Static Distal Lock Insertion Affects the Rates of Cephalomedullary Nail Breakage in Unstable Intertrochanteric Fractures

Disclosures

• Devices used in this study are approved by the FDA
Introduction

- Hip fractures in the elderly are expected to increase in incidence to 500,000 a year by 2040\textsuperscript{1}
- Intertrochanteric (IT) femur fractures represent roughly 50\% of all hip fractures\textsuperscript{2}
- Unstable fracture patterns make up roughly 50\% of all IT fractures\textsuperscript{2}
• Implants used to treat IT fractures include the sliding hip screw and cephalomedullary devices with variable lag screw design.
Introduction

• Intramedullary devices are biomechanically superior when treating unstable fracture patterns$^{3,4}$
Introduction

- Increased compression leading to decrease varus collapse and less femoral neck shortening\(^5\)
- Minimized post op pain, shorter hospital stays, and earlier timed up and go\(^6-8\)
Introduction

• Nevertheless, nail breakage occurs with all implants
Purpose

- Report the incidence of nail breakage with the dual integrated screw system in unstable IT fracture patterns
- Determine if the placement of static or dynamic interlocks played a role in these failures
Patients and Methods

- Retrospective analysis from Jan 1, 2011 to Dec 31, 2016
- Identified all patients with complete medical charts, appropriate preoperative, intraoperative, and postoperative imaging
Patients and Methods

• Exclusion criteria:
  • Stable IT femur fractures
  • Ipsilateral femoral shaft or distal femur fractures
  • Pathological fractures
  • Fractures treated with a short CMN
Patients and Methods

**Group:** Femur, proximal end segment, trochanteric region, multifragmentary pertrochanteric, lateral wall incompetent (≤ 20.5 mm) fracture 31A2

**Subgroups:**
- With 1 intermediate fragment 31A2.2
- With 2 or more intermediate fragments 31A2.3

→ For more information about calculating the lateral wall thickness, please refer to the Appendix.

**Group:** Femur, proximal end segment, trochanteric region, intertrochanteric (reverse obliquity) fracture 31A3

**Subgroups:**
- Simple oblique fracture 31A3.1
- Simple transverse fracture 31A3.2
- Wedge or multifragmentary fracture 31A3.3

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Patients and Methods

- Xrays were reviewed for:
  - Tip to apex distance
  - Lag screw position
  - Quality of the reduction
  - Neck shaft angle
  - Use of a proximal set screw
  - Use and type of distal interlocking screw
  - Nail breakage
  - Failure of the distal interlocking screw defined as screw breakage or backout
Patients and Methods

- Follow up was broken down into:
  - > 6 months
  - > 3 < 6 months
  - > 1 < 3 months
  - < 1 month
- Patients loss to follow up were excluded
- Patient demographics were reviewed for age, sex and comorbidites
Results

• Identified 989 IT femur fractures treated
• 496 unstable IT femur fractures
• 138 failed to follow up
• 358 fractures in 348 patients for review
• 241 OTA/AO 31A2 fracture patterns
• 117 OTA/AO 31A3 fracture patterns
Results

• Average age: 77 years-old (23 – 102 yo)
• 33.4% male; 66.6% female
• Average BMI: 24.4 kg/m$^2$ (13.3- kg/m$^2$ – 57.8 kg/m$^2$)
• Diabetes: 69 (19.2%)
• Tobacco: 58 (16.2%)
Results

- Follow up:
  - 170 patients > 6 months
  - 72 patients > 3 < 6 months
  - 66 patients > 1 < 3 months
  - 50 patients < 1 month
- Median follow up: 20 weeks
- 47% followed up > 6 months
### Table 1:

| Case | Age | Gender | AO/OTA Classification | Tobacco | DM | ASA | Set Screw | Distal interlock | TAD (mm) | NSA | Screw position calcar? | Outcome  
|------|-----|--------|------------------------|----------|----|-----|-----------|------------------|--------|-----|----------------------|---------  
| 1    | 55  | Male   | 31A3                   | NO       | NO | 2   | YES       | Static           | 10.1   | 130°| NO                   | Nail fracture  
| 2    | 74  | Male   | 31A2                   | NO       | YES| 3   | YES       | Static           | 18.3   | 123°| NO                   | Nail fracture  
| 3    | 77  | Female | 31A3                   | NO       | NO | 3   | YES       | Static           | 5.0    | 123°| YES                  | Nail fracture  
| 4    | 81  | Female | 31A3                   | NO       | NO | 4   | YES       | Static           | 10.0   | 126°| NO                   | Nail fracture  
| 5    | 76  | Female | 31A2                   | NO       | NO | 3   | YES       | Static           | 9.3    | 141°| YES                  | Nail fracture  
| 6    | 76  | Female | 31A3                   | NO       | NO | 3   | Yes      | Static           | 17.0   | 124°| YES                  | Nail fracture  
| 7    | 57  | Female | 31A2                   | NO       | NO | 2   | Yes      | Static           | 10.6   | 126°| NO                   | Nail fracture  

7/358 (2%) nail breakage, all at the interface between the proximal lag screw and the nail

**Results**
Results

• Median time to nail breakage: 9 weeks
• All with proximal set screw, statically placed distal interlocks and visible fracture gap in the subtrochanteric region
• No mention if traction was release prior to placing distal interlocking screws
Results

- Multifragmentary IT with gapping below the screws
Results

• Stational distal interlocks
Results

- Nail breakage at 16 weeks
Results

• 14 constructs locked dynamically or left unlocked and all healed
• 35 distal interlocks failed
  • 17 fractured, 14/17 healed
  • 18 backed out, 18/18 healed
Results

- OTA/AO 31A2.3 fracture with gapping below the screw
Results

- Static distal interlocks
Results

• 3 year follow up with fracture of the distal interlock and shortening of the nail
Results

- 3 year follow up with visible healing proximally
Conclusion

- Overall nail breakage rate was 2%
- Majority of unstable IT fractures healed despite distal interlocking configuration
- All failures occurred with constructs locked proximally and statically locked distally with fracture gapping in the subtrochanteric region
- Our recommendations are to release traction prior to placing the distal interlocks and placing the distal interlock dynamically if gapping is still noted below the dual integrated screws
References


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