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# Periprosthetic Fracture Fixation in Ankylosing Spondylitis: A Surgical Challenge in a Stiffened Skeleton

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## Abstract

Periprosthetic femoral fractures are challenging complications following total hip arthroplasty, especially in patients with ankylosing spondylitis due to altered biomechanics and compromised bone quality. We report a 37-year-old male with a history of bilateral total hip replacement (13 years prior) for ankylosed hips, who presented after a motorcycle fall with a right Vancouver type B1 periprosthetic femoral fracture. He was successfully managed with open reduction and internal fixation using a reversed contralateral distal femur anatomical locking plate augmented with cerclage wire. At six-month follow-up, the fracture had united, resulting in an excellent functional outcome. This case highlights the importance of accurate classification, stable fixation, and appropriate implant selection in complex periprosthetic settings.

**Keywords:** Periprosthetic fracture, Ankylosing spondylitis, Vancouver B1, Locking plate, Cerclage wire.

## Introduction

Periprosthetic femoral fractures (PFFs) are increasingly encountered as the prevalence of total hip arthroplasty (THA) rises and implant survivorship improves. The reported incidence of PFF ranges from 0.1% to 6% of all primary THAs, with higher rates in revision arthroplasty and in patients with poor bone quality or altered biomechanics [5, 15]. The Vancouver classification system, based on fracture site, implant stability, and bone stock, is widely accepted to guide management [2]. Type B1 fractures occur around or just distal to a well-fixed femoral stem and are generally amenable to fixation rather than stem revision.

Locking plate osteosynthesis has emerged as the preferred fixation method for Vancouver B1 fractures, particularly in osteoporotic or compromised bone, due to its superior angular stability and capacity for unicortical screw fixation adjacent to the prosthesis [1, 2, 4]. However, achieving sufficient fixation around the prosthesis remains technically demanding [1]. Adjunctive cerclage wiring may facilitate reduction and augment fixation, with some studies suggesting shorter time to union and reduced revision rate when used with locking plates [19]. There is limited literature on PFF management in ankylosing spondylitis patients, where rigid joints and altered force transmission add complexity. We present such a case managed with a reversed contralateral distal femur locking plate and cerclage wiring, with a focused discussion on current evidence.

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## Case Presentation

A 37-year-old male with a known history of ankylosing spondylitis presented to the emergency department following a fall from a motorcycle, complaining of severe pain in the right thigh and inability to bear weight. The patient had undergone bilateral cemented total hip arthroplasty 13 years earlier for ankylosed hips and had been ambulatory before the injury.

Clinical examination displayed swelling, tenderness, and deformity over the right proximal thigh. There were no neurovascular deficits associated. Anteroposterior radiograph of the pelvis revealed bilateral total hip arthroplasty in situ (Fig. 1). Focused radiographs of the right hip and femur in anteroposterior and lateral views revealed a periprosthetic femoral fracture around the femoral stem, consistent with a Vancouver type B1 fracture pattern (Fig. 2).

A computed tomography scan was obtained to improve delineation of the fracture morphology and extent, aiding surgical planning (Fig. 3). Based on clinical and radiological findings, planning of operative fixation was done.

## Surgical Technique

Surgery was performed under spinal anaesthesia with the patient positioned supine on a radiolucent table. A standard posterior approach to the femur was used. After exposure, intraoperative assessment of the femoral stem was performed by direct visualization and manipulation, and the implant was confirmed to be well fixed and stable (Fig. 4).

Fracture reduction was achieved using indirect reduction techniques under fluoroscopic guidance. A contralateral distal femur anatomical locking plate was selected and applied in a reversed configuration to optimize proximal fixation around the femoral stem. Cerclage wire was used around the fracture site to assist in reduction and augment stability.

The plate was secured distally with locking screws, ensuring adequate plate length to span the fracture and distribute stresses. Final

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**Figure 1:** Preoperative anteroposterior radiograph of the pelvis showing bilateral total hip arthroplasty with periprosthetic fracture.

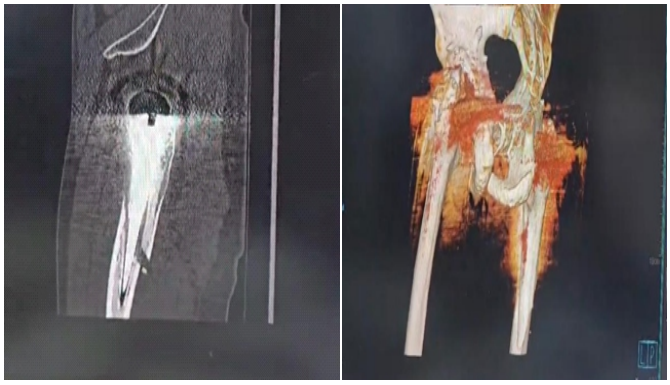

**Figure 3:** Computed tomography scans of the right femur showing fracture configuration around the femoral stem and confirming implant stability.

fluoroscopic images confirmed satisfactory fracture reduction, implant position, and stable fixation.

## Postoperative Management and Follow-Up

Postoperatively, the patient was encouraged to engage in physiotherapy with partial weight-bearing initially. Thromboprophylaxis and routine wound care were applied. Six-week radiographs showed maintained alignment with early callus formation. At twelve weeks, progressive weight-bearing was permitted. By six months, complete fracture union was noted

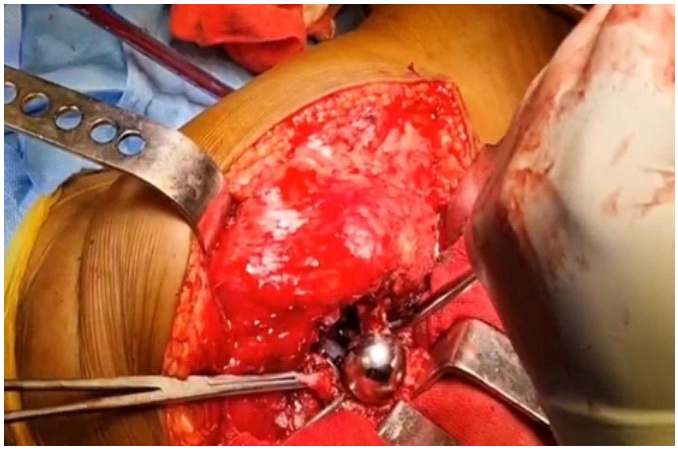

**Figure 4:** Intraoperative photograph demonstrating stability of the femoral stem following fracture exposure.


**Figure 2:** Preoperative anteroposterior and lateral radiographs of the right hip demonstrating a periprosthetic femoral fracture around a well-fixed femoral stem (Vancouver type B1).

radiographically, and the patient reported a pain-free gait and return to daily activities (Fig. 6).

## Discussion

Periprosthetic femoral fractures following THA present major


**Figure 5:** Postoperative anteroposterior radiograph showing fracture fixation using a reversed contralateral distal femur anatomical locking plate with cerclage wire augmentation.


**Figure 6:** Postoperative radiograph showing fracture union at 6 months.

difficulties in fixation due to the presence of a stable stem and compromised bone quality. The Vancouver classification assists decision-making, with B1 fractures typically treated by ORIF as opposed to stem revision [2]. Locking plate constructs provide stable, fixed-angle support, which is particularly advantageous in osteoporotic or inflammatory bone [1].

Clinical studies report high union rates (up to ~90%) with locking plate fixation of Vancouver B1 fractures, with a relatively low revision rate for mechanical failure when construct principles are adhered to [5]. A pooled analysis of 135 Vancouver B1 fractures showed a union rate of ~91% with locking compression plates, with only 5% requiring revision for implant failure or pull-out, highlighting this technique's reliability[5]. However, plate complications related to stress risers and early loading underscore the importance of adequate plate length and spanning beyond the fracture zone [5].

Adjunctive cerclage wiring remains a debated but useful addition; retrospective series have demonstrated that the combination of locking plates with cerclage wires may reduce time to union and revision rates, without significant increases in complications [19]. The biomechanical role of cerclage is to aid reduction and enhance initial stability, particularly where screw purchase is less optimal near a prosthetic stem [1, 16].

A study specifically comparing distal femur locking plate fixation with and without cerclage in periprosthetic fractures found that the cerclage group had significantly shorter time to union and lower revision rates, suggesting a beneficial role of combined fixation in selected cases [19]. Conversely, some analyses of cerclage in periprosthetic and distal femoral fractures noted higher mechanical complication rates with cerclage, emphasizing careful surgical technique to avoid soft tissue compromise and focal stress concentration [7]. Hence, cerclage should be applied judiciously, with attention to soft tissue handling.

The use of reversed contralateral distal femur locking plates has been described with good outcomes in Vancouver B1 fractures, achieving multiple proximal fixation points and a mechanical construct that accommodates the stem's presence [6]. Reported union times in such constructs average approximately 14–15 weeks with satisfactory functional scores [6], consistent with the outcome observed in the present case.

Although traditional stem revision with long femoral components may provide biomechanical benefits in unstable fracture patterns, in Vancouver B1 cases with stable stems, revision is generally not indicated, as fixation alone is sufficient when construct principles are respected [8].

Overall, achieving stable fixation across the fracture zone and around the femoral stem, minimizing soft tissue disruption, and allowing early controlled rehabilitation are keys to successful outcomes. The presence of ankylosing spondylitis adds complexity due to altered biomechanics and rigid lever arms, making robust fixation particularly important.

## Conclusion

Vancouver type B1 periprosthetic femoral fractures in patients with ankylosing spondylitis can be successfully treated with locking plate fixation. A reversed contralateral distal femur anatomical locking plate augmented with cerclage wiring offers a stable construct that facilitates fracture healing and functional recovery. Careful surgical planning and implant selection, considering bone quality and load distribution, are essential for optimal outcomes.

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**Declaration of patient consent:** The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient has given his/her consent for his/her images and other clinical information to be reported in the Journal. The patient understands that his/her name and initials will not be published, and due efforts will be made to conceal his/her identity, but anonymity cannot be guaranteed.

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