

# Peripheral arterial embolism: A prospective study of 40 consecutive cases

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## Summary

A prospective study was made of 40 consecutive patients who presented with peripheral arterial embolism to the Vascular Surgical Service in UKM. Atrial fibrillation was the most common source of the embolus. Twelve patients did not present until the affected limb(s) were in established gangrene. Thirty-two embolectomies were performed on 25 patients. Only 10 of these patients were discharged well with their limbs intact. Four patients required amputation because embolectomy did not restore viability of the limbs. Eleven patients died following embolectomy. The overall mortality for arterial embolism was 50%. Among the survival (n=20), only 11 patients were discharged with their limbs intact. The cause of the poor result was related to the delay in definitive treatment and the poor general state of the patients. It was concluded that the prognosis for arterial embolism was very poor. This result needs to be improved and recommendations are made to achieve this.

*Key words:* Artery, embolus, embolism

## Introduction

Peripheral arterial embolism is the most common cause of acute limb ischaemia. It is a surgical emergency. If the diagnosis is missed or appropriate treatment is not instituted early, a high morbidity (in terms of limb lost) and a high mortality is to be expected.<sup>1</sup> However with prompt treatment, the result can be improved.

A study was made of all patients who presented with peripheral arterial embolism to the Vascular Surgical Service (VSS) of the Department of Surgery, Universiti Kebangsaan Malaysia. The aim of the study was to analyse the results and to see if any recommendations could be made to decrease the morbidity and mortality.

## Patients and Methods

A prospective study was made of all patients who presented with arterial embolism to the VSS between January 1986 to June 1989 (3½ years). Acute thrombosis and arterial embolism following vascular surgery were not included in the study. On admission, a detailed history was taken. The sequence of events from the time of onset of symptoms to the presentation at the VSS were noted. Patients discharged were all followed up at the Vascular clinic. The treatment

and its results were reviewed. Analysis were made of the method of treatment, the delay in presentation (by the patients) and the delay in referral to the VSS to see if these factors affected the final prognosis of the patient.

## Results

There were 40 patients. The racial distribution was 18 Malays, 12 Indians and 10 Chinese. The sex ratio was 26 males to 14 females. The age range was 21 to 96 years with a mean of 59 years. Most patients had other associated medical illness. These are listed in Table 1. The source of the emboli was known in 20 patients. Atrial fibrillation was the most common (Table 2). There were acutely ischaemic limbs in the 40 patients (in some patients more than one limb was involved). All, except five, were lower limbs. The location of the emboli is shown in Table 3.

For the purpose of analysis, the patients were divided into two groups (Table 4). In Group A, the affected limbs were already in established gangrene when the patient was first seen at the VSS. These patients were offered amputation. There were 12 patients in this group. Seven patients had above knee amputations. In one patient this was bilateral. Two had hip disarticulation. There were two operative mortality. Two patients died while they were being prepared for amputation. Three other patients refused surgery and took their own discharge.

**Table 1**  
**Associated medical illness**

Ischemic heart disease	17
Previous myocardial infarction	5
Rheumatic heart disease	3
Hypertension	9
Cerebrovascular disease	3
Diabetes mellitus	11
Chronic obstructive airway disease	4
Smoking	20
Others*	3

\* Others include one of each – Nephrotic syndrome, carcinoma of pancreas and a drug addict.

**Table 2**  
**Source of Arterial Embolus**

Atrial fibrillation	9*
Myocardial infarction (mural thrombus)	8
Rheumatic heart disease	3*
Angiography	3
D.C. Shock for Atrial flutter	1
Cardiac pacemaker	1
Unknown+	20

\* Three patients with Rheumatic heart disease had associated Artrial fibrillation.

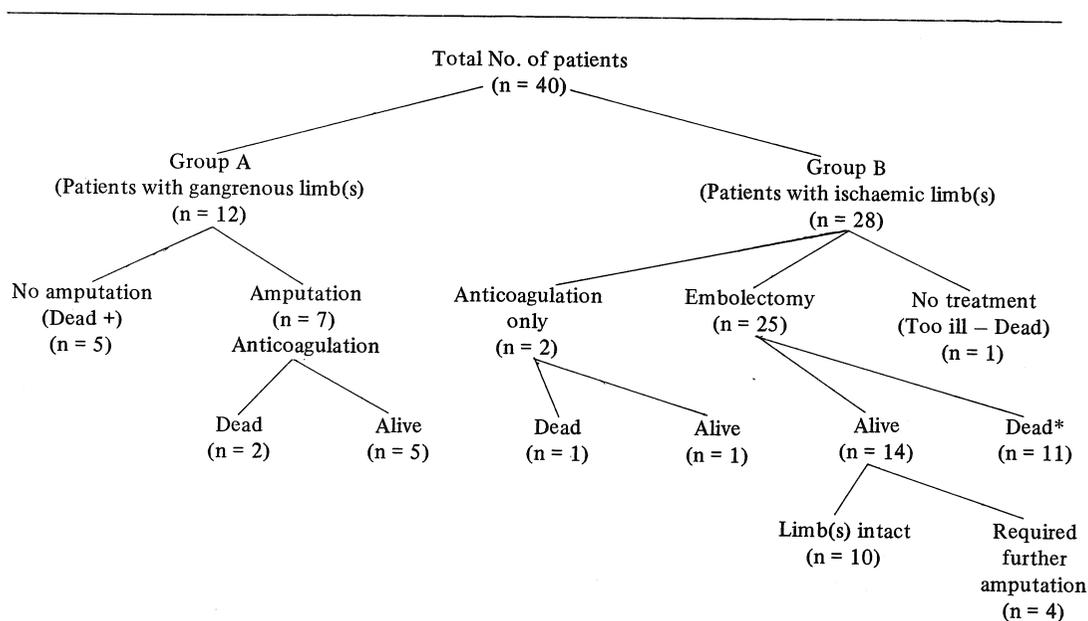
+ Include one young female on oral contraceptive pill.

**Table 3**  
**Site of Emboli**

Arterial Sites	Right	Left	Bilateral
Aorta (Saddle)			7
Iliac/CF <sup>1</sup>	8	9	
SF <sup>2</sup> /Popliteal	5	9	2
Distal (LL)	2		
Brachial	2	3	

1. CF – Common femoral
2. SF – Superficial femoral

**Table 4**  
**Presentation and Outcome**



+ – 2 patients died while being prepared for amputation; 3 patients refused amputation.

\* – in 6 of these patients, the embolectomy restored viability of the affected limb(s), death was due to other causes.

There were 28 patients in Group B. These patients presented with acutely ischaemic limbs, that on initial clinical assessment were thought to be viable. Two patients were treated by anticoagulation alone. It was felt that these emboli were distal. The affected limbs in these patients improved. One of these patients died while on heparin therapy. A computerised tomogram of brain showed a cerebral infarct, probably from another embolus. His arm before death had returned to normal.

Twenty-five patients with 30 ischaemic limbs had 32 embolectomies. Four patients had bilateral embolectomies for saddle emboli and three patients had repeat embolectomies for recurrent embolism. Embolectomy was successful in returning viability of the affected limbs in 16 patients (21 limbs). This gave a limb salvage rate of 70% (21/30). Ten of these patients were discharged well, but six patients died in the postoperative period. Embolectomy did not restore viability of the limbs in nine patients despite successful retrieval of emboli and thrombi. In retrospect the degree of ischaemia in these limbs were under estimated, i.e. these limbs were already gangrenous on presentation. Four of these patients went on to have amputation, but the other five patients died. Therefore, 11 patients who had embolectomy died in the postoperative period, giving a postoperative mortality of 39% (11/25).

The overall result for arterial embolism was appalling. It was the terminal event in 20 of these patients giving an overall mortality of 50.0% (20/40). Nine of the 20 patients who survived the arterial embolism had major limb(s) amputation (amputation rate = 45.0% (9/20)). Only 11 patients were discharged well with their limbs intact.

## Discussion

The diagnosis of arterial embolism can usually be made after history and physical examination. A history of acute severe limb pain with associated coldness and pallor that progresses to numbness and paralysis is often present. On examination, the limb is cold and pale with loss of sensation and power and pulses are absent. Once the diagnosis has been made, treatment should be instituted immediately. The patient should be heparinised and referred to an appropriate centre where specific treatment can be instituted. Any delay in treatment will risk loss of limb(s) and sometimes death.

The optimal treatment of arterial embolism is emergency embolectomy.<sup>2</sup> Though conservative treatment, i.e. anticoagulation and close observation had been advocated by some centres,<sup>3,4</sup> it should only be done selectively in patients where the ischaemia is less acute. Furthermore, it should only be practised in centres where facilities for embolectomy are available. Embolectomy should be performed immediately when the ischaemia deteriorates.

With the advent of the balloon catheter,<sup>5</sup> embolectomy has become a simple surgical procedure that may be performed under local anaesthesia. We performed 32 embolectomies in 30 acutely ischemic limbs. Our limb salvage rate of 70% is comparable to other series.<sup>8</sup>

Embolectomy continues to carry a significant mortality.<sup>6,7,8</sup> This is related to the underlying cardiovascular disease of these patients.<sup>1</sup> Also when the ischaemic limb is revascularised, metabolites such as lactic acid dehydrogenase, creatinine phosphokinase, myoglobin, excessive potassium and other breakdown products are released into the system, causing damage to the lung, myocardium, liver and kidney.<sup>8</sup> The operative mortality for embolectomy in this series of 44% is higher than that of other series.<sup>1,2</sup> This figure may be reduced if more patients were offered primary amputation, a procedure with lower mortality but very significant morbidity.

The mortality for arterial embolism in most reported series is in the region of 25%.<sup>1,2,4,8</sup> The overall mortality in this series is 50%. This high mortality is an indication of the serious cardiovascular and respiratory disease these patients suffer. More than half of our patients had significant ischemic heart disease or a history of previous myocardial infarction. More than one quarter are diabetic and 50% of them are chronic smokers. Embolism is an incident in these diseases.<sup>1</sup> Most of our patients were very ill at presentation. Some of our patients are

literally, transferred to us (from peripheral hospitals) to die. The most serious morbidity is major amputation. The amputation rate among the patients who survive is 45%. Only 11 patients are discharged well with their limbs intact.

The poor result is explained by the delay in presentation to the VSS. Usually a delay of 12 hours will result in some permanent deficit of the affected limb(s) and a delay of 24 hours invariably results in gangrene. The mean delay in this series is 6.4 days! While patients need to be educated to present themselves early, it should also be noted that delay is also caused by qualified practitioners. Not infrequently, patients are 'observed' until there is established gangrene before referral to us. The delay is also contributed by the fact that facilities for embolectomy are not available outside the centres in Kuala Lumpur. Even with prompt diagnosis, precious time is wasted on transport of patients, usually by ambulance and often over a long distance. This not only causes deterioration of the affected limb and delay in treatment but the patient's general condition also frequently gets worse. We feel that this contributed partly to the high mortality in this series.

We conclude that arterial embolism is a terminal condition in many patients. To improve the situation, there is need to educate patients to present early and increase awareness among medical practitioners of the urgency of the condition. Embolectomy should be included in the training programme of general surgeons and there should be improvement in facilities, at least in the peripheral general hospitals, so that embolectomy could be performed. Meanwhile, we recommend that on diagnosis of peripheral embolism, the patient should be heparinised and referred immediately and directly to a centre where facilities and expertise for embolectomy are available.

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