# Cement Technique for Reducing Post-Operative Bursitis after Trochanteric Fixation

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Post-operative trochanteric bursitis is a known complication secondary to the surgical approach in total hip arthroplasty. This phenomenon may be partially attributable to repetitive microtrauma generated when soft tissues rub against implanted hardware. Significant rates of post-operative trochanteric bursitis have been observed following procedures in which a trochanteric fixation device, such as a bolt-washer mechanism or a cable-grip/claw system, is used to secure the trochanteric fragment after trochanteric osteotomy. We present a simple technique for use with a bolt-washer system or grip plate in which trochanteric components are covered in bone wax followed by a layer of cement to decrease friction and to diminish the risk of post-operative bursitis.

## Introduction

The majority of primary total hip arthroplasties (THAs) and many revision procedures are performed without greater trochanteric osteotomy. However, osteotomy may prove beneficial in select cases. Numerous variations exist, each with its own indications. In general, these include instances in which wide exposure is required for complex femoral reconstruction (e.g. congenital dysplasia or proximal femoral deformity), when femoral shortening is necessary, or when well-fixed implants must be removed in the revision setting[1].

Trochanteric fixation may be accomplished by use of a bolt-washer system, as is used in modular THA or with the use of a cable/grip-plate system in the setting of trauma or periprosthetic fractures. The S-ROM hip system (DePuy Orthopaedics Inc., Warsaw, IN), for example, is a cementless modular prosthesis used in complex primary and revision THA[2]. A trochanteric bolt and washer, available for use with the calcar-replacing body[3], may be employed to secure the greater trochanter following trochanteric osteotomy or nonunion. The trochanteric fixation system may also enhance rotational stability of the implant in patients with an intact trochanter but compromised bone stock[2].

Greater trochanteric bursitis has been observed with high frequency with use of a bolt and washer for stabilization[3]. This condition is a minor yet painful complication of the surgical approach in THA, for which various potential etiologies have been postulated. These causes include altered biomechanics, scar tissue formation, and repetitive soft tissue trauma[4,5]. We employ a simple technique that involves coating the bolt and washer screw holes with bone wax and then cementing the washer construct in order to reduce friction across the components. A smoother surface may decrease the incidence of post-operative trochanteric bursitis.

## Technique

The hip joint is exposed via a standard arthroplasty approach. Following acetabular exposure and reaming, a trochanteric osteotomy is made, and the calcar area is removed. Femoral components are impacted using a calcar-replacing stem. The trochanter is reattached using the bolt and washer attachments that complement the system (Fig. 1A). Multiple screws are placed to augment the fixation and rotational stability of the reconstruction. A Dall-Miles cable (Stryker, Inc., Mahwah, NJ) may also be placed for supplemental fixation of the trochanteric osteotomy; although there is theoretical risk of wire breakage and symptoms related to fragmented wiring. The bolt and screw heads are coated with bone wax (Fig. 1B), and cement is then laid over the entire greater trochanteric hardware (Fig. 1C). The bone wax is completely covered and thus contained by the cement. Bone wax is applied to the screw heads prior to the cement in order to facilitate removal of hardware if necessary in the future. The cement layer is hand-contoured to affect a smooth gliding surface for the overlying soft tissues. As the cement cures, the surgeon must take care to create a smooth surface, free of macroscopic irregularities, and to ensure that the high profile of the bolt-washer mechanism is adequately contoured by the overlying cement. Autogenous bone graft is placed at the osteotomy site and fixation construct to promote ultimate healing of the trochanteric osteotomy site. The incision is closed in a standard layered fashion, and post-operative protocols are followed to protect trochanteric healing. Protocols are tailored to the particular reconstruction but generally include weight bearing as tolerated and avoidance of the extremes of abduction during initial osteotomy healing. Bracing or other protective devices are usually not necessary.

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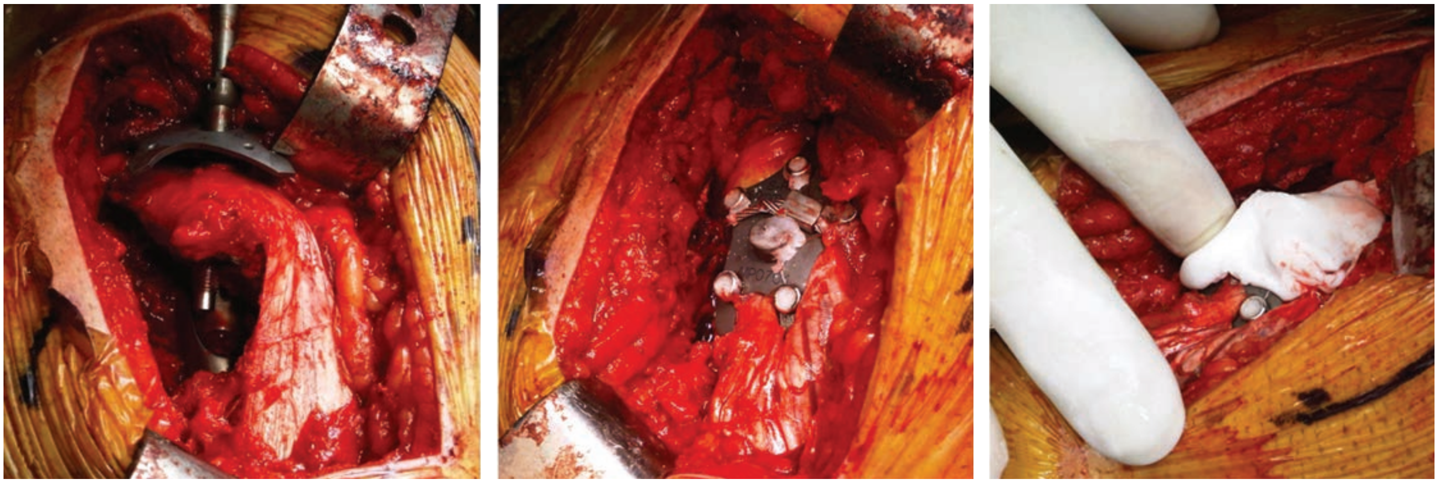

A B C

**Figure 1.** Intra-operative images showing placement of the trochanteric washer (A), the fixation bolt and washer screw heads coated with bone wax (B), and application of polymethylmethacrylate cement to the greater trochanteric hardware with hand-contouring of the cement interface (C).

## Case Study

A 52-year-old man with a history of renal osteodystrophy and dwarfism presented with significant functional disability and pain in the right hip. He had undergone previous femoral internal fixation and osteotomy at the age of fourteen for subtrochanteric fracture. On physical exam, the patient had an antalgic gait, pain with right hip internal and external rotation, limited external rotation of the right hip, and a leg length discrepancy (right greater than left) treated with a 3/8$^{th}$ inch lift. No assistive devices were used. He was neurovascularly intact in all motor and sensory distributions. Imaging revealed that he had developed malunion with significant varus deformity of the proximal femur (Fig. 2A). The patient elected to pursue THA for degenerative arthritis of the right hip and impairment in activities of daily living. The S-ROM modular implant was selected in order to account for the proximal femoral "shepherd's crook" deformity, as version and neck-shaft angular issues might complicate the use of standard implants. The bone wax and cement technique presented here was used to cover trochanteric components. Clinical follow-up showed equalized leg lengths and the absence of neurovascular deficits or trochanteric bursitis. He performs activities of daily living independently and only uses a cane when walking long distances. Radiographs at 18 months demonstrate adequate osteotomy union (Fig. 2B, C).

## Discussion

The use of trochanteric osteotomy may result in trochanteric nonunion, pain, instability, and Trendelenburg gait[3]. Despite these drawbacks, however, trochanteric osteotomy allows for increased exposure and thus continues to be indicated in a number of specific situations (e.g., complex revision arthroplasty and primary THA in certain patients with hip dysplasia). Numerous variations of the standard trochanteric osteotomy, such as the trochanteric slide and extended trochanteric osteotomy, have been developed in an effort to extend the applications and/or minimize the complications of the technique[1]. Similarly, variations in trochanter reattachment have evolved to overcome the complications seen with the original cerclage wiring technique described by Charnley[3,6].

The S-ROM modular system is designed for complex primary and revision THA, with appropriate stem and sleeve versatility to correct excessive version found in some forms of dysplasia and the revision THA[2]. The S-ROM trochanteric bolt-washer mechanism provides a means for securing the trochanteric fragment when an osteotomy is required. However, the success of the S-ROM trochanteric fixation device has been called into question, as its use has been associated with complications such as trochanteric migration, hip instability, nonunion and bursitis[3]. Other modular systems designed to accommodate complex deformities feature analogous trochanteric fixation devices—e.g., the Arcos claw and the Mallory-Head bolt and claw (Biomet, Inc., Warsaw, IN). Alternative options for trochanteric fixation, such as the Dall-Miles grip and grip plate (Stryker, Inc., Mahwah, NJ), are also commonly used.

While trochanteric bursitis is the least devastating of the complications associated with the S-ROM trochanteric bolt-washer system, it causes significant discomfort in affected patients. Considerable variability exists in the observed incidence of trochanteric bursitis after THA depending on a number of factors, including surgical technique, implant selection, and case complexity. Some recent papers report bursitis rates of approximately 4.5% after primary THA[4,7]. Vicar et al. found that this figure increases to 11% when trochanteric osteotomy is added to the procedure[8]. Chandler et al. reported that 11 patients in a cohort of 48 patients undergoing revision THA with the S-ROM femoral component experienced bursitis/tendonitis associated with the use of cables for trochanteric re-attachment[9]. Furthermore, Chilvers et al. observed trochanteric bursitis at a rate of 31% when the S-ROM bolt-washer mechanism was utilized in concert with the rest of the system[3]. While the exact pathogenesis of this complication is unknown, it is suggested that repetitive soft tissue microtrauma and scar tissue formation may account for

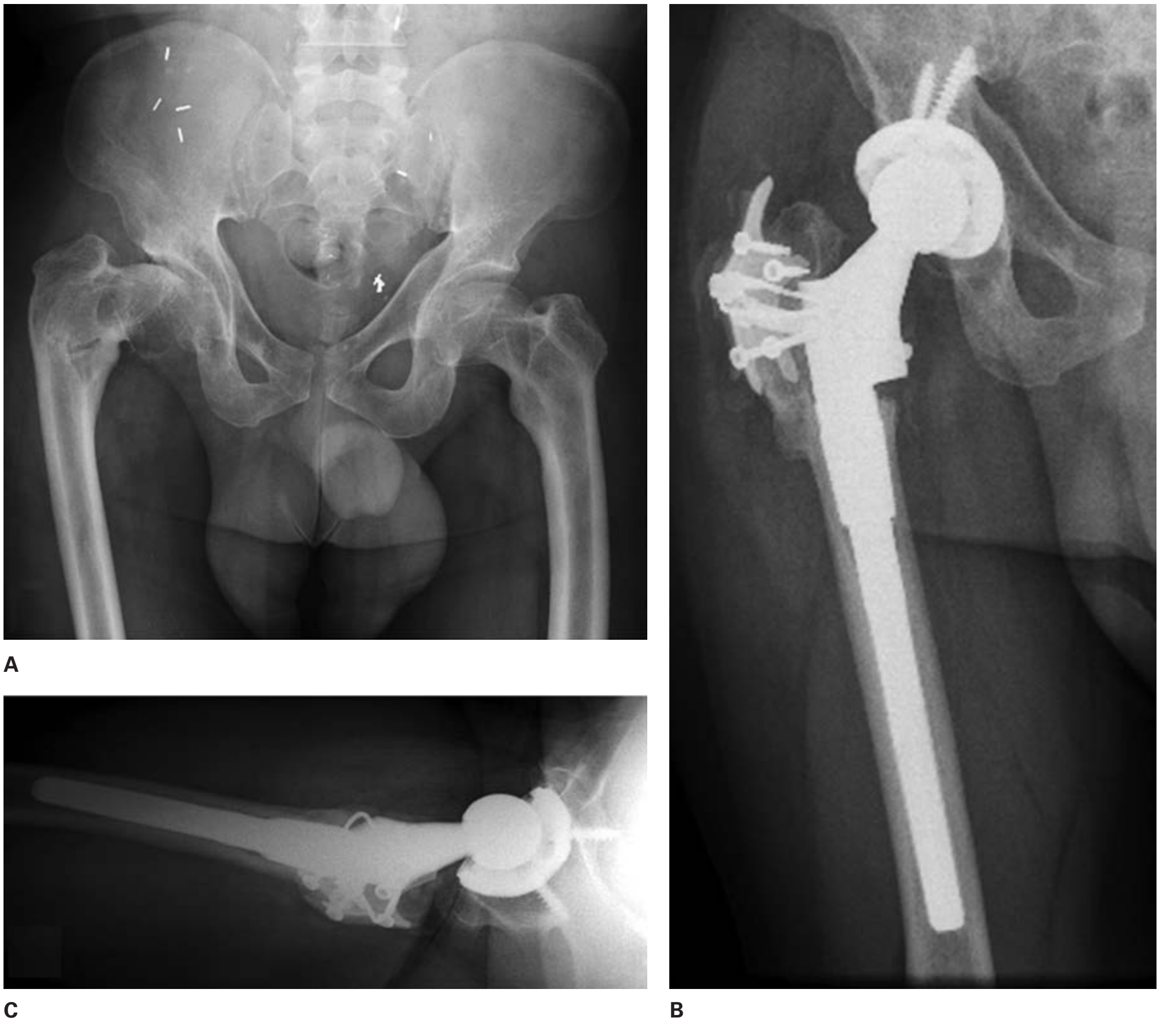


**Figure 2.** Pre-operative anteroposterior radiograph of the pelvis (A) demonstrating severe deformity of the right proximal femur requiring modular prosthesis implantation. Post-operative anteroposterior (B) and lateral (C) radiographs after greater trochanteric and subtrochanteric osteotomies and placement of the modular prosthesis.

some cases of this condition after THA[4,5]. When observing the exposed bolt and washer of the S-ROM hip system (Fig. 1B), the damaging effect of this hardware on the surrounding soft tissues is readily appreciated.

We believe that covering the exposed greater trochanteric hardware with a layer of cement (Fig. 1C) helps minimize mechanical friction about the prosthesis by providing a smooth gliding surface about the trochanter. This theoretically decreases soft tissue abrasion and reduces the risk of post-operative trochanteric bursitis. Additionally, coating the bolt and washer with cement potentially protects the surrounding soft tissue from the titanium staining and irritation associated with mechanical fretting described by Chilvers et al.[3]. To date, this novel technique has been utilized on five patients, and no instances of trochanteric bursitis or adverse events have been observed related to cement technique. While there is the theoretical concern for foreign body reactions with the use of bone wax, the authors feel that the bone wax is necessary to prevent cement interdigitation into the bolt head and screwing mechanism while the cement hardens. If access to the bolt head is needed at a later time (e.g., to remove the bolt in a revision setting), the bone-wax interface will facilitate easier extraction. Contraindications to this cement technique include general arthroplasty contraindications (e.g. active infection) as well as poor trochanteric reconstruction scenario such significant abductor deficiency. The cement technique is an adjunct to the trochanteric fixation system and is not meant to increase the stability of the construct; the goal is for decreased friction and bursitis.

Previous studies have indicated that the choice of surgical approach to the hip joint can significantly affect the incidence of trochanteric bursitis. Iorio et al. found that the use of a posterior approach resulted in a trochanteric bursitis incidence of only 1.2% compared to 4.9% in a direct lateral approach[7]. The technique we describe here also utilizes a posterior approach with the intention of reducing the formation of scar tissue over the greater trochanter.

In conclusion, the simplicity, minimal financial and operative time costs, and observed clinical success of this technique make it an attractive option for minimizing undesirable bursitic complications often associated with trochanteric washer systems. To date, it has been employed exclusively in patients in whom a S-ROM trochanteric bolt-washer device was implanted, but it may be applicable to a wider variety of trochanteric fixation systems to afford a stable, low-friction construct in the setting of primary or revision arthroplasty as well as in trauma.

## References


1. **McGrory, Bal, Harris.** Trochanteric Osteotomy for Total Hip Arthroplasty: Six Variations and Indications for Their Use. *J Am Acad Orthop Surg.* 1996;4(5):258–267.
2. **Buly R.** The S-ROM stem: versatility of stem/sleeve combinations and head options. *Orthopedics.* 2005;28(9 Suppl):s1025–1032.
3. **Chilvers M, Vejvoda H, Trammell R, Allan DG.** Trochanteric fixation in total hip arthroplasty using the S-ROM bolt and washer. *J Arthroplasty.* 2002;17(6):740–746.
4. **Farmer KW, Jones LC, Brownson KE, Khanuja HS, Hungerford MW.** Trochanteric bursitis after total hip arthroplasty: incidence and evaluation of response to treatment. *J Arthroplasty.* 2010;25(2):208–212.
5. **Shbeeb MI, Matteson EL.** Trochanteric bursitis (greater trochanter pain syndrome). *Mayo Clin. Proc.* 1996;71(6):565–569.
6. **Charnley J.** Arthroplasty of the hip. A new operation. *Lancet.* 1961;1(7187):1129–1132.
7. **Iorio R, Healy WL, Warren PD, Appleby D.** Lateral trochanteric pain following primary total hip arthroplasty. *J Arthroplasty.* 2006;21(2):233–236.
8. **Vicar AJ, Coleman CR.** A comparison of the anterolateral, transtrochanteric, and posterior surgical approaches in primary total hip arthroplasty. *Clin. Orthop. Relat. Res.* 1984;(188):152–159.
9. **Chandler HP, Ayres DK, Tan RC, Anderson LC, Varma AK.** Revision total hip replacement using the S-ROM femoral component. *Clin. Orthop. Relat. Res.* 1995;(319):130–140.