebrovascular disease, ischemic heart disease) were investigated. **Results.** Twenty (28.57%) patients who had been operated on because of AAA, had adjunctive aneurysmal disease of F-P segment. Diabetes was no statistically significantly more

present among the patients who, beside AAA, had adjunctive aneurysmal disease of F-P segment ($\chi^2 = 0.04$; DF = 1; $p > 0.05$). Also, in both groups there was no statistically significant difference in gender structure ($\chi^2 = 2.05$; DF = 2; $p > 0.05$), age ($\chi^2 = 5.46$; DF = 1; $p > 0.05$), total cholesterol level ($\chi^2 = 0.89$; DF = 1; $p > 0.05$) and triglyceride ($\chi^2 = 0.89$; DF = 1; $p > 0.05$) levels, the presence of arterial hypertension ($\chi^2 = 1.38$; DF = 2; $p > 0.05$), smoking ($\chi^2 = 1.74$; DF = 1; $p > 0.05$), obesity ($\chi^2 = 1.76$; DF = 1; $p > 0.05$) and presence of cerebrovascular disease ($\chi^2 = 2.34$; DF = 1; $p > 0.05$). Conversely, ischemic heart disease was statistically significantly more present among the patients who, beside AAA, had adjunctive aneurysmal disease of F-P segment ($\chi^2 = 5.45$; DF = 1; $p < 0.05$). **Conclusion.** Twenty patients, beside AAA, had adjunctive F-P segment aneurysm. The results of this study suggest the necessity of performing ultrasonographic examination of F-P segment in all patients with proven AAA.

Key words: aneurysm; femoral artery; popliteal artery; risk factors; diagnosis; ultrasonography; aortic aneurysm, abdominal.

Apstrakt

Uvod/Cilj. Zbog boljeg ishoda lečenja kao i ekonomske koristi, veoma je važno otkriti bolesnike sa istovremenom pojavom aneurizme aorte i arterije još u ranom stadijumu. Cilj ove prospektivne studije bio je da se utvrde učestalost i faktori koji utiču na pojavu aneurizme femoro-poplitealnog (F-P) segmenta kod bolesnika sa aneurizmom abdominalne aorte (AAA). **Metode.** Studijom je bilo obuhvaćeno 70 bolesnika kojima je u periodu od 1. januara 2006. do 31. decembra 2007. godine, AAA lečena operativno, elektivno ili urgentno. Nakon ultrasonografskog pregleda femoropoplitealnog (F-P) segmenta formirana je grupa od 20 bolesnika koji su imali, odnosno 50 bolesnika koji nisu imali pridruženu aneurizmu F-P segmenta. Kod bolesnika obe grupe

analizirane su demografske karakteristike (pol, životno doba), faktori rizika (šećerna bolest, povišen serumski nivo holesterola i triglicerida, arterijska hipertenzija, pušenje, gojaznost) i kardiovaskularni komorbiditet (cerebrovaskularna i ishemijska bolest srca). **Rezultati.** Dvadeset (28,57%) bolesnika operisanih zbog AAA imalo je pridruženu aneurizmatičku bolest F-P segmenta. Šećerna bolest nije bila statistički značajno češće prisutna kod bolesnika koji su pored AAA imali i pridruženu aneurizmatičku bolest F-P segmenta ($\chi^2 = 0,04$; DF = 1; $p > 0,05$). Takođe, kod obe grupe bolesnika nije bilo statistički značajne razlike u spolnoj strukturi bolesnika ($\chi^2 = 2,05$; DF = 2; $p > 0,05$), životnom dobu ($\chi^2 = 5,46$; DF = 1; $p > 0,05$), nivou holesterola ($\chi^2 = 0,89$; DF = 1; $p > 0,05$), nivou triglicerida ($\chi^2 = 0,89$; DF = 1; $p > 0,05$), prisustvu arterijske hipertenzije ($\chi^2 = 1,383$; DF =

2; $p > 0,05$), navici pušenja ($\chi^2 = 1,74$; DF = 1; $p > 0,05$), gojaznosti ($\chi^2 = 1,76$; DF = 1; $p > 0,05$), prisustvu cerebrovaskularne bolesti ($\chi^2 = 2,34$; DF = 2; $p > 0,05$). Nasuprot tome, ishemijska bolest srca bila je statistički značajno češće prisutna kod bolesnika koji su pored AAA imali i pridruženu aneurizmatiku bolest F-P segmenta ($\chi^2 = 5,45$; DF=1; $p < 0,05$). **Zaključak.** Pored AAA, dvadeset bolesnika imalo je i pridruženu aneurizmu F-P segmenta. Rezultati

ove studije sugeriraju neophodnost izvođenja ultrasonografskog pregleda F-P segmenta kod svih bolesnika sa dokazanom AAA ukoliko imaju prisutne faktore rizika.

Ključne reči:

aneurizma; a. femoralis; a. poplitea; faktori rizika; dijagnoza; ultrasonografija; aorta, abdominalna, aneurizma.

Introduction

Many different forms of aortic and arterial aneurysms get a huge expansion¹⁻³. With efforts to have better both medical and economic effects of aneurismatic disease treatment, for many years there have been corresponding screening programmes carried out across the world. Screening is reasonable to perform if the disease lasts for a long time, if during screening the disease can be detected in early stage, if detecting the disease in its early stage the outcome of treatment would improve, if a screening programme is low priced, if it is painless, safe and comfortable for the patient, and if the treatment cost is reduced in that way^{4,5}.

The benefit is bigger if screening includes target groups⁶. The aim of this study was to determine the frequency and factors contributing to femoropopliteal (F-P) segment aneurysms in the patients with abdominal aortic aneurysm (AAA), as well as to define a group of patients for whom the screening programme is indicated.

Methods

This prospective study included 70 patients who had undergone elective or urgent surgery of abdominal aortic aneurysm at the Surgery Clinic, Clinical Center Banja Luka, from January 1, 2006 to December 31, 2007. In electively treated patients, F-P segment was examined by ultrasonography before the operation, and in urgently treated patients after it. For ultrasonographic examination an ultrasonographic device (Siemens Acuson Antares with 10 MHz and 7.5 MHz

probes) was used. On that basis, the group of 20 patients with and the group of 50 patients with no adjunctive F-P segment aneurysm were formed. In both groups demographic characteristics (gender, age), risk factors (diabetes mellitus, elevated serum levels of cholesterol and triglycerides, arterial hypertension, smoking habit, obesity) and cardiovascular comorbidity (cerebrovascular disease, ischemic heart disease) were analyzed, with the aim to establish their possible association with aneurismatic disease of F-P segment. The presence of cerebrovascular disease included cerebrovascular insult, transitory ischemic attack or performed carotid endarterectomy in the medical documentation. The presence of coronary artery disease included past myocardial infarction, angina pectoris or coronary artery by-pass grafting performed. The collected data were analyzed by different models of descriptive and analytic statistics (statistical significance of the difference between the groups was tested by χ^2 -test ($p < 0.05$ was considered as statistically significant), using computer support and programs for statistical analysis (SPSS 10-Science, Chicago, Illinois).

Results

Twenty (28.57%) patients who had been operated on because of AAA had adjunctive aneurysm disease of F-P segment. Out of them, 11 patients had popliteal artery aneurysm, and 9 patients had aneurysm of femoral artery. Demographic characteristics of patients, risk factors and adventitious diseases were shown in Table 1.

Table 1
Demographic characteristics of patients, risk factors, comorbidities and statistical influence of some parameters on appearance of multiple aneurysms

Characteristics	Isolated AAA (n = 50) n (%)	AAA + F-P segment An (n = 20) n (%)	χ^2	DF	p
Sex, n (%)					
male	38 (76)	14 (70)	2.05	2	> 0.05
female	12 (24)	6 (30)			
Average age (years)	68.38	71.60	5.46	1	> 0.05
Risk factors, n (%)					
diabetes mellitus	21 (42)	9 (45)	0.04	1	> 0.05
increased cholesterol	14 (28)	8 (40)	0.89	1	> 0.05
increased triglycerids	14 (28)	8 (40)	0.89	1	> 0.05
arterial hypertension	49 (98)	19 (95)	1.38	2	> 0.05
smoking habit	33 (66)	11 (55)	1.74	1	> 0.05
obesity	10 (20)	7 (35)	1.76	1	> 0.05
Comorbidity, n (%)					
cerebrovascular disease	11 (22)	8 (40)	2.34	2	> 0.05
ischemic heart disease	41 (82)	11 (55)	2.44	1	< 0.05

AAA – abdominal aortic aneurysm; AAA+F-P An – abdominal aortic aneurysm with an adjunctive femoro-popliteal segment aneurysm

Males were dominant in both groups, but there was no statistically significant difference in gender structure ($\chi^2 = 2.05$; DF = 2; $p > 0.05$).

Even though the average age of patients in the group with adjunctive F-P segment aneurysm too, was bigger than in the group with isolated AAA (71.60 vs 68.38 years), that was not statistically significant ($\chi^2 = 5.46$; DF = 1; $p > 0.05$).

Twenty one (42%) patients from the group with isolated AAA, and 9 (45%) patients from the group with adjunctive F-P segment aneurysm had diabetes mellitus, but there was no statistically significant difference between the groups ($\chi^2 = 0.04$; DF = 1; $p > 0.05$).

The serum level of cholesterol was increased in 14 (28%) patients who suffered from isolated AAA and in 8 (40%) patients who had an adjunctive F-P segment aneurysm. This difference was not statistically significant ($\chi^2 = 0.89$; DF = 1; $p > 0.05$).

Serum level of triglyceride was increased in 14 patients who suffered from isolated AAA and in 8 patients with adjunctive F-P segment aneurysm. There was no statistically significant difference between groups ($\chi^2 = 0.89$; DF = 1; $p > 0.05$).

Arterial hypertension had no patient from the group suffering from isolated AAA and only one patient from the group with adjunctive F-P segment aneurysm. There was no statistically significant difference between the groups ($\chi^2 = 1.38$; DF = 2; $p > 0.05$).

There were 33 (66%) smokers in the group with isolated AAA, and in the group with adjunctive F-P segment aneurysm there were 11 (55%). This difference was not statistically significant ($\chi^2 = 0.74$; DF = 1; $p > 0.05$).

Although obesity was more frequently present in the group of patients who, apart from AAA, had also adjunctive F-P segment aneurysm than in the group suffering from isolated AAA (35% vs 20%), this difference was not statistically significant ($\chi^2 = 1.76$; DF = 1; $p > 0.05$).

In the group with isolated AAA and in the group with adjunctive F-P segment aneurysm, 22% and 40% of the patients had cerebrovascular disease, respectively. However, statistical analysis showed no statistically significant difference ($\chi^2 = 2.34$; DF = 1; $p > 0.05$).

In the group of patients suffering from isolated AAA, there was even 82% of patients with ischemic heart disease (IHD), while in the group suffering from adjunctive F-P segment aneurysm IHD had about 55% of patients. This difference was statistically significant ($\chi^2 = 5.45$; DF = 1; $p < 0.05$).

Discussion

According to some data, there are over 80% of all peripheral aneurysms artery localised in F-P segment^{7,8}. Evolution of these aneurysms is done in a quite usual way, *i.e.* like all other aneurysms, and they can rupture, thrombose, give distal embolism and may perform compression on the surrounding structures⁹. Bearing in mind the importance of clinical results of these changes, since 1961 Hunter et al.¹⁰

classified all the complications of popliteal artery aneurysms into large (major) and small (minor).

Large complications are: thrombosis, distal embolism and rupture and small ones are complications of compression on the surrounding structures and angulation under knee arteries.

Thrombosis and distal embolism are the most common complications of F-P segment aneurysms. Due to its larger dimensions and decreased flow, aneurysms of this region considerably more thrombose, compared to AAA¹¹. The last consequence of thrombosis and/or distal embolism of these aneurysms, is the irreversible ischemia and limb loss^{12,13}. Rupture is essentially unusual complication among F-P segment aneurysm¹⁴.

In arteriosclerotic form it occurs in about 5% of patients, as we found in the previous study analyzing 2,000 cases published from 1948 until 1989^{12,13}.

The biggest incidence of up to 16% of ruptured popliteal artery aneurysms, claimed Gifford et al.¹⁵ in 1953. This is reasonable because it was a period when diagnosis of popliteal artery aneurysms was not that simple, adequate as well as timely. Recording on the experience may gained in the analysis until then the largest series of 100 popliteal artery aneurysms treated at the Mayo Clinic since 1913 until 1951, the most illustrated and at the same time very concise, they defined medical importance of the disease, saying that "the popliteal artery aneurysm is sinister harbinger of sudden catastrophe"¹⁵.

The conclusion is much reasonable due to the significant number of patients who have been asymptomatic until recently, comes with advanced, irreversible ischemia of the feet and lower leg, when it is only possible and indicated to do amputation. By analysis of data published since 1948 until 2000, the already mentioned studies, we found that the average incidence of primary amputation at the popliteal artery aneurysm is 18.5%^{12,13}.

Another important problem is more frequent adjunctions of F-P segment aneurysms in patients with AAA^{16,17}. According to current data, AAA is present in 85% of patients with femoral artery aneurysms and in 62% of patients suffering from popliteal artery aneurysm^{11,18}. On the other hand, 14% of patients with AAA have an F-P segment aneurysm¹⁹. In our study, adjunctive F-P segment aneurysm was considerably more frequent. Specifically, it was found in 20 (28.5%) patients. These patients were on average older. They had no more often diabetes, hyperlipidemia, obesity, smoking habit and cerebrovascular disease. Conversely, patients with isolated AAA had more often coronary artery disease. Sex structure and hypertension were equally represented in both groups.

Our study, similar to some previous ones²⁰, suggests the necessity of performing ultrasonographic examination of F-P segment in all patients with proven AAA.

Conclusion

Our study shows that 20 patients, beside AAA, had an adjunctive F-P segment aneurysm. It is more difficult, but

there is an equally essential question which category of people need screening of aneurysmatic aortic and peripheral artery disease. If in patients with AAA the existence of F-P segment aneurysm is not established at the first ultrasono-

graphic examination, that does not mean that it will not appear later. It is, therefore, highly advisable to run skreening ultrasonographical examinations even after that, especially if the patient has any of risk factors.

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