

Bone Transport in Post Traumatic Segmental Defect, Including Infected Nonunion Using Simple AO Fixator with Threaded Rod

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ABSTRACT

We report our experience of the using AO fixator for bone transport in 10 patients with segmental bone loss, chronic osteomyelitis after trauma 3 cases with femoral shaft fracture, 8 cases with tibial fracture. The mean age of the patients was 32 year (20-50). Most of the patient had open fracture IIIA. All patients were initially managed somewhere else. Six were initially treated with external fixator 4 had IM Nailing. All patients were anaemic with raised TLC count. Culture swabs were positive for staphylococcus, and E coli. IM nails were removed necrotic segments were excised. With frequent debridements they were made culture negative. The direction of transport proximal to distal. The mean bone defect 9.36. In femoral case it was 8.5 cm. The mean duration of transport was 14.5 months. 11-19 months. The total duration from application to removal of fixator was 11-24 months. There was no deep infection, refracture. In 4 patients 60% had bone grafting of docking site. The common complication was pin tract infection which was managed accordingly..

INTRODUCTION

With the increase in high velocity injuries the incidence of open fracture with extensive bone loss increased. The lower limbs is frequently affected in high energy trauma. High energy tibial, femoral fracture often present with bone defect. In the past amputation was the usual treatment for such type of fracture.⁹ However different treatment methods are available for this problematic complication. The conventional treatment include debridement stabilization, allograft, autograft, vascularized bone graft, soft tissue procedures¹¹. Bone transport after radical resection of necrotic segment is an alternative method¹². The distraction osteogenesis technique entails segmental bone transport in which the

Corticotomy is performed in metaphyseal region, after 7-10 days latency bone is gradually distracted. The bone is thus lengthened by callus distraction and the defect is gradually closed.¹⁰ In this study we attempted to evaluate the clinical outcome of segmental bone loss, gap non union, including infected non union. The study was carried out in 10 patients, using locally made AO fixator with threaded rods for bone transport at BMC Hospital Quetta.

PATIENTS AND METHODS

Ten patients with segmental bone loss including infected non-union and osteomyelitis after trauma, treated using AO External fixator locally made for bone transport. Primary lab investigation carried out for all patients and managed accordingly. Empirical anti biotics started along with hypermentation Cultures and anti bio gram were performed where infection was suspected. Later antibiotics were

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administered according to anti bigram report.

All operations were performed under spinal anaesthesia, in supine position after adequate blood reservation. Methylene blue injection was given the day before surgery. We defined the extent of bone resection with regard to plane radiography, by appearance of bone during operation, bleeding while osteotomy. Infected pin tracts thoroughly opened debrided if they were previously operated. Fracture site was opened through a small incision by raising osteoperiosteal flap and sclerotic bone was osteotomized adjacent healthy soft tissue spared as well as periosteum of both ends. At this time culture obtained. Curettage and reaming of both proximal and distal ends carried out both ends and wound irrigated with saline, again culture was taken. Then AO Fixator with threaded rod applied. Three Schanz screws in proximal and distal segment. two screws in portable assumptive part placed. A subperiosteal osteotomy with gigli saw was carried out between proximal and assumptive middle portion. Wound left open at that time and packed with sterile gauze. Later we started closing the wound gradually. Of 5-10 days started distraction. 5mm in the morning and 5mm in the evening 1 mm daily After reaching the docking site bone graft was done if found necessary. Then partial weight bearing started. After bone canalization full weight bearing started then device was taken out.

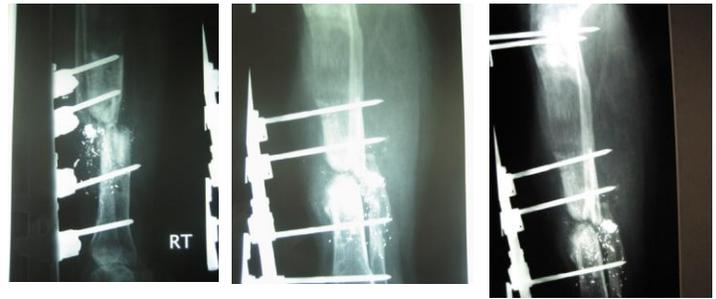
RESULTS

In total there were 10 patients which were included for this study. All were male belonging to different area of Balochistan. All patients had open fractures type IIIA. The mean age was 32 years (20-50). 3 cases of femoral fracture 30% while seven were having fracture of both bone of leg 70%. All patients

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were initially managed somewhere else. 6 were initially with external fixator 60% while 4 had IM nailing. All were grossly anaemic with raised TLC count. Culture swab were taken which were positive. Staphylococcus and E coli were causative pathogens. IM nails were removed. Necrotic segment were excised. With the frequent debridement they were made culture negative. Mean bone defect was 9.36 cm. in femoral case it was 8.5cm. The mean duration of transport was 14.5 months 11- 19 months. The total duration from application to taking off the fixator was 11-24 months. The main complication was superficial pin track infection which was well managed after good cleaning of pin site. In three cases there was deep infection with curettage and thorough washing of track it was treated in four cases. There was loosening of pins which were re adjusted. In 2 femoral cases there was refracture of

callus and in one there was malalignment which was managed accordingly.



Fire arm injury in patient with segmental tibial loss. After radical resection, bone transport. Docking site and distraction osteogenesis behind it.

Summary of patients

Patients	1	2	3	4	5	6	7	8	9	10
Age	32	30	26	20	40	36	23	25	45	50
Fracture type	Tibial fx III A	Tibial fx III A	Tibial fx III A	Tibial fx II	Tibial fx III A	Tibial fx II	Tibial fx II	Tibial fx I	Fem, fx III A	Fem, fx III A
Initial fixation	Ext, fix	Ext, fix	Ext, fix	IMN	Ext, fix	Ext, fix	IMN	IMN	Ext, fix	Ext, fix
Time between fracture application ex fix	42 weeks	50 weeks	40	60	40	48	80	70	70	68
sequester	10 cm	10.6 cm	12 cm	7cm	8cm	8 cm	11 cm	10 cm	9 cm	8cm
Bone graft of docking site	+	-	-	-	+	-	-	-	+	+
Duration of treatment	12 months	18 months	13 months	12 months	11 months	14 months	12 months	16 months	18 months	19 months
Reinfection	-	-	-	-	-	+	-	-	+	+
Sup, schnaz screw infection	+	+	+	+	+	+	-	+	+	+
loosening	-	-	-	-	-	+	+-	-	+	+
Refracture	--	--	--	--	--	--	--	--	+	+
Malalignment	--	--	--	--	--	--	--	--	+	-
Nerovascular injury	--	--	--	--	--	--	--	--	+	--
Pre op problems	Anaemic	Anaemic	addict	Anaemic Addict	Anaemic cachetic	Anaemic cachetic	Addict, anaemic	Anaemic Addict	Anaemic cachetic	Anaemic cachetic

Fx. Fracture, Ext Fix, External fixator. IMN. Intra Medulary Nail

DISCUSSION

The current rationale open fracture treatment is based on work of Gustilo, Mendoza, and William¹. Their classification of fracture treatment has been shown to be of prognostic value^{1, 2, 3}. Type IIIC in which there is arterial injury requires repair, usually result in amputation, poor results⁴. Type IIIB open fracture usually often develop painful non union and chronic sepsis may lead to amputation.⁴ The prolonged nature of treatment for this type of fracture frequently result in disruption of all aspect of patients life for a prolonged period of lifelong standing bone infection, gap non union with infection is all more challenging. Such situations tend to have residual deformity persistent infection, contractures, and prolonged fracture disease⁵. The Illizrove method of

treatment, lengthening and filling the defect has been shown to be an alternate to the more conventional methods of treatment of bone loss, such as bone grafting, free fibular graft, vascularised fibular graft^{6, 7}. The Illizrove fixator non union, gap non unions has the advantage, that chances of angular and rotational deformity are less and can be easily corrected²¹. It is cumbersome, dressing of wound is difficult. It needs expertise, so many gadgets²² can not be applied even in DHQ set up running in balochistan. Due to increase in population and civil war condition in our country and Afghanistan the firearm injury, high energy trauma is on increase. Because of better understanding and soft tissue management of these defects a lot of limbs are being saved, which would normally have been amputated^{7, 8, 9}. The treatment of bone defect is debatable and difficult issue. In the

past the treatment of choice for these injuries was amputation. Several other options are available such as autogenous cancellous bone graft, allografts, and bone morphogenetic proteins. BMP bone morphogenetic proteins are still experimental^{13,14,15}. Autogenous bone graft has been used successfully for the management of defect of 6-10 cm^{9,16,17}. It requires long period before strengthening of graft occurs and makes weight bearing possible. Stresses fractures may develop at the graft site as well as non-union at the bone graft junction^{14,18,19}. Free vascularised bone graft have been used since seventies. It has been reported that that success rate for segmental bone defect 69% and 15% cases requires secondary surgical procedure.^{9,4,20}. This require long term immobilization, bracing, graft stress fracture usually occurs at the graft site. This is micro surgical techniques which are not available in every centre. Infact that graft requires up to three years to achieve normal bone dimension are further disadvantage of this method^{19,20}. The unilateral configuration of the frame (fixator) greatly reduced the risk of neurovascular injuries and is more comfortable for the patient than ring fixator. It seems that less time between the fracture and using external fixator for bone transport the better treatment outcome and less complication. generally the better general condition before operation the better treatment outcome. Bone graft carried out in 3 patients. However it is suggested to be done prophylactically in order to decrease the duration of treatment²³. In our experience there was neither any reinfection nor a need for amputation in any of the cases. Bone transport using AO fixator is an alternative treatment in the salvage of limbs with infected non union, segmental loss, that may otherwise have been amputated, and returns disabled patients to normal and productive level of activity.

CONCLUSION

The clinical condition like post traumatic infection, bone loss, should be diagnosed as soon as possible since otherwise if treatment is delayed as it was in our cases. The progressive soft tissue and bone destruction will occur and aggressive surgical treatment will be needed. The AO fixator distracter is the only alternative available in current scenario, where modern facilities are not available, to manage such clinical situations.

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