

# Operative Treatment of Early Peri-Prosthetic Femur Fractures Following Primary Total Hip Arthroplasty

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**Abstract:** The risk factors for and results of operatively treated peri-prosthetic femoral fractures sustained within 90 days following primary THA were evaluated. 5,313 consecutive THAs were reviewed and 32 (0.60%) fractures were identified which included 9 A<sub>g</sub>, 2 B<sub>1</sub>, 18 B<sub>2</sub>, 1 B<sub>3</sub>, and 2 A<sub>g</sub>/B<sub>2</sub> fractures. 19 (61%) patients sustained 23 complications including 9 greater trochanter non-unions, 2 femoral shaft non-unions, 3 patients with Brooker III HO, and 2 deep infections. 7 patients (23%) required a second operative procedure and one patient required a third. Peri-prosthetic fractures were associated with advancing age, female gender, developmental hip dysplasia, and cementless metaphyseal engaging components, particularly flat wedge tapers. Overall, operative treatment of acute peri-prosthetic fractures is associated with a high rate of complications (61%) and re-operation (23%). **Keywords:** total hip arthroplasty, peri-prosthetic fracture, complications, revision total hip arthroplasty.  
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While the rate of peri-prosthetic fracture following primary total hip arthroplasty (THA) is low, with the expected increase in the total number of THA's performed each year, the total number of peri-prosthetic fractures is likely to increase in the future. The incidence of peri-prosthetic fracture is uncertain but thought to occur in 0.1-2.1% of patients undergoing primary THA [1,3,4,12-14]. These fractures are difficult to treat as they are often found in association with poor bone quality and gaining fixation around the implanted femoral component can be challenging. Further, peri-prosthetic fractures are associated with substantial morbidity and mortality [5].

Peri-prosthetic fractures of the femur can occur in the early post-operative period, particularly if a cementless implant is utilized, however the precise prevalence of this complication and the results of treatment are

unknown. In the early post-operative period, operative management can be even more complex given a fresh operative wound and a patient who has recently undergone a major operative procedure. The purpose of this study is to determine the prevalence of, risk factors for, and outcomes of operative treatment of peri-prosthetic fractures in the early post-operative period following primary THA with a focus on complications encountered during treatment.

## Materials and Methods

During the 10-year period from July 1998 to July 2008, 4,433 patients underwent 5,313 primary THAs by nine different surgeons at our institution. These patients were retrospectively reviewed to determine the incidence of peri-prosthetic fractures about the femoral component occurring within the first 90 days following the index procedure that underwent operative treatment. Operatively treated peri-prosthetic fractures were identified from a database of revision THA procedures. All intra-operative and non-operatively treated fractures were excluded from the analysis. All of the primary THA and subsequent revision procedures were performed by surgeons at our institution. This study was approved by our Institutional Review Board.

Fractures were classified using the Vancouver classification [10] and the type of operative intervention was recorded, including if the femoral component was revised or if the fracture was treated with open reduction

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and internal fixation (ORIF). If the femoral component was revised, it was documented if an attempt was made to anatomically reduce the fracture with wires or cables at the time of the revision procedure. Vancouver A fractures were generally treated operatively if the fracture was displaced >5 mm, associated with severe pain or associated with a dislocation; all type B and C fractures were treated operatively. Post-operative radiographs were assessed for loosening of the revision femoral components using the criteria of Engh et al. [11] at the most recent follow-up. Femoral components were considered osseointegrated if there was increased bone density adjacent to the implant porous coating and

if divergent radiolucent lines, implant subsidence, and pedestal formation were absent [18]. Evidence of fracture union was based on radiographic bridging callous formation, the absence of pain with weight bearing, and stability of the revision components [11]. Heterotopic ossification was graded based on the Brooker classification with Grade III or IV heterotopic ossification considered clinically relevant [6]. Post-operative complications and re-operations were carefully recorded for all patients. Implanted components are listed in Table 1.

Logistic regression modeling was used to identify independent predictors of early peri-prosthetic fracture

**Table 1.** Summary of Femoral Components

	Manufacturer	Femoral Stem Type	Total	Percentage	
Cemented	Smith & Nephew	Spectron EF	8	0.15%	
	Wright Medical	Perfecta IMC	109	2.05%	
	Wright Medical	Perfecta IMC slim	16	0.30%	
	Wright Medical	Perfecta PDA	7	0.13%	
	Wright Medical	Extend	1	0.02%	
	Zimmer	Versys Cem PC+	229	4.31%	
	Zimmer	Advocate	76	1.43%	
	Zimmer	Versys Cem Statin	25	0.47%	
	Zimmer	Harris PC	9	0.17%	
	Zimmer	Versys Cem Smooth	6	0.11%	
	Zimmer	Versys Cem Rough	5	0.09%	
	Zimmer	Heritage	1	0.02%	
	Zimmer	Versys LD FX	1	0.02%	
				493	9.28%
Metaphyseal Engaging	Biomet	Mallory/Head	1	0.02%	
	DePuy	SROM	6	0.11%	
	DePuy	Summit	1	0.02%	
	Smith & Nephew	Synergy	166	3.12%	
	Wright Medical	Perfecta RS	110	2.07%	
	Wright Medical	Perfecta Slim RDC	46	0.87%	
	Wright Medical	Perfecta RS Offset	15	0.28%	
	Wright Medical	Extend	7	0.13%	
	Wright Medical	Perfecta Extend	6	0.11%	
	Zimmer	Versys FM Taper	1228	23.11%	
	Zimmer	Anatomic	16	0.30%	
	Zimmer	Versys FM Midcoat	13	0.24%	
	Zimmer	TM Stem	7	0.13%	
	Zimmer	Versys Beaded Midcoat	2	0.04%	
			1623	30.55%	
Diaphyseal Engaging	DePuy	Bantam	48	0.90%	
	DePuy	Prodigy	37	0.70%	
	DePuy	AML	14	0.26%	
	DePuy	Solution Calcar	1	0.02%	
	Smith & Nephew	Echelon	18	0.34%	
	Stryker	Restoration PS	1	0.02%	
	Wright Medical	Perfecta IMC slim	8	0.15%	
	Wright Medical	Profemur	6	0.11%	
	Zimmer	Versys FC	2026	38.13%	
	Zimmer	Versys Epoch	326	6.14%	
	Zimmer	Epoch	76	1.43%	
	Zimmer	ZMR	1	0.02%	
				2563	48.24%
	Flat Wedge Taper	Stryker	Accolade	2	0.04%
Zimmer		ML Taper	483	9.09%	
Zimmer		Kinectiv	149	2.80%	
			634	11.93%	

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