A Prospective Study for Functional Outcome of Tension Band Wiring in Treatment of Proximal Humerus Fractures Neer's Type III

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ABSTRACT:

BACKGROUND:

Many methods used for treatment of proximal humerus fractures, in this study used the tension band wiring in treatment of proximal humerus surgical neck as figure of 8 in treatment of these fractures.

OBJECTIVE:

To prove the advantages of tension band wiring in treatment of proximal humerus fractures.

Patients& Methods:

From December 2003- December 2006, 16 patients with closed two part surgical Neck proximal humerus fractures Neer's type III were admitted to the department of orthopaedic surgery and traumatology in Alkarama General Hospital &Sulaimania Teaching Hospital. All patients were males mean age 32 years, all patients were treated by figure –of- 8 tension band wiring techniques with minimal osteosynthesis in fixation, surgical deltoid splitting approach without disturbing the Vascularity of the humeral head, but with a stable secure fixation.

RESULTS:

The out come of this method of treatment was reviewed monthly for 12 months. The results were evaluated according to the Neer's criteria and scores. The final follow up 13 patients out of 16 (81.25%) achieved excellent and satisfactory results, 3 patients (18.75%) was rated as unsatisfactory result. So the final outcome according to Neer's scores was good and excellent result.

CONCLUSION:

Two parts displaced proximal humerus fractures in young adults patients Treated by open reduction with fixation by tension band wiring has improved the functional outcome results of these type fractures.

KEY WORDS: FOOSH fall on out stretched hand, RTA road traffic accident, T tuberosity DT direct trauma, HIIP harness injury, AP anterior-posterior, lat; lateral.

INTRODUCTION:

Many authors have discussed the proximal humerus fractures with the functional methods of treatment, from historical review start by; Roberts, Codman, Stewart, Hundley and Cooke from 1932 till 1949 they explained the good result with conservative treatment. Bosworth 1949 the early beginning of open reduction with internal fixation of proximal humerus fractures[1]. Then Paavolainen used plate and screws in fixation[2] Muller used T plate and screws,[3] Kristiansen and Kofoed used the external fixation in treatment.[4] Flatow 1991 ,Cuomo 1992,Darder1993 treated proximal humerus fractures by using humeral ender nails incorporated into a tension band wire through rotator cuff tendon [5,6,7] . Our technique used tension band wiring with two k wire as figure of 8 after open reduction and internal fixation by this minimal osteosynthesis to assess the value of this method in treatment of proximal humerus fractures. In 1970 Neer's reported the basic Classification of proximal humerus fracture and treatment accordingly; also he added the significance of using tension wire technique for fixation of the fractures.[8,9,10,14,15].

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Table1: Sex distribution / Neer's classification

Groups	Type of fractures	Women	Men	Total	%
G I	Minimally displace	29	8	37	5
G II	Two part anatomical Neck	0	0	0	0
G III	Two part surgical Neck	12	6	18	25
G IV	Two part or more including greater T.	7	2	9	13
G V	Two part or more including lesser T.	1	0	1	1
G VI	Fracture dislocation	5	2	7	10

There are three ossification centers give rise proximal humerus (one for humeral head and other two for tuberosity) fusion of these ossification centers at physis creates a weakened point that susceptible to the fractures.(22,23,32)

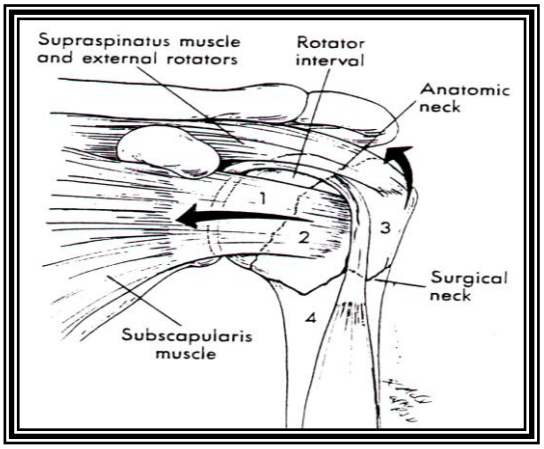

Figure 1: Ossification centers

PATIENTS AND METHODS:

During the period from December 2003 to December 2006. 16 patients were admitted to the orthopedic department in HAMMAD SHIHAB military hospital. Presented with closed proximal humerus fractures (two parts) Neer's type III, were treated by open reduction internal fixation by tension band wiring techniques. The average period of follow up was 12 months for each patient. The patients were male their average age 32 years. Surgery was performed at an average of 3 days after the injury. The right shoulder involved in 9 patients (56.25 %), left shoulder was In 7 patients (43.75 %).

Causes of injury:

There were different factors which led to the proximal humerus fractures. The most common one resulted from falls on out stretched hand, the second commonest causes is road traffic accident .

Table 2: Causes of injury

Causes of injury	NO /patient	%
1. Fall on out stretched hand FOOSH	10	62.25
2. Road traffic accident RTA	3	18.75
3. Direct trauma DT	2	12.5
4. Harness injuries in parachutist HIIP	1	6.25
Total	16	100

Table 3: Preoperative Assessment

NO	Sex	Age	Side	Causes	Presented	Association injuries	Radiology AP/Lat/Axillary
1	M	24	R	FOOSH	Tenderness swelling		Ap + lat + Axillary
2	M	29	R	R.T.A			Ap + lat + Axillary
3	M	25	R	DT	Tenderness swelling		Ap + lat + Axillary
4	M	33	L	FOOSH	Pain tenderness swelling + partial axillary n. palsy		Ap + lat + Axillary
5	M	21	R	FOOSH	Tenderness swelling		Ap + lat + Axillary
6	M	27	L	RTA	Swelling		Ap + lat + Axillary
7	M	42	R	FOOSH	Pain tenderness swelling bruising	Fracture femur	Ap + lat
8	M	28	L	FOOSH	Tenderness swelling bruising	Fracture tibia	Ap + lat
9	M	31	L	DT	Swelling		Ap + lat + Axillary
10	M	24	R	FOOSH	Swelling bruising		Ap + lat + Axillary
11	M	22	L	RTA	Tenderness swelling bruising		Ap + lat + Axillary
12	M	41	R	FOOSH	Swelling + bruising	Head injuries	Ap + lat
13	M	35	R	HIIP	Swelling severe bruising		Ap + lat
14	M	38	L	FOOSH	Swelling		Ap + lat + Axillary
15	M	22	R	FOOSH	Bruising		Ap + lat + Axillary
16	M	30	L	FOOSH	Tenderness swelling		Ap + lat + Axillary

Surgical procedure:

1. Preparation of patients for surgical incision Through Anterior deltoid – splitting approach, skin incision about 10 cm. long extend down wards and laterally from the coracoids process following the medial edge of the deltoid muscle. Then going to deep fascia through deltopectoral groove (which is in the junction between pectoralis major & deltoid M.). The marker of this groove was the cephalic vein. The vein retracted medially with the pectoralis major & keeps this exposure by self retaining retractor.

2. After reduction, the fracture held by bone holder to pass 2 K-wires 2.5 mm. from the tuberosity through the humeral shaft in the medularlly canal. A hole was made distally by drill for the passage of circulage wire (18 gauge stainless steel wire), about 20cm length and in a figure of -8-shape around 2 K-wires after holding the circulage wire by wire forceps and twisting around the 2 k-wires that done after passage of the circulage wire under the tendon of supraspinatus to continue twisting until became securely fixed and rigid.

3. After fixation of the fracture we repaired any tear in the rotator cuff, also reattached the tendons of coracoids process if they were cut.

Postoperative care:

1- 1st phase: Early passive motion 3-4 days postoperative

.2- 2nd phase: Active exercises 1 -6 weeks postoperative

3- 3rdphase: Advance stretching with progressive increase resistance 6weeks-12 weeks.

RESULTS:

All patients were evaluated clinically and radiological after operation and followed up to 12 months after surgery. The evaluation clinically post operative was for the pain, function, range of motion, and the radiological evaluation for the anatomical reduction. Every result of proximal humeral fractures had to be evaluated according to the,

Neer's criteria: which evaluated the results according to the scoring system of Neer's (1970), which consists of a maximum of 100 units, then evaluation according to scoring systems as shown in the following tables .

Table 4: Neer's criteria

Clinical assessment	unit score
Pain	35
Function	30
Range of motion	25
Anatomy	10
Total	100

Table 5: Neer's score system

Resultant score	Resultant score in unit
Excellent score	90 or more
Satisfactory	80 – 90
Unsatisfactory	70 – 79
Failure score	less than 70 units

Table 6: Assessment of shoulder function (neer's criteria)

no	pain	function	range of motion	anatomy radiology	results
score	35	30	25	10	100
1	no	normal	good	normal	excellent
2	no	normal	good	normal	excellent
3	no	normal	good	acceptable	satisfactory
4	no	normal	good	acceptable	satisfactory
5	no	normal	good	normal	excellent
6	no	normal	good	acceptable	satisfactory
7	mild	normal	mild limitation	not acceptable	unsatisfactory
8	mild	normal	mild limitation	acceptable	unsatisfactory
9	no	normal	good	normal	excellent
10	no	normal	good	normal	excellent
11	no	normal	good	normal	excellent
12	moderate	moderate weakness	moderate limitation	not acceptable	failure score
13	no	normal	good	normal	excellent
14	no	normal	good	acceptable	satisfactory
15	no	normal	good	acceptable	excellent
16	no	normal	good	normal	excellent

Table 7: Assessment of shoulder function (neer's score)

no	pain	function	range of motion	anatomy	results
score	35	30	25	10	100
1	34	28	22	8	92
2	35	27	21	10	95
3	33	27	23	7	88
4	32	26	21	6	85
5	34	28	22	8	92
6	34	25	21	7	87
7	30	25	19	5	72
8	30	24	18	6	79
9	34	28	22	9	93
10	35	30	24	8	97
11	32	27	22	10	91
12	25	19	15	5	64
13	34	29	22	8	93
14	32	25	21	7	85
15	34	28	23	7	92
16	34	28	22	9	93

Table 8: Follow up of the results.

no. of patients	results (scores)	%
9	excellent (≥ 90)	56.25
4	satisfactory (80-89)	25
2	unsatisfactory (70-79)	12.5
1	failure score (< 70)	6.25

Excellent and satisfactory result 81.25 %

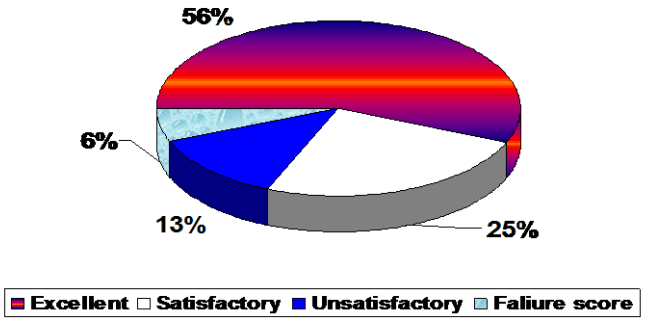

Fig 2: The Results

DISCUSSION:

Use of minimal internal Fixation in displaced fractures of proximal humerus (two part fractures Neer's type III) by tension band wiring techniques in stabilization of the fractures with a high percentage of acceptable results, in young adults patients.

In our study the excellent and satisfactory results was 13(81.25%), unsatisfactory results 3(18.75%).All the fractures healed with no infection or a vascular necrosis or non union. In comparing our result to the Cuomo. F [4, 16] who used Enders nail incorporated into a tension band wiring through rotator cuff tendon reported 18(82%) good or excellent results, 4 (18%) unsatisfactory results. All the fractures healed with no infection or nonunion with good functional outcome.

Flatow.EL [5], who reported 16(80%) were rated as excellent results, 4(20%) unsatisfactory results. All the fractures healed with no postoperative displacement, No limitation in activities, No a vascular necrosis were in

treatment used Enders nail in fixation.

Paavolainen et al [2] reported (74.2%) excellent & satisfactory results, (17.8%). Unsatisfactory,) poor results. Infection rate 4%, a vascular necrosis (2.75%), (15.8%) with mild to moderate

limitation of movement after using the plate and screws for the fixation.

Thomas B. young, W .A Wallace [(1)] reported (40%) good & excellent results, (40%) acceptable results, (20%) poor results. No a vascular necrosis, (8%) with mild limitation of movement, (22%) with moderate to severe limitation of the movement, non union rate 20%, after conservative treatment of two part proximal humerus fractures .

Muller et al [(3)] reported (78%) excellent & satisfactory results, (15%) unsatisfactory, (7%) poor results. No non union, infection rate 2.5%, (12.6%) mild to moderate limitation of movement, a vascular necrosis (3.25%) after using T plate fixation .

There was no infection rate in our study & supported by the study of Cuomo F. [(6)] and Flatow.EL .[(5)] While Paavolainen et al[(2)] who reported 4% of infection after using the plate &screws, while Muller et al[(3)] reported infection rate 2.5% after using T plate fixation.

In our study one patients (6.25%) had mild limitation of movement, while Paavolainen et al[(2)] reported (15.8%) mild to moderate limitation of movement after using plate & screws, Muller et al[(3)] reported (12.6%) mild to moderate limitation of movement after using T plate .

In our study no a vascular necrosis while Muller et al [(3)] reported (3.25%) a vascular necrosis after using T plate, Paavolainen et al [(2)] who reported (2.75%) a vascular necrosis after using plate & screws .No non union rate or malunion interfered with function in our study & no persistent nerve palsy.

CONCLUSION:

1- Two–part fractures of displaced proximal humerus in young adult's patients need prompt reduction & fixation, by Our technique open reduction and tension band wiring with 2 k-wire transfixion of the rotator cuff gives a high acceptable results specially compression at the fracture site is regarded as a factor for early healing in comparison to other methods of treatments even more favorable results than conservative treatment.

2- Generally a simple technique with minimal complications (infection & a vascular necrosis. By the use of minimal osteosynthesis in this type of surgery is strong enough to allow early post operative rehabilitation, reduce the post operative stiffness.

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