Initial Microsurgical Experiences at the National Orthopaedic Hospital

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ABSTRACT: The bony defect of different bones was replaced with vascularized bone graft by mean of microsurgical technique. The causes of the pathology were chronic osteomyelitis involving 3 tibiae, one humerus, giant cell tumor of the distal radius, congenital pseudarthrosis of one tibia and one radius. Two patients with Buerger's disease underwent bilateral palmar sympathectomy by microsurgical mean. The result of surgical invervention appeared to be good in the group of patients with giant cell tumor, congenital pseudarthrosis, and Buerger's disease. In the chronic osteomyelitis group the result of operation was unfavourable due to graft failure.

INTRODUCTION

Microsurgery as applied to orthopedics is an accepted hi-tech surgical procedure. With this technique, massive bone or skin defects can be treated with a one-stage operation which has been shown to greatly reduce hospitalization time and to facilitate a faster rehabilitation program. While orthopedic microsurgery flourished in the past two decades in foreign centers including those in Southeast Asia, this subspecialty remained, until recently, only a possibility in our hospital. Inspired by the pioneering efforts and encouraging results in the foreign centers, our modest microsurgical unit was set-up in the National Orthopedic Hospital two years ago.

During the first year, emphasis was placed on the familiarization with the operating microscope, the minute microsurgical instruments and microsutures, and the basic microsurgical techniques learned from Dr. E. Owen of the Microsearch Foundation of Sydney, Australia.[1] The following year was dedicated to exercises in canine limb replantation complete with angiography studies.[2] All these experimentations were carried out to ensure the microsurgical skills of the staff in preparation to actual clinical cases.[3] It was at this time when the microsurgical team was formed. Finally, in June 12, 1985, the first clinical microsurgical case involving free vascularized bone grafting was done.[4]

During this infancy stage, the microsurgical team has already done twelve cases and this will be the subject of this report.

OBJECTIVE

This paper aims to report our initial microsurgical experiences at the National Orthopedic Hospital primarily to create awareness of the availability of this technology in our country as an additional armamentarium in orthopedic surgery particularly in the treatment of massive bone and/or skin defects with a one stage surgical procedure. This paper further aims to solicit constructive criticisms on how we can further improve on our protocol.

MATERIALS AND METHODS

All 12 cases had routine pre-operative angiography to outline the vascular anatomy of both the donor and recipient sites. This was repeated postoperatively to verify the patency of the anastomosis. There were two surgical teams involved: one team prepared the recipient site; the other harvested the free vascularized graft. Eight – 0 and ten – 0 microsutures were used for vessels from 1 – 1.5 mm in external diameter. Broad spectrum antibiotics were regularly prescribe. Serial monthly x-rays were ordered to observe for bone union.

The external fixation in the cases of bone defects with chronic osteomyelitis was removed and

TABLE 1
Free Vascularized Fibular Graft in Chronic Osteomyelitis with Massive Bone Defect.

Name	Age/Sex	Diagnosis	No. prior surgeries	Morbidity	Outcome
S.P.	35 yr/M	Type III open fracture R. tibia	3	Post-operation infection	Graft failure
R.B.	16 yr/M	Type II open fracture L. humerus	2	Post-operation infection	Lost to f /up
M.D.	30 yr/M	Type III open fracture L. tibia	3	Post-operation infection	Graft failure
L.M.	35 yr/M	Type III open fracture R. tibia	3	Post-operation infection	Graft failure

f/up = follow up

debridement was done. Free vascularized fibula was fixed on the recipient tibia by telescoping it to the medullary cavity and putting two cortical screws on both ends. The peroneal vessels of the graft were subsequently anastomosed to the posterior tibial vessels.

In cases with giant cell tumor of the radius, the fibula was fixed to the proximal half of the radius using a four-hole semitubular plate after the tumor was thoroughly resected. The peroneal vessels were connected to the radial artery and veins.

For congenital pseudoarthrosis, all the sclerotic tissues in the affected zone were removed. The bone defect, the abnormal angulation and the shortening were corrected using the free vascularized fibula in one setting. The first case was fixed with mini-cortical screw to the telescoped fibula in the medullary cavity of the tibia. The second case was fixed with a K-wire passing through the wrist joint into the medullary cavity of the fibula to the medullary cavity of the recipient radius.

Palmar sympathectomy was done by removing the adventitial layer of all vessels found after a palmar and a dorsal thumb incisions.

The superficial circumflex iliac artery and vein was harvested together with the groin flap which was used to cover a large skin defect located at the middle portion of the right leg. Vascular anastomosis was made with the anterior tibial artery and vein.

RESULTS

The age range of the 12 patients was 1 year, 2 months to 44 years with a mean of 30.3 years. Only two of the patients were females. The average operating time was 9 hours with a range of 6 – 12 hours. Nine of these cases involved free vascularized fibular grafting, two cases were palmar sympathectomies for Buerger's disease, and one case had a free vascularized groin flap. All patients tolerated their respective procedures well.

TABLE 2
Free Vascularized Fibular Graft for Giant Cell Tumor of the Radius

Name	Age	Sex	Site	Morbidity	Outcome
F.S.	40 yrs	M	L. radius	None	Good healing
Y.A.	28 yrs	F	R. radius	None	Good healing
A.T.	40 yrs	F	L. radius	None	Good healing

TABLE 3
Free Vascularized Fibular Graft for Pseudoarthrosis

Name	Age	Sex	Site	Morbidity	Outcome
R.D.	1 yr, 2 mos.	M	L. tibia	Collapse of fixation	Graft failure
J.B.	3 yrs.	M	R. radius	none	Good healing

TABLE 4
Bilateral Palmar Sympathectomy for Buerger's Disease

Name	Age	Sex	Morbidity	Outcome
N.C.	32 yrs	M	None	Good healing
J.D.	30 yrs	M	None	Good healing

Despite the good patency of the vascular anastomosis of the bone graft vessels, all our cases with chronic osteomyelitis had resurrence of infection by the third post-operative week (Table 1). Subsequent x-rays showed sequestrations in the free vascularized fibular graft.

All our cases of giant cell tumor of the radius had uneventful post-operative course (Table 2).

TABLE 5
Free Vascularized Groin Flap

Name	Age/Sex	Diagnosis	No. prior surgeries	Morbidity	Outcome
L.M.	44 yr/M	Wide skin defect middle third right tibia	2	Necrosis of skin portion of the graft	Graft failure

Rehabilitation was started after the K-wires were removed which was about the third week after surgery.

The first case of pseudoarthrosis had disruption of this vascular anastomosis after the posterior mold broke when the infant stood up in the crib 24 hours after the procedure (Table 3). He is still recuperating from a second surgery which was done to correct the angulation. The fibula at this time was already avascular. The other similar case had an uneventful postoperative course.

The most dramatic result was seen in the cases of palmar sympathectomy (Table 4). A distinct increase in external diameter of the vessels was observed intra-operatively. Immediately post-operation, the digits improved in temperature, color, and blanching. The patient claimed improvement in sensation. The ulcers in the digits all subsequently healed.

The free vascularized groin flap showed viability only for the first two weeks. The skin necrosed and was sloughed off. On exploration, the anastomotic site was found to be disrupted.

DISCUSSION

Microsurgery has given a new era in the field of reconstructive surgery.[5] Without the microsurgical technique, large bone or skin defect invariably, at least in our hospital, undergoes a series of operations. As shown in this report, the application of free vascularized bone graft has resulted in several patients a successful one-stage operation which shortened hospitalization and facilitated early rehabilitation. There is no doubt that this technique is a major advancement in orthopedic surgery.[6]

Our results, however, showed some apparent limitations to this procedure. The poor outcome in cases with chronic osteomyelitis suggests against its routine use particularly when infection is still active. Nonetheless, this should still be studied to in the hope of improving the portocol since no other procedure seems to be uniformly effective in these cases. With more experience, better infection control and proper selection of patients, the outcome may improve.

The very satisfactory results in giant cell tumor of the radius suggests that free vascularized bone grafting is an effective procedure of reconstruction after tumor resection.[7] The transplanted fibula behaves like a fractured radius and rehabilitation can immediately be started as soon as evidence of host-graft bone union is seen.[5,8] The availability of this autologous graft should allow the surgeon to be aggressive in excising the tumor radically to lessen the chance of recurrence.

Congenital pseudoarthrosis is a difficult orthopedic condition in which conventional techniques often fail. The microsurgical procedure offers an alternative method through which amputation can be avoided. Its main advantages are that the whole diseased tibia can be removed since a large fibular graft is avilable, and the leg lengthening with correction of the deformity is done with the grafting procedure.[9] Furthermore, it has been reported that the use of a free vascularized graft may even stimulate growth of the epiphysis.[10]

Since the symphatetic fibers are imbedded in the adventitial layer of the palmar vessels, stripping off the adventitia during palmar sympathectomy resulted in vasodilatation. The results in this study suggest that this microsurgical procedure should first be tried before proceeding to the conventional surgical procedure.

Free flaps represents a dramatic one-stage procedure of distal transfer of skin flaps over areas with massive skin defects.[11] However, its utilization mandates extensive experience in multiple microvascular techniques and clinical microsurgery. That preservation of the anatomosis is central to the success of a free vascularized bone and skin grafting is shown by the failure of the first case with pseudoarthrosis (Table 3) and of our only case of free vascularized groin graft. With more individual and institutional experience with microsugery, such problems could be minimized.

CONCLUSION

Microsurgery was found to be a useful armamentarium in the treatment of massive bone defect after removal of giant cell tumor and after treatment of pseudoarthrosis in our local setting. One-stage surgery instead of serial operative procedures can be done with this technique successfully. In Buerger's disease, microsurgical palmar sympathectomy proved effective in restoring adequate circulation and in healing of the digital ulcers. With increasing experience, success rates of our new microsurgical unit should improve and this may be extended to other orthopedic microsurgical procedures as well.

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