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# Peri-prosthetic fractures: A prevention and treatment algorithm

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ABSTRACT

Risk factors for periprosthetic hip fracture include female gender, increased age, and higher ASA class. Patients with periprosthetic fractures have higher mortality, greater length of stay, and are discharged more often to extended care facilities than the general population of THA patients. Periprosthetic hip fractures can be classified based on fracture location, implant stability, and bone quality. Fractures around a stable stem can be treated with ORIF while those resulting in loss of stem stability require stem revision. Segmental replacement of the proximal femur may be necessary if proximal bone is too poor to support a revision component.



## 1. Introduction

Periprosthetic hip fractures are not uncommon, so most surgeons will encounter these in a typical total joint practice. Periprosthetic fractures account for 4–7% of total joint admissions [1]. Patients with periprosthetic fractures are typically older than the general population of total hip arthroplasty patients, more frequently female gender, are typically admitted through the emergency room, have higher mortality, greater length of stay, and are discharged more often to extended care facilities [1,2]. Obesity does not appear to be a risk factor for periprosthetic fracture, while ASA class of 3 or 4 and Deyo Charlson index of 2 or greater are associated with a higher risk [2]. The 1-year mortality between 13% and 24% has been reported after periprosthetic hip fracture [3,4].

## 2. Classification

Treatment of periprosthetic fractures depends on many factors including the fracture pattern, implant stability, bone quality, and patient demands. The Vancouver classification system was developed in 1995 and has been validated by several investigators [5–8]. In this system, factures are separated based on location, implant stability, and quality of bone stock since these factors largely influence treatment decisions. Type A fractures are greater trochanteric (A1) or fractures of the medial proximal femur, including the lesser trochanter (A2), and categorized as stable or unstable. Type B fractures are fractures around the femoral stem or at the stem tip. These are further subdivided into those in which the prosthesis is stable (B1), those in which the prosthesis is loose and there is good bone stock (B2), and those in which the prosthesis is loose and bone stock is poor (B3). Type C fractures are distal to the stem and do not involve the periprosthetic bone around the stem.

## 3. Treatment

An A1 fracture is an avulsion of the greater trochanter. Treatment of these fractures depends on the clinical symptoms and functional impairment associated with abductor weakness, and feasibility of surgical repair. If the fracture

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fragment is not widely displaced and can be reduced, bone stock is adequate to permit fixation of the fragment, and the fragment is non-comminuted and large enough to achieve fixation then cable plating is a viable option (Fig. 1). Type A2 fractures involve the lesser trochanter and medial calcar. These typically occur with cementless wedge tapered stems during surgery or in the early post-operative period. The lack of circumferential bony support in the proximal femur is associated with loss of stem stability necessitating femoral component revision and cerclage fixation of the fracture (Fig. 2).

Type B1 fractures around the stem in which the stem is stable can occur during surgery as a result of reaming and broaching, or stem insertion. These fractures may be stable and not apparent until seen on the post-operative radiograph (Fig. 3). A stable unicortical fracture in a compliant patient may be treated non operatively, while a more transverse or oblique bicortical fracture at high risk of displacement should be treated with internal fixation. Type B2 and B3 fractures in which the stem is unstable require stem revision. Type B2 fractures have good bone stock, and if reduction of the fracture fragments is feasible, these can be treated with cerclage or cable plate fixation around a longer revision stem (Fig. 4). Usually the distal portion of the fracture is reduced and stabilized with cerclage cables to re-establish the cortical diaphysis, followed by implantation of a long cementless stem, and then the proximal bone fragments are reduced and stabilized around the proximal stem. Use of distally tapered

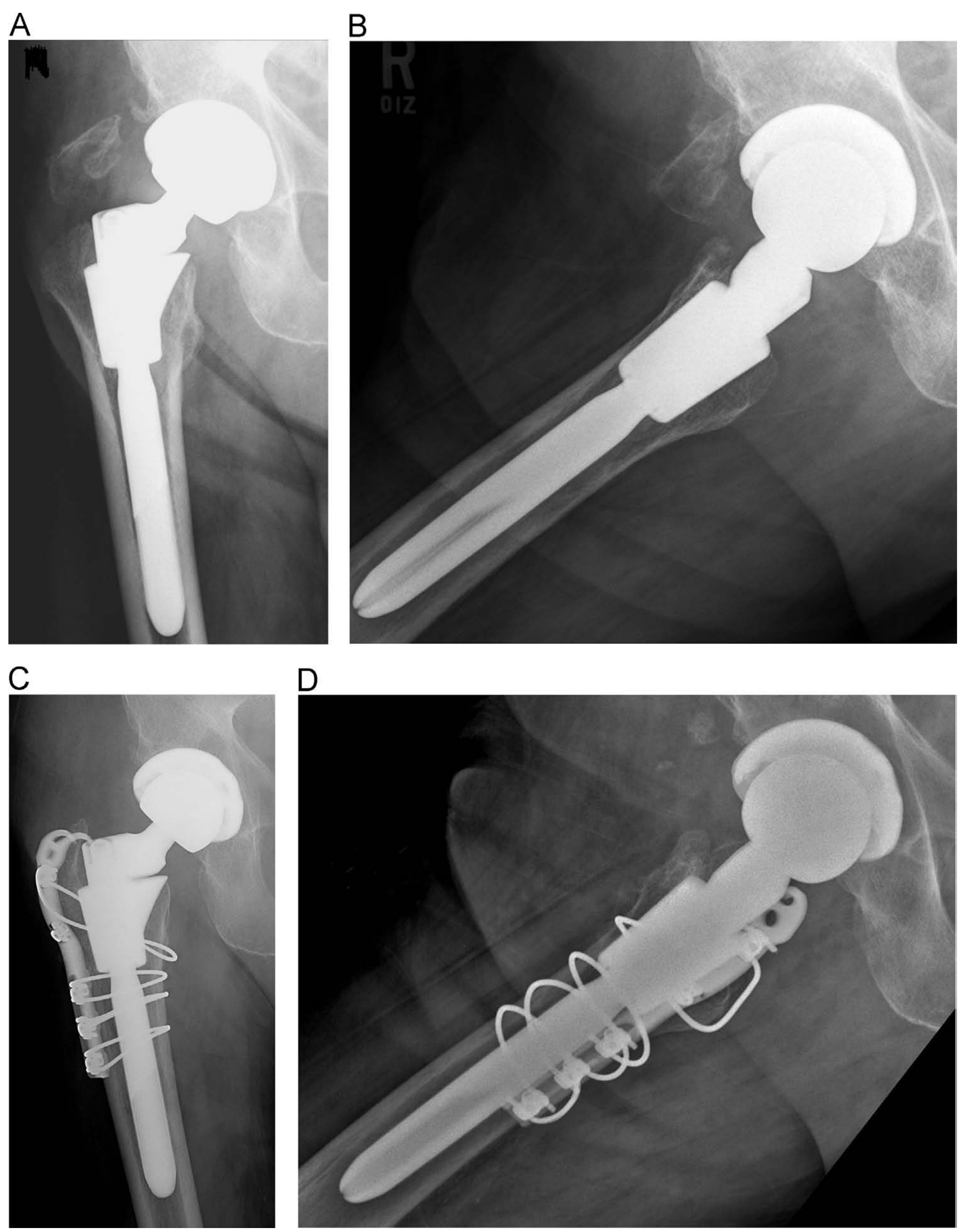


**Figure 1 – (A) Anteroposterior (AP) and (B) lateral x-rays of a type A1 greater trochanter avulsion fracture. The patient had symptomatic loss of abductor function. Since the avulsed bone was a single large relatively non-osteoporotic fragment, ORIF with cable plating was considered appropriate. (C) AP and (D) lateral x-rays after cable plating resulted in healing of the trochanteric fragment and restoration of abductor function.**