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HUMERAL SHAFT FRACTURE FIXATION WITH ANTEGRADE INTRAMEDULLARY INTERLOCKING NAIL: A STUDY

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ABSTRACT

Operative management of Humeral shaft Fractures can be with Plate osteosynthesis or with Intra medullary nailing. As the intra medullary nails can be introduced in a closed manner, they preserve the fracture hematoma, providing early fracture consolidation with higher union rates and low infection rates. Interlocking achieves rotational stability, providing early mobilization of the neighboring joints. But with antegrade nailing they do have a disadvantage of causing shoulder stiffness.In this study, we have tried to analyze the outcome in terms of time for consolidation, union rates, functional results & complication of humeral shaft fractures managed with Antegrade intramedullary interlocking.Methods: 25 Adult patients with acute humeral shaft fractures were treated with closed intramedullary nailing in an antegrade manner. 20 males & 5Females with an average age of 37.5Yrs (25-70Yrs). All the patients were followed over a period of 2 years and the results were analyzed. Results: 23 (92%) Fractures united with an average consolidation time of 13.5 weeks (10-16Weeks), 1 (4%) fracture ended in nonunion. There were 2 (8%) cases of intraoperative fracture comminution which did not affect fracture healing. There was 1 (4%) case of transient iatrogenic radial nerve palsy, which recovered by 6 weeks. Nail impingement was seen in 1 (4%), Shoulder stiffness in 1 (4%) and none of the patients got infected. Functional results were excellent in 21(84%), Moderate in 3(12%) and poor in 1(4%). Conclusion: Closed intramedullary nailing offers a safe & Reliable method of fixing humeral Shaft fractures, with early fracture consolidation & Higher union rates. It provides early rehabilitation &Reduces the hospital Stay.

KEYWORDS: Humerus Fracture, Interlocking Nail.

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INTRODUCTION

Closed treatment of humeral shaft fractures has been recorded since ages and multiple methods advocated with reports of variable success. Among these hanging arm cast, abduction humeral shoulder spica cast, overhead traction, U-splint and velopeu dressing and functional brace are extensively used procedures[13,14] The inherent problems of closed methods viz; inability to anatomically align fragments, distraction at the fractures site, delayed union and non-unions, prolonged immobilization and the disability thereof outweighs the benefits of these versatile closed treatment methods. It is almost inapplicable in open fractures, fractures associated with the vascular and nerve injuries, bilateral fractures, multiply injured patients, Ipsilateral forearm fractures and fractures with overlying burns.[13,15,16,17] Prior to the advent of interlocking intramedullary devices, osteosynthesis with compression plate was the so called 'gold standard' for the surgical treatment of the humeral shaft fractures. However, intramedullary nails have certain potential advantages over plates and screws. The intramedullary nail is closer to the normal mechanical axis and can act as load shearing device. They are subject to lower bending forces, making failures by fatigue less likely[17] Intramedullary nails can be placed with out direct fracture exposure and with much less soft tissue dissection.[17] Additionally cortical osteopeania caused by stress shieling as seen with plates and screws is less likely.[17] Several reports had demonstrated that with newer implants and improved techniques, locked intramedullary nailing can have a success rate as high as that of other methods[7,12]. With the use of image intensification, these devices can be inserted in a closed manner without exposing the fracture site, with minimal soft tissue scaring & low infection rates. This preserves the fracture hematoma, which provides early fracture consolidation with higher union rates. With interlocking mechanism we achieve rotational stability and provide early mobilization of the neighboring joints & decrease the morbidity. Reduced hospital stay and early return of the patient to his job. Keeping all these aspects in mind, we took up this study to assess the role of closed intramedullary nailing with a interlocking nail in managing humeral shaft fractures.

Aim's& Objectives.

The aim of the present study was to evaluate the results of closed diaphyseal fractures of humerus treated by inter locking intramedullary nailing. Twenty humeral shaft fractures were treated by closed intramedullary interlocking unreamedantegrade nailing between Jan. 2003 to Jan. 2005. There were 20(80%) males and 5 (20%) females with average age of 37.5 years (25 to 70 years). Fall from height was most common mode of injury (70%). Average time between injury and surgery was 9.5 days (4 to 15 days), pathological fractures were excluded. The most common postoperative complication was shoulder stiffness occurring in four patients. There was no latrogenic radial nerve palsy. We conclude that interlocking nailing is a viable option in treating acute humeral shaft fractures, the most common adverse outcome of shoulder stiffness and impingement can be decreased by meticulous surgical technique.

METHODS

Our study is a series of 25 cases of acute humeral shaft fractures treated with antegrade closed intramedullary interlocking nailing. This study was conducted over a period of 2 years from july 2003 to june 2005. The source date were inpatients at basaveshwar teaching & general hospital attached to M.R Medical College, Gulbarga. Study subjects were adult patients with fracture shaft of humerus. Patients were selected based upon following criteria's. age more than 17 years, when physis is fused, fractures of humeral shaft from 3cm proximal to the olecranon fossa to within 2cm of surgical neck of the humerus, fractures with unacceptable alignment after closed reduction, fractures in polytrauma patients.Our patients age range from 25 to 70 yrs with and average of 40.5 yrs. The majority of the patients 20 (80%) were males & 5 (20%) were females. Right humerus was involved in 14 (56%) & left in 11 (44%)

patients. The RTA road traffic accident was the most common mode of injury. It accounts for 16(64%) out of 25 patients, 7(28%) with a history of self fall, 1(4%) with H/O Assault, 1(4%) with H/O industrial accident.16(64%) had fracture at middle 3rd level, 7(28%) had fracture at distal 3rd level, 2(8%) had fracture at proximal 3rd level. 22 (88%) were closed fractures & 3 (12%) were grade1 open fractures. All fractures were classified according to AO Classification system. (Table-1) 11-Patients had associated injuries consisting of ipsilateral femoral shaft fracture, supracondylar fracture, open fracture tibia, contralateral intertrochanteric fracture, collies fracture, fracture neck of scapula, fracture second metacarpal, multiple rib fractures & 1 patient had liver laceration.

Table 1

AO Fracture Type		No. of Patients	Percentage.
A	A2	9	36%
	A3	7	28%
B	B2	7	28%
	B3	1	4%
C	C1	1	4%

Most of the fractures were treated with in a week after trauma. On an average time interval was 9.5 days, delay in surgery was either due to late presentation or managing associated injuries or for seeking physician fitness for undergoing the procedure.

Operative Technique

with the patient in supine on a radiolucent table, head turned towards contralateral side, a sand bag is placed underneath the scapula for better exposure on the entry site. A 3cm longitudinal incision is made from lateral tip of acromion, after splitting deltoid an entry point us made medial to greater tuberosity. The selected nail whose dimensions has been determined preoperatively is inserted. Nail is locked with self tapping screws, the proximal one from lateral to medial using Jig & Distal from anterior to posterior by a free hand technique. AO type Interlocking nails were used. 6mm & 7mm nails are solid ones 8mm nails are cannulated ones. After surgery a sling is given, on 3rd or 4th post operative day active assisted mobilization of shoulder & elbow is started.

RESULTS

All 25cases were available for followup. On an average follow-up period was for 7.5months (3.5 to 11.5). Assessment of the patient was done on the basis of clinical radiological union, Range of motion at shoulder & Elbow & Subjective complaints like Pain in the Shoulder/ Elbow. Functional results were graded by the criteria of Rommens et al. Shoulder &Elbowfunctions were graded excellent, moderate or poor Depending upon the loss of range of motion in any direction, Subjective complaints like pain was also taken into account. Table-2

Table 2

Grade	Range of Motion (ROM)(shoulder/Elbow)	Subjective Complaints
Excellent	<10° loss of ROM in any Direction	NONE
Moderate	Loss of ROM Between 10° to 30° in any direction.	MILD
Poor	Loss of ROM >30° in any Direction	Moderate to severe

The Total functional Outcome at the time of review took both joints (Shoulder& elbow) in to account. In our series out of 25 patients, Shoulder function was excellent in 21(84%) patients, Moderate in 3(12%) & poor in 1(4%). Elbow function was excellent in 23(92%) & Moderate in 2(8%) . over all functional results were excellent in 88%, Moderate in 8%, Poor in 4%. Table-3.

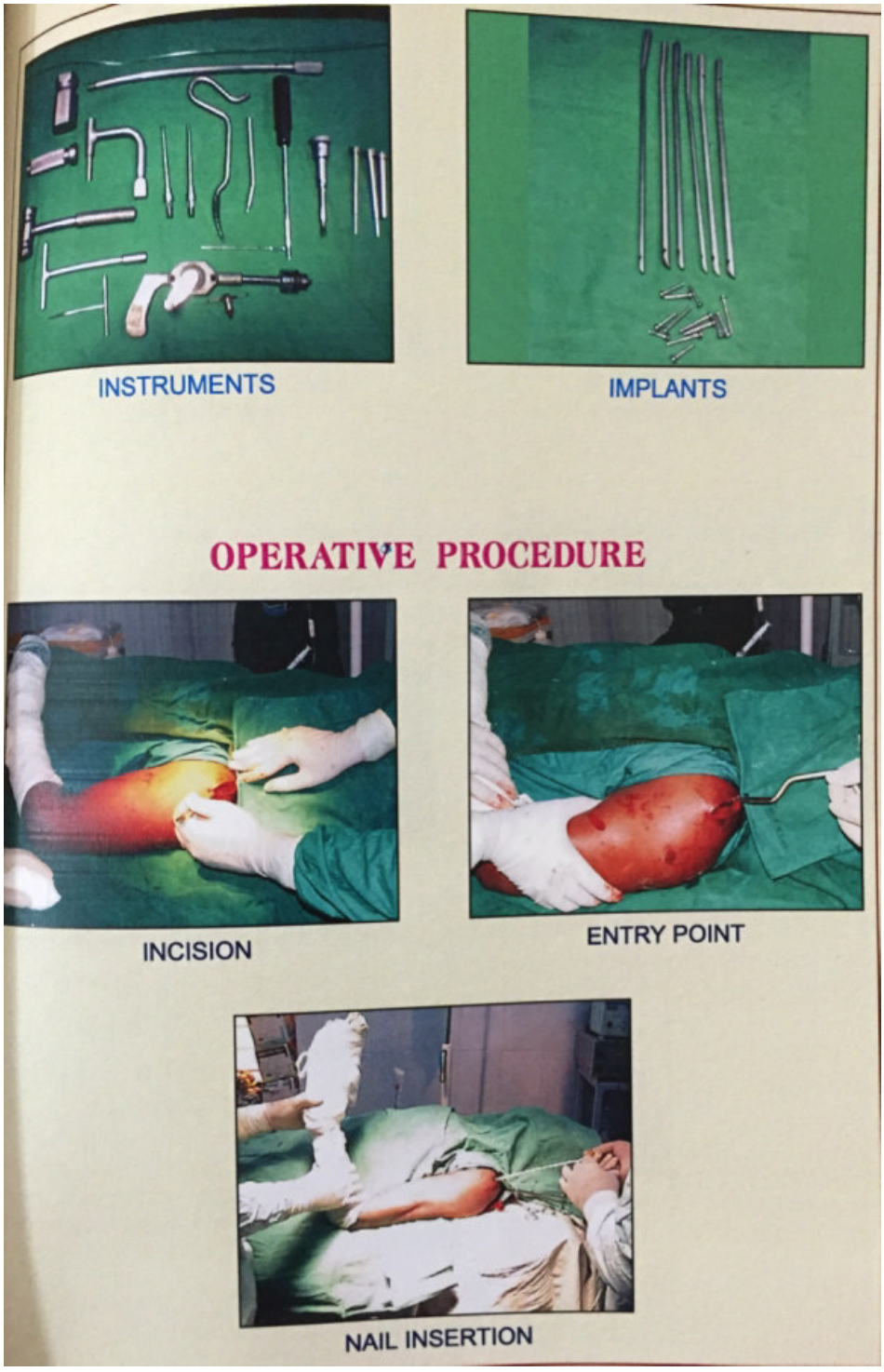
Table 3

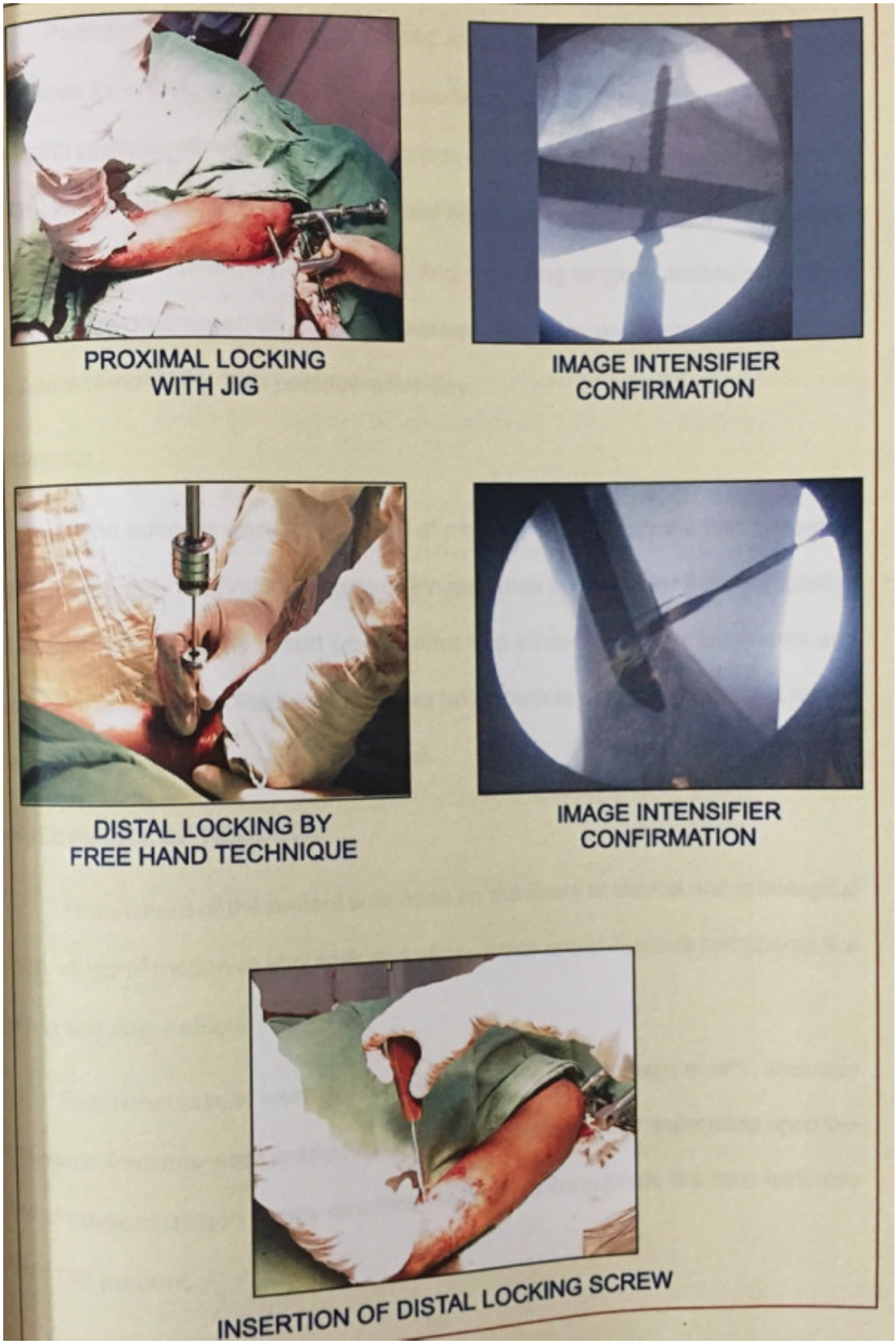
Shoulder & Elbow Function.						
GRADE	Shoulder		Elbow		Total outcome	
	No	%	No	%	No	%
Excellent	21	84%	23	92%	22	88%
Moderate	3	12%	2	8%	2	8%
Poor	1	4%	-	-	1	4%

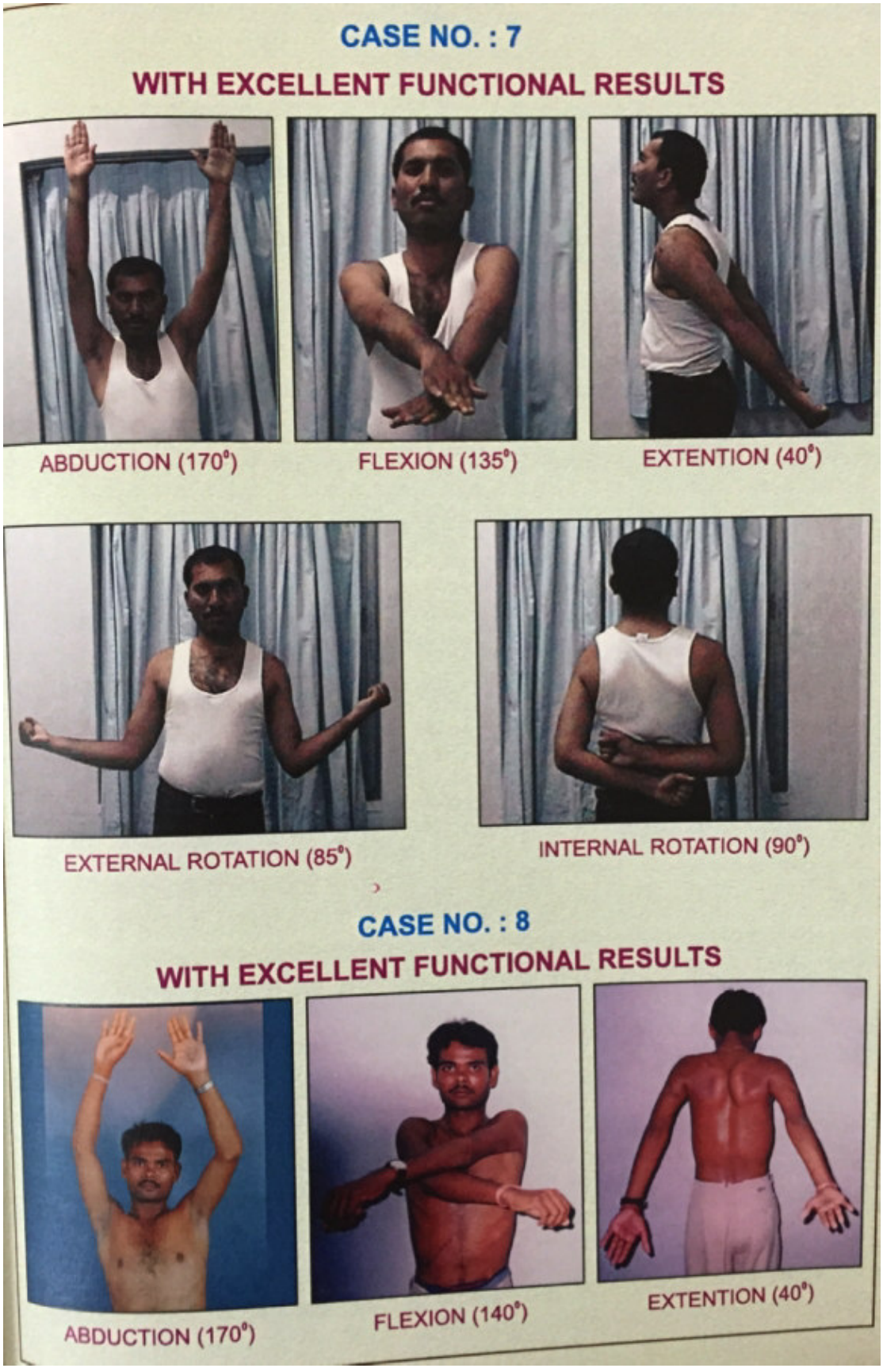
In most of the patients functional outcome was satisfactory. Restriction of joint motion was seen in patients who didn't followed physiotherapy properly.

Complication

2 Patients (8%) suffered additional comminution at the fracture site while nailing but, this did not affect the fracture union. There was transient iatrogenic radial nerve palsy in 1(4%) which was fully recovered with in 6 weeks with out any active intervention. In 1 case fracture was fixed in distraction. On follow up there were no signs of union, it ended in non union. A secondary procedure with autologous bone grafting was performed later. 1(4%) patient ended with severe shoulder stiffness. Mainly, abduction was affected & was later Restricted to 130°. Same patient had terminal 20° restriction of elbow extension. This patient was not following instructions of physiotherapy properly. He had a poor functional outcome. 1(4%) had impingement of proximal end of nail, as it was buried completely into the bone. He had occasional pain in the shoulder outcome. In our study there was not even a single case of superficial/ Deep Infection. This may be attributed to closed method of fracture fixation.


INSTRUMENTS
IMPLANTS
OPERATIVE PROCEDURE
INCISION
ENTRY POINT
NAIL INSERTION


PROXIMAL LOCKING
WITH JIG
IMAGE INTENSIFIER
CONFIRMATION
DISTAL LOCKING BY
FREE HAND TECHNIQUE
IMAGE INTENSIFIER
CONFIRMATION
INSERTION OF DISTAL LOCKING SCREW


CASE NO. : 7
WITH EXCELLENT FUNCTIONAL RESULTS
ABDUCTION (170°)
FLEXION (135°)
EXTENTION (40°)
EXTERNAL ROTATION (85°)
INTERNAL ROTATION (90°)
CASE NO. : 8
WITH EXCELLENT FUNCTIONAL RESULTS
ABDUCTION (170°)
FLEXION (140°)
EXTENTION (40°)

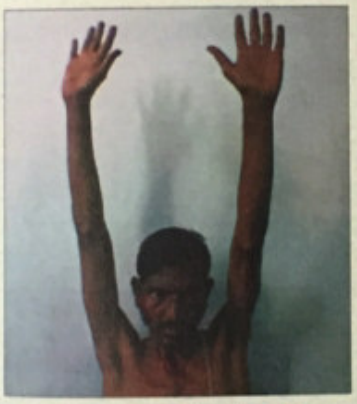
CASE NO. : 8

EXTERNAL ROTATION (90°)

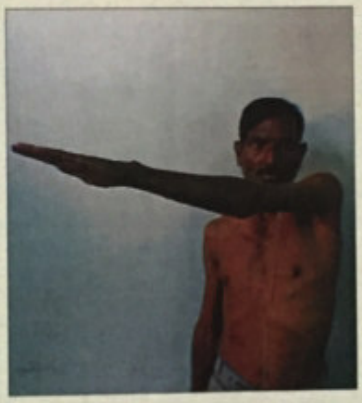
INTERNAL ROTATION (90°)

CASE NO. : 14

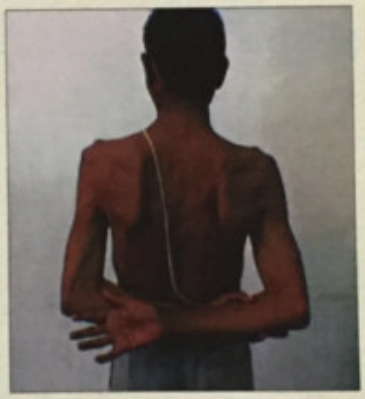
WITH EXCELLENT FUNCTIONAL RESULTS



ABDUCTION (180°)

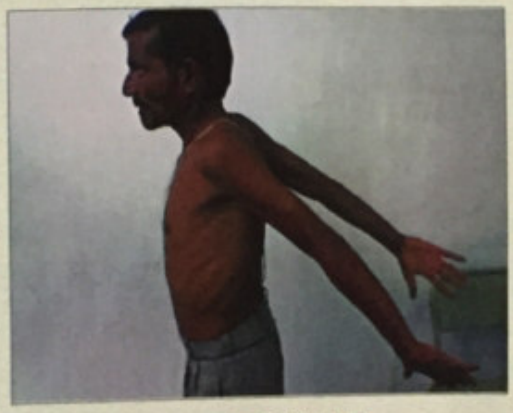


FLEXION (140°)

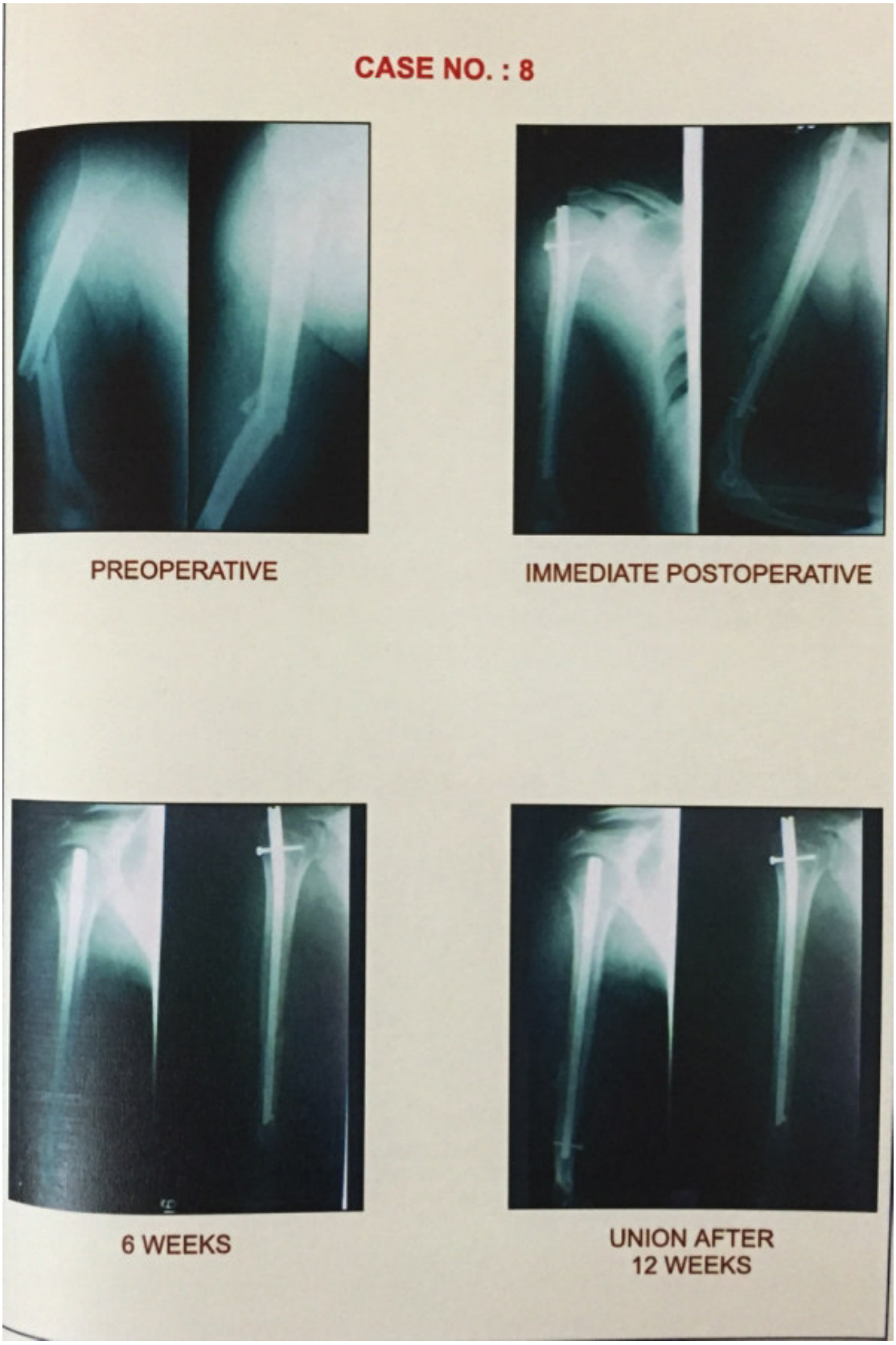


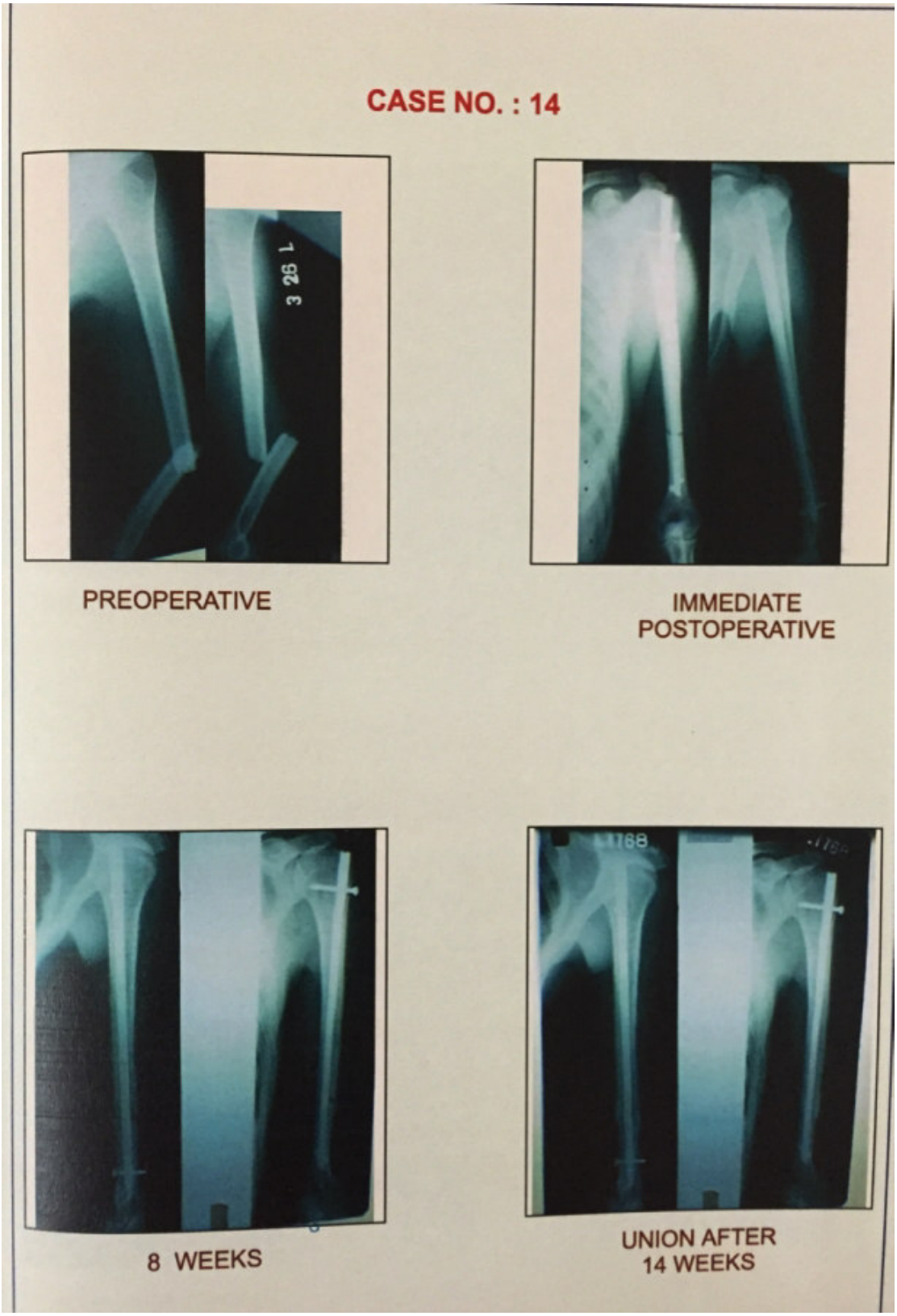
INTERNAL ROTATION (90°)

EXTERNAL ROTATION (90°)



EXTENTION (45°)


CASE NO. : 8
PREOPERATIVE
IMMEDIATE POSTOPERATIVE
6 WEEKS
UNION AFTER
12 WEEKS


CASE NO. : 14
PREOPERATIVE
IMMEDIATE POSTOPERATIVE
8 WEEKS
UNION AFTER 14 WEEKS


CASE NO. : 7
PREOPERATIVE
IMMEDIATE POSTOPERATIVE
UNION AFTER 12 WEEKS
CASE NO. : 9
PREOPERATIVE
IMMEDIATE POSTOPERATIVE
UNION AFTER 14 WEEKS

DISCUSSION

The results of the use of interlocking nailing for humeral shaft fractures is varied. RTA was the main mode of injury in most of the studies[2,3,7,10]in our study it was 65% Romens et al [12] Reported union in 95% cases with mean time of 13.7 weeks, Crates et al [2] Reported union in 97% of fractures with mean time of 3.2months. In our study union was achieved in 95% of cases with an average time of 13.5weeks. Fernandez[4] reported 2 cases and jinn lin[8] reported 1 case of iatrogenic fracture comminution. We had such complication in 2(8%) cases.Rommens et al[12] Ikpeme et al[6] Crates et al[2] reported no infections. In our study none of the fractures got infected. This may be attributed to closed method of nailing. Robinson et al[11] reported 3.3%, Crates et al[2] reported 2.7% & jinn lin[8] reported 0% iatrogenic radial nerve palsy. We had one case 4% of iatrogenic radial nerve palsy which fully recovered by 6 Weeks. The most frequent critisim of antegrade humeral nailing has been its potentially deleterious effect on shoulder function. Crates et al[2] reported 90% petsatodes et al[10] reported 87.2% patients regaining full shoulder function. Kropflet al[9] reported limited shoulder motion in 19 out of 111 patients. In our study shoulder function was excellent in 84%, Moderate in 12% & poor in 4%. Post operatively early mobilization of the shoulder & elbow was very critical in attaining full range of movements. It was observed that the movements & the functional ability of the shoulder depended upon the patients adherence to rehabilitation programme& early intensive physical therapy hastened the recovery of shoulder function.Most of our findings, including period of fracture consolidation, union rates, complications & Functional results are comparable with studies where intramedullary nailing was used to treat humeral shaft fractures.But as the study sample was very small, for better conclusion it has to be repeated in a larger group of patients with longer follow up periods.

CONCLUSION

Based on our experience & results we conclude that closed intramedullary nailing with an interlocking nail is a safe & reliable method of treating humeral shaft fractures. It is excellent mode of managing communited& unstable humeral shaft fractures. It is the best surgical method available to fix humeral shaft fractures in patients with poly trauma & osteoporosis where reduction in operating time & early rehabilitation are primary objectives. It reduces the hospital stay. Since closed nailing preserves the fracture hematoma, it appreciably decreases the time required for fracture to consolidate &achiveshigh rate of fracture union. Complications like non-union can be avoided by intraoperative compression & avoiding distraction at fracture site. Certain technical aspects like burying the proximal nail end at the entry portal are essential in avoiding impingement and to gain better shoulder function. We think that early intensive physical therapy hastens the recovery of shoulder function.

REFERENCES

1. brumback RJ, Bosse MJ, Poka A, Burgess AR. Intramedullary stabilization of humeral shaft fractures in patients with multiple trauma. J Bone Joint Surg; 68A: 960-970, 1986.
2. Crates J, Whittle AP. Antegrade interlocking Nailing of acute Humeral Shaft Fractures. J Clinic Orthop; 350 : 40-50, 1998.
3. Cox MA, Dolan M, Synnott K, McElwain JP. Closed interlocking Nailing of Humeral Shaft Fractures with Russell-Taylor Nail. J Orthop Trauma; 14(5) : 349-353, 2000.
4. Fernandez FF, Matschke S, Hulsenbeck A, Egenolf M, Wentzensen A. Five years Clinical experience with undreamed humeral nail in the treatment of humeral

shaft fractures. Injury; 35(3): 264-271, 2004.
5. Hall RF, Pankovich AM. Ender nailing of acute fractures of the humerus. A study of closed fixation by intramedullary nails without reaming. J bone Joint Surg; 69 A : 558-567, 1987.
6. Ikpeme JO. Intramedullary interlocking nailing for humeral fractures: Experiences with Russell-Taylor Humeral Nail. Injury; 25(7) : 447-455, 1994.
7. Ingman AM, Waters DA. Locked Intramedullary nailing of humeral shaft fractures: implant design, Surgical technique & Clinical Results. J Bone Joint Surg; 76B : 23-29, 1994.
8. Jinn Lin. Treatment of humeral shaft fractures with humeral locked nail &comparision with plate fixation. J Trauma; 44(5) : 859-864, 1998.
9. Kropfl A, Naglik H, Niederwieser B, Hertz H. Unreamedantegrade humeral interlocking nailing.Unfallchirurg; 103(5) : 348-354, 2000.
10. Petsatodes G, Karataglis D, Papadopoulos P, Christoforides J, Gigis J, Pournaras J. Antegrade interlocking nailing humeral shaft fractures. J OrthopSci; 9 (3) : 247-252, 2004.
11. Robinson CM, Bell KM,Court- Brown CM, Mc Queen MM. Lockd nailing of humeral shaft fractures : experience in Edinburgh over a 2 year period. J Bone Joint Surg; 74B : 558-562, 1992.
12. Rommens PM, Verbruggen J, Broos PL. Retrograde Locked Nailing Of humeral Shaft Fractures. A review of 39 patients. J Bone Joint Surg; 77B : 84-89, 1995.
13. Zuckerman JD, Koval KJ: Fractures of the Shaft of the humerus. In: Rockwood CA, Green DP, Bucholz RW, Heckman JD, eds. Rockwood and Greens. Fractures in adults 4th edition Philadephia, Pa: Lippincott-Raven; ,1025-1053, 1996.
14. Crenshaw AH: Shaft of humerus. In: Canale ST, ed Campbell's operative Orthopaedics 9th ed. St Louis, Mo: Mosby:2296-2309, 1998.
15. Foster RJ, Dixon GL Jr, Bach AW, et al: Internal fixation of fractures and non-unions of the humeral shaft. Indications and results in a multi-center study. J Bone Joint Surg Am Jul; 67 (6) :857-64, 1985.
16. Gregory PR, Sanders RW: Compression plating versus intramedullary fixation of Humeral shaft fractures. JAmAcadOrthop. Surg,; 5(4): 215-223, Jul1997.
17. Beaty JH: Hameral shaft fractures. In: Orthopaedic knowledge update: Rosemont, III: American Academy of Orthopaedic surgeons:, 278-286, 1999.
18. Winquist R, Hansen S, et.al. closed intramedullary nailing of femoral fractures. J. Bone Joint Surg. Am;, 529-539, 1984.
19. Mc Cormack RG, Brien D, Buckley RE, McKee MD, Powell J. and Schemitsch EH: Fixation of fractures of the shaft of humerus by dynamic compression plate or intramedullary nail, a prospective randomized trail; J Bone J.Surg.(Br);, 82-B:336-39, 2000.
20. Mc Cormack RG, Brien D, Buckley RE, McKee MD, Powell J. and Schemitsch EH: Fixation of fractures of the shaft of humerus by dynamic compression plate or intramedullary nail, a prospective randomized trail; J Bone J.Surg.(Br);, 82-B:336-39, 2000.
21. Cox MA, Dolan M, Synnott K, et.al. closed interlocking nailing of humeral shaft fracture with Russel – Taylor nail. J. Orthop Trauma., 14: 349 – 353, 2000.
22. Cox MA, Dolan M, Synnott K, et.al. closed interlocking nailing of humeral shaft fracture with Russel – Taylor nail. J. Orthop Trauma. , 14: 349 – 353, 2000.
23. Riemer BL, Foglesong ME, Burke CJ 3rd. Complications of seidel intramedullary nailing of narrow diameter humeral diaphyscal fractures: Orthopaedics;, 17(1) 19-29, 1994.
24. Ajmal M, O"Sullivian M et. al, Antigrade Locked Intramedullary nailing in humeral shaft fracturers: injury,32 (9): 692-4, 2001.
25. Moran MC: Distal interlocking during intramedullary nailing of the humerus: ClinOrthop. and Related Research;,317,215-218, 1995.