

Iatrogenic vascular injuries in western Saudi Arabia

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A group of 30 consecutive patients with iatrogenic vascular injury were studied to determine the aetiology of the condition and to investigate its possible prevention. Of the patients, 18 were males and 12 females; mean age was 37.0 years (range 2 weeks to 70 years). Most injuries ($n = 25$) involved the arterial system; eight cases (27%) were recognized during the operative procedure. The most common presentations were bleeding and chronic ischaemia. Cannulation of vessels was the cause of injury in 14 cases (47%); two-thirds of these were iatrogenic in nature. A conservative policy was adopted in nine patients; surgery was planned but not performed in two. A total of 19 patients were operated on (17 reconstructions, one ligation, one fasciotomy); two died from causes related to their original condition. In order to reduce the incidence of iatrogenic injury, medical personnel should be informed of possible vessel damage, especially during cannulation. All surgical and radiological procedures should be carefully audited.

Keywords: iatrogenic vascular injury, cannulation, ischaemia

Iatrogenic damage is an abnormal state that occurs in patients as a result of inadvertent or erroneous treatment by physicians or surgeons. In developing countries, healers or bone-setters are considered equivalent to orthopaedic surgeons; hence they were included here as a source of iatrogenic injury. Vascular iatrogenic injuries are fairly rare though their incidence is steadily increasing, especially after cannulation of vessels. This report describes all cases of iatrogenic vascular injuries seen and/or treated in the authors' unit.

Patients and methods

Patients with iatrogenic vascular injury incurred between August 1988 and July 1992 who were seen or managed in the authors' unit at King Abdulaziz University Hospital were reviewed to identify any pattern and possible method of prevention. Cases were referred from throughout Saudi Arabia, though most were from the Jeddah area. An iatrogenic vascular injury was defined as 'any injury to a main blood vessel

(excluding those originating directly from the heart and those distal to wrist and ankle joint) caused by a physician, surgeon or bone-setter'.

The clinical presentation, and site and type of vessel injury were each analysed. The speciality and qualification of each responsible doctor were documented. Angiography was performed in some patients to confirm or assess the degree of damage. Vascular reconstruction was considered the first line of management in all cases. Not all patients were monitored long term; four were lost from follow-up, which ranged from 6 months to 3 years.

Results

A total of 30 consecutive patients were studied; 18 were males and 12 females. Mean age was 37.0 years (range 2 weeks to 70 years). Most injuries ($n = 25$) involved the arterial system; venous injuries were seen in five patients (17%). Half of the patients presented acutely; eight (27%) injuries were recognized during the operation. The most common mode of presentation was bleeding or chronic limb ischaemia (Table 1). Angiography was performed in 12 cases (11 arteriograms and one venogram).

Radiologists, cardiologists and intensivists caused most injuries (Table 2); types of catheter-induced injuries are shown in Table 3.

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Table 1 Clinical presentation of iatrogenic vascular injury

Clinical finding	No. of patients
Bleeding	9(30.0)
Chronic limb ischaemia	8(26.6)
Aneurysm	4(13.3)
Arteriovenous fistula	2(6.6)
Acute arthrombosis	2(6.6)
Venous thrombosis	2(6.6)
Foreign body	2(6.6)
Ligation	2(6.6)
Arterial embolism	1(3.3)

Values in parentheses are percentages

Table 2 Classification of iatrogenic vascular injury according to type of procedure

Type of procedure	No. of patients
Cannulation	14
Orthopaedic	6
Irradiation	2
General surgery	2
Healer	2
Urological	1
Gynaecological	1
Vascular	1
Others	1

Table 3 Types of catheter-induced injuries

Type of injury	No. of patients
Cardiac catheterization	2
Angioplasty	2*
Arteriography	2
Intra-aortic balloon	2
Others, e.g. C.V.P., missing foreign body	6

*One percutaneous transluminal coronary angioplasty, one percutaneous transluminal angioplasty

Two-thirds of the injuries were caused by qualified doctors, compared with eight (27%) by residents. Two injuries occurred in children after attempted bone-setting by a local healer of a supracondylar fracture. Some 19 patients were managed surgically: 17 by reconstruction, one by ligation and one by fasciotomy. Two patients were offered operation but refused. A conservative policy was adopted in nine patients. The follow-up was incomplete and short. Two patients died as a result of their underlying condition (one myocardial infarction, one head injury); lower-limb amputation was expected in these two. A total of 20 patients (67%) were symptom-free, but four had neurological complications and two developed postphlebotic limb.

Discussion

Iatrogenic vascular injuries are rare and thought to be caused by inexperienced surgeons or radiologists. However, their incidence has increased in the past few decades in the western world¹⁻⁴. In Sweden the total incidence per 100 000 population rose from 11.0 to 26.6 per year over a 30-year period (1955-1984)¹. A similar increase was also noted in the US, from 1 to 25 cases². Iatrogenic vascular injuries represented about one-third of all arterial injuries in a Greek series⁵ compared with only 14.3% in a series in Saudi Arabia⁶. This wide variation in prevalence is influenced by the local pattern of arterial injuries and their aetiological factors, as well as the progress achieved in the field of medical care. In Saudi Arabia, three cases were seen each year until 4 years ago⁶, but this has risen to an average of 12 per annum in the past 2 years - a fourfold increase. This can perhaps be attributed to the rapid progress in medical care, including the introduction of many diagnostic and therapeutic procedures used in management of cardiovascular disease.

Injuries from cannulation of vessels were the most common cause in the authors' series, mainly during treatments by radiologists, cardiologists and intensivists. Four cases occurred as a result of diagnostic procedures such as arteriography and cardiac catheterization. Although the list of complications after angiography is extensive, only 0.1% of such cases require surgical intervention⁷.

Therapeutic procedures are more harmful⁷⁻¹⁰; two problems occurred after percutaneous transluminal angioplasty¹¹ and two after insertion of an intra-aortic balloon. Catheter-induced injuries can be reduced, if the common femoral artery is punctured accurately. Atherosclerotic and hypoplastic arteries should be avoided. Intra-aortic balloons may cause persistent limb ischaemia, although improvements in wire-guided balloon technology have reduced the incidence of major aortic injuries. However, there is no evidence that limb ischaemia or its sequelae have been reduced, a fact which should be borne in mind before aortic balloons are inserted^{8,9}.

Orthopaedic surgery was the second most common cause of vascular damage in the authors' series; one case had lumbar disc surgery which resulted in iliac arteriovenous fistula. Such injuries are rare but well described in the literature¹² although their severity is often underestimated, their mortality rate being about 50%. Other orthopaedic procedures such as nailing, plating, total knee and hip replacements have also been reported to cause problems^{1,13,14} and were associated with some of the injuries reported here.

In Saudi Arabia, healers (bone-setters) are considered professional physicians by many of the rural population. Healer-induced injuries usually occur after unsuccessful attempts at reducing grossly displaced fractures. Both present cases were displaced supracondylar fractures in

children which resulted in brachial artery injuries. One child required an inter-position vein graft and the other fasciotomy for limb salvage. These injuries presented late as a result of valuable time being wasted in the healer's room¹⁵.

Other injuries in the present series resulted from miscellaneous procedures (Table 2); detailed discussion of every injury is beyond the scope of this paper^{3,8,16,17}. However, early recognition of these injuries is essential.

In this series most injuries (78%) were caused by a qualified surgeon, though those caused by residents occurred in the absence of senior supervision. Most such injuries (83%) were arterial in nature, although it is possible that the incidence of venous injuries is low because they were not reported or were undiagnosed. Arterial injuries should be managed surgically whenever possible; indications for surgery are obvious in the presence of bleeding or acute ischaemia. Nevertheless, it is difficult to convince a patient who has sustained an iatrogenic vascular injury to undergo further surgery in the same hospital to correct a 'doctor failure'. Two patients refused surgery for this reason. Recently endoscopic intravascular surgery has been used to manage intraluminal flaps, dissections and remove thrombi¹⁸.

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