

Ulceration of Leg Associated with Therapeutic Femoral Arteriovenous Fistula

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We treated a rare case of stasis ulceration of the leg due to surgically induced femoral arteriovenous fistula. The patient is a 24-year-old Japanese man who had poliomyelitis in his infancy and had a sequela of short left lower limb. At ten years of age he underwent surgical creation of a femoral arteriovenous fistula at another hospital to accelerate the bone growth. Although the operation was effective on the growth of the impaired extremity, stasis signs progressed in the left leg and an ulceration developed 14 years after operation. We closed the fistula restoring the arterial and venous continuities, which was followed by a rapid healing of the ulcer.

INTRODUCTION

These days a majority of surgically induced arteriovenous fistulas (AVF) are vascular access for hemodialysis. Besides, AVF for the improvement of patency in venous and small arterial reconstruction¹⁾⁻⁵⁾ and that for the therapy of limb length discrepancy⁶⁾⁻⁸⁾ have been reported. One of complications of surgically created AVF is disorders associated with venous stasis in the involved leg. Most of the disorders are, however, as mild as represented by local swelling and rare cases show severe lesions such as ulceration⁹⁾¹⁰⁾. We recently encountered a patient in whom a femoral AVF had been constructed for the purpose of equalizing a leg length difference in a case of old poliomyelitis, marked ulceration of leg being induced but healed by the closure of AVF as described below.

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CASE REPORT

A 24-year-old Japanese man was admitted to Nagasaki University Hospital in August, 1982 because of stasis ulcer of the left lower limb. At four months of age he suffered from poliomyelitis. After that, arrested growth of the left lower limb occurred as a sequela. When ten he was unable to walk without the aid of crutches because the left lower limb was shorter than the other by as much as 8 cm. In 1968, when he was ten years of age, the left femoral arteriovenous fistula was constructed for the purpose of stimulating bone growth of the left lower limb at another university hospital. This operation accelerated growth of the left lower limb, so the discrepancy in length of both limbs was reduced to 3 cm and he became able to walk without aid in several years. When about 16 he began to have stasis signs such as dark brown pigmentation in the left leg but did not seek medical advice owing to little pain. In 1982, when he was 24 years of age, ulceration developed in the left medial leg and grew to involve severe pain and itching sensation around the ulcer, so he was referred to our clinic in August of the year.

Physical examination on admission revealed a height of 173 cm, a weight of 47 kg and no abnormalities in either the chest or the abdomen except that a grade 3/6 apical systolic murmur was audible. In the left thigh, there were a postoperative scar of 6

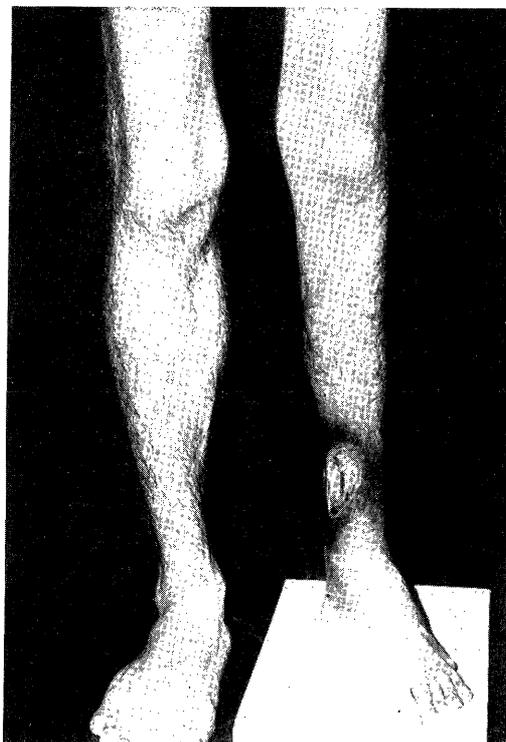


Fig. 1. Preoperative appearance of bilateral lower extremities

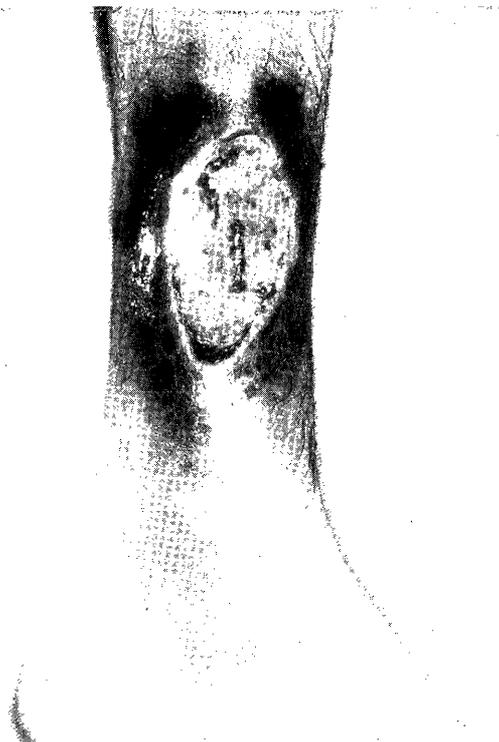


Fig. 2. Deep ulcer with circumferential pigmentation, left leg

cm, intense thrill and bruit. Compression on the scar induced BRANHAM's sign indicating a reduction in heart rate from 69 to 58 beats/min. The left lower limb was found atrophied; discrepancy in lower limb circumference was about 6 cm at a femoral level and about 9 cm at a leg level. The difference in length between the lower extremities was about 3 cm (Fig. 1). In the left medial leg was a deep ulcer measuring 8.5×4.0 cm, around which prominent pigmentation was noticed (Fig. 2).

Hematological studies, blood biochemistry, renal and respiratory function tests were within normal limits. Electrocardiograms were unremarkable except for a high voltage in the chest leads. Chest roentgenograms revealed a cardiothoracic ratio of 0.52 and a slight increase in pulmonary vascular marking (Fig. 3). Pelvic arteriograms revealed an arteriovenous communication in the thigh and a remarkable dilatation of the external iliac vein (Fig. 4).

On August 31, 1982 the arteriovenous fistula was closed under general anesthesia. The diameter of AVF was 1.7 cm. The fistula was cut to separate the artery from the vein and both vessels were reconstructed by simple suture closure with 5-0 polypropylene monofilament. The patient did well following operation, showing a remarkable ulcer-healing tendency from an early postoperative day. Free skin autografting was performed after one month, leading to a complete cure (Fig. 5). On electrocardiograms the high

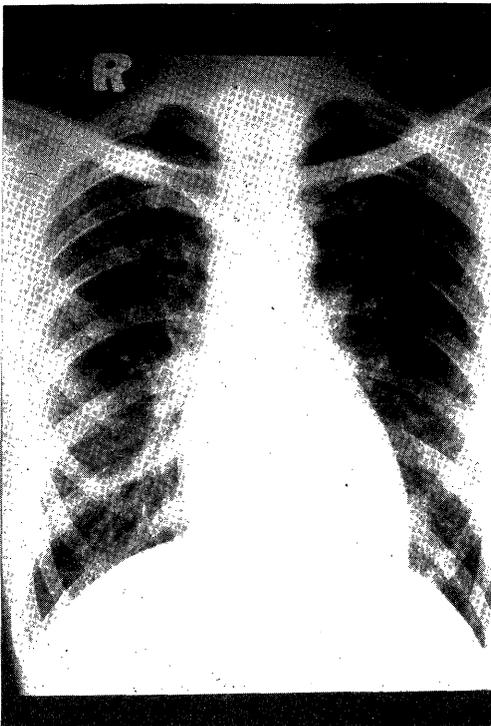


Fig. 3. Preoperative chest roentgenogram

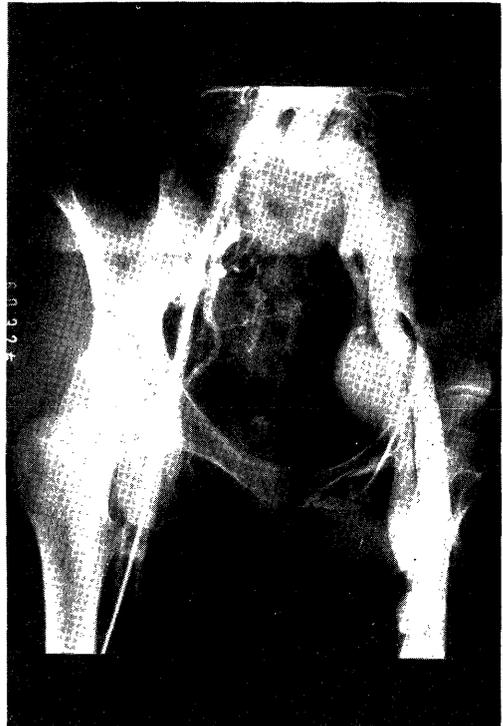


Fig. 4. Preoperative pelvic arteriogram showing presence of a large arteriovenous shunt and dilatation of the left iliac vein

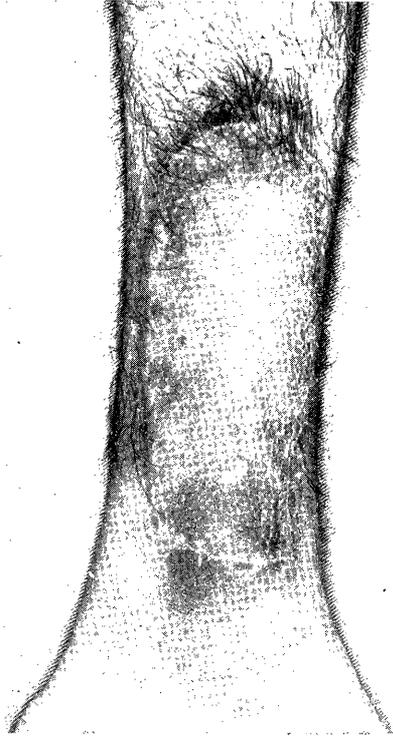


Fig. 5. Postoperative appearance of the left leg showing complete cure of the ulcer after an auto skin grafting

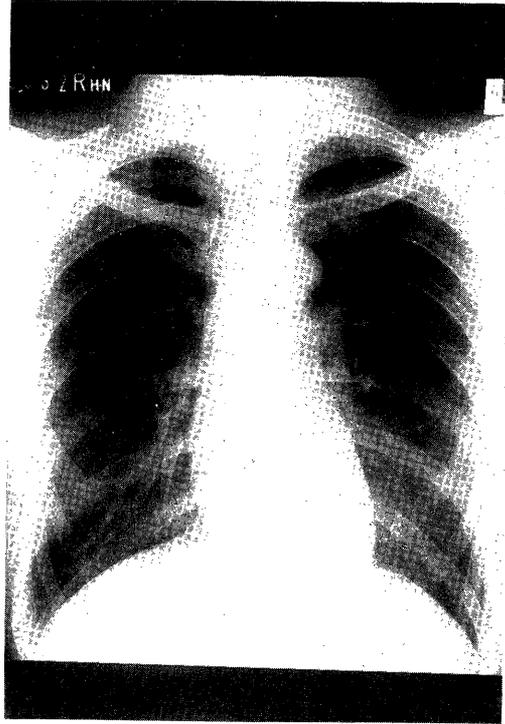


Fig. 6. Postoperative chest roentgenogram

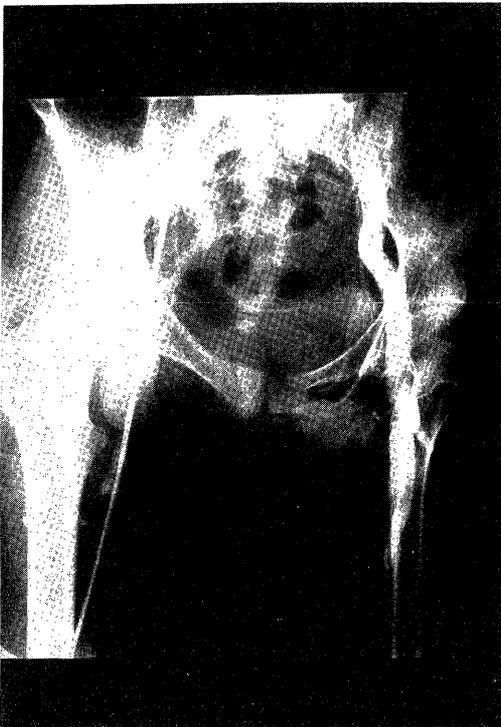


Fig. 7. Postoperative pelvic arteriogram showing complete closure of AVF

voltage in the chest leads was found diminished. Chest x-rays revealed a reduced shadow of the heart (Fig. 6). Postoperative arteriograms also revealed a complete closure of AVF (Fig. 7).

DISCUSSION

The creation of an AVF for the purpose of stimulating bone growth was first performed by JANES⁶⁾ in 1950 in a child with a short lower extremity due to old poliomyelitis, a total of 58 patients being operated on by 1961⁷⁾. HIERTONN⁸⁾ also reported five cases of success in the operation. These operations were based on the known growth stimulating effect often produced in cases of congenital AVF's. Recently, however, bone-lengthening operations took the place as more reliable surgical methods to treat disorders of this type⁹⁾. Therefore, we could not find any report of AVF construction for such a purpose from the 1970's on.

Complications associated with surgically induced AVF¹⁰⁾⁻¹⁵⁾ comprise those related to the shunt itself such as obstruction, aneurysm formation, hemorrhage and infection and those associated with hemodynamic change in AVF such as heart failure and local disturbance of the involved limb. The heart failure results from the volume load on both ventricles due to a large amount of shunt flow through AVF¹⁶⁾ and the local disturbance can be divided into 1) ischemic disorders due to "steal" of arterial blood flow on the distal side of AVF and 2) stasis disorders due to increase in venous pressure locally in the vicinity of AVF. A most common symptom of stasis disorders is swelling and it is rare to see severe disorders such as ulceration and necrosis. Incidence and severity of symptoms are also related to operation method: the larger the size of AVF or the amount of shunt, the more often occur disorders. Regarding the mode of shunt, disorders are reported to occur more often with the side-to-side shunt than the end-to-end one⁸⁾¹³⁾. Particularly, the ligation of vein on the proximal side of AVF constructed by side-to-side shunt cases intense swelling on its distal side, sometimes followed by stasis ulceration⁸⁾.

Our patient underwent femoral AVF construction for treatment of arrested growth of the left lower limb in 1968, when he was ten years of age. After that bone growth was accelerated obviously, which suggests that the operation itself was effective. However, since the AVF was kept unclosed for a long period of time, stasis signs in the leg became prominent in about 6th postoperative year, which reached ulceration in 14th year. Although subjective cardiac symptoms were still very slight, chest roentgenograms and electrocardiograms suggested presence of considerably heavy load on the heart. Since the AVF for hemodialysis, which is seen most commonly these days, is usually constructed between a relatively small artery and vein, complications associated with hemodynamic change will occur infrequently. When an AVF with large amount of shunt is constructed between a large artery and vein like in this case, however, one should carefully observe postoperative developments of heart failure and stasis disorders and close the AVF as soon as a therapeutic goal is reached or a sign of complication appears.

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