

Лечение дефектов плечевой кости по методу Илизарова

Omer Ali Rafiq Barawi

Школа Медицины, Университет Sulaimani, Региональное Правительство Курдистана, Ирак

Management of bone defect of humerus by Ilizarov method

Omer Ali Rafiq Barawi

School of Medicine-University of Sulaimani-Kurdistan Regional Government of Iraq

INTRODUCTION

The treatment of posttraumatic diaphyseal bone defects (BD) calls for a number of techniques including bone transport techniques, shortening, compression-distraction at the fracture site, shortening followed by lengthening in a corticotomy distant from the site and segmental bone transport [1]. The earliest treatment for these problems included

amputation or shortening where as more recent treatments have included bone lengthening, bone grafting, Titanium mesh cage packed with allograft and distraction osteogenesis [2]. The French technique of bone grafting within induced membranes, otherwise known as the Masquet technique, offers a viable alternative with minimal complications [3].

PATIENTS AND METHODS

Between Feb.2010 and Feb.2014, 10 patients with bone loss and upper arm shortening were treated by segmental bone transport using Ilizarov method, the amount of bone loss in the humeri ranging from (3cm-9cm), average 6 cm, male to female ratio is 7/3. Their age ranged from 20-60 years (average 37.8 years). Number of previous operations ranged from 2-6 operations (average 3.6 operations).

The causes were trauma in 9 cases as they were treated by multiple operations of open reduction and internal fixation and bone graft, while one of the cases was a complication of bone elongation causing delayed union of distraction site (Table 1).

External fixation index 34.8 days/cm, bony results, Table 2 showing 6 cases excellent and 4 cases good depending on four criteria (union, infection, deformity and upper limb length discrepancy). Recommended by Paley et al [4, 5, 6].

An excellent result was one with union, no infection, axial deviation <5°, no limb length discrepancy. A good result was union, no infection, axial deviation between 5° and 15° and limb length discrepancy < 3 Cm. A poor result was nonunion, refracture, axial deviation >15° or limb length discrepancy >3 cm.

Functional results 7 cases excellent and 3 cases good. The functional results based on 3 criteria as recommended by Cattaneo et al., which are range of motion of shoulder and elbow, functional activities such as perineal care, sports, brushing teeth and face washing and patient satisfaction.

An excellent result was one with improved or unchanged range of movement, improved functional activities and satisfaction. A good result was with no change or < 10° loss of preoperative range of movement, with maintained functional activities and satisfaction. A poor result was one with loss of range of movement by < 10°, deteriorated functional activities or dissatisfaction [4, 5, 6].

Table 1

Preoperative patient data

Case	Age	Gender	No. of previous operations	Bone loss in Centimeters	Type of operation
1	60	Female	5	9	O.R.I.F.&B.G
2	28	Female	2	9	Bone elongation
3	20	Male	3	4	O.R.I.F.&B.G
4	35	Male	4	5	O.R.I.F.&B.G
5	40	Male	4	5	O.R.I.F.&B.G
6	42	Male	3	5	O.R.I.F.
7	32	Male	3	7	O.R.I.F.
8	62	Male	4	4	O.R.I.F.
9	29	Male	6	5	O.R.I.F.
10	30	Female	2	6	O.R.I.F.

Note: O.R.I.F. – open reduction and internal fixation by plate and screws. B.G. – bone graft.

Table 2

Results

Case	Lengthening in cm	External fixation index, Days/cm	Bone status at last follow up	Functional status at last follow up
1	9	40	Excellent	Excellent
2	8	40	Good	Good
3	4	30	Good	Good
4	5	35	Excellent	Excellent
5	5	36	Good	Excellent
6	6	35	Excellent	Excellent
7	6	37	Good	Good
8	4	31	Excellent	Excellent
9	5	33	Excellent	Excellent
10	6	31	Excellent	Excellent

COMPLICATIONS

Pin tract infection 4 cases 3 of them treated by oral antibiotics and proper hygiene, while one of them treated by replacing the pin with another pin.

Inferior subluxation of gleno-humeral joint one case and treated by physiotherapy.

DISCUSSION

Intraoperatively, I didn't expose the docking site of two of the cases for removal of the false joints as the failed implants were removed before their presentation to me, the limbs were protected by braces, similar to the study done by T. Liu et al [7]. While in the remaining 8 cases, refreshing

of nonunion sites done till capillary cortical bleeding seen from the fragments, Paprika sign, which is considered as the endpoint of resection [8]. The reason for refreshing the fragments is that as a part of removal of implant failure I refreshed the exposed fragments also (Fig. 1).



Fig. 1. (a, b): Plain radiograph of left humerus of 60 years old lady, A.P. & Lateral views, showing non-union & implant failure

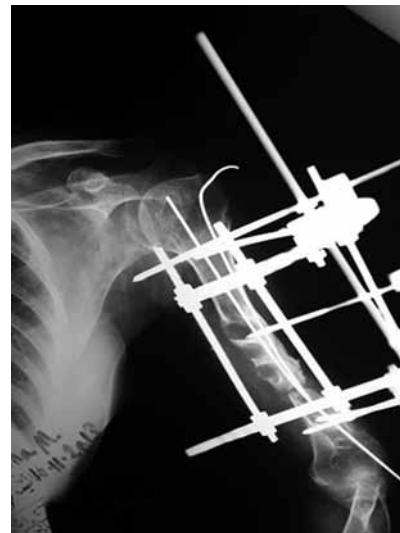


Fig. 1. (c): Plain radiograph of left humerus of the same patient after removal of the failed implant & fixation by two intramedullary K-wires & Ilizarov frame



Fig. 1. (d, e): The same patient after bifocal bone transportation & removal of fixators & using brace



Fig. 1. (f, g, h): The same patient holding a chair or her bag



Fig. 1. (i, j): Plain radiograph of the same patient showing well corticalised distraction sites & well united compression site

Regarding case No. 4, there was nonunion of docking site so I did Accordion Procedure for her, which is shortening for 3 days daily 3 mm i.e. 1mm/8 hours thus totally 9 mm will be shortened, then stop for 10 days and

restart elongation 0.25mm/12 hours thus within 18 days the shortened 9 mm will be compensated [9].

Case No. 2. She was 28 years old, her chief complaint was discrepancy of upper arms 9 cm, so both elbows were not at the same level that was the sequel of pyogenic osteomyelitis of proximal humerus during her childhood, I started bone elongation using Ilizarov frame 9 days after starting of distraction, she developed wrist drop, her radiograph showing malaligned distal fragment, compressing the radial nerve in spite of stopping distraction and waiting for 6 weeks no improvement of wrist drop, confirmed by Electromyography and Nerve Conduction Study, so exploration of the radial nerve done with adjustment of external fixator frame, the distraction is restarted, 4 days after the operation 1 mm/day till equalization of the limb done but it was ended by delayed union, so proximal to distraction site a corticotomy done for distraction of new corticotomy site and compression of the non-union site (Fig. 2). Wrist drop disappeared 50 days after exploration of the radial nerve.

All the 10 cases had been cases of fracture of the humerus treated by surgical intervention, they are prone to nonunion and bone defect this is in favour that most diaphyseal fractures of humerus heal without surgical intervention [10].

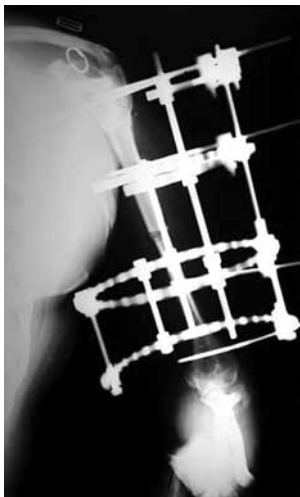


Fig. 2. (a): Plain radiograph of left humerus of a 28 years old lady, 9-cm shortening as sequel of osteomyelitis, corticotomy of the middle part of the humerus

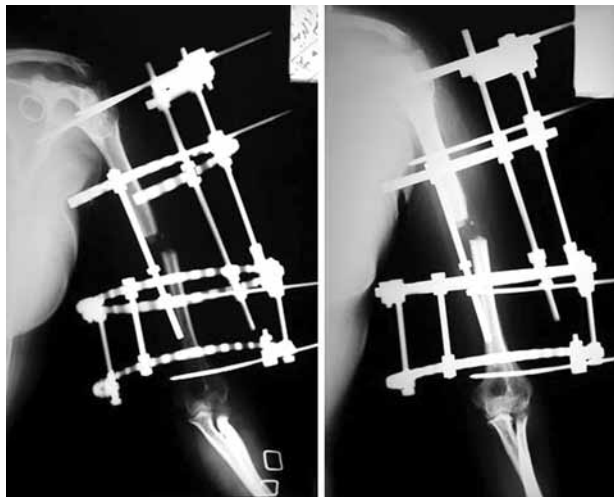


Fig. 2. (b, c): Plain radiograph of the same patient with malaligned distal fragment causing wrist drop

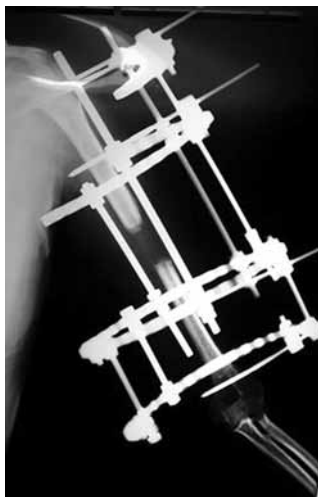


Fig. 2. (d): Plain radiograph of left humerus of the same patient with distraction of corticotomy site & no evidence of union



Fig. 2. (e): Plain radiograph of left humerus of the same patient, corticotomy done in the proximal part of the left humerus



Fig. 2. (f): Distraction started to fill the gap & compensate for shortening

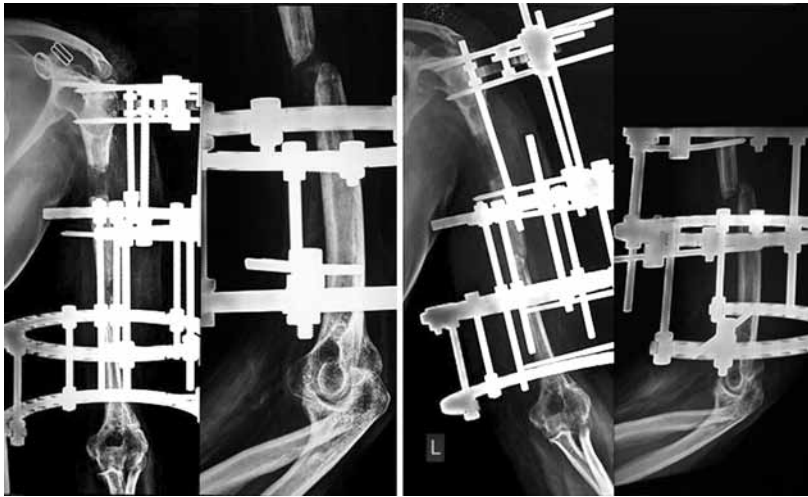


Fig. 2. (g, h): Plain radiograph of left humerus of the same patient, even there is some overlap of the fragments at the compression site



Fig. 2. (i): Plain radiograph of the same patient showing evidence of union at the compression site



Fig. 2. (j, k, l): The same patient after removal of the Ilizarov frame, well equalized humeri (as there were 9-cm shortening), scar tissues of her childhood operations for infection, she can use her hand holding her bag



Fig. 2. (m, n): Plain radiograph of the same patient, showing well corticalised distraction site & well united docking site

CONCLUSION

Segmental Bone Transport is a very successful method for treating bone defects in humerus to control infection, stimulate osteogenesis at docking (non-union) site and to compensate for any shortening.

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Information about author:

Barawi Omer Ali Rafiq – School of Medicine–University of Sulaimani–Kurdistan Regional Government of Iraq.