Acute Arteriovenous Fistulas in War Injuries*

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ACUTE arteriovenous fistulas frequently result from and follow vascular injuries. Chronic arteriovenous communications were frequent during World War II, because arteriovenous fistulas seldom were treated in forward hospitals.[1] Repair was delayed intentionally until the patient reached an established vascular center.[2] As recently as the Korean conflict, selected injuries of the carotid and subclavian vessels were not operated upon during initial treatment.[3]

Experience with arterial injuries in Vietnam emphasizes the practicality of prompt repair at forward hospitals of all major acute arterial injuries except those requiring partial or total cardiopulmonary bypass. This is a report of arteriovenous fistulas which immediately followed war injuries and which were repaired at the time the patient was first admitted to the hospital.

Clinical Material

Six of 60 patients with arterial injuries treated from December, 1966, through October, 1967, at the 18th Surgical Hospital (MA) and during November, 1967, at the 71st Evacuation Hospital, Vietnam, were operated upon for acute arteriovenous fistulas. The hospitals, located at Pleiku in the Central Highlands, treated a large number of injured patients from the II Corps area during the months indicated.

Five U. S. Infantrymen had acute arteriovenous fistulas, and one Montagnard Striker was referred with a chronic fistula. The acute fistulas were noted upon admission of the patients to the hospital, which ranged from 1 to 6 hours following injury. The patient with a chronic fistula was admitted 2 months following injury.

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Cause of Injury

The injuries in all six patients were caused by fragments from grenades, artillery, or mortar. During the same period the causes of all arterial injuries at those hospitals were equally divided between gunshot and fragment wounds. The association of arteriovenous fistulas with small arterial wounds caused by low velocity fragments was noted in World War II.[2]

Location of Fistula

Table 1 lists the sites of the six arteriovenous fistulas. The carotid, external iliac, superficial femoral, and popliteal fistulas were acute, whereas the brachial fistula was chronic and associated with an aneurysm (Fig. 1).

Diagnosis

Diagnosis was established by physical examination in all instances. A distinct thrill was present in all but one patient; a popliteal fistula had no detectable thrill, and its murmur could be detected only by careful auscultation. The site of injury often was unimpressive (Fig. 2A). A mod-

TABLE 1. *Arteriovenous Fistulas, 18th Surgical Hospital, MA and 71st Evacuation Hospital, Vietnam, December 1966–November 1967*

Patient	Location of Fistula
1.	Common carotid artery, internal jugular vein
2.	External iliac artery and vein
3.	Superficial femoral artery and vein
4.	Popliteal artery and vein
5.	Popliteal artery and vein
6.	Brachial artery and vein; false aneurysm

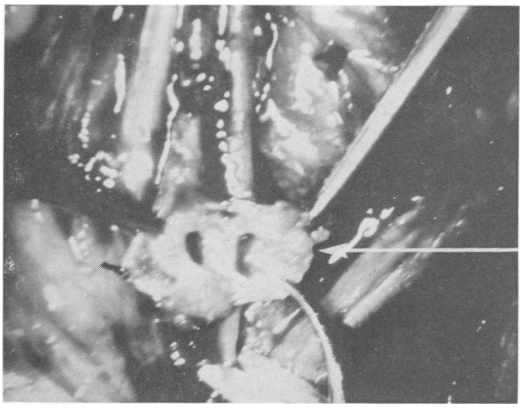

FIG. 1. Chronic arteriovenous fistula and aneurysm of brachial artery.

erate amount of hematoma was usual, and peripheral pulse were present in all patients. Arteriography was used to demonstrate the precise location of a popliteal arteriovenous fistula on one occasion (Fig. 2B) and to demonstrate the chronic brachial fistula and false aneurysm.

Operation

The artery and vein routinely were isolated proximally and distally to the fistula. At least 500 ml. of fresh hematoma was present in each acute injury, but proper proximal and distal control of the vessels prevented further blood loss (Fig. 2C).

Vein grafts were used for arterial reconstruction in the common carotid, superficial femoral, and both popliteal fistulas (Fig. 2D), but the external iliac artery was repaired by direct suture. Although repair of all veins was attempted, extensive and multiple venous injuries required ligation of the external iliac, the superficial femoral and one popliteal vein. The brachial repair, because of the small size of the artery, was accomplished by endoaneurysmorrhaphy, and the vein was ligated.

Following thorough debridement of the wounds, the arterial reconstructions were covered by a layer of muscle. The subcutaneous tissues and skin were not closed initially in patients with acute injuries, but were closed by delayed primary technic 4 to 5 days later.

Results

All patients had satisfactory results with excellent peripheral pulsations immediately following operation. A single complication, transient leg edema, occurred in the patient who required ligation of the external

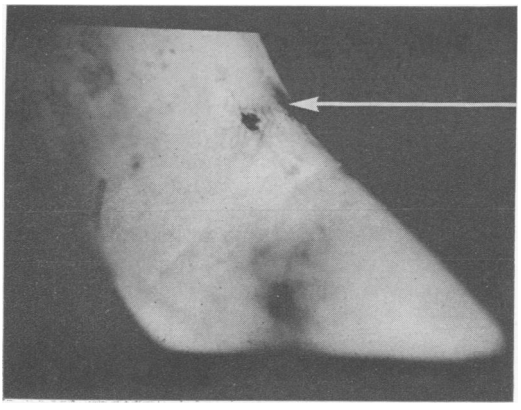

FIG. 2A. Fragment wound popliteal space resulted in acute arteriovenous fistula. Diagnosis made by the presence of a murmur.

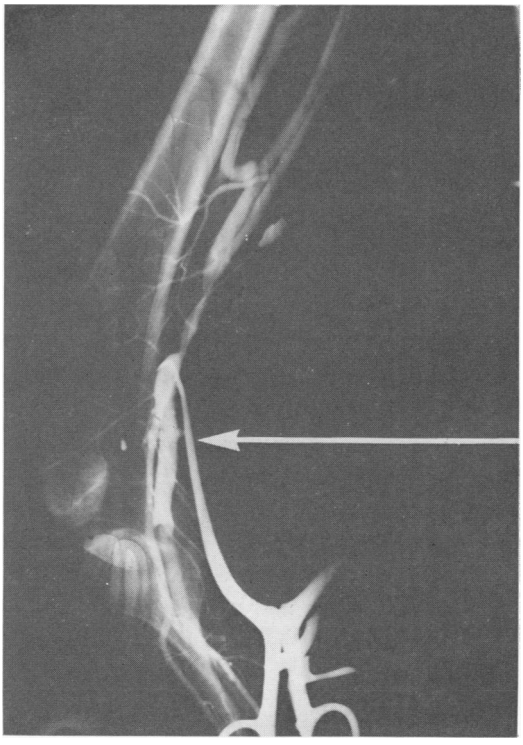

FIG. 2B. Arteriogram showing popliteal arteriovenous fistula in same patient.

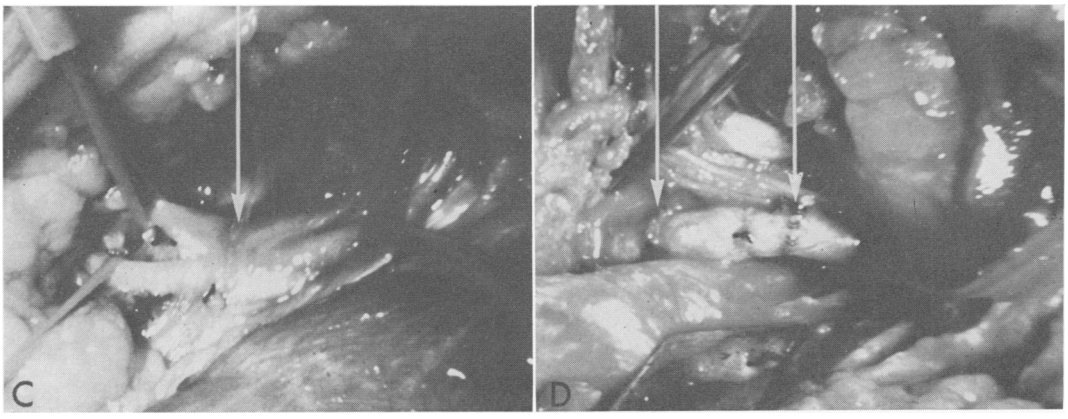

FIG. 2C. Popliteal artery and vein isolated proximally and distally to fistula. FIG. 2D. Autogenous vein graft in popliteal artery repair.

iliac vein. The edema subsided, and 6 months later the patient was active with no edema or disability. These results compare favorably to an approximate 83 per cent success rate for arterial injuries treated at the 18th Surgical Hospital (MA) during this same period.

Discussion

Restorative arterial surgery at Surgical Hospitals has become routine in Vietnam. Arterial injuries receive highest priority and are operated upon whenever the patient reaches the hospital. The development of chronic arteriovenous fistulas and pulsating hematomas thus should be largely prevented.

A surprising number of arteriovenous fistulas develop almost immediately and are diagnosed upon admission to the hospital. All penetrating wounds which are near major arteries should be carefully examined by palpation and auscultation. Auscultation is all too frequently omitted in the examination of extremity wounds. The reasons for considering such injuries as emergencies are obvious. The presence of continued blood flow through the artery and absence of ischemia favor an excellent prognosis for this particular vascular injury.

Summary

Six among 60 arterial injuries at the 18th Surgical Hospital (MA) and 71st Evacuation Hospital, Vietnam, were treated for arteriovenous fistulas. Five of six fistulas caused by war injuries were acute, and one was chronic.

All injuries were caused by fragments, and diagnosis was obvious at time of admission. The importance of auscultation of all penetrating wounds near major arteries is emphasized. Patients with carotid-jugular, femoral and popliteal arteriovenous fistulas had their arteries repaired with autogenous vein grafts, while an external iliac injury was repaired by direct suture and a brachial artery fistula and aneurysm was repaired by endoaneurysmorrhaphy. All patients had satisfactory results.

Acute arteriovenous fistulas, like other acute arterial injuries, should be operated upon promptly. The presence of continued blood flow through the artery and absence of ischemia favor an excellent prognosis in this injury.

References

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