The Validity of Tension Band Wring In Treatment of Olecranon Compound Fractures

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ABSTRACT:

BACKGROUND:

Compound fracture olecranon alone or associated other injuries is common in Iraq in last years due to different type of war injuries. Different methods of treatment used in its management. In this study I asses the validity of using tension band wiring and intramedullary K-wires in treatment of such fractures and comparing this result with others studies.

OBJECTIVE:

Of the study is to asses the validity of this technique in the management of compound fracture olecranon.

METHODS:

Non-Randomized clinical trial (NRCT)done in Al-Kindy teaching hospital and Al-Jarah private hospital in the period between Jan,2001 and Dec.2006.two hundred twelve patients visited these hospitals. A 96 patients were selected according to certain criteria (type B ASIF classification and type 1 and 2 Gustillo classification).We divided those patients in to two groups ,group A 62 patients with isolated compound fractures olecranon ,and group B 32 patients with neglected fractures (treated in other hospitals either they treat them without fixation or they were dealt with other injuries and leave the olecranon fracture later on Those patients visited these hospitals within 4-6 weeks.

RESULT:

Male to female ratio was3.77:1for the sample “group A and B”. In group A; the highest age group was 20-29 year (48.4%).The rate of union was 61.3% healed within the first three months .The range of motion was 61.3% got full rang of motion and 3.23% developed loss of extension 15-20 degrees. The incidence of infection was 11.3% and mostly superficial. Follow up for two years. In group B ,the male to female ratio was 7.5:1 also the highest age group was 20 -29 year (44.1%).The rate of union was 8.8% during the first three months while 38.2% within 6-9 months and 26.5%within 9-12 months. The incidence of infection was 8.82%.Gaining full range of motion 5.9% while loss of extension 10-15degrees was 26/5% and loss of more than 20 degrees was 11.8%.Follow up for two years.

CONCLUSION:

Tension band wiring and intramedullary K-wires proved to be the ideal method of fixation of compound fracture olecranon as early as possible in order to get rapid union and excellent rang of motion.

KEYWORDS: olecranon, fracture, tension band wiring.

INTRODUCTION:

Isolated fractures of the olecranon occur frequently in adult [(1)] they are caused by forced flexion of elbow against the actively contracting triceps. In Iraq, in the last years due to the war, we faced the problem of compound fracture of olecranon more than closed as an isolated fracture or in association with other injuries due to missile, bullet, and motor vehicle ….etc. There is no national statistic, not only for olecranon fracture but also for all types of injuries .so the size of the problem in Iraq can not be determined The second important point is whether to do internal fixation early or late irrespective to the degree of the soft time injury ,the type of fractures and the type of infection. .

Most fractures are intraarticuler, although extraarticular fractures do occur with a small bony fragments avulsed the fractures may be transverse, oblique with wide separation of the fragments or comminuted. Generally, the aim of the treatment is to prevent infection, to restore the power of active

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extension, mobility and the stability of the joint. if a separated fragments is allowed its heal by fibrous tissue, movement is preserved and active extension is satisfactory because of gravity but the lack of power in an elbow will make the treatment produces a real disability.[3] Open reduction and internal fixation compose the currently recommended treatment for most olecranon fractures .However some literatures stressing the importance of the anterior oblique ligament may influence selection of an appropriate operative procedures [4][5] Different methods of treatment were used but the treatment is influenced by the state of the triceps insertion, if detached, repair of the tendon is the primary concern[6]. The separated bony fragments must be reduced and fixed internally. Fracture of the olecranon, although involving the articular surface of the elbow, do not cause sufficient degenerative change to warrant excision of the separated fragments. Also excision of the displaced fragments is an attractive alternative in the elderly patients, up to 50% of the articular surface can be resected without decreasing stability but must not to disturb the medial collateral ligament "anterior oblique ligament[7]. Tension band fixation provide distribution of stresses with tension on convex and compression on the concave side of olecranon in order to restore the load – bearing capacity of eccentrically loaded fracture bone ,the tensile force have to be absorbed by tension band and the bone itself has to be able to withstand axial compression [8].Tension band concept was introduced to orthopaedic surgery by Pauwels in the 1930 [9].The function of k-wires is prevent rotational movement of the fracture and to anchorage the wire[10]. The triceps muscle is a major deforming force .Tension band wire counteract the triceps pulls while minimizing the small gap on the flexion compression side of the bone. The wire must counteract tensile forces, this method of fixation is cheap and effective method of internal fixation there are many types of classification but the A.O-ASIF classification used in this study: [11]

1- Type A Fractures are extraarticular .

2- Type B Fractures are intraarticular .

3- Type C Fractures are intraarticular of both head of radius and olecranon. The decision whether to use primary internal fixation in open fractures is still controversial. when stable reduction of an open fracture can not be obtained or maintained by other methods it is important that the use of primary internal fixation should be considered The risks of its use must be carefully weighed against the problems of gross instability , mal-alignment severe comminution and potentially infected wounds, all of which are attendant upon the conservatively treated open fractures ,although infection may occur with internal fixation ,at least the fractures should remain in good position .deformity should be controlled and reconstruction and grafting in a clean field " once infection has been overcome" may be carried out at a later date [12].

PATIENTS AND METHODS:

This is a non-randomized clinical trial done in Al-kindy teaching hospital and Al-Jarah private hospital in the period between Jan.2001 and Dec.2006. About 212 patients with fractures olecranon and other injuries visited these hospitals. A 96 cases were selected according its certain criteria. We divided those patients in to two groups. Groups A: Included 62 patients with isolated compound fractures of(type B AO-ASIF classification and Gustillo type 1 and 2) treated surgically by proper wound debridementl and internal fixation of the fractures by Tension Band Wires and intramedullary k-wires.

Group B: Includes 34 patients with or without other injuries in addition to compound fractures olecranon type B "AO-ASIF" classification and Gustillo 1 and 2. they reached our hospitals 4-6 weeks after injury either because of the treatment of other injuries in other hospitals.(abdominal ,chest, head or other injuries) or isolate compound fracture olecranon treated by wound debridement in other hospital in Baghdad or other Governorate .those patients treated surgically by proper wound debridement with or without skin graft and later after heading of the skin, internal fixation by Tension Band Wires and intra-medullary K-wire was used. A special are forma was arranged for this purpose and all information related to these patients are collected and studied. Follow up of those patients Weekly and then monthly till the end of the treatment .Our protocol for management includes the following:-

1-Group (A) Under general anaesthesia proper wound debridement and removal of accessible foreign bodies, repeated washing with ringer or isotonic saline. Then reduction of the fracture and fixation by figure 8 cerclege wires and two intra medullay K- wires, readivac drain was used and closure of the wound without tension, then above elbow posterior slab.

- After 48 hours removal of the drain and changes of dressing using isotonic saline or ringer solution then providin iodin 10 %.

- One week after surgery change of dressing same as above.
- Two weeks after surgery change of dressing and removal of stitches and the slab and encourage active movement of elbow joint ,after two weeks also another visit ,checking X-ray (antero-posterior and lateral views) then monthly visit and checking X-ray till healing of the fracture occur.

2-Group (B) Same as managements of group A but no early internal fixation. Waiting till granulation tissue formation then skin graft if needed using posterior above elbow slab. After healing of covering tissues, exploration and using tension Band Wires and intramedully K-wires with posterior above elbow slab for two weeks then continue the same group A procedures. Waiting till granulation tissue formation then skin graft if needed .using posterior above elbow slab .Matching were done between group A and B regarding age, gender, and occupation. Ethical issue were taken into consideration. Assessment of outcome were relied and confirmed by external evaluator. Statistical analysis were done using percentages, chi-square and fisher exact test when needed. Level of significance were 0.05.

RESULTS:

From 212 patients, 96 patients selected according to above criteria; 79 male and 17 female, male to female ratio was 3.77:1.The findings in each group was :-

1- Group (A): 62 patients.

1- As shown in (Table -1) 49 male (79.03%) and 13 female (20.97 %) and the highest age group was (20 – 29) years (48.4%). Male to female ratio was3.77:1.

2- From (Table -2) policeman was 35.5 %.

3- From (Table -3) no much differences between right and left side

4- The rate of union was 61.3% within the first 3 months of injuries ,delayed union 21 % (3-6 months) and 4.48% in less than 9 months. No nonunion found. (Table 4)

5- The rang of movement (Table-5) Full rang of movement 61.3% and 3.23 % developed loss of extension 15-20 degrees. 6- Incidence of infection was 9.68% and staphylococcus infection was the commonest micro-organ as shown in (Table -6) 7- 34 patients of Gustillo type 1 (54.8%) and 28 patients (45.2%)of Gustillo type 2 (Table 7). 8- follow–up of patients for 12-18 months (38.7%) and 20 patients for 19-24 month (32.3%) –Table 8)

2-Group (B) 34 patients:-

1- Male to female ratio was 7.5:1 and the highest age group was (20-29 years) 44.1% .(Table 1)

2- Policemen were 14 patients (41.2%) ,next was the workers (32.4%).(Table 2)

3- There is no important difference between left and right sided.(Table 3)

4- The rate of union, the least was in the period of less than three months 8.8% while the highest was in the period (6 -9 months)was (38.2%) (Table 4).

5- The range of motion. Full range of movement was 5.9%, loss of extension 10-15 degree 26.5% and loss of more than 20 degree was 11.8% (Table 5).

6- Incidence of infection was 8.82% and staphylococci (two patients) pseudomonas aerogenosa (one patient).(Table 6).

7- Twenty patients (58.9%) were of Gustillo type 1 and 14 patients (41.1%) were of Gustillo type 2.Table 7).

8- Follow up for 12-18 months (76.5 %) and for 19-24 months (23.5%).(Table 8)

Table -1: Age Distribution

	GROUP (A)				GROUP B			
Age	Male	Female	Total	%	Male	Female	Total	%
20-29	24	6	30	48.4	13	2	15	44.1
30-39	13	4	17	27.12	9	1	10	29.4
40-49	9	3	12	19.4	5	1	6	17.7
50-59	3	-	3	4.84	2	1	2	5.9
60-69	-	-	-	-	1	-	1	2.9
	49	13	62	-	30	4	34	*

P. Value=0.25 X^2 test (gender and groups) N.S
p. Value=0.18 (age and groups) N.S

Table -2: Occupation and Sex Distribution

Occupation	GROUP (A)				GROUP B			
	Male	Female	Total	%	Male	Female	Total	%
Policemen	22	-	22	35.5	14	-	14	41.2
Workers	18	3	21	33.84	10	1	11	32.4
Housewives		8	8	13%	2	2	4	11.8
Students	9	2	11	17.74	4	1	5	14.7
	49	13	62	-	30	4	43	-

Table -3: Laterality

Group A			Group B	
Side	Right	Left	Right	Left
	34	28	16	18

Table -4 :Time of Union

Time of Union	Group A				Group B			
	Less than 3 months	3-6 month	6-9 month	9-12 month	Less than 3 months	3-6 month	6-9 month	9-12 month
	38	13	3	8	3	9	13	4
	61.3%	21%	4.48%	13%	8.8%	26.5%	38.2%	26.5%

Table -5: Range of Movement

Group A				Group B				
Full Range	Loss of extension 5-10	Loss of extension 10-15	Loss of extension 15-20	Full range	Loss of extension 5-10	Loss of extension 10-15	Loss of extension 15-20	Loss of extension >20
38	16	6	2	2	5	9	14	4
61.3%	25.8%	9.7%	3.23%	5.9%	14.7%	26.5	41.2	11.8

Table -6: Type of Micro-organism

	Group A				Group B		
Type of micro-organism	Staph.aurus	Pseudomonas aerogenosa	E-Coli		Staph. Auras	Pseudomonas aerogenos	E-Coli
	3	2	1		2	1	

(Table -7) Gustillo T Classifications

Type	Group A	Group B
Type I	34(54.8%)	20 (58.9%)
Type II	28(45.2%)	14(41.1%)

Table -8: Follow up

Group A			Group B		
12-18 months	19-24 months	25-30 months	12-18 months	19-24 months	25-30 months
24	20	-	26	8	-
38.71%	32.3%	-	76.5%	23.5%	-

X^2=4.007 DF=1 P=0.045

DISCUSSION:

In this prospective study 96 patients were selected according to special criteria and divided into two groups (A and B). in group A there was isolated compound , type B (AO-ASIF classification) and Gustillo type , 1 and 2 fracture olecranon while in group B, the same criteria of group A but the differences were in the mode of treatment regarding the fractures itself . The aim of the study is to compare the results of using tension band wires and intra-medially K-wires in fracture fixation early during first operation with wound debridement and the result of late use of such fixation after healing of the skin and tissues around the fractures sites and also to compare the results of group A with other studies depending on certain parameter like infections, rate of the fracture union and the rang of elbow movement. There were no important statistical differences regarding age and sex distribution, laterality, and occupation between group A and B and the high incidence of patients in age group 20 - 29 year. Because those patients are more active and most of them work as policemen or students and susceptible to injury by bullet, missile and motor vehicle accidents due to the war in Iraq (group A 87% group B 58.3%) But the difference between both groups were –

1-Rate of healing of the fractures: In group A about 74.2% healing in the first 3 months8 patients(13%) nonunion was seen while in group B delayed union (6-9 months) about (53%) and nine patients (26.5%) need bone graft and 4 of then needed re exploration and second bone graft were done, I think this is most probably due of interference with newly formed blood vessels at fractures sites and frequent stripping of soft tissues around the fractures and also because of recurrent infections. In our studies the over all rate of union was 87% in group A but non union was 13% re exploration and bone graft was done and later on union rate was 100%. In a study done by R.L. Hucksteps 1998 in 13 patients using the same regime the rate of union was 93% (13)this is because of the small sample in his study(13 patients). In another study done by Senol. Akman (14) in 2003 on 41 patients 39% of the sample were compound fracture. Overall result was 100% union although he used the same regime used in our study he did not mention whether he re explore the patients and if he did bone grafts or not .during the long periods of follow up (48 months).

1- Range of Motion In group A 61% got full range of motion while 3.23% got loss of 15-20 degree extension .In group B only 5.9% got full range of motion and 41.2% got loss of 15-20 degree and 11.8 % got loss more than 20 degrees. These differences mostly due to the early movements in group A and contracture of triceps muscle or of the elbow joint and delayed fixation and high incidence of infection (35.3%) before surgery in group B in comparison with group A. If we compare the result of group A with other studies like R.L.Hucksteps study there were full rang of motion in 69.2% nearly equal to our result 61.3% while 16 – 20 degrees loss in our study (3.23%) was less than Huckstep study (7%). In Seniol Akman study 75.6% got full range of motion this because his sample include closed (60.9%) and compound (39.1%).

1-Infection: - In group A the incidence of infection was 25.8% while in group B was 35.3% at first visit but after frequent wound debridement and after using internal fixation it was 20.6 %. The causative micro-organism in both groups nearly the same (staphylococcus auras), the site of infection ranging form superficial to deep infection. Chronic osteomyelitis in group A(9.7%)being slightly higher than group B(8.8%) this may be due to frequent wound debridement and washing and removal of small bony fragments in patients in group B. If we compare the results of group A and R.L.Huckseps study in which the incidence of infection was 38.4% in early stage and 15.3 % continue to chronic stage, this may be due long period of follow up (36 months). While in Seniol Akman study the infection rate was 24.3% in early stage and no chronic osteomyelitis cases were seen and this may be due to high percentage (60.9%)were closed fractures and only 39.1% were compound . Regarding follow up, in our study most of patients were lost during the study may be due to the defects in the system of health in our country.

CONCLUSION:

Tension Band Wiring prove to be an ideal method of treatment in compound fracture olecranon as early as possible during the first operation as it allow early active movement of elbow joint ,union of the fracture in optimum time and the same chance of infection if we compare it with later usage of the fixation.

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