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

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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[1]
- Intertrochanteric (IT) femur fractures represent roughly 50% of all hip fractures[2]
- Unstable fracture patterns make up roughly 50% of all IT fractures[2]

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Introduction

- Implants used to treat IT fractures include the sliding hip screw and cephalomedullary devices with variable lag screw design

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Introduction

- Intramedullary devices are biomechanically superior when treating unstable fracture patterns[3,4]

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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]

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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

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Patients and Methods

- Exclusion criteria:
  - Stable IT femur fractures
  - Ipsilateral femoral shaft or distal femur fractures
  - Pathological fractures
  - Fractures treated with a short CMN

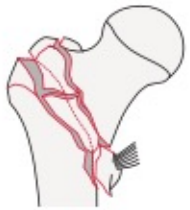
Patients and Methods

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

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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

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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%)

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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

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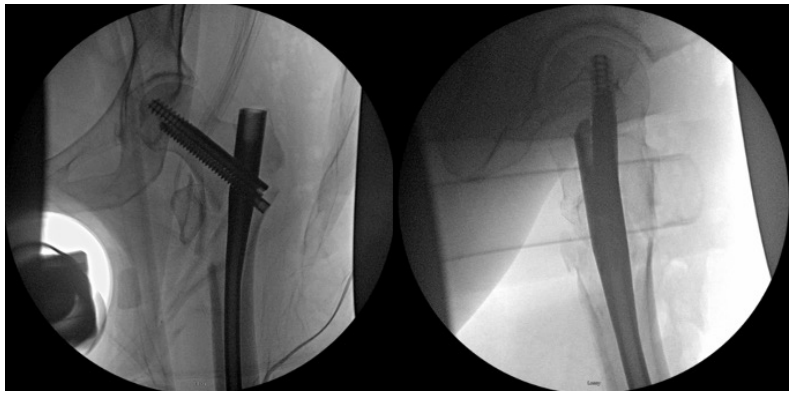

Results

- Multifragmentary IT with gapping below the screws

Results

- Statical 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

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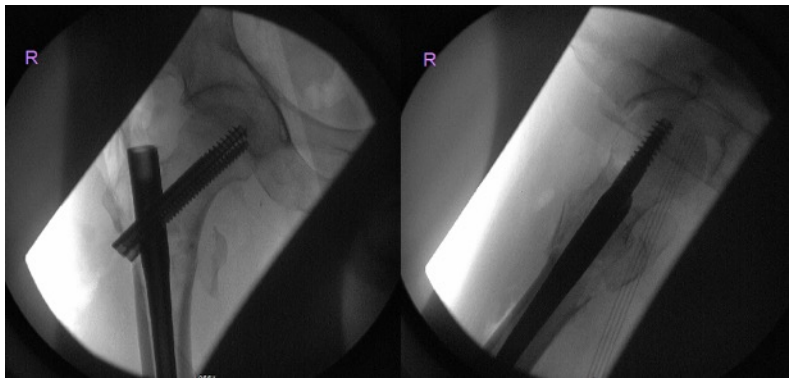

Results

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

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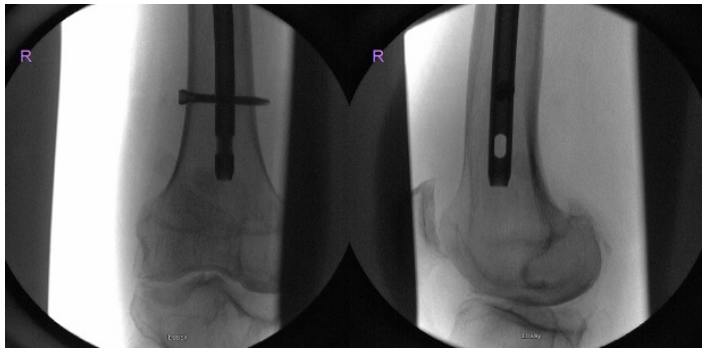
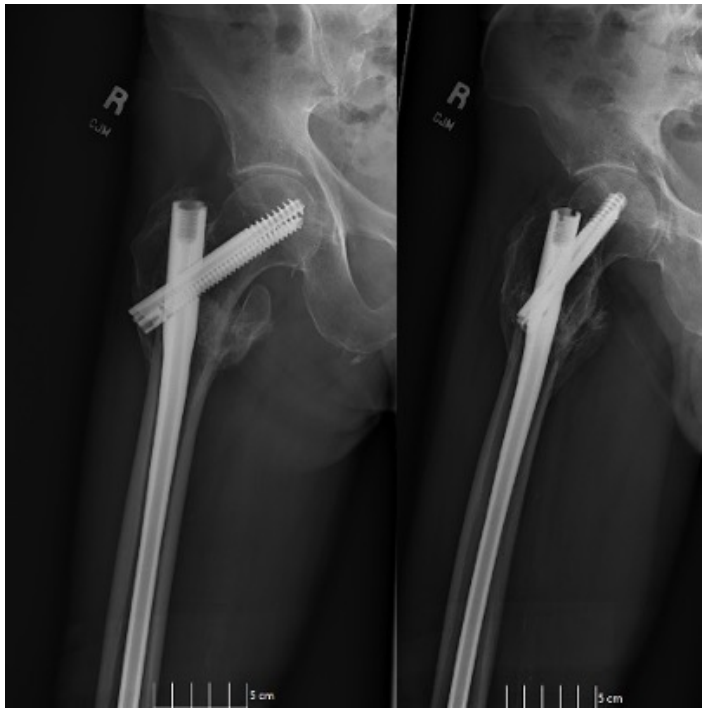


Results

- 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

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