

Management of Isolated Greater Trochanter Fractures associated with Total Hip Arthroplasty

Erik Hegeman, Andrew Fraval, Chad A Krueger

INTRODUCTION:

There are various models predicting the increasing incidence of total hip arthroplasty (THA), the one thing they have in common is estimating a linear or even exponential growth into the near future. Accompanying the growth of primary and revision THAs performed will be the number of complications associated with these procedures. Current rates of periprosthetic femoral fractures range from 0.8% to 10% of all primary THA. Abdel et al. performed large retrospective epidemiological studies on the complications associated with primary and revision THA over a 40-year period. Overall, the cumulative rate of periprosthetic fracture at 20 years was 3.5% in primary cases and 17.5% in the revision setting. Isolated fractures of the greater trochanter (GT) are thought to be rare complications that comprise 5% of all perioperative fractures, however recent data suggests that they are more commonly encountered than previously reported.

The aim of this review is to provide a summary of the literature on how best to manage periprosthetic isolated greater trochanter fractures. Malunion and displaced fractures may cause abductor insufficiency which may lead to persistent pain, weakness, instability, and Trendelenburg gait. Yet, which patients are bothered by these deficiencies and to what degree are difficult to predict. Furthermore, surgical management to alter the natural history of these outcomes are associated with high complication rates in terms of loss of fixation, hardware prominence, and subsequent malunion with no consensus on appropriate management.

METHODS:

A comprehensive search was undertaken on PubMed, Embase, and Cochrane databases for studies related to GT fractures in THA. The following search terms were utilized, periprosthetic greater trochanter fracture, greater trochanter fracture in total hip arthroplasty, and greater trochanter fracture. All relevant abstracts were reviewed.

RESULTS:

MANAGEMENT OPTIONS

Nonsurgical

Nonsurgical management usually involves a period of protected weight-bearing while utilizing an assistive device for gait. Avoiding active hip abduction for 6 - 8 weeks to minimize the chance of displacement has also been described. Contrary to this are reports where no restrictions are applied with patients who are able to weight bear as tolerated and participate in normal postoperative protocols. Currently, there is no consensus on the physical therapy or management protocols to optimize nonsurgical clinical outcomes. The authors of this article are of the view that due to the deforming forces that may be exerted on the greater trochanter in functional activities such as rising from sitting to standing, it is unlikely that restricting mobility would have a protective effect on fracture fragment migration. Given this we provide patients with a gait aid to protect against falls but provide no other restrictions in the postoperative period.

Surgical

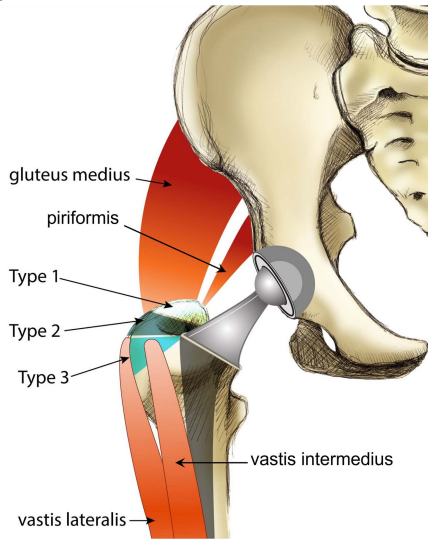
Surgical management involves fixation of the greater trochanteric fracture. Isolated fractures of the GT should not lead to stem loosening and therefore rarely need femoral revision. The fixation methods include cerclage cables, claw plates (either using cable fixation, screw fixation, or a combination of both), locking plates, tension bands, and suture fixation. A recent systemic review concluded that the literature reporting on the outcomes of these various fixation options is heterogenous and no one fixation method has proven superiority. Complication rates of surgical management were found to be 4 – 16% for nonunion, 3 – 18% for GT fragment migration, and 5 – 24% for abductor weakness. Of note is the fact that this systemic review included fixation for GT osteotomies as well as fractures, with lower rates of failure of fixation in the setting of osteotomy as compared to fracture.

Based on the available intraoperative and postoperative classification schemes, fractures of the GT are not appropriately subclassified to predict their behavior based on the deforming forces of the anatomical attachments. We propose a new classification based on location of the fracture with respect to the GT insertional anatomy (Table 1). This classification refers to the important fracture variations with respect to the main muscle attachment points which will influence how the fracture behaves in terms of displacement (Figure 2). Following a review of the literature on periprosthetic greater trochanter fractures, this proposed classification system may have implication for union rates, persistent morbidity associated with fracture nonunion and may inform management strategies.

DISCUSSION AND CONCLUSION:

Upon review of the available literature on isolated GT fractures sustained intraoperatively during a total hip replacement, there is no clear proven benefit for surgical fixation as compared to nonsurgical management. Applying the classification system proposed by the authors of this article to fractures seen postoperatively, we would recommend treating 'type 1' fractures nonsurgically as these fractures pose little potential for functional impairment. 'Type 3' fractures may have lower rates of migration due to the persistence of the vastus insertion to the proximal fragment and as such we would also recommend for nonsurgical management. 'Type 2' fractures have a high potential for migration due to the unbalanced

muscle attachments of the proximal fragment. These fractures may be associated with functional impairment and ongoing pain.



Modified Greater Trochanter Fracture Classification						
Type	Radiograph	Description	Anatomic Significance	Displacement	Functional Impairment	Treatment Recommendation
1		Tip avulsion fracture of the GT	These are fractures of the superomedial rim of the greater trochanter and do not contain significant muscle attachment.	Unlikely, given a lack of muscular attachments.	Unlikely	Observation with nonoperative protocols
2		Mid-substance GT fracture	The fracture line passes between the gluteus medius/minimus and vastus lateralis attachment sites.	Likely, due to significant unbalanced deforming forces in most cases.	Likely	ORIF or non operative management (ORIF associated with high rates of non union)
3		GT Base Fracture	This fracture line lies distal to the vastus insertion. The fracture line may often extend to shoulder of the prosthesis.	Unlikely, given the persistence of some vastus attachment to the proximal fracture fragment.	Unlikely	Observation with nonoperative protocols