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= Abstract =

## Treatment of Humeral Shaft Fracture with AO Unreamed Humeral Nail

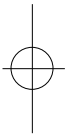
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We performed a retrospective study of nine humeral shaft fractures which were treated by interlocking intramedullary nailing, the AO UHN (Unreamed Humeral Nail) system between March 1996 and February 1997 with more than one year of follow up. AO UHN inserted by either antegrade or retrograde technics through limited incisions followed by insertion of 2 proximal and distal Interlocking screws. Compression between fractured fragments was achieved in the non-comminuted and indicated cases. Immediate postoperately, soft shoulder immobilizer was applied and rehabilitation was started with active shoulder motion exercise few days to 1 week postoperately as soon as patient could tolerate pain. Union occurred at average of 13 weeks except one expired case with pathologic fracture due to advanced metastatic cancer. Pain relief and functional restoration were rated as good to excellent in most cases. Interlocking intramedullary nailing using AO UHN for the humeral shaft fractures usually provides

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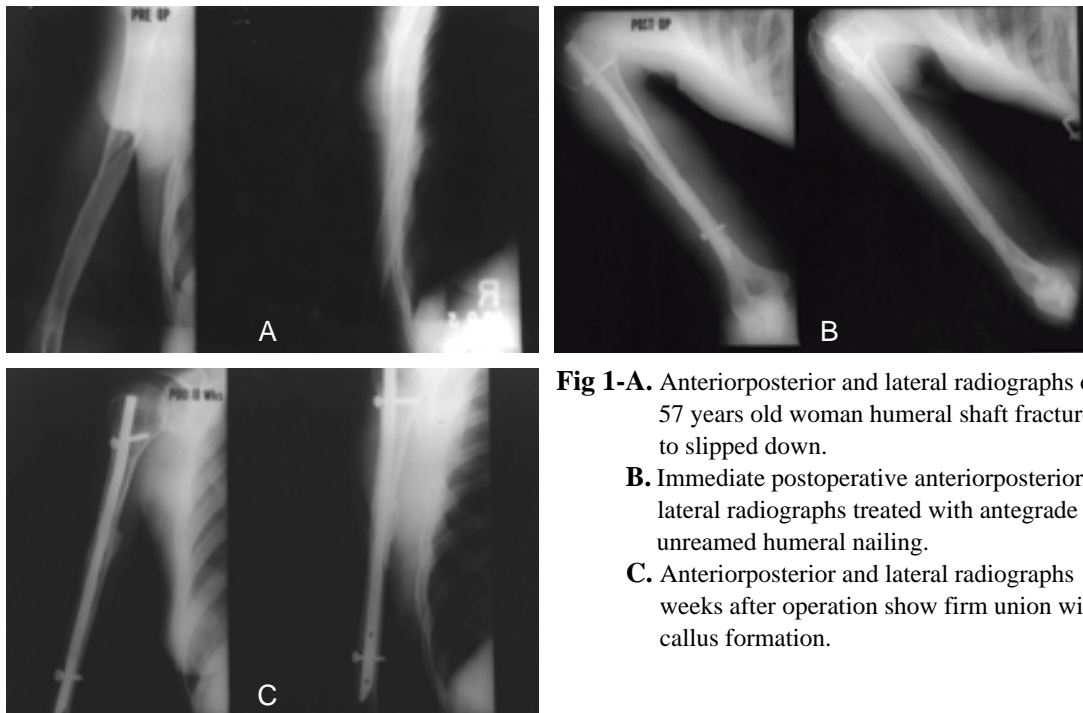
immediate stability of the fracture and can be accomplished with a closed technique, minimum morbidity, with a resultant early return of function of the extremity. Therefore we recommend AO UHN for the treatment of the humeral shaft fractures if available without hesitation.

**Key Words :** Humeral shaft fracture, AO Unreamed Humeral Nail

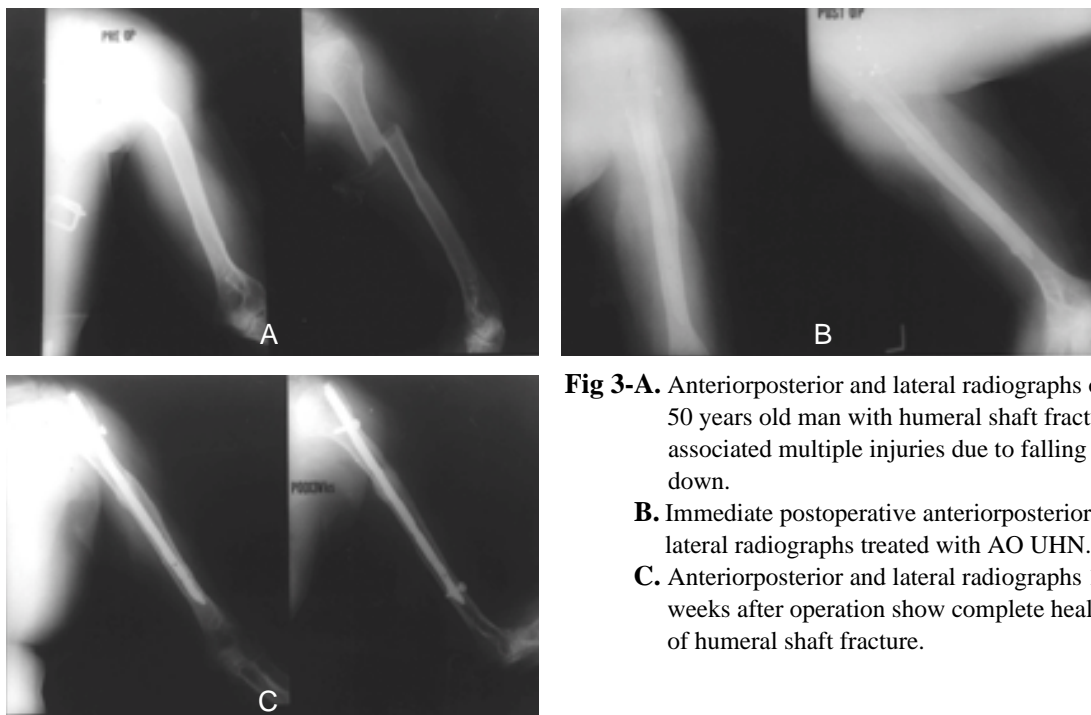
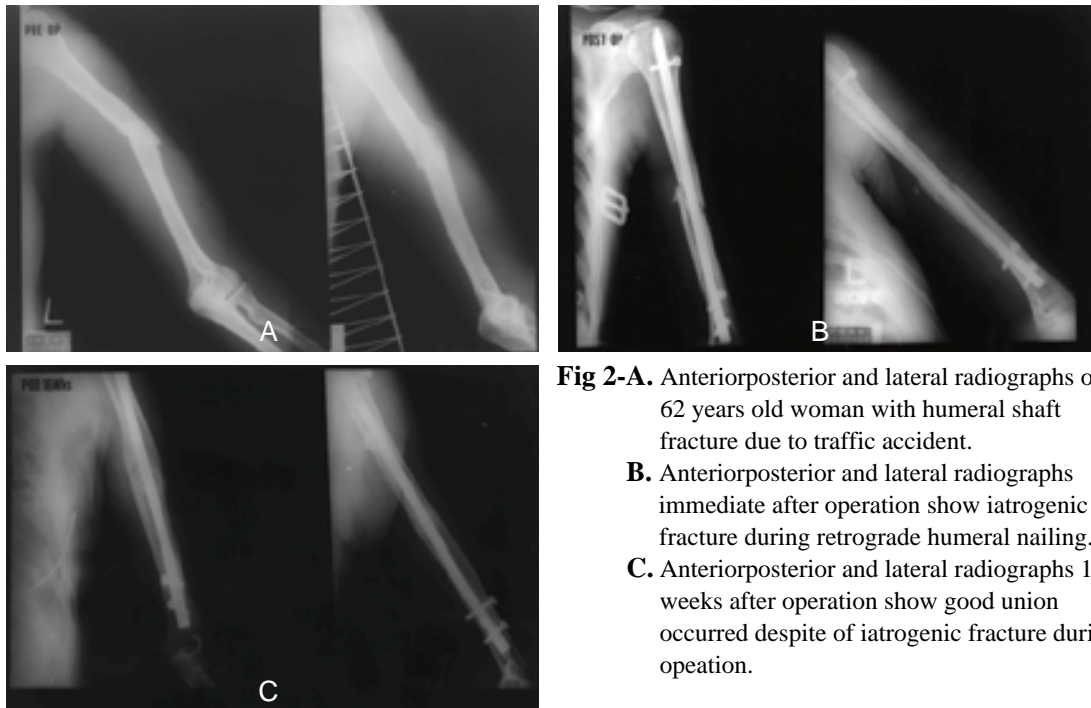
## INTRODUCTION

Traditionally fracture of the shaft of the humerus was treated non-operatively with a hanging cast or brace or others. Although nonoperative treatment should be planned and being successful for majority of diaphyseal humeral fractures, operative intervention is recommended in several situations such as difficulty to satisfactory reduction and alignment cannot be achieved by conservative measures, limitation of adjacent joint motion, segmental fractures, non-union, associated neurovascular injury, pathologic fractures or multiple traumatic cases<sup>1)</sup>. Currently most investigators recommended early motion after internal fixation for

humeral fractures with intramedullary nail or plate osteosynthesis. Plating requires rather extensive soft tissue stripping for application and surgeon frequently feels possibility of nerve dysfunction. Sometimes comminuted humeral fractures often need bone grafting. With the enthusiasm for intramedullary fixation of fractures in recent years, interlocking nails have been developed for the humerus as for other long bones. There are several IM nails for fractured humerus are available. The interlocking nail gives rotational stability, decreasing the need for postoperative bracing and allowing early mobilization of the extremity. We are reporting our experience of IM nail procedure with AO UHN (Unreamed Humeral Nail) which



**Fig 1-A.** Anteriorposterior and lateral radiographs of a 57 years old woman humeral shaft fracture due to slipped down.  
**B.** Immediate postoperative anteriorposterior and lateral radiographs treated with antegrade AO unreamed humeral nailing.  
**C.** Anteriorposterior and lateral radiographs 10 weeks after operation show firm union with callus formation.





used locking screws proximally and distally and can be inserted antegrade or retrograde for nine humeral shaft fractures.

were followed until fracture union was achieved.

## RESULTS

### MATERIALS AND METHODS

Between March 1996 and February 1997, nine humeral shaft fractures were treated with antegrade or retrograde insertion of AO UHN. The average age of patients was 57 years, two males and six females with one bilateral fracture case. The most common mode of injury was traffic accidents followed by slipped down and one pathologic fracture. So we should be excluded one case of metastatic cancer because of difference character of fracture compared to others. 3 patients had associated multiple injuries. Fracture types were two transverse, two oblique, two spiral and two comminuted. AO UHN inserted by antegrade or retrograde technics through limited incisions followed by 2 interlocking screws proximally and distally with compression of the fragments if indicated and possible. After operation, soft shoulder immobilizer was applied immediately. Rehabilitation was started with active shoulder motion exercise few days to 1 week postoperatively depend upon surgeon's feeling of the stability of the fracture fixation during surgery and patient's tolerability of pain. All patients

The determination of bone union was obtained by callus formation on 4 views of X-ray of the humerus and patient's feeling of the strength of arm. No significant difference of union rate or time between the fracture patterns (Table 1). Union occurred at an average of 13 weeks. Union occurred within 8 weeks of 2 cases, at 8 to 12 weeks of 3 cases, at 12 to 16 weeks of 2 cases. A case of delayed union was established, so we performed additional autogenous bone graft to unhealed area 18 weeks after initial operation and obtained firm union. We graded results into 4 groups by modified criteria of Rodriguez-Merchan<sup>2)</sup>: Excellent, shoulder flexion about 150 degrees with no subjective pain - 5 cases; Good, flexion about 120 degrees with occasional pain - 2 cases; Fair, flexion about 90 degrees with moderate pain - 1 case; Poor, flexion below to 60 degrees with moderate pain - case.

During operation, iatrogenic fractures were occurred in two cases during retrograde nail insertion, but healing and functional recovery were ultimately unaffected. There was no iatrogenic radial nerve palsies and postoperative infection.

**Table 1.** The difference of union time and functional result between the fracture patterns

		Union				Nonunion	Result
		<8 weeks	8-12 weeks	12-16 weeks	16 weeks >		
Transverse	(2)		1 (7x265)		1 (7x250)		1 Excellent 1 Fair
Oblique	(2)	1 (6x250)	1 (6x250)				2 Excellent
Spiral	(2)		1 (7x265)	1 (7x280)			1 Excellent 1 Good
Comminuted	(2)	1 (6x245)		1 (8x265)			1 Excellent 1 Good

\* ( ) : nail diameter and length



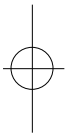
## DISCUSSION

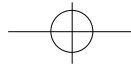
Fracture of the humeral shaft are common, accounting for approximately 3% of all fractures.<sup>3)</sup> Appropriate treatment of patients with humeral shaft fractures requires an understanding of humeral anatomy, the fracture pattern, and the patient's activity level and expectations. The goal of humeral shaft fracture management are to establish union with an acceptable humeral alignment and restore the patients to their prior level of function.<sup>4)</sup> Good to excellent results have been reported in most series of humeral shaft fractures treated closed or with open reduction and internal fixation.<sup>5)</sup> Operative stabilization often is necessary for humeral shaft fractures to improve healing, fracture alignment, and functional result.<sup>6)</sup> Locked intramedullary nails allow loadsharing between the implant and the fracture bone; infrequently require bone grafting, avoid extensive soft tissue dissection required for plating, control rotation better than flexible nails, and allow early mobilization and strengthening of the extremity.<sup>7)</sup> An intramedullary nail is satisfactory for most diaphyseal fractures of the humerus. Mechanically, intramedullary nails offer several advantages over non-operative and plate fixation. Intramedullary nails also offer significant biologic advantages over other fixation methods.<sup>8)</sup> Although insertion can be technically demanding, intramedullary nails do not require the extensive exposure, which is required for plate application.<sup>9)</sup> These closed techniques may result in a lower infection rate and higher union rate with minimal soft-tissue injuries. Early motion of adjacent joint was possible.<sup>10)</sup> Sometimes delayed union or non-union occurred due to distracted fracture fragments after interlocking IM nailing. It should be resolved by fracture site compression method. So we had a chance to try AO UHN probably first time in Korea and expressing our experience to treat humeral shaft fractures with it. Especially compression device of the AO UHN system was advantageous for stabilization of the fractured fragments as well as fracture healing compare to other systems by compression technique that others does not possible with permittable early shoulder motion postoperatively.

## CONCLUSION

Although various interlocking humeral nails currently available, few chinal series have been published evaluation their use. The presumable advantage of AO UHN inserted by antegrade or retrograde technics through a limited incision seemed to be good for treatment of various humeral shaft fractures with reasonably satisfactory results according to our study even though small members of material. Complication including infection is relatively infrequent after operative stabilization of humeral shaft fractures.

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