

HUMERUS NAILS

SURGICAL TECHNIQUE

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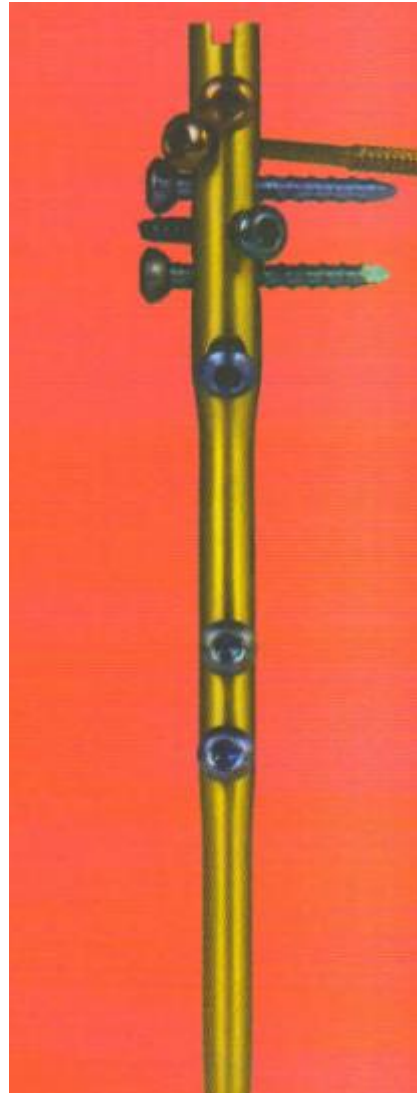
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1. Description of Surgical Technique

Name - Humerus Nails

Available in SS 316L and Titanium Gr. 5 materials



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2. Feature of Benefits

Advanced proximal locking

Using locking screws enables the optimal locking for every anatomical situation and fracture type.

Locking screws

- Possibility of interfragmentary
- Compression for enhanced
- Stabilization of transverse and
- Short oblique fractures

Improved Stability

End cap

- Allows angular stable locking of the spiral blade
- Prevents ingrowth of tissues and facilitates nail extraction
- End cap to be easily and reliably picked up

One system for humeral fractures

- Proximal fractures
- Diaphyseal and proximal-diaphyseal combined fractures –
- Can be used for both left and right humerus
- For easy guided insertion
- For both antegrade and retrograde access

Improved Stability

Locking screw –

- Thread closer to screw head which provides better bone purchase and
- Titanium alloy for improved mechanical and fatigue properties
- Effortless and secure pick-up locking screw

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Distal locking –

- Targeted distal locking
- New positions and angulations of the locking holes for optimal positioning of the locking screws
- Secure fixation of even short distal or proximal fragments.

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3. AO Principle

In 1958, the AO formulated four basic principles, which have become the guidelines for internal fixation:

1. **Anatomic reduction:** Fracture Reduction and fixation to restore anatomical relationships.
2. **Stable fixation:** Fracture fixation providing absolute or relative stability, as required by the patient, the injury, and the personality of the fracture.
3. **Preservation of blood supply:** Preservation of the blood supply to soft tissues and bone by gentle reduction techniques and careful handling.
4. **Early, active mobilization:** Early and Safe Mobilization and rehabilitation of the injured part and the patient as a whole.

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4. Indications

Non-operative management in cooptation splint and functional brace for fractures with $<20^{\circ}$ anterior angulation, $<30^{\circ}$ varus/valgus angulation, $<3\text{cm}$ shortening absolute indications include open fracture with soft tissue injury, vascular injury, brachial plexus injury relative indications for nailing include pathologic fractures, segmental fractures, severe osteoporosis, skin compromise, polytrauma, Multi fragmented proximal humerus fracture.

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5. Intended Purpose

The Humerus Nail is intended to provide temporary stabilization of various types of fractures, malunions and nonunions of the humerus. Types of fractures include, but not limited to fractures of the humeral shaft, non-unions, malalignments, pathological humeral fractures, and impending pathological fractures.

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6. Contraindications

- Since external fixation devices are often used in emergency situations to treat patients with acute injuries, there are no absolute contraindications for use. The surgeon's education, training and professional judgment must be relied upon to choose the most appropriate device and treatment for each individual patient. Whenever possible, the device chosen should be of a type indicated for the fracture being treated and/or for the procedure being utilized.
- Insufficient quantity or quality of bone which would inhibit appropriate fixation of the device.
- Compromised vascularity that would inhibit adequate blood supply to the fracture or operative site.
- Previous history of infections.
- Any neuromuscular deficit which could interfere with the patient's ability to limit weight bearing.
- Any neuromuscular deficit which places an unusually heavy load on the device during the healing period.
- Malignancy in the fracture area.
- Mental, physical or neurological conditions which may impair the patient's
- Ability to cooperate with the post-operative regimen.
- Patients with a compromised immune system.
- Pre-existing internal fixation that prohibits proper pin placement

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7. Surgical Steps

Equipment & Positioning

Humerus intramedullary nailing system

C-arm fluoroscopy

Radiolucent table

Position

Patient supine with ipsilateral shoulder at edge of bed with or without arm board

If no arm board use assistant to manipulate and hold arm

Tape down and secure head, chest, and abdomen rotate bed 90° so that ipsilateral arm is away from Anesthesia

Prep and drape entire arm into axilla and over medial clavicle to ensure adequate working area OR Setup and C-arm

Radiolucent table c-arm in from foot of bed with monitor screen parallel to bed take initial fluoro AP/Lat. of shoulder and humerus to ensure proper positioning during remainder of case can internal/external rotate arm to get Lat. View

Approaches

Anterolateral Shoulder incision 3-4cm along anterolateral border of acromion tenotomy to develop soft tissue plane then cautery through subcutaneous tissue sharp dissection through fascia, bursa, and rotator interval.

Procedure

- Approach mark out anterior, lateral, and posterior borders of acromion incision and dissection along anterolateral border of acromion down to rotator cuff interval
- Guide wire Insertion guide pin start point is between greater tuberosity and sulcus in center of humeral head
- Aim for 50% bare area, mallet into place, and check on fluoro divide rotator interval then drive guidewire down canal on power check AP/Lat. fluoro to make

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- sure in center of canal use lateral entry awl or reamer (~8mm) with soft tissue protector and ream until it hits the stop plate
- Fracture Reduction reduce fracture by using traction, Varus/valgus, and rotational force applied manually
 - Once fracture reduced, manually push long balltip guidewire past fracture site using T-handle (with slight bend at tip)
 - Mallet to distal aspect of humerus (olecranon fossa), check on fluoro AP/Lat use radiolucent ruler to measure appropriate nail length on AP fluoro of shoulder need to recheck fracture site to ensure no gapping in order to get accurate length
 - Use ruler on contralateral side to measure intact humerus if segmental comminution exists
 - Reaming start with size 6-7mm reamer, then ream up 0.5-1.0mm with each reamer push through entry hole before reaming to avoid reaming out anterior cortex check chatter from reamer feedback and diaphysis fit on fluoro AP ream 1.5-2.0mm above size of final nail “ream and run”: ream up to fracture site with smaller reamers then push through fracture site and restart reamer full speed to avoid eccentric reaming don’t stop reamer in canal with larger reamer sizes (avoids reamer head from getting stuck)
 - Nail Insertion build nail on back table and make sure targeting guide lines up with holes in nail, check sleeves for each interlock hole tighten top locking screw with pumpkin screwdriver to lock together insert nail over guidewire, follow 6° lateral bend of nail, mallet in with strike plate targeting jig should be 30° anterior to bed for proper alignment hold nail by handle, not the targeting guide, mallet or manually advance to fracture site,
 - Check on fluoro AP/Lat manually advance nail past the fracture site to avoid iatrogenic comminution or development of new fracture lines possible with use of the mallet insert nail completely and seat fully, check seating in humeral head need to bury nail ~7-10mm to decrease incidence of shoulder pain remove long ball tip guidewire.
 - Humeral Head Interlocking Screws check on AP fluoro to see where humeral head interlock screws will be located can insert 3-4 (5mm) proximal interlock screws

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multiplanar screws for right vs. left sides mark skin with triple sleeve through jig, use 15blade through skin and deep fascia place inner sleeves (x2) into guide, push guides down to bone

- Drill through 1st cortex, tap second, measure, then drill through 2nd cortex insert screw and check length and placement on fluoro to ensure no articular penetration on multiple fluoro views can add end cap into top of nail to lock in most
- Proximal interlock screw and prevent bony ingrowth into top of nail use pumpkin screwdriver to remove locking screw from nail and remove handle and targeting guide
- Distal Interlocking Screws recheck fracture site and reduction prior to insertion of distal interlock screws if gapping at fracture use hand to strike elbow and compress across fracture site place arm on mayo stand or stack of towels and move to distal nail at elbow take AP fluoro for perfect circles technique for interlocking screws c-arm stays still and rotate arm to get perfect circles (anterolateral direction for screws) once distal interlock holes appear as perfect circles, use hemostat handle to localize holes, mag x2 in with fluoro blade through skin, hemostat spread down to bone need to visualize bone in order to prevent injury to surrounding nerves radial nerve can be damaged with lateral to medial interlock screws, musculocutaneous nerve with anterior to posterior screws place drill through hole, then make drill perpendicular to C-arm beam and drill through first cortex and nail stop at 2nd cortex, measure (add 5mm to length to add 2nd cortex thickness), and then drill 2nd cortex while still in perfect circles lat fluoro, complete 2nd distal interlock screw and measure c-arm to AP position to get out of the way, insert both interlock screws Confirm Nail Position and Extremity Check take final AP/Lat of distal and proximal aspects of nail and fracture check limb length, rotation, and alignment.

Closure

- Irrigation & Hemostasis

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- Strongly flush out nail insertion site and interlocking screw sites with saline bulb irrigation
- Cauterize peripheral bleeding vessels
- Rotator Interval and Fascia Closure close rotator cuff and fascia with 0-vicryl or 2-0 Ethibond sutures subcutaneous and skin closure with 2-0 vicryl and staples
- Dressing soft incision dressings over shoulder and proximal/distal interlock incisions

Post – Operative Care

- Immediate Post-op weight-bearing as tolerated, physical therapy sling for comfort immediate range of motion exercises to elbow/wrist/hand to reduce swelling pendulems for shoulder range of motion recheck neurovascular exam (radial nerve) 2 Weeks wound check staples/sutures removed continue physical therapy and range of motion exercises

Document complications

- Screw penetration into articular surface
- Shoulder pain
- Varus malunion
- Nonunion
- Avascular necrosis
- Malrotation
- Nerve injury (radial nerve with lateral to medial interlock screws, musculocutaneous nerve with anterior to posterior screws)
- Infection

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8. Implant Removal

- In case of implant removal firstly remove the end cap with help of hex screw driver. Proceed by removing both locking bolt from the bone using hex screw driver.
- Used extractor rod, handle for extractor & round hammer for nail removing.
- Assemble the rod, handle & round hammer & back hammer the nail for removing.

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9. Caution

Used Implants:

Used implants which appear un-damaged may have internal and/or external defects. It is possible that individual stress analysis of each part fail to reveal the accumulated stress on the metals as a result of use within the body. This may lead ultimately to implant failure after certain point of time due to metal fatigue. Therefore, reuse of implants is strictly not recommended.

SINGLE BRAND USAGE: Implant components from one manufacture should not be used with those of another. Implants from each manufacture may have metal, dimensions and design differences so that the use in conjunction with different brands of devices may lead to inadequate fixation or adverse performances of the devices

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10. Disposal of Implants

Every used or removed implant must be discarded after use and must never be re- used. It should be bent or scratched & then disposed of properly so that it becomes unfit for reuse. While disposing it off, it should be ensured that the discarded implant does not pose any threat to children, stray animals and environment. Dispose of the implants as per applicable medical practices and local, state and country specific regulatory requirement of Bio Medical Waste rules.

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11. Packaging Material Disposal

The packaging material of this device is made special packing material and therefore if swallowed, may cause choking Hazards. Therefore, it should be disposed of in such a way that keep out of reach of children and stray animals.

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12. MRI Information

IMPORTANT:

- Yogeshwar Implants (I) Pvt. Ltd. implants are manufactured from SS 316L and Titanium Grade 5 material both are non-magnetic material, hence it do not pose any safety risk.
- Patients should be directed to seek a medical opinion before entering potentially adverse environments that could affect the performance of the implants, such as electromagnetic or magnetic field or including a magnetic resonance environment.
- Doctor shall conduct a Risk Benefit Analysis before directing the patient to enter electromagnetic or magnetic fields or including a magnetic resonance environment.
- The Yogeshwar Implants (I) Pvt. Ltd. implants has not been evaluated for safety and compatibility in the MR environment but on the basis of literature study below mentioned points can be taken care during MRI
 - ✓ The minimum recommended time after the implantation that allows patients to safely undergo MRI examination or allowing the patient or an individual to enter the MRI environment is 6 (six) weeks.
 - ✓ The maximum recommended time limit for MRI examination in patients implanted with the evaluated device is 30 min with a scanner operating at 1.5T (Tesla) or less.

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13. Note

This above surgical technique is also applicable for all below mention product	
Sr. No.	Product Name
01	INTERLOCKING NAIL FOR HUMERUS - 1 D.H.
	Dia Length
	6MM - 200 to 300MM
	7MM - 200 to 300MM
	8MM - 200 to 300MM
	(Difference of 10MM each)
02	PROXIMAL HUMERUS NAIL - 2DH CANN
	7MM*, 150 MM, 200MM, 220MM, 240MM,260MM,280MM,300MM
	8 MM * 150 MM, 200MM, 220MM, 240MM,260MM,280MM,300MM
	9 MM * 150 MM, 200MM, 220MM, 240MM,260MM,280MM,300MM
03	R HUMERUS NAIL - SOLID
	6 MM * 205, 220,230,240,250,260,270,280,295,300
	6.7 MM * 205, 220,230,240,250,260,270,280,295,300
	7.5 MM * 205, 220,230,240,250,260,270,280,295,300
04	POLARIS PLUS NAIL -
	6 MM * 200 MM, 220MM, 240MM,260MM,280MM,300MM
	7 MM * 200 MM, 220MM, 240MM,260MM,280MM,300MM
	8 MM * 200 MM, 220MM, 240MM,260MM,280MM,300MM
	9 MM * 200 MM, 220MM, 240MM,260MM,280MM,300MM

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