

Acute peripheral arterial occlusion: a review of 137 cases

Akut periferik arteriyel tıkanıklık: 137 olgu sunumu

Yüksel Dereli,¹ Ramis Özdemir,¹ Nihan Kayalar,² Musa Ağrıç,¹ Kemalettin Hoşgör,¹ Ali Suat Özdiş¹

Department of Cardiovascular Surgery, Konya Numune Hospital, Konya, Turkey;

Department of Cardiovascular Surgery, Bağcılar Training and Research Hospital, İstanbul, Turkey

Background: We evaluated the patients who were performed surgical treatment due to acute peripheral arterial occlusion.

Methods: Between January 2005 and February 2011, 137 patients (74 males, 63 females; mean age 62.85 years; range 34 to 91 years) who underwent surgical treatment due to acute peripheral arterial occlusion were evaluated retrospectively.

Results: The arterial occlusion was on the right upper extremity in 25 patients, on the left upper extremity in 16 patients, on the right lower extremity in 48 patients, on the left lower extremity in 39 patients and bilateral lower extremity in nine patients. Sixty-one patients were admitted within the first 12 hours, while 76 patients were admitted after the first 12 hours. Embolectomy was performed on all patients. Reembolectomy was done for 17 patients (12.40%) with recurrent ischemia. Amputation were performed on nine patients (6.56%). Mortality rate was 4.37% with six cases.

Conclusion: Acute arterial occlusions are associated with high mortality and morbidity rates. Early diagnosis and surgical intervention play a significant role in reducing mortality and morbidity.

Key words: Acute arterial occlusion; embolectomy; embolism.

Amaç: Akut periferik arteriyel oklüzyon nedeniyle cerrahi tedavi uygulanan hastalar değerlendirildi.

Çalışma planı: Ocak 2005 - Şubat 2011 tarihleri arasında, akut periferik arteriyel tıkanıklık nedeniyle cerrahi tedavi uygulanan 137 hasta (74 erkek, 63 kadın; ort. yaş 62.85 yıl; dağılım 34-91 yıl) retrospektif olarak değerlendirildi.

Bulgular: Arteriyel oklüzyon, 25 hastada sağ üst ekstremitede, 16 hastada sol üst ekstremitede, 48 hastada sağ alt ekstremitede, 39 hastada sol alt ekstremitede ve dokuz hastada ise iki taraflı alt ekstremitede idi. Altmış bir hasta ilk 12 saat içinde, 76 hasta ise 12 saatten sonra başvurmuştu. Tüm hastalara embolektomi uygulandı. Reküren iskemi gelişen 17 hastaya (%12.4) tekrar embolektomi uygulandı. Dokuz hastaya (%6.56) amputasyon uygulandı. Mortalite oranı altı hasta ile %4.37 idi.

Sonuç: Akut arteriyel oklüzyonlar, yüksek mortalite ve morbidite oranları ile ilişkilendirilir. Erken tanı ve cerrahi girişim mortalite ve morbiditenin azaltılmasında önemli rol oynar.

Anahtar sözcükler: Akut arteriyel tıkanıklık; embolektomi; embolism.

Acute arterial occlusion of the lower extremities with the high tendency for major limb loss and death are very common peripheral vascular problems that require emergency management.^[1] Arterial emboli are the most common cause of acute peripheral arterial occlusions and mostly originate from the heart. On the other hand, another large group involves acute arteriosclerotic thrombosis which is mainly caused by arteriosclerosis. The clinical manifestations of both diseases are similar. Acute limb ischemia, the

most common clinical manifestation of this disease, substantially causes disturbances in hemodynamic status and multiple organ functions due to the release of accumulated anaerobic metabolites into the systemic circulation when the ischemic process persists over a long period.^[2] Irreversible ischemia is inevitable whenever revascularization has not been accomplished within the proper time. The most frequently used techniques for the management of acute arterial thromboembolism are the administration of heparin, an embolectomy,

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Correspondence: Yüksel Dereli, M.D. Konya Numune Hastanesi Kalp ve Damar Cerrahisi Kliniği, 42100 Selçuklu, Konya, Turkey.
Tel: +90 332 - 236 45 41 e-mail: yuxel.dereli@myynet.com

and thrombolysis, but the main treatment for acute limb ischemia is surgery. In this study, we investigated the surgical treatment of patients with acute arterial occlusion in our clinic.

PATIENTS AND METHODS

One hundred and thirty-seven patients (74 males, 63 females; mean age 62.8 years; range 34 to 91 years) who underwent urgent embolectomies between January 2005 and February 2011 and who had been preliminarily diagnosed with acute peripheral arterial occlusion were included in this retrospective study (Table 1). Acute ischemic pain was the most common clinical manifestation of acute arterial occlusion. The diagnosis of acute peripheral arterial occlusion was based on clinical manifestations (pain, pallor, poikilothermia, paresthesia, and paralysis), the absence of distal peripheral pulses, and Doppler ultrasound examination. Patients with acute peripheral arterial occlusion due to trauma, aortic dissection, and vascular graft occlusion were excluded from the study.

RESULTS

The femoral artery bifurcation was the most common area of occlusion in acute peripheral arterial occlusion. The arterial occlusion was on the right upper extremity in 25 cases (18.25%), on the left upper extremity

in 16 cases (11.68%), on the right lower extremity in 48 cases (35.03%), on the left lower extremity in 39 cases (28.46%), and on the bilateral lower extremity in nine cases (6.58%). Sixty-one patients (44.52%) presented within the first 12 hours, and 76 patients (55.48%) presented after a delay of more than 12 hours. All patients underwent urgent embolectomies, which were performed under local anesthesia in all patients. Anticoagulant and antiplatelet drugs (low molecular weight or standard heparin, warfarin, and acetylsalicylic acid) were administered to all patients after the embolectomies.

In order to investigate the origin of the arterial occlusion, all patients were examined via transthoracic echocardiography during the postoperative period. Echocardiography detected mitral valve stenosis in 18 patients (13.13%), another valve disease in 15 patients (10.94%), and left atrial myxoma in one patient (0.72%). All of these patients underwent surgery or received medical treatment. Atrial fibrillation was the most common comorbidity with 43 patients (31.38%). Re-embolectomies were performed for 17 cases (12.40%) with recurrent ischemia. The successful revascularization after the initial embolectomy was higher in the management of early acute embolism than for late acute embolism. Amputations were performed in nine cases (6.56%). The mortality rate

Table 1. Demographic informations of patients

	n	%	Mean age	Range
Mean age			62.85	34-91
Gender				
Male	74	54.01		
Female	63	45.99		
Localization				
Right lower extremity	48	35.03		
Left lower extremity	39	28.46		
Right upper extremity	25	18.25		
Left upper extremity	16	11.68		
Bilateral lower extremity	9	6.58		
Comorbidity				
Atrial fibrillation	43	31.38		
Mitral stenosis	18	13.13		
Other cardiac valve disease	15	10.94		
Ischemic heart disease	13	9.48		
Stroke	11	8.02		
Peripheral arterial disease	10	7.29		
Myxoma	1	0.72		
Unknown	26	18.97		
Reembolectomy	17	12.40		
Amputation	9	6.56		
Mortality	6	4.37		

was 4.37% with six cases. Patients with late acute embolism had a higher incidence of major amputations, re-embolectomies, and other complications than those with early acute embolism. The mortality rate after revascularization was also higher.

DISCUSSION

Acute peripheral arterial occlusion is the most common type of emergency in vascular surgery, and it accounts for 16-33% of all cases of acute limb ischemia.^[3] Acute arterial embolism and thrombosis are the most common causes of acute arterial occlusion of the extremities. In acute arterial embolism, the artery is suddenly occluded resulting in rapidly progressive ischemia in the distal limb without adequate collateral circulation. On the other hand, the ischemic process in acute arterial thrombosis is gradually progressive due to the presence of collateral circulation which develops during the progression of atherosclerosis.^[4] Accordingly, the symptoms caused by the embolism are much more acute, and the initial stage of thrombosis is rather hidden.

It has been suggested that the significant clinical factors for the differentiation between acute arterial embolism and thrombosis were the peripheral pulse status on the contralateral limbs, clinical risk factors of arterial embolism, such as atrial fibrillation (AF) and mitral stenosis, and symptoms of intermittent claudication.^[5] Normal peripheral pulses on the contralateral limb, atrial fibrillation, and mitral stenosis were all more commonly found in patients with acute arterial embolism than in those with thrombosis. However, patients with acute arterial thrombosis had intermittent claudication more often than acute arterial embolism. Even though angiography was the most effective method for differentiating between these two diseases, this investigation is not simple and may not be available in emergency situations.

Arterial embolism is a common cause of acute peripheral arterial occlusion. A review of the literature shows that the source is the heart in 78% of arterial emboli, but this often cannot be confirmed pathologically.^[6] Other sources include patent foramen ovale, prosthetic valves, spontaneous echocardiographic contrast (SEC), atheromatous plaque in the aorta, and dystrophy and calcification of the foramen ovale orifice.^[7] Myocardial infarction, mitral stenosis, and AF pose greater risks for the development of cardiac thrombus. In previous studies, 82-87% of cases of acute ischemia of the lower and upper extremities were classified as cardiogenic embolism, and more than 50% of patients had AF.^[3,8] In our study, AF was detected in 43 cases (31.38%),

mitral stenosis in 18 cases (13.13%), and myocardial infarction in 13 cases (9.48%).

Thrombi occur in the ear of the left auricle, and after that, they most often align from the inner heart or the aorta wall and travel to the distal arterial system. They usually stick in the bifurcation of the femoral artery or in the trifurcation of the popliteal artery and disturb the flow of blood to further branches.^[6] The acute disruption of arterial circulation distal to the occlusion causes anoxia and loss of function in the distal organ. Toxic free radicals accumulated in the prolonged ischemic tissue are released into the systemic circulation. The latter contribute to the disturbance of cardiopulmonary and renal function.^[9] In this study, the femoral artery bifurcation was the most common area of acute arterial occlusion.

Transthoracic echocardiography (TTE) is the most commonly used monitoring method in the investigation of potential embolic sources and is cost effective, easily applicable, and yields significant information.^[7] Left atrial SEC is seen in 80% of the patients with a history of mitral stenosis, and its presence is an indicator of hypercoagulation.^[10] Stasis and the development of AF mutually increase their effects in thrombosis formation. In the study of Gossage et al., 42 patients underwent surgical embolectomies, 27 for lower limb ischemia and 15 for upper limb ischemia.^[11] Postoperatively, 34 patients (81%) had TTE which demonstrated a source or potential source for thrombus in 19 patients (56%). In the series by Yetkin et al.,^[12] serious cardiac pathologies were determined with TTE in 55% (n=28) of cases. In our study, in order to investigate the origin of the arterial occlusion, all patients were examined via TTE during the postoperative period. Mitral valve stenosis was detected in 18 (13.13%) patients, other valve disease was detected in 15 patients (10.94%) and left atrial myxoma in one patient (0.72%) with TTE.

Acute peripheral arterial occlusion is divided into early acute and late acute occlusion prior to revascularization. Acute peripheral arterial occlusion requires an urgent decision for effective management in order to avoid progressive limb ischemia and extensive gangrene. Delayed diagnosis and treatment eventually results in major limb loss and death.^[13,14] The main causes of death in long-term follow-up are cardiovascular and cerebrovascular problems.^[15] Among the 137 consecutive patients in this study, 61 patients (44.52%) presented within the first 12 hours and 76 patients (55.48%) presented after a delay of more than 12 hours. All patients underwent urgent embolectomies.

The main treatment for acute peripheral arterial occlusion is surgery. The introduction of the balloon catheter to the surgical treatment of thromboembolisms by Fogarty marked the start of a new era.^[16] Since this catheter allows for urgent radical treatment of peripheral thromboembolism, it has a crucial role in decreasing mortality and morbidity. Available treatments for acute peripheral arterial occlusion include thromboembolectomies, thrombolysis, and percutaneous transluminal angioplasty. Stents and bypasses are options in cases with stenosis. An embolectomy is a specific treatment for acute arterial embolism whereas acute arterial thrombosis requires more complicated procedures such as arterial bypass surgery or endovascular methods (balloon angioplasty or a stent) after successful catheter-directed thrombolysis.^[17]

Patients with arterial embolism have a high rate of recurrence, and one of the cornerstones in the clinical treatment of peripheral arterial occlusion is the use of heparin both before and after surgical intervention. A study reported no significant differences in survival between patients who received anticoagulants or acetylsalicylic acid and those who did not receive them.^[15] Another study indicated that postoperative anticoagulant therapy seems to improve the survival rate.^[18] Warfarin showed a 64-68% reduction in the risk of stroke in patients with AF,^[19,20] and the administration of warfarin may improve life-threatening conditions. A targeted increase in the international normalized ratio (INR) from 2.0 to 3.0 has been recommended in various studies.^[19,21] In our study, anticoagulant and antiplatelet drugs (low molecular weight or standard heparin, warfarin, and acetylsalicylic acid) were administered to all patients after the embolectomy.

In conclusion, acute arterial occlusions are associated with high mortality and morbidity rates. Early diagnosis and urgent surgical interventions help to achieve minimum morbidity and mortality rates. In addition, the investigation of etiologic factors and application of prophylactic treatments will decrease the risk of recurrent embolic occlusion.

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