Acute peripheral Arterial Occlusion, Upper and Lower Extremities: A review of 120 cases

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ABSTRACT

Background: Acute peripheral arterial occlusion (upper and lower-extremity) is responsible for a wide variety of complications culminating in limb loss or death . Acute arterial occlusion of the extremities with the high tendency for major limb loss and death are very common peripheral vascular problems that require emergency management.

Aims and Objective: The aim of the study was to evaluate the patients who were performed surgical treatment due to acute peripheral arterial occlusion.

Material and Method: This study was conducted at the department of cardiothoracic and vascular surgery, sulaimanyah teaching hospital. Between January 2006 and October 2011, 120 patients (70 males, 50 females; mean age 68.1 years; range 35 to 90 years) who underwent surgical treatment due to acute peripheral arterial occlusion were included in this study.

Results: Among the 120 patients, 55(45.8%) were admitted within the first 12 hours, while 65 (54.2%) patients were admitted after the first 12 hours. The arterial occlusion was on the upper extremity in 45 patients (on the right upper extremity in 25 patients, on the left upper extremity in 20 patients).On the lower extremity in 75 patients (on the right lower extremity in 40 patients, on the left lower extremity in 35 patients). Embolectomy was performed on all patients. Reembolectomy was done for 10 patients (8.3%) with recurrent ischemia. Amputation was performed on seven patients (5.8%). Mortality rate was 4.2% with five cases.

Conclusion: Acute peripheral arterial occlusion is associated with a high risk of limb loss and death. The high mortality rate is as much a function of the multiplicity of baseline comorbidities as it is a result of the insult from the peripheral ischemia and reperfusion.

Keywords: Acute arterial occlusion; embolectomy; embolism, 12 hour duration of occlusion, Outcome of Management.

INTRODUCTION

Acute peripheral arterial occlusion occurs when flow through a peripheral arterial channel is suddenly interrupted, resulting in a compromised supply of oxygenated blood to the tissues of the affected arm or leg.

Acute peripheral arterial occlusion is the most common type of emergency in vascular surgery (1). 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 (2).

Accordingly, the symptoms caused by the embolism are much more acute, and the initial stage of thrombosis is rather hidden. It is essential to determine if the patient had symptoms of chronic ischemia before the acute event occurred. Patients with an embolus usually have no preexisting ischemic symptoms, and can frequently pinpoint the exact time that symptoms began. Thus, the sudden and dramatic development of ischemic symptoms in a previously asymptomatic patient is most consistent with an embolus, while gradually increasing symptoms in a patient with chronic ischemia is indicative of thrombosis.

Arterial occlusion is well recognized as the emergency problem of peripheral vascular disease causing sudden ischemia in the organ supplied by the occluded artery (3). Irreversible ischemia is inevitable whenever the revascularization has not been accomplished in a proper time (4).Acute arterial occlusion is more prevalent in lower extremities with the high tendency for major limb loss and death are very common in peripheral vascular problems that require emergency management(5). 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(6). The most frequently used techniques for the management of acute arterial thromboembolism are the administration of anticoagulant (heparin), embolectomy, and thrombolytics, 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 unit. Major amputation and death can be expected in the management of this disease due to several factors (7, 13). Duration of arterial occlusion, correlating well with the degree of distal organ ischemia, is one of the important factors influencing the clinical consequence and the result of treatment (8, 14).

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 (9). Left atrial thrombus is seen in 80% of the patients with a history of mitral stenosis, and its presence is an indicator of hyper coagulation (10). Stasis and the development of AF mutually increase their effects in thrombosis formation.

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 (11). 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 (12).

PATIENTS AND METHODS

This study was carried out at the department of cardiothoracic and vascular surgery, sulaimanyah teaching hospital, sulaimanyah city from January 2006 to October 2011.informed written consent was taken from patients to be placed in this study. One hundred and twenty patients (70 males, 50 females; mean age 68.1 years; range 35 to 90 years) who underwent urgent embolectomies and who had been preliminarily diagnosed with acute peripheral arterial occlusion were included in this study (Table 1,2,3,4).fig(2,3,4,5). 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.

The severity of limb ischemia was classified into three categories: viable, threatened ischemia and irreversible ischemia.

RESULTS

The study included 120 patients, 70 patients (58.3%) were male 50 patients (41.7%) were female. The average age was 68.1 years (range 35-90)

The femoral artery bifurcation was the most common area of occlusion in acute peripheral arterial occlusion of lower extremities. The arterial occlusion was on the right upper extremity in 25 cases (20.8%), on the left upper extremity in 20 cases (16.7%), on the right lower extremity in 40 cases (33.3%), on the left lower extremity in 35 cases (29.2%).Fifty-five patients (45.8%) presented within the first 12 hours, and 65 patients (54.2%) presented after a delay of more than 12 hours. All patients underwent urgent embolectomies(fig.1), which were performed under local anesthesia in all patients. Anticoagulant and antiplatelet drugs (low molecular weight or standard heparin, warfarin) were administered to all patients before and 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 20 patients (16.7%), another valve disease in 15 patients (12.5%), and left atrial myxoma in one patient (0.83%). All of these patients underwent surgery or received medical treatment. Atrial fibrillation was the most common comorbidity with 50 patients (41.7%). Re-embolectomies were performed for 10 cases (8.3%) 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 7 cases (5.8%). The mortality rate was 4.2% with 5 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 re-embolectomies was also higher

DISCUSSION

It is well established that arterial embolism is a common cause of acute peripheral arterial occlusion.

Emboli from the proximal sources either cardiac or proximal aorta commonly occluded at the bifurcation of the arteries of the extremities (26).

The significant clinical factors for the differentiation between acute arterial embolism and thrombosis were the peripheral pulse status on the contra lateral limbs, clinical risk factors of arterial embolism, such as atrial fibrillation (AF), mitral stenosis, and symptoms of intermittent claudication (15). 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. The status of the pulses in the contralateral extremity is also important. The presence of a pulse deficit in an asymptomatic contralateral extremity is an indication of underlying chronic arterial occlusive disease and suggests that acute thrombosis of an already diseased vessel is the most likely cause of the acute occlusion. By contrast, the presence of normal pulses in the contralateral extremity suggests the absence of chronic occlusive disease, and increases the likelihood that an embolus is the etiology of acute occlusion.

Eighty percent of arterial emboli originate in the heart and travel to the extremities; the lower extremities are affected much more frequently than the upper extremities. The majority of these emboli occur in patients with significant underlying cardiac disease; the severity of the patient's underlying cardiac condition may increase the risk of surgery, and limit the options available for restoring blood flow to the ischemic extremity. A review of the literature shows that the source is the heart in 78% of arterial emboli, but this often cannot be confirmed pathologically (16) while in our study 62.4%. Other sources include patent foramen ovale, prosthetic valves, atheromatous plaque in the aorta, and dystrophy and calcification of the foramen ovale orifice (9). 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 (13, 18). In our study, AF was detected in 40 cases (33.3%), mitral stenosis in 15 cases (12.5%), other cardiac valve disease in 10 cases (8.3%), and myocardial infarction in 10 cases (8.3%).

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 (16). 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 (19). In this study, the femoral artery bifurcation was the most common area of acute arterial occlusion. Arteritides, ergotism, and

hypercoagulable states can also result in arterial thrombosis, occlusion, and acute extremity ischemia. While these conditions most frequently affect the venous circulation, certain hypercoagulable states favor arterial thrombosis (eg, antiphospholipid antibodies and hyperhomocysteinemia).

In the study of Gossage et al., 42 patients underwent surgical embolectomies, 27 for lower limb ischemia, and 15 for upper limb ischemia (21). Postoperatively, 34 patients (81%) had TTE which demonstrated a potential source for thrombus in 19 patients (56%).In the series by Yetkin et al. (22). 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 15 (12.5%) patients; other valve disease was detected in 10 patients (8.3%) and left atrial myxoma in one patient (0.83%) 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 (23,24). The main causes of death in long-term follow-up are cardiovascular and cerebrovascular problems (25). Among the 120 consecutive patients in this study, 55 patients (45.8%) presented within the first 12 hours and 65 patients (54.2%) presented after a delay of more than 12 hours. All patients underwent urgent embolectomies.

The management of acute arterial occlusion remains a challenge for vascular surgeons. Surgical thromboembolectomy and bypass grafting have been the mainstays of therapy for many years. Recently, thrombolytic therapy and percutaneous transluminal angioplasty (PTA) have become treatment options for selected patients. Despite these advances, however, the morbidity, mortality, and limb loss rates from acute lower extremity ischemia remain high. Thus, regardless of the treatment modality used, early diagnosis and rapid initiation of therapy are essential in order to salvage the ischemic extremity.

The best defense against limb loss is prompt initiation of therapy. Thus, once the diagnosis of acute arterial occlusion has been made by history and physical examination, the patient should immediately receive 10,000 units of intravenous heparin followed by a continuous heparin infusion (10). Anticoagulation will prevent further propagation of thrombus, and inhibit thrombosis distally in the arterial and venous systems due to low flow and stasis. Time is crucial; the decision to administer heparin is based upon the clinical evaluation and should not be delayed while waiting for diagnostic procedures to be performed.

In our study, anticoagulant and antiplatelet drugs (low molecular weight or standard heparin, warfarin) were administered to all patients after the embolectomy.

In conclusion, acute peripheral arterial occlusion is associated with a high risk of limb loss and death. The high mortality rate is as much a function of the multiplicity of baseline comorbidities as it is a result of the

insult from the peripheral ischemia and reperfusion.

Recommendations

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.

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Demographic and clinical manifestations of patients

Table 1

Gender	n	%
Male	70	58.3
Female	50	41.7

Table 2

Localization	n	%
Right lower extremity	40	33.3
Left lower extremity	35	29.2
Right upper extremity	25	20.8
Left upper extremity	20	16.7

Table 3

Comorbidity	n	%
Atrial fibrillation	40	33.3
Mitral stenosis	15	12.5
Other cardiac valve disease	10	8.3
Ischemic heart disease	10	8.3
Stroke	5	4.2
Peripheral arterial disease	20	16.7
Myxoma	1	0.9
Unknown	19	15.8

Table 4

	n	%
Reembolectomy	10	8.3
Amputation	7	5.8
Mortality	5	4.2

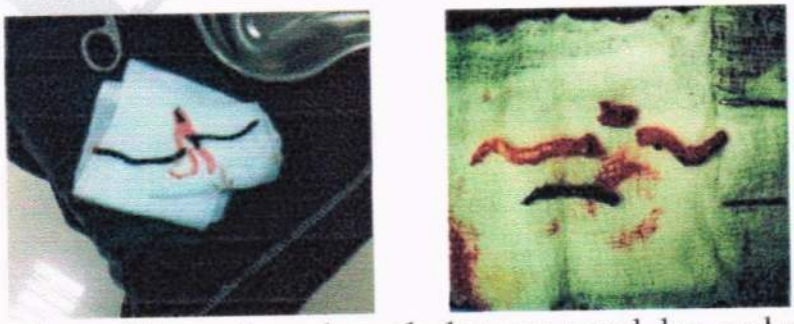

Fig.1: Examples of long thromboembolus removed by embolectomy by using Fogarty catheter (different patients).

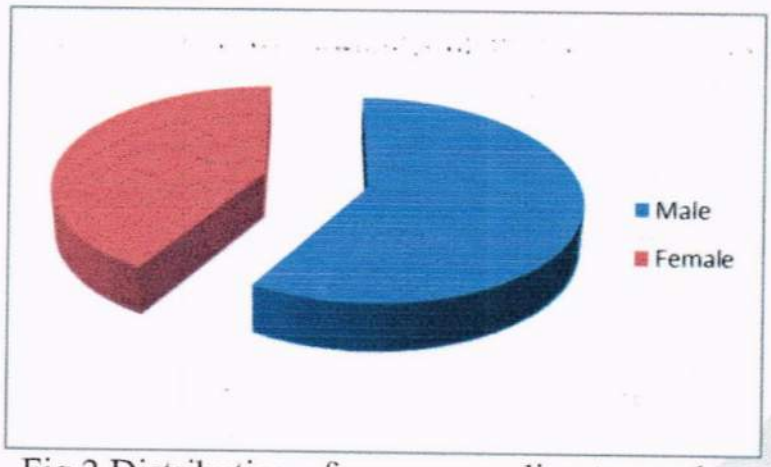

Fig 2 Distribution of cases according to gender.

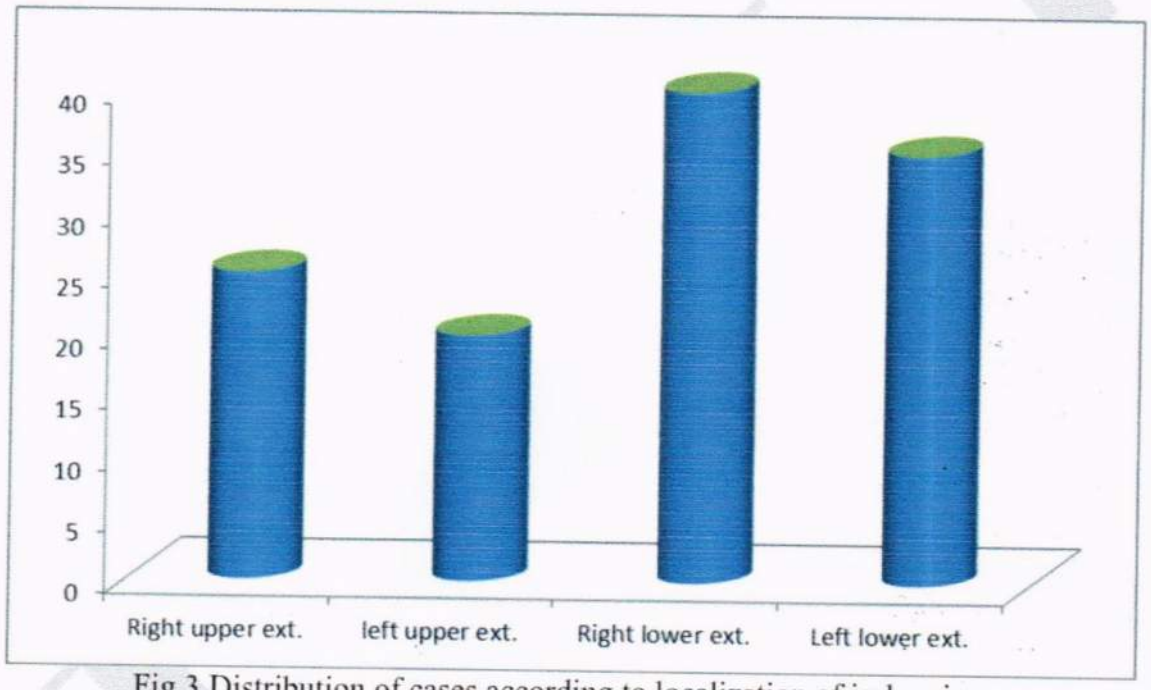

Fig 3 Distribution of cases according to localization of ischemia:

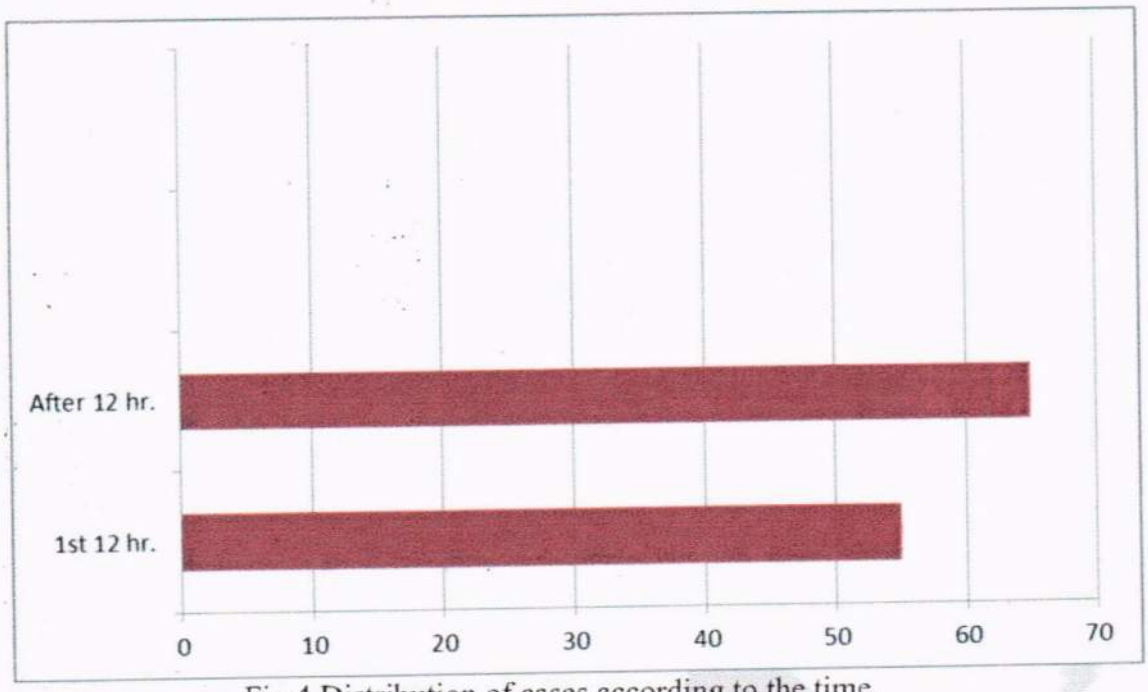

Fig 4 Distribution of cases according to the time.

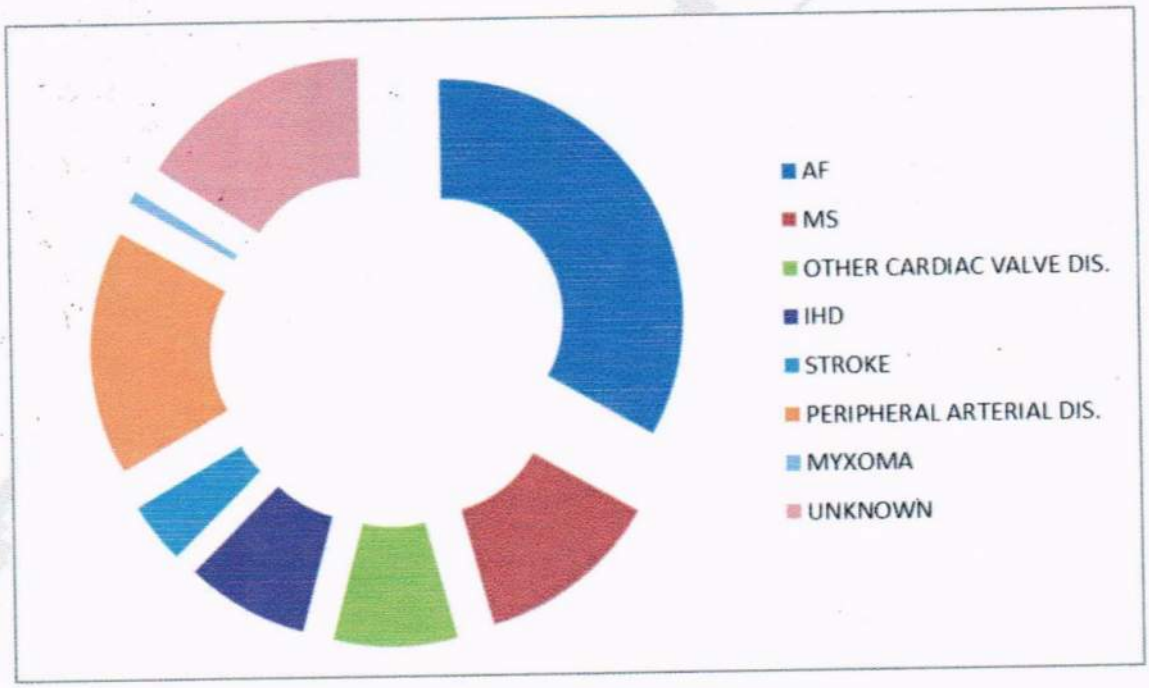

Fig 5 Distribution of cases according to comorbidity.