

MECHANICAL COMPLICATIONS ASSOCIATED WITH INTRAMEDULLARY NAILING FOR TROCHANTERIC AND SUBTROCHANTERIC FEMUR FRACTURES

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INTRODUCTION

- Intramedullary nailing (IMN) for femur fractures has become more popular in recent years
- Advantages of this technique include key patient metrics such as more efficient load transfer, less soft tissue disruption and shorter hospital stay
- Mechanical complications following IMN are not described in detail in the published literature

OBJECTIVES

To determine the rates of mechanical complications and evaluate factors associated with mechanical complications that occur over two years following IMN

METHODS

Study Design: Retrospective, observational cohort study

Data Source: Healthcare claims from the IBM® Marketscan® Medicare Supplemental database

Study population:

- Patients 65 years and older with a claim for IMN for femur fractures, either trochanteric or subtrochanteric, in an inpatient setting between 2007-2019 were identified based on International Classification of Disease (ICD) diagnostic and common procedural terminology (CPT) codes
- The date of inpatient admission for IMN was defined as index
- Patients were included if they had continuous enrollment 6-months pre-index
- Patients were excluded if they had prior long bone fractures in the 6 months pre-index period

Outcomes:

Rates of mechanical complications for trochanteric and subtrochanteric femoral fractures were reported at 2 years post discharge. Mechanical complications included nail breakage, breakage of internal fixation, displacement of internal fixation and other mechanical complications

Statistical Analysis:

- Means and standard deviations were provided for continuous variables
- Proportions were provided for categorical variables
- Kaplan Meier analysis was conducted to calculate the rates of mechanical complications at 2 years post discharge
- Median time to mechanical complications among patients who had a diagnosis for mechanical complication was reported
- Multivariable Cox regression was conducted to identify the independent factors to predict the risk for mechanical complications after adjusting for demographic and clinical factors

RESULTS

- The study included 17,675 patients with IMN for trochanteric or subtrochanteric femoral fractures
- The mean (standard deviation (SD)) age of the cohort at the index was 83.3 (7.9) and the majority of patients were females - 72.4% (**Table 1**)
- The top three comorbid condition among these patients were hypertension (53.1%), osteoarthritis (26.7%) and cardiac arrhythmia (22.9%)
- There were 81.0% patients with an Elixhauser score of 1 or greater
- The mean (standard deviation (SD)) length of stay for the IMN procedure was 6.2 (5.2) days

Table 1. Demographic information of patients included in the study

	Overall (n=17,675)
Gender	
Female	72.4%
Male	27.6%
Age	
Mean (SD)	83.3 (7.9)
Elixhauser Score	
Mean (SD)	2.5 (2.2)
Elixhauser Score Category	
0	19.0%
1-2	39.3%
3-4	25.0%
5+	16.7%
Region	
Northeast	29.6%
North Central	18.9%
South	34.5%
West	16.4%
Unknown	0.7%
Year of Procedure	
2007	4.2%
2008	4.4%
2009	5.6%

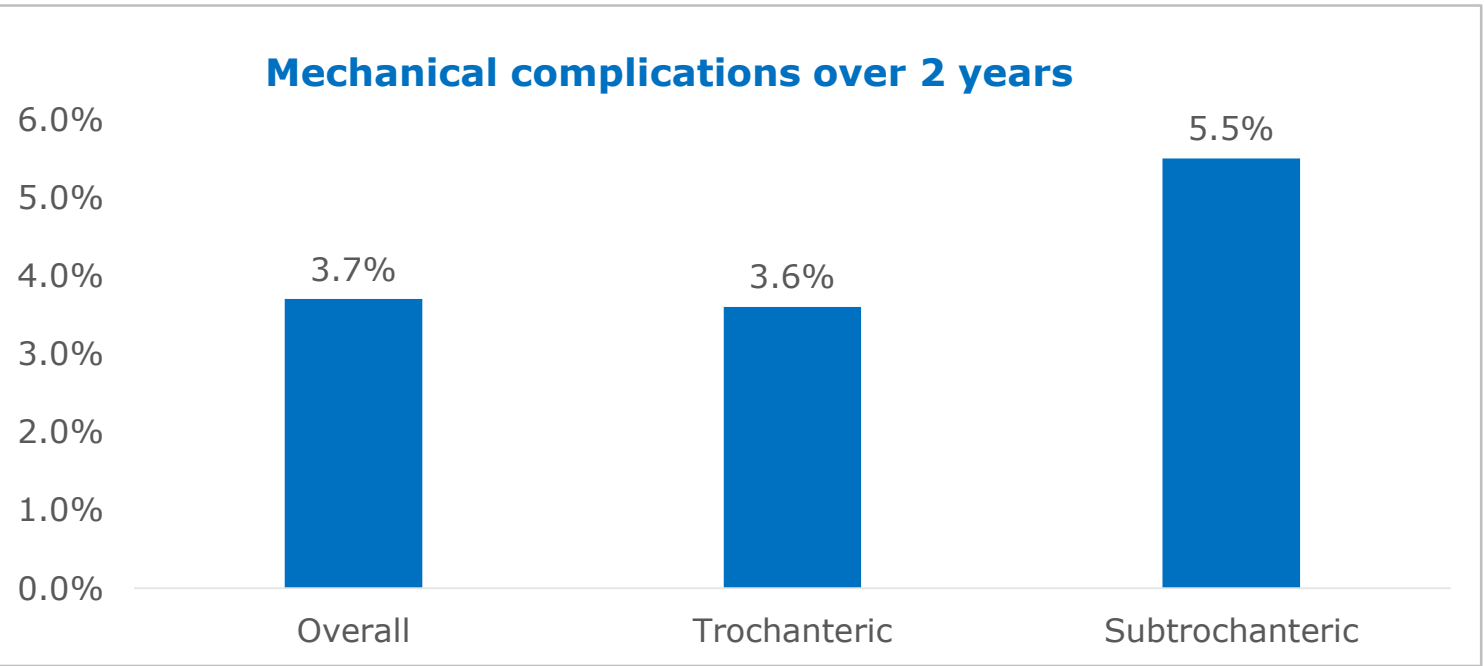
RESULTS

Table 1. Demographic information of patients included in the study

	Overall (n=17,675)
2010	6.7%
2011	8.6%
2012	7.9%
2013	7.8%
2014	6.8%
2015	7.3%
2016	16.6%
2017	12.2%
2018	9.9%
2019	2.0%
Fracture Type	
Subtrochanteric	6.0%
Trochanteric	0.9%
Comorbidities	
Hypertension	53.1%
Osteoporosis	26.7%
Cardiac Arrhythmia	22.9%
Diabetes	17.7%
Chronic Pulmonary Disease	17.3%

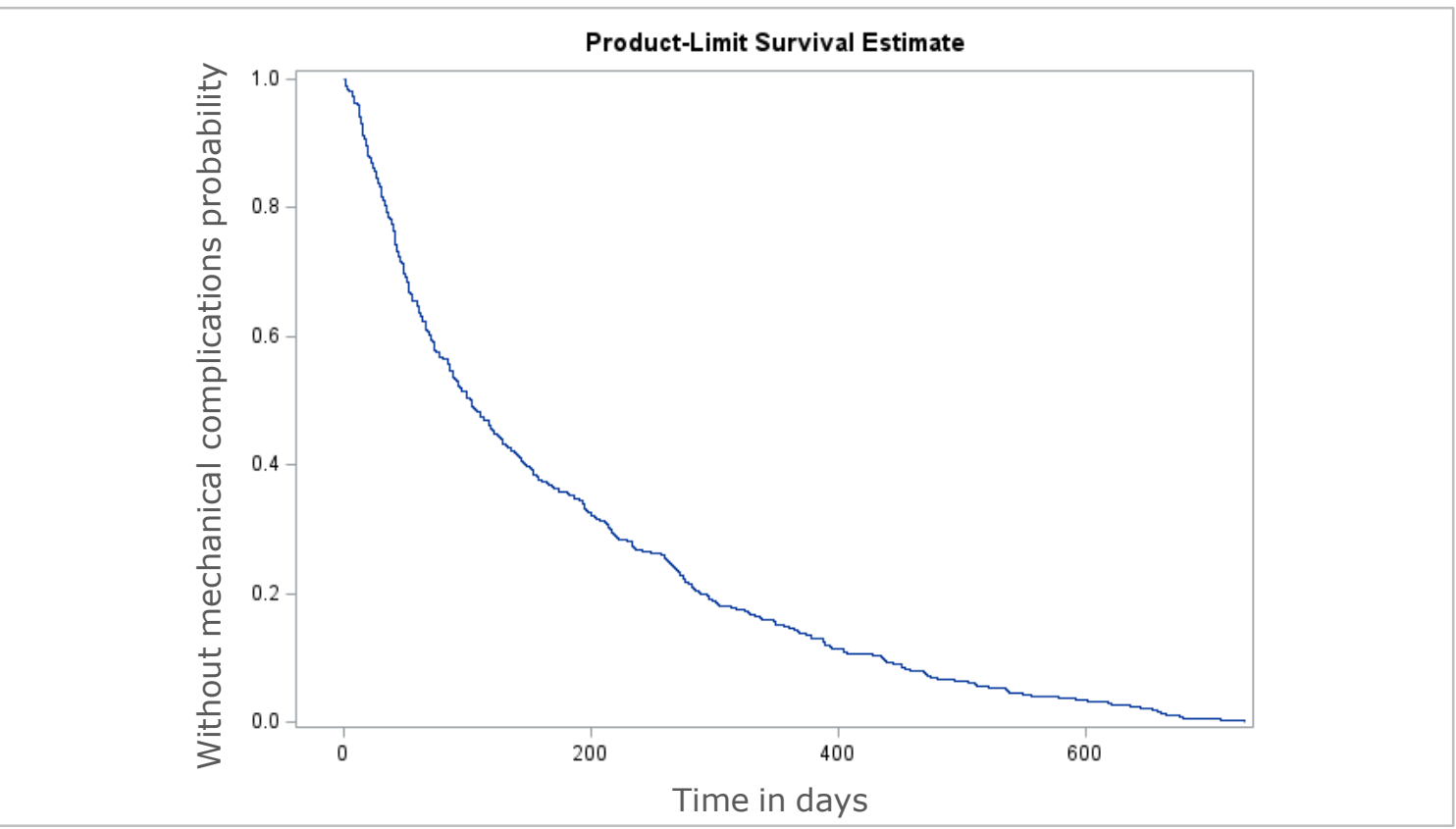
- The Kaplan Meier analysis showed that the crude rates of mechanical complications at the 2-year time point for trochanteric fractures was 3.6% while that for subtrochanteric fracture was 5.5% (**Figure 1**)
- The overall rate of mechanical complications was 3.7% (**Figure 1**)

Figure 1. Mechanical complications associated with intramedullary nailing by type of femur fracture over 2 years period



- Among patients that had a mechanical complication, the Kaplan Meier analysis showed that the median time to breakage was about 104 days (**Figure 2**)

Figure 2. Kaplan Meier curve for time to mechanical complication over 2 years period



- After adjusting for demographic and clinical factors the multivariable Cox model found the presence of any subtrochanteric fracture and age was statistically significantly associated with the risk of mechanical complication (**Table 2**)
- No other variables were found to be statistically significant

Table 2. Multivariable Cox model to assess factors associated with the risk of breakage

Factors	Hazards Ratio	95% Confidence Interval	p-value
Age	0.96	0.95	0.97
Any subtrochanteric fractures vs Not	1.48	1.15	1.91

CONCLUSION

- Femoral fractures treated by IMN had an overall mechanical failure rate of 3.7% over 2 years after surgery with the implant
- The results from this study indicate treatment of femoral fractures with IMN is associated with generally low rates of mechanical failure 2 years after surgery with the implant