

Modalities of Management of Radial Nerve Injury presented with Fracture in different Sites of Humerus

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Hamza N. Aboud

MD, Ph.D., Lecturer in Orthopedics, Department of Surgery, Al-Mustansiriya College of Medicine

Abstract:

Background: This topic has been the subject of interest for many authors for many years, because still there is a recurrent theme ...should the nerve be explored routinely along with internal fixation of fracture or should exploration be limited to those cases in which spontaneous recovery has not occurred within expected time ? or when justify?

Objectives: This study is designed is to shed a light on the dilemma of management radial nerve injury, in surgically treated patients versus conservatively treated others .

Methods : A series of 25 patients presented with any degree of radial nerve palsy complicating 140 case of closed fracture shaft humerus , were treated by surgical & conservative method , according to certain indicators and evaluated during three years period, in two teaching hospital in Baghdad, from 2006 to 2008. Most of patients were males 19 case & the remaining patients were females 6 cases ,their age ranging from 3 days old baby to 45 years old & the mean age was 25 years .Ten (10) patients treated conservatively , Fifteen (15) patient treated surgically by either early exploration (too early & late early) or delayed exploration.

Results: The radial nerve was explore in seventeen patients from total number of study 25 patients. Eight treated by early exploration .. (five by too early exp. within few days & three by late early exp. within next two weeks).Nine patients treated by delayed exploration after (3.5~ 4) months post traumatic period .In the last eight patients , the radial nerve was not explored & treated conservatively? The overall useful recovery rate from applying our policy was (84 %).

Conclusion: Treatment of radial nerve palsy complicated closed fracture shaft humerus should be programmed well, depending on many factors , such as severity & onset of nerve lesion and type & site of associated fractures.

Key words: Radial , Nerve , Fracture, Management.

Introduction:

The radial nerve most frequently injured in association with humeral fracture, because of the spiral groove containing the nerve , oriented obliquely starting from behind humerus & running laterally , forward & distally . padded by triceps & brachiaii muscle fibers , and when the radial nerve just reach supracondylar ridge it will be in direct contact with the bone ⁽¹⁾ , that's why long spiral fracture in this area can lead to severely injured nerve?

Although the radial nerve can be injured or bruised along through its course from axillary area till proximal phalanx of thumb by any means ^(2,3) , but its superficial sensory branch can be compressed even by repeated compression in finger grip of laparoscopic instruments during laparoscopic surgery ⁽⁴⁾.

A policy to a wait re-innervations seems reasonable^(1,5) , since, most humeral fractures can be treated conservatively with higher incidence of fracture union & nerve recovery, meanwhile the progress of nerve function return, can be evaluated with periodic electromyography (EMG), nerve conduction study(NCS) , & frequent clinical examination.

Patients and Methods:

The types of fractures are two comminuted , three segmental , five transverse, six oblique eight spiral & only one supracondylar fracture.

Forty eight percent of the sample had blunt trauma as a cause of fracture and only 4% were caused by child abuse (Figure-1).

Ten of the fractures were located in the distal third of humerus , seven in the junction of distal & middle thirds, six in the middle third & the remaining two in the proximal third .. Table(1).

The fracture presented in (3- days) old baby was displaced transverse mid shaft humeral fracture associated with radial nerve palsy which occur as a result of traumatic effort done by his older brother (5-years old), when he pulled baby arm horizontally & then angulated downward at bed edge .

To evaluate type of treatment applied & to identify which one have superiority than other, we depend on finding of: clinical examination, Electromyography (EMG) & Nerve conduction study (NCS), x-ray report (depend on its type, site, displacement), we divided our patients into two groups :

1. **First group:** 10 patients treated conservatively using initially U-shape plaster cast with wrist splint , after maintained reduction of displaced fracture , & they followed waiting for signs of spontaneous recovery within four months.
2. **Second group:** 15 patients treated surgically by: **Either** early exploration within first three weeks done for eight. **OR** by delayed exp. within (3.5 - 4) months done for seven , by using AO compression plate for shaft fractures. T-plate for proximal third fractures & two-wire for supracondylar fracture fixation, for nerve lesion treatment, neurorraphy or neurolysis from callus formation or from inbetween bony fragments... were performed. Figure-2

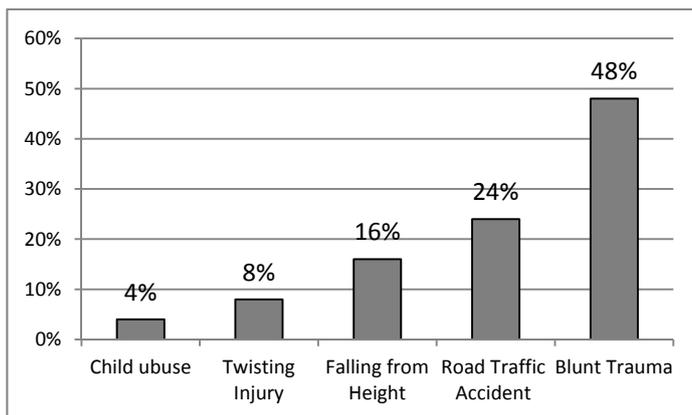


Figure-1: Distribution of causes of Fractures of Humerus that had been complicated by radial nerve injuries

Table-1: Sites and types of fractures associated with radial nerve palsy

Site of Fracture	No .	Type of Fracture	No .
Proximal 1/3 rd	2	Comminuted	2
Middle 1/3 rd	6	Segmental	3
Junction of distal & middle Thirds	7	Transverse	5
		Short oblique	7
Distal 1/3 rd	10	Spiral	8
		Supracondylar	1
Total	25	Total	25

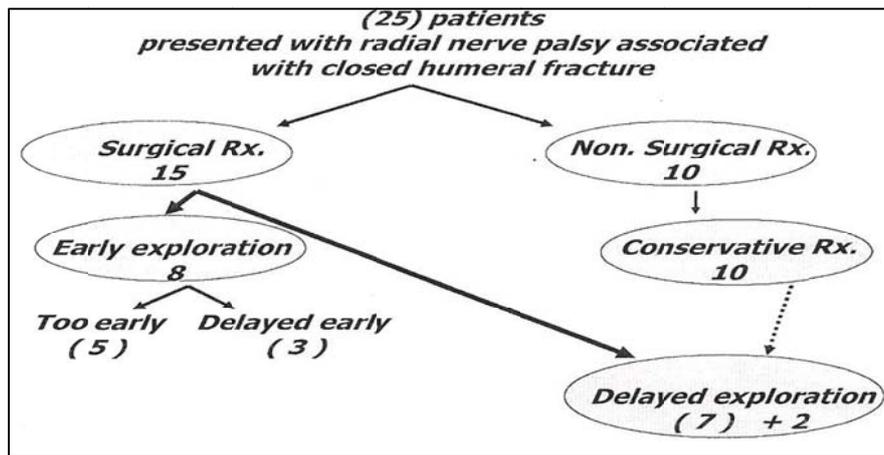


Figure-2: patients' distribution according to their treatment modality

Result:

The patients in our study classified into (3) groups, depending on starting onset of treatment:

First group – Surgical treatment (Early exp.)

8 patients treated surgically by early exp. (6) patients of them (75%) recovered completely within five months; (1) patients recovered partially (12.5%) ,(1) patient showing no recovery evidence ,The overall useful recovery of early exploration were about (87.5%) .

Second group – Conservative treatment

10 patients from total number 25, treated conservatively, presented with no evidence of severely injured nerve & have not need open reduction, internal fixation for fracture management, 8 patients show full recovery representing (80%) success rate ,failure rate only in 2 patients.

Third group - Surgical (Delayed exp.)

7 patients primarily involved, (plus 2 patients from second group not recovered by conservative treatment,so number of cases of this group apparently become 9), four patients recovered completely, two recovered partially, two have no sign of recovery & one patient from this group was lost follow up?The overall useful recovery seen in our study regarding each type treatment....shown in table (2) below:

Early exploration finding, showing lacerated radial nerve present in two patients for them immediate neurorrhaphy performed ,in four patients the nerve was found entrapped in between bony fragment, but with undisturbed continuity for whom neurolysis done. In the last two patients the nerve was found apparently intact or just slight bruising.

In delayed exploration the finding showed lacerated nerve in two patients. Entrapment in callus formation was found in five patients, for them neurolysis done. only in two patients the nerve was found apparently intact but with evidence of atrophied nerve.

Laceration, interposition or entrapment of the nerve at exploration was significantly associated with longitudinal fracture of distal third than with transverse fracture middle third.

Lacerated nerve found in 4 patients., entrapment of the nerve within callus formation found in 9 patients., apparently intact or slight bruising found in 4 patients from total number 17 patients. as shown in table – 3.

Table-2: Distribution of the study sample according to the recovery rate

Type of Treatment	No of cases	No. of recovery	%
Early exposure	8	7	87.5
Delayed exposure	9	6	75
Conservative	10	8	80
Total	25	21	84

Table-3: Frequency Distribution of nerve lesions

Type of Nerve Lesion	No.	%
Lacerated	4	23.5
Entrapment	9	53
Slight bruising	4	23.5
Total	17	100

Discussion:

Routine exploration of the nerve may subject patients to an unnecessary operation & increased incidence of complication .but our policy reserve early exploration for primary indications for high **risk signs** such as: Patients develop immediate radial nerve palsy after trial of fracture reduction. Poly traumatized patients & segmental humeral fractures. Failure of established & maintained good reduction by closed method, severely displaced Long spiral fracture in the distal third humerus .and reserve delayed exploration for nerve function which has not returned after four months follow up ^(6,7) .

Although all types of treatment applied whether surgical or non-surgical, have certain advantage & disadvantage, but from the result mentioned previously in our study and according to treatment regime used, we found each method used can play its game properly when the field is? ^(8,9)

Certainly the conservative method give good recovery results when properly applied , since it give (80%) success rate in our policy , especially when there is partial nerve lesion associated with fracture in the proximal third or transverse fracture in the middle third humerus , & this is most probably because the radial nerve well padded by muscles in the mid humeral region , that’s why the nerve most frequently suffered slight bruising or contusion representing as neuropraxia syndrome. ^(10,11)

Early exploration management , again can provide good results, when applied on its desert, since it have some marginally improved prognosis particularly, when nerve lesion occur in association with comminuted or displaced spiral fracture in the distal third , which is the greatest potential threat to radial nerve in this region. ^(12,13)

According to many factors which can influence nerve regenerations such as , age of the patient ,gap between nerve ends., delay between time of injury & repair., level of injury, condition of the nerve ends., experience & technique of the surgeon . ^(14,15)

So the delayed treatment (delayed neurorrhaphy) can effect motor recovery more profoundly than sensory recovery!! And every delayed (six days) between injury & repair.... give variable loss of potential recovery about (1%) of maximum performance , so this loss increased rapidly after (3-4) months. ^(16,17)

But in spite of these factors, repairing radial nerve injury (3-4 months) post traumatic period still can give good or fair results since regeneration prognosis after radial nerve repair more favorable than any other major nerve in upper extremity., Primarily because it is predominantly motor nerve., Secondarily because the muscle innervated by it, are not involved in finer movement of finger & hand. ^(15,18)

Lastly. regarding delayed exploration recovery results still encouraging which represent (75%) in our study , compared with other method of treatment . this result can be increased more by using other accurate measures of radial nerve assessment ,in addition to EMG , NCS , x-ray finding & clinical examination , by for instance ultrasound examination which used nowadays by many author’s , since it can gives further visualization about nerve state. ^(19,20)

Conclusions:

Modalities of management radial nerve injury presented with fracture in different sites of Humerus can be summarized as follow :

1. Early Exploration:

- a. **Too early** Exp. , done within first few days for high risk patients.
- b. **Late early** Exp. , done within next two weeks for patients with signs of sever nerve lesion detected by a viable measures

2. **Conservative Management** : Applied for those patients with no high risk signs & no signs of severely injured nerve, i.e. patients with partial nerve lesion.

3. **Delayed exploration** : Applied for those patients who have no signs of spontaneous recovery within 3.5 - 4 months.

References

1. Robbert O. whiston ;Relation of radial nerve to shaft of humerus, J Bone Joint Surgery 36 A,No.1 Jun,2000.
2. Bora , F.W.Jr. & Osterman,A.L : Compression neuropathy , clinical orthopedic ;163 ;20- 2006.
3. Burns J. & Lister ,G.D; Localized constructive radial neuropathy in the absence of extrinsic compression :three cases ,J. Hand surgery ,9 –A :99 , 2005
4. Lee-W-J ;Chae , Y-S , Superficial nerve damage of thumb of laparoscopic surgeon ,surg. Laproscope- endoscope –percutaneous-Tech. 2003 Jun;11(3) :207 -8
5. Takami-H :Takahashi – S ;Ando –M, Severance of the radial nerve complicating transverse fracture of the mid shaft humerus , Arch –orthop. Trauma Surg.2003;119 (12): 109 -11.
6. Kline,DG, Timing for exploration of nerve lesion & evaluation of the neuroma-in-continuity , clinical orthopedic 163 ; 429 ,2002
7. Woodhall,B.& Lyons, W.R. ; peripheral nerve injures :1- The results of early nerve suture preliminary report surgery 19 :757 , 2005
8. Branu,R.M. : Epineurial nerve suture , clinical orthopedic 163 :50 , 2002 .
9. Edward –P;Kurth –L, Postoperative radial nerve paralysis caused by fracture callus, J-Ortho.Trauma ,2007.
10. A.H.Crenshaw ;Campbell's Operative Orthopedics ;seventh edition 1987 ,vol.4 ,peripheral nerve injuries.page 2783.
11. S.Terry Canale ; Campbell's perative Orthopedics ; ninth edition 1998 , fractures of shoulder girdle , arm & forearm . page 2281 .
12. A. H. Hnoosh (FRCS), H. N.Aboud; Radial nerve injury associated with fracture shaft humerus , Thesis submitted to the the Iraqi commission for medical specialization in orthopedic surgery ,1994.
13. Lim –K-E ;Yap –C-K ; Org-S-C ; Aminuddin , plate osteosynthesis of the humerus shaft fracture associated with radial nerve injury .Med.J Malaysia , 2007 Jun;56 suppl C:8-12
14. American academy of orthopedic surgeons: instructional course lectures ,vol.33,St.Lonis, 2007
15. Zachary,R.B ;Results of nerve suture , Ann Seddon, H.J editor ;peripheral nerve injuries , London , 1997
16. Dabezies EJ.Banta cj.II,Murphy CP ,d'Am brosia RD; plate fixation for acute humeral shaft fractures with or without radial nerve injuries,J ortho.Trauma 6:10 , 2005.
17. Sariyo –K ;Hemni-T ;kanematsu –Y ..etal ,radial nerve palsy associated with pediatric supracondylar humerus fracture ,J –ortho-Trauma. 2004 Apr;11(3) :2257-9.
18. Jaberg H.Waener JJP. ;Percutaneous stabilization of unstable fractures of humerus , J. bone Joint Surg.74-A :508 2006.
19. Bonder –G;Huber –B; Schwabegger –A, etal.. Sonographic detection of radial nerve entrapment within humerus fracture,J –Ultrasound-Med.2003. Oct.18 (10) ;703 -6 .

20. Bondar –G; Buchberger , W; Schocke-M, etal, Radial nerve palsy associated with humeral shaft fracture evaluation with ultrasound – initial experience ,radiology – 2006 Jun,219 (3),811-6.