MultiLoc Humeral Nails

Humeral Nails with multiple locking options for simple and complex fractures
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Indications
Indications

MultiLoc Proximal Humeral Nail (short)

- Fractures of the proximal humerus, including
  - 2-part surgical neck fractures
  - 3-part fractures
  - 4-part fractures
Indications
MultiLoc Humeral Nail (long)

- Diaphyseal fractures of the humeral shaft
- Fractures of the proximal humerus with diaphyseal extension
- Fractures of the proximal humerus
  - 2-part surgical neck fractures
  - 3-part fractures
  - 4-part fractures
- Impending pathological fractures
Design Rationale

– Entry Point
– Proximal Fixation
– Distal Locking
## Entry Point

<table>
<thead>
<tr>
<th>Multiloc design feature</th>
<th>Benefit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Entry point is medial to sulcus between head and greater tuberosity</td>
<td>Preserves hypovascular region where rotator cuff inserts</td>
</tr>
<tr>
<td>Straight nail designed to anchor in strong subchondral bone</td>
<td>Avoids potential insertion through fracture site</td>
</tr>
</tbody>
</table>
Antegrade Humeral Nailing Through the Rotator Cuff Interval: A new entry portal.


“The proposed advantage of this technique was that postoperative shoulder pain would be minimized by avoiding damage to the critical (hypovascular) zone of the rotator cuff muscles and by burying the upper end of the nail deep in the head of the humerus”

→ Entry Point preserves hypovascular region where rotator cuff inserts
Entry Point: Scientific Evidence

Fixation of Proximal Humeral Fractures with an Intramedullary nail: Tips and Tricks.

“The typical dense subchondral bone layer which is always present even in manifest osteoporotic bone offers increased stability as a fifth anchoring point in addition to the four head fixation screws.”

→ Entry Point avoids potential insertion through fracture site.
In all age groups, the highest BMD (bone mineral density) was found in the most cranial aspects of the medial and dorsal regions of the proximal humerus.

→ Straight nail designed to anchor in strong subchondral bone.
# Proximal Fixation

## Multiloc design feature

<table>
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<tr>
<th>Multiloc design feature</th>
<th>Benefit</th>
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</thead>
<tbody>
<tr>
<td>4 Multiloc screws in multiplanar configuration</td>
<td>Multiple points of fixation in the humeral head</td>
</tr>
<tr>
<td>Innovative screw-in-screw option</td>
<td>Improved stability in osteoporotic bone, when needed*</td>
</tr>
<tr>
<td>Ascending screw</td>
<td>Provide medial calcar support</td>
</tr>
</tbody>
</table>

* Comparative testing on file at Synthes. Refer to the technique guide for details of test. Bench test results do not necessarily reflect clinical performance.
Proximal Fixation: Design Rationale

1. Standard **MultiLoc™ Screws**
targeting medial and posterior pillar
   → Basic stability

2. Optional **3.5 mm Locking Screws**
targeting **postero-medial interval**
   → Augmented stability

   → Provide multiple points of fixation in the humeral head

“Act as Intramedullary Philos”
Proximal Fixation: Biomechanical evidence

Biomechanical evaluation of two intramedullary nailing techniques with different locking options in a three-part fracture proximal humerus model.


“The introduction of additional two screw in-screw and a calcar screw, together with the multi-planar diaphyseal fixation with angle-stable locking screws, supports the humeral head fragment in both axial and rotational direction.”

→ The ascending calcar screw and the 3.5 mm screw-in-screw options designed to increase resistance to head migration, varus deformation and greater tuberosity rotation.
Screw-in-screw: Scientific Evidence

Biology and Biomechanics in Osteosynthesis of Proximal Humerus Fractures.


“Regardless of the specimen’s age, the highest BMD and bone strength were found in the proximal aspects and in the medial and dorsal regions of the proximal humerus.”

→ Screw configuration aimed at regions of increased bone density.
Influence of peri-implant bone quality on implant stability.


“The secondary locking screws (screw-in-screw) targeted bone volumes in the postero-medial part of the humerus with statistically significant higher quality”

“Significant correlation was found between the varus deformation and apparent BMD at the secondary locking screws (screw-in-screw).”

→ Screw configuration aimed at regions of increased bone density.
**Feature: Polyethylene Inlay**

**Clinical Challenge:** Screw back-out

Polyethylene inlay in Nail

→ for secure screw fixation

**Feature: Blunt screw tip**

**Clinical Challenge:** Secondary screw perforation

Blunt screw tips

→ Reduce risk associated with secondary screw perforation


MultiLoc Humeral Nails/ InService Presentation/ DJ4825-B
Feature: Suture holes in screw

Clinical Need: attach rotator cuff tendons

Suture holes in screw head
→ Facilitate rotator cuff attachment
## Distal Locking

<table>
<thead>
<tr>
<th>Multiloc design feature</th>
<th>Benefit</th>
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<tbody>
<tr>
<td>Short Nail: 2 targeted distal locking screws in multiple planes</td>
<td>Multi-planar screws to reduce implant toggling</td>
</tr>
<tr>
<td>Long Nail: All 3 distal screws designed to avoid vascular structures</td>
<td>Located in the &quot;safe zone&quot; defined between the median and radial nerve</td>
</tr>
</tbody>
</table>
Distal Locking: Scientific Evidence
MultiLoc PHN (short)

Anatomical study with MultiLoc PHN.
Marco F (2012) Preliminary study draft [courtesy of Prof. F. Marco, Complutense University, Madrid, Spain].

- Anatomical study on multiple upper extremity specimens including analysis of neurovascular structures with regards to safety of locking options at all screw levels of the MultiLoc PHN

AN = axillary nerve; CI = clavicle; DM = deltoid muscle; LAT = lateral head of triceps brachii muscle; LBB = long head of biceps brachii muscle; PBA = profunda brachii artery; PHCA = posterior humeral circumflex artery; PM = pectoralis major muscle.
Distal Locking: Scientific Evidence

MultiLoc HN (long)

The risk of injury to neurovascular structures from distal locking screws of the Unreamed Humeral Nail (UHN): A cadaveric study.


“We recommend using only the two anteroposterior screws for distal interlocking, avoiding the lateromedial locking option. If this lateromedial locking screw is needed to gain adequate stability, it should be introduced under visual control.”

→ Multiloc HN: All 3 distal screws designed to be located in the "safe zone" defined between the median and radial nerve
Feature: Anatomic AP screws

MultiLoc HN (long)

2 Anatomical AP screws:
- 90° to Epicondylar axis
- accounting for retroversion of humeral head

1 Oblique screw:
- anterolateral to posteromedial

→ May facilitate free hand locking and minimize malrotation of the distal fragment
Feature: Compression feature

MultiLoc HN (long)

Bicortical compression feature:

- Self holding compression mechanism
- No need for static holding screw to maintain compression intraoperatively

→ Designed to increase stability in transverse and short oblique fractures.
Implants
Implants: Overview

- Multiloc Nails:
  - MultiLoc Proximal Humeral Nail (short)
  - MultiLoc Humeral Nail (long)
- MultiLoc End Cap
- MultiLoc Screws
- 3.5 mm Locking Screws (LCP)
- 4.0 mm Locking Screws (Expert or ASLS)
MultiLoc Proximal Humeral Nail (short)
- Straight design
- Right and left version
- Diameters: 8.0 mm, 9.5 mm
- Length: 160 mm
- Material: Ti-6Al-7Nb (TAN) nail, polyethylene inlay
- Do not re-sterilize
- Part #'s:
  04.019.034S
  04.019.035S
  04.019.038S
  04.019.039S

MultiLoc Humeral Nail (long)
- Straight design
- Right and left version
- Diameters: 7.0 mm, 8.5 mm
- Length: 180 – 315 mm
- Material: Ti-6Al-7Nb (TAN) nail, polyethylene inlay
- Do not re-sterilize
- Part #'s:
  04.016.180S – 04.016.315S
  04.017.180S – 04.017.315S
  04.018.180S – 04.018.315S
  04.019.180S – 04.019.315S
Implants

MultiLoc Screws
- Countersunk head profile
- 4 suture holes
- Blunt screw tips
- Outer diameter: 4.5 mm
- Core diameter: 3.9 mm
- Lengths: 20 – 60 mm
- Material: Ti-6Al-7Nb (TAN)
- Art Nos: 04.019.020(S) – 04.019.060(S)

MultiLoc End Caps
- Diameter: 9.5 mm
- Extensions: 0, 2, 5, 10, 15 mm
- Material: Ti-6Al-7Nb (TAN)
- Art Nos: 04.019.000S – 04.019.015S
Implants

Proximal locking:
- **Locking Screws Ø 3.5 mm**

Distal locking:
- **Locking Screws Ø 4.0 mm (Expert)**

  or

- **ASLS4 Screws & Sleeves**
Trays and Sets
MultiLoc Proximal Humeral Nail set

- Needed for both short & long nail cases
- Contains 3 Instrument trays
- Screw Rack contains:
  - 4.5 mm Titanium MultiLoc Screws
  - 3.5 mm Titanium LCP Locking Screws
  - 4.0 mm Titanium Locking Screws
  - MultiLoc End caps
MultiLoc Humeral Nail set

- Contains instruments needed for long nail cases
- Contains 1 Instrument tray
Technique
- Determine entry point
  - In line with the medullary canal in both AP and lateral views

- Posterolateral to the biceps tendon and medial to the sulcus between the greater tuberosity and the humeral head
Technique

- Open medullary canal

- Insert nail
Technique

- Nail positioning
  - Insertion depth

- Rotation
Technique

– Proximal locking
  – MultiLoc Screws
Technique

- Option for proximal locking
  - 3.5 mm Locking Screws (screw-in-screw)
Technique

- Distal locking
  - 4.0 mm Locking Screws (Expert)
  - ASLS4 Screws
Technique: MultiLoc HN (long)
Freehand Distal Locking

- Freehand distal locking
  - 4.0 mm Locking Screws (Expert)
  - ASLS4 Screws
Technique: MultiLoc HN (long)  
Compression Locking (Optional)

- Lock nail distally
- Insert bicortical locking screw for compression
  - 4.0 mm Locking Screws (Expert)

- Apply Compression
- Lock nail proximally
Technique

- Insert end cap

- Insert sutures (optional)
Thank You for Your Attention