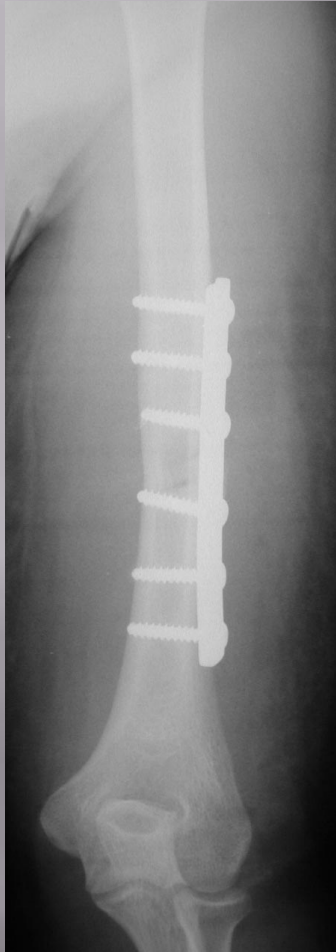


Humeralus Plating

Why it is the best



Kakwani

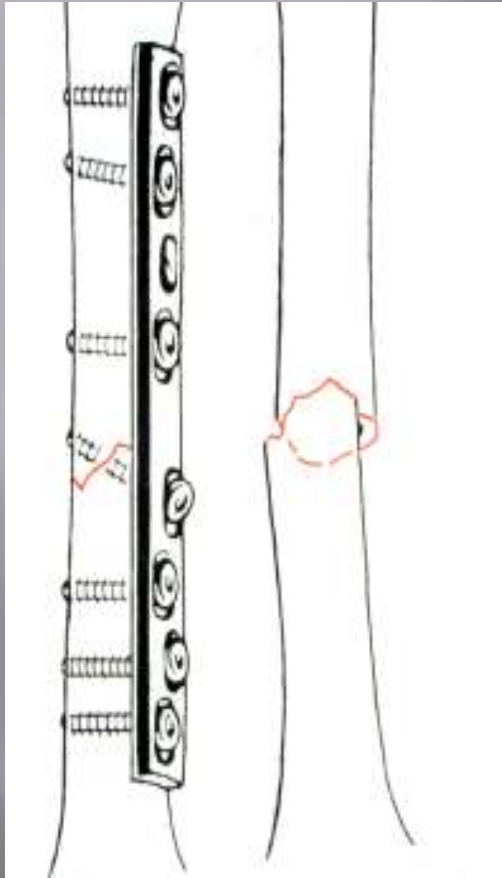


Indications for internal fixation

- ▣ Multiply injured patients,
- ▣ Open fractures,
- ▣ Patients with spinal cord injury (high quadriplegia) or brachial plexus injuries,
- ▣ Fractures with associated neurovascular injuries
- ▣ Radial nerve palsy after closed reduction
- ▣ Floating elbows, and
- ▣ Cases in which a satisfactory reduction cannot be maintained by closed methods



Humeral shaft fractures



Absolute stability



Relative stability

Implants



- ▣ Broad 4.5 large fragment plate
- ▣ Small bone individuals
 - Narrow large fragment plate
 - Small fragment plate 3.5

Plating



- ❑ Open reduction with plate fixation usually ensures a high likelihood of anatomic reduction
- ❑ Radial nerve exploration
- ❑ Patients with narrow medullary canal

Plating – Disadvantages



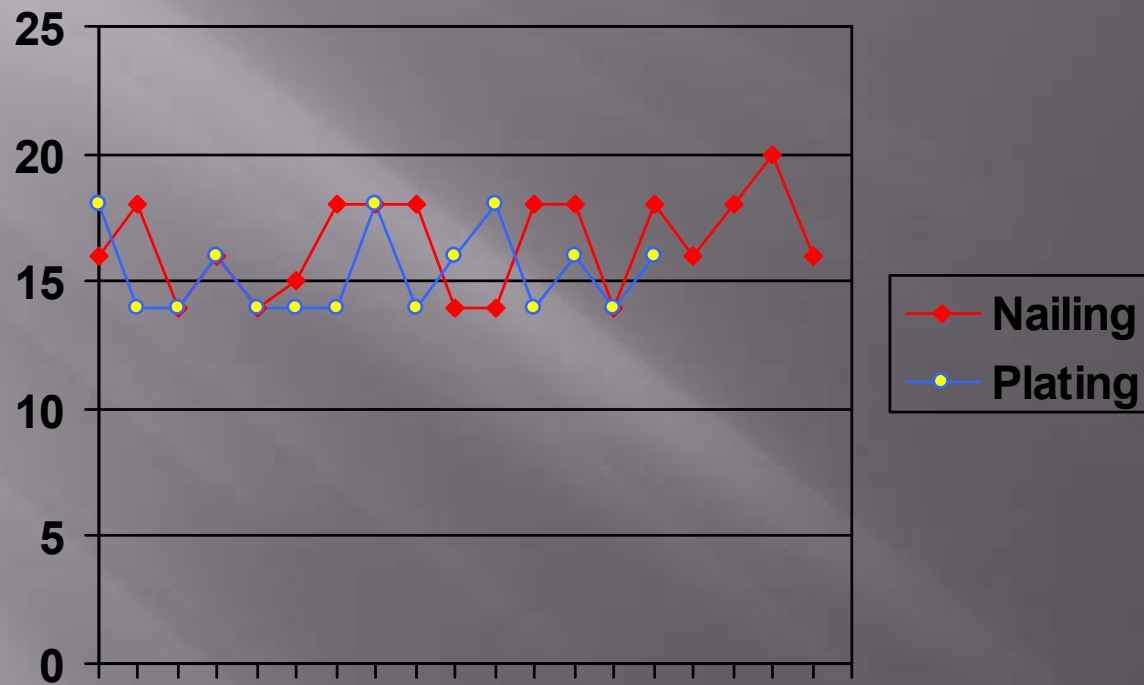
- ▣ Extensive dissection with greater disruption of the soft tissue envelope,
- ▣ Risk of infection,
- ▣ Potential injury to the radial nerve(5%),
- ▣ Poor fixation in osteoporotic bone,
- ▣ The possible need for plate removal at a later date

Heim D, Herkert F, Hess P, Regazzoni P. Surgical treatment of humeral shaft fractures: the Basel experience. J Trauma 1993;35:226-32.

An Z, He X, Zeng B. A comparative study on open reduction and plating osteosynthesis and minimal invasive plating osteosynthesis in treating mid-distal humeral shaft fractures. Zhongguo Xiu Fu Chong Jian Wai Ke Za Zhi. 2009 Jan;23(1):41-4.

A Jiang R, Luo CF, Zeng BF, Mei GH. Minimally invasive plating for complex humeral shaft fractures. Arch Orthop Trauma Surg. 2007 Sep;127(7):531-5. Epub 2007 Mar 31.

Time to Union

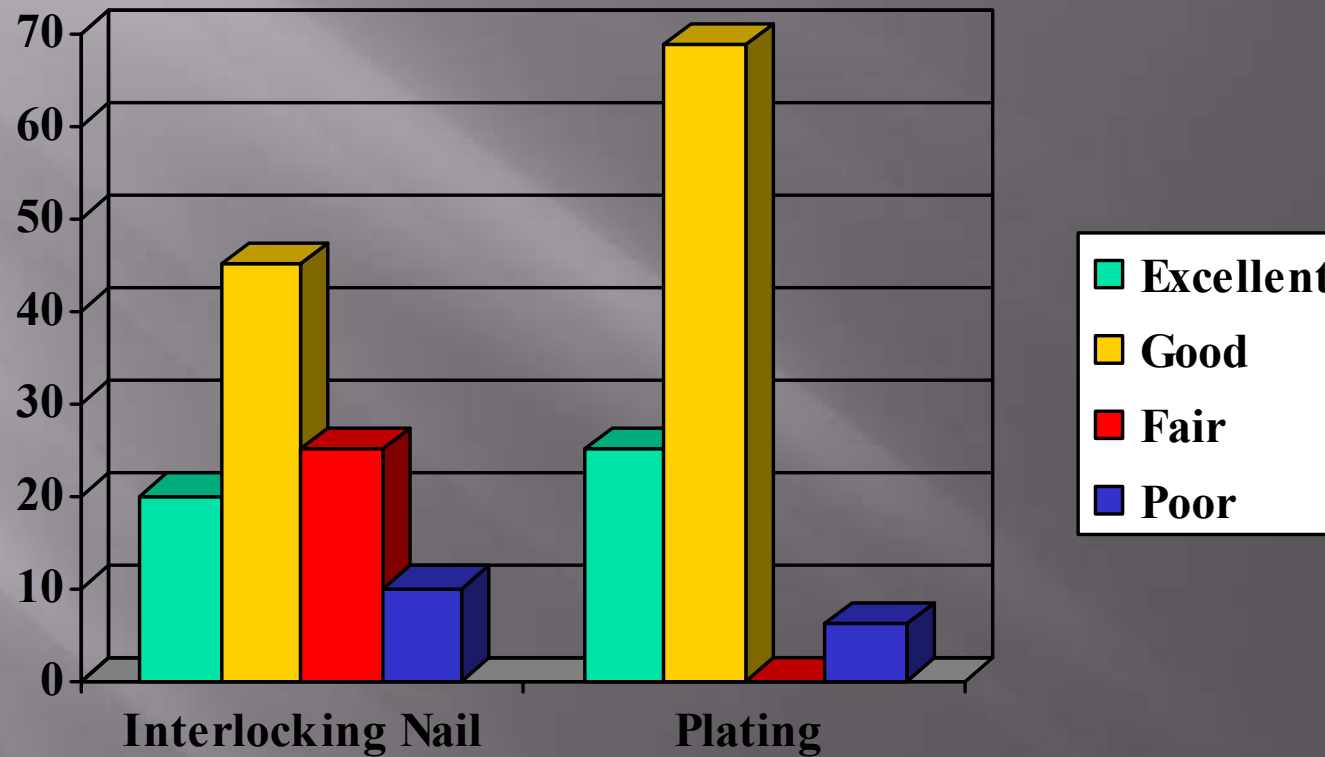


Raghavendra S, Bhalodiya HP. Internal fixation of fractures of the shaft of the humerus by dynamic compression plate or intramedullary nail: A prospective study. Indian J Orthop 2007;41:214-8

Kiran Singiseti & M. Ambedkar: Nailing versus plating in humerus shaft fractures:A prospective comparative study. International Orthopaedics2009 Jun 9

Functional results

(Rodriguez-Merchan criteria)



Kiran Singiseti & M. Ambedkar: Nailing versus plating in humerus shaft fractures:A prospective comparative study. International Orthopaedics2009 Jun 9

No Difference in

ASES scores

Visual analogue pain score

Time taken to return to normal activity

- Changulani M, Jain UK, Keswani T (2007) Comparison of the use of the humerus intramedullary nail and dynamic compression plate for the management of diaphyseal fractures of the humerus. A randomised controlled study *Int Orthop* 31(3):391-5
- McCormack RG, Brien D, Buckley RE, McKee MD, Powell J, Schemitsch EH (2000) Fixation of fractures of the shaft of the humerus by dynamic compression plate or intramedullary nail: A prospective randomized trial. *J Bone Joint Surg Br* 82(3): 336-339
- Amit B Putti, Rajendra B Uppin, Babu B Putti: Locked intramedullary nailing versus dynamic compression plating for humeral shaft fractures *Journal of Orthopaedic Surgery* 2009;17(2):139-41

Complications

| | Plating | Nailing |
|------|---------|---------|
| Rate | 17% | 50% |

Amit B Putti,Rajendra B Uppin,Babu B Putti: Locked intramedullary nailing versus dynamic compression plating for humeral shaft fractures *Journal of Orthopaedic Surgery* 2009;17(2):139-41



Postop shoulder pain & Shoulder stiffness

Chapman JR, Henley MB, Agel J, Benca PJ (2000) Randomized prospective study of humeral shaft fracture fixation: Intramedullary nails versus plates. *J Orthop Trauma* 14:162-166

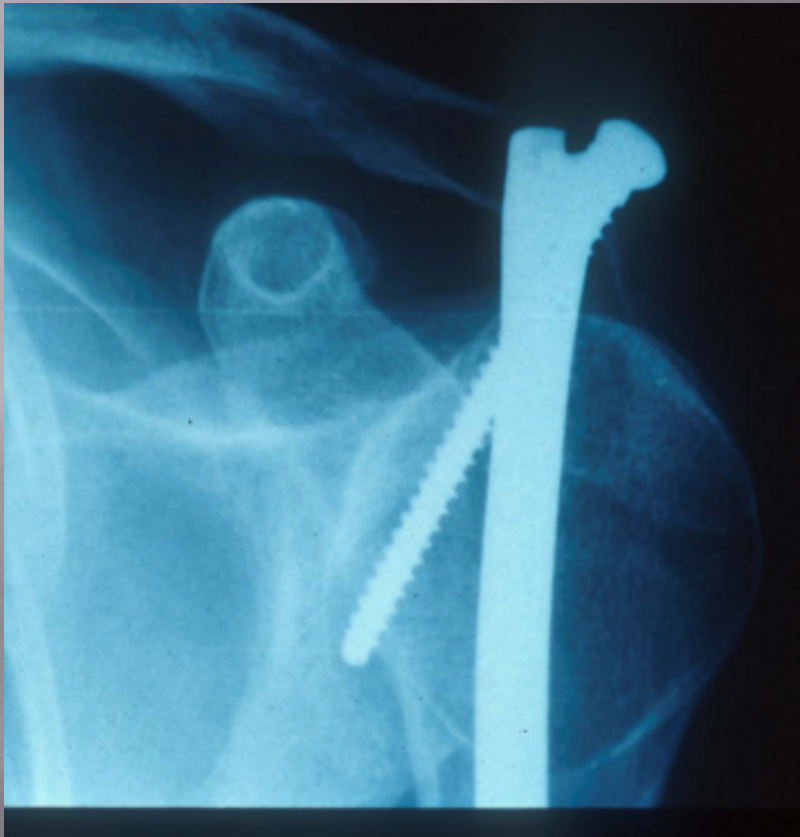
Singiseti K, Ambedkar (2009) Nailing versus plating in humerus shaft fractures: A prospective comparative study. *Int Orthop*. 2009 Jun 9.

Brumbach et al(1986) Intramedullary stabilization of humeral shaft fractures in patients with multiple trauma. *J Bone Joint Surg Am* 68(7):960-970

McCormack RG, Brien D, Buckley RE, McKee MD, Powell J, Schemitsch EH (2000) Fixation of fractures of the shaft of the humerus by dynamic compression plate or intramedullary nail: A prospective randomized trial. *J Bone Joint Surg Br* 82(3): 336-339

Raghavendra S, Bhalodiya HP. Internal fixation of fractures of the shaft of the humerus by dynamic compression plate or intramedullary nail: A prospective study. *Indian J Orthop* 2007;41:214-8

Nailing – Disadvantages



The possibility of impingement from proximally prominent hardware



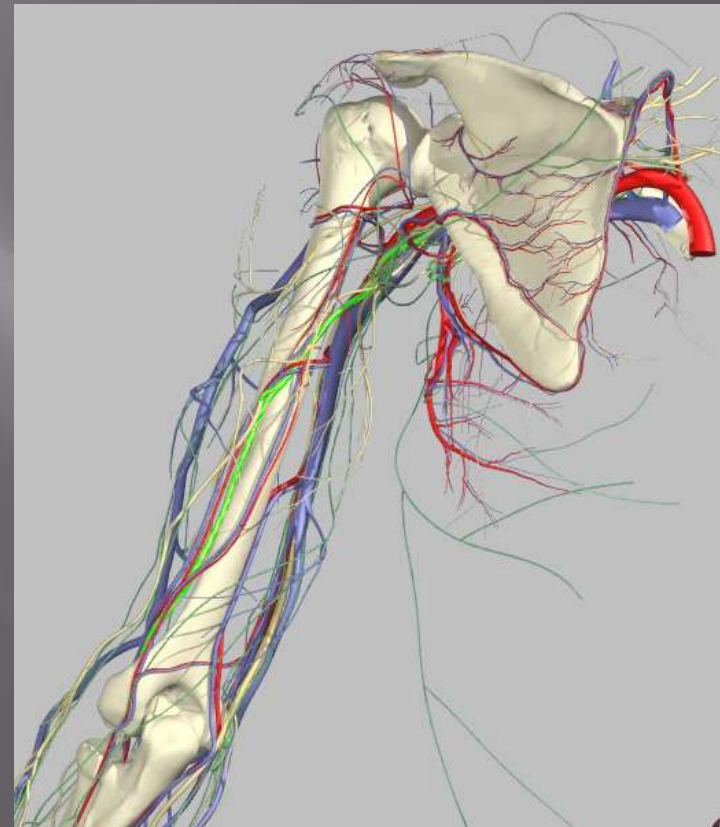
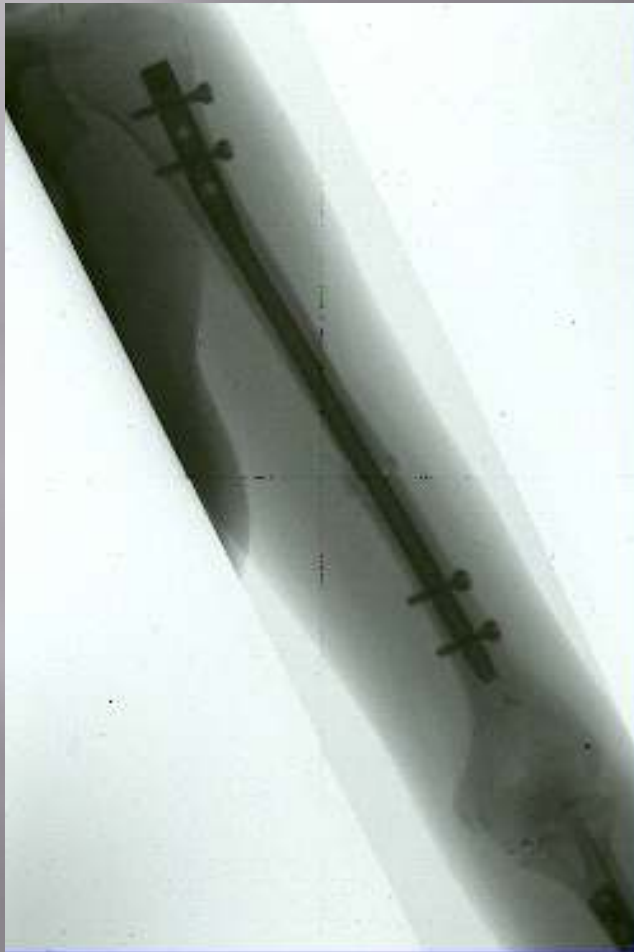
Antegrade nailing can
affect fracture healing
by distracting the
fracture



7-15% Risk of further fracture comminution during reaming or nail insertion

Ingman AM, Waters DA. Locked intramedullary nailing of humeral shaft fractures. *J Bone Joint Surg Br* 1994;76:23-9
Brumback RJ, Bosse MJ, Burgess AR, Poka A. Intramedullary stabilization of humeral shaft fractures in patients with multiple trauma. *J Bone Joint Surg Am* 1986;68:960-70
Durbin RA, Gottesman MJ, Saunders KC. Hackethal stacked nailing of humeral shaft fractures. *Clin Orthop Relat Res* 1983;179:168-74
Ruedi T, Moshfegh A, Pfeiffer KM, Allgower M. Fresh fractures of the shaft of the humerus—conservative or operative treatment? *Reconstr Surg Traumatol* 1974;14:65-74.
Rommens PM, Verbruggen J, Broos PL. Retrograde locked nailing of humeral shaft fractures. A review of 39 patients. *J Bone Joint Surg Br* 1995;77:84-9.
Singiseti K, Ambedkar: Nailing versus plating in humerus shaft fractures: A prospective comparative study. *Int Orthop*.2009

Neurovascular injury at interlocking sites



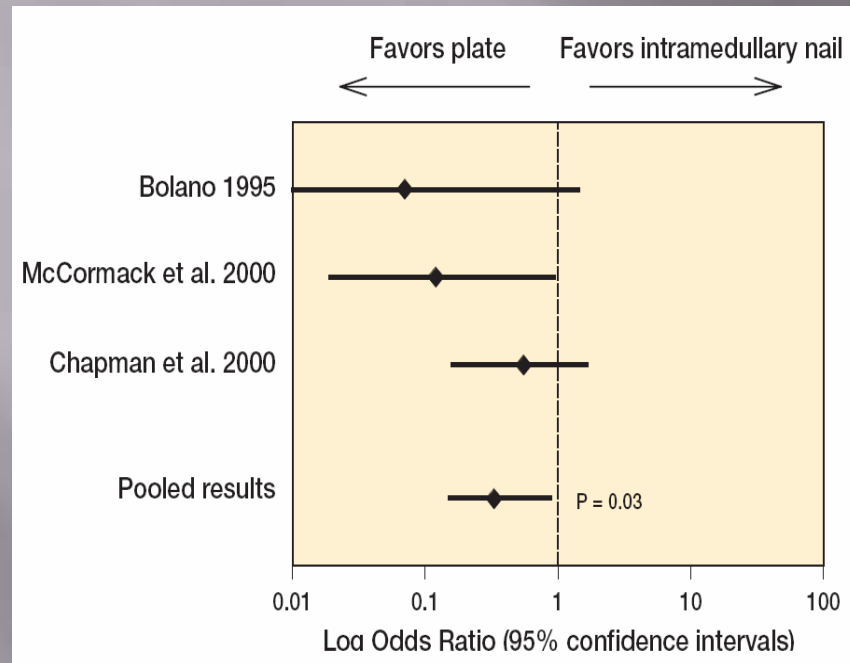
[Albritton MJ](#), [Barnes CJ](#), [Basamania CJ](#), [Karas SG](#). Relationship of the axillary nerve to the proximal screws of a flexible humeral nail system: an anatomic study. *J Orthop Trauma*. 2003 Jul;17(6):411-4.

Nijs S, Sermon A, Broos P. Intramedullary fixation of proximal humerus fractures: do locking bolts endanger the axillary nerve or the ascending branch of the anterior circumflex artery? A cadaveric study. *Patient Saf Surg*. 2008 Dec 16;2(1):33.

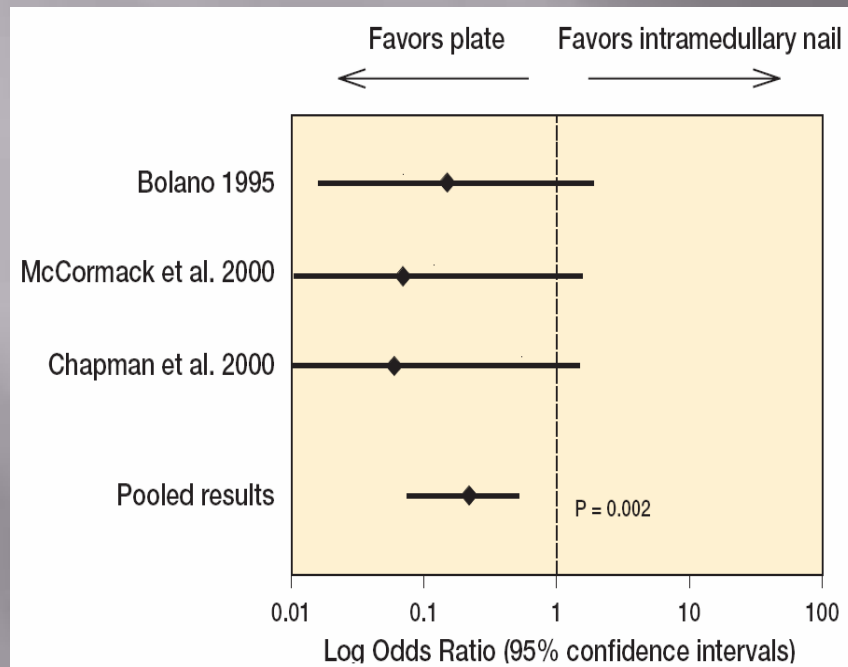


The shortening of the affected arm by 1.5–4 cm was noted in 33% cases with IMN fixation

Re-operation rate



- The difference in risk of reoperation with plates and intramedullary nails was 10%
- Every 10 patients treated with plates, 1 reoperation might be prevented (i.e. NNT = 10)



- ▣ The difference in risk of reoperation with plates and intramedullary nails (18%)
- ▣ For every 6 patients treated with plates, 1 shoulder impingement would be prevented (i.e. NNT = 6)

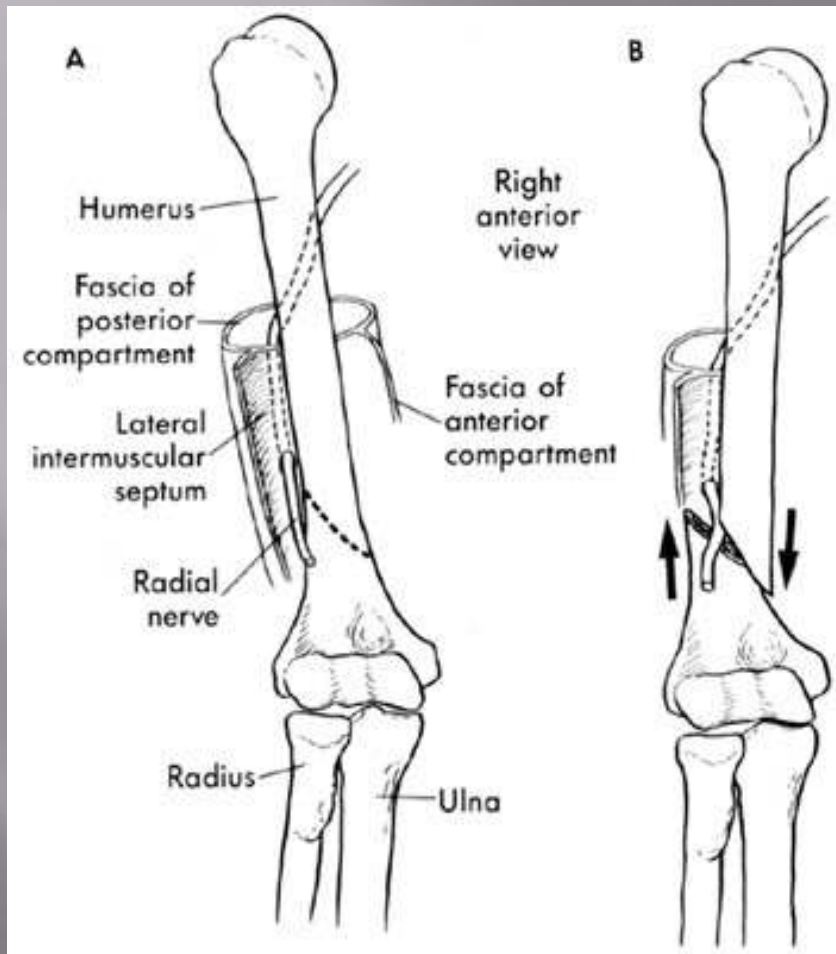


Plate fixation did not incur greater risks of

Nonunion,

Infection,

Radial nerve palsy

RCT

- Amit B Putti, Rajendra B Uppin, Babu B Putti: Locked intramedullary nailing versus dynamic compression plating for humeral shaft fractures *Journal of Orthopaedic Surgery* 2009;17(2):139-41
- Kiran Singiseti & M. Ambedkar: Nailing versus plating in humerus shaft fractures: A prospective comparative study. *International Orthopaedics* 2009 Jun 9
- Changulani M, Jain UK, Keswani T (2007) Comparison of the use of the humerus intramedullary nail and dynamic compression plate for the management of diaphyseal fractures of the humerus. A randomised controlled study *Int Orthop* 31(3):391-5
- McCormack R G, Brien D, Buckley R E, McKee M D, Powell J, Schemitsch E H. Fixation of fractures of the shaft of the humerus by dynamic compression plate or intramedullary nail: A prospective randomized trial. *J Bone Joint Surg (Br)* 2000; 82: 336-9.
- Chapman J R, Henley M B, Agel J, Benca P J. Randomized prospective study of humeral shaft fracture fixation: Intramedullary nails versus plates. *J Orthop Trauma* 2000; 14: 162-6.
- Bolano L E, Jaquinto J A, Vasicek V. Operative treatment of humerus shaft fractures: A prospective randomized study comparing intramedullary nailing with dynamic compression plating. Presented at the Annual Meeting of the American Academy of Orthopaedic Surgeons, 1995.
- Rodrigues-Merchan E C. Compression plating versus hackethal nailing in closed humeral shaft fractures failing nonoperative reduction. *J Orthop Trauma* 1995; 9: 194-7.

References

- Hems TE, Bhullar TP (1996) Interlocking nailing of humeral shaft fractures. The Oxford experience. 1991–1994. *Injury* 27:485–489
- Brumback RJ, Bosse MJ, Burgess AR, Poka A. Intramedullary stabilization of humeral shaft fractures in patients with multiple trauma. *J Bone Joint Surg Am* 1986;68:960-70
- Durbin RA, Gottesman MJ, Saunders KC. Hackethal stacked nailing of humeral shaft fractures. *Clin Orthop Relat Res* 1983;179:168-74.
- Flinkkila T, Hyvonen P, Lakovaara M, Linden T, Ristiniemi J. Intramedullary nailing of humeral shaft fractures. A retrospective study of 126 cases. *Acta Orthop Scand* 1999;70:133-6

Questions???