

Trauma Rounds

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Femur Fractures around Hip Implants



David Lhowe, MD

Approximately 200,000 total hip replacements and an equal number of hemiarthroplasties are performed annually in the United States. With the marked success of this procedure, patients are able to maintain active lifestyles for many more years. Consequently, millions of elderly are at risk for fracture around their prosthesis.

Periprosthetic fractures typically result from common household falls. The Mayo Clinic reported a 1% prevalence of periprosthetic fracture after primary THR, increasing to 4% following revision surgery.¹ Barring dramatic improvements in treating osteoporosis or reducing falls in an aging population, periprosthetic fractures will become an increasing medical and societal burden.

Fortunately, the majority of periprosthetic fractures do not result in implant loosening and may be managed without the need for implant revision. These fractures include the isolated trochanteric fractures (Vancouver A), diaphyseal fractures about a well-fixed stem (Vancouver B1), and fractures well below the distal tip of the stem (Vancouver C). Complex management with revision of components is required when the femoral stem is loose (Vancouver B2) and loosening is further complicated by inadequate bone stock (Vancouver B3). These variants are appropriately referred to experienced hip revision surgeons.

Evaluation of the periprosthetic femur fracture is best accomplished with plain radiographs of the pelvis and entire femur. CT/MR scans are degraded by artifacts from the metal and add little. Inflammatory markers like ESR and C-reactive protein are invariably elevated and of no therapeutic value. Aspiration of the joint or fracture site should be reserved for cases where infection is suspected by history or clinical signs. If the fixation of the femoral component is questionable, surgery should be planned to include possible revision in the event that operative

findings confirm loosening. Thus, preoperative anesthetic evaluation should allow for a potentially prolonged procedure.

Treatment is nearly always surgical, with the exceptions of the Vancouver A patterns or non-displaced B or C patterns in patients who are not surgical candidates. Positioning the patient in lateral decubitus on a radiolucent table allows the preferred lateral approach to the femur to be easily extended to an anterior or posterior hip approach, should a revision of the femoral component be necessary.

Surgery follows established concepts for plate fixation of other long bones - including restoration of proper length, alignment, and rotation without devascularization of fracture fragments. The femoral stem must be adequately exposed to confirm its fixation within the proximal fragment. Anatomic reduction is not necessary for comminuted fractures, and the dissection required to achieve it is detrimental to fracture healing. Apart from simple 2-part fractures where anatomic reduction and rigid fixation can be reasonably obtained, a bridge plating technique is preferable. Fixation is obtained proximally and distally without disturbing the fracture fragments, and the plate is sufficiently long to obtain adequate fixation - at least 2 cortical diameters above and below the fracture. Longer plates are preferable considering the likely osteoporotic bone.



Above: Femur fracture around a well-fixed cemented THR. Note presence of a medullary cement plug in the distal fragment.

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Fixation of the proximal fragment is complicated by the femoral stem, but screws may often be passed anterior or posterior to it. Locking screws may provide better fixation in poor quality bone, but cannot be angled around an implant as easily as standard screws. When adequate screw fixation is not obtainable, cerclage cables passed through eyelets screwed into the plate will suffice. The absolute number of fixation points for each fragment has not been established, but most critical are those screws or cables closest to and furthest from the fracture zone.²

Allograft cortical struts may provide increased stability, but require substantial soft tissue stripping from the fracture and interpose avascular cortical bone between the fracture and its investing musculature - an environment which can compromise fracture healing. The availability of more rigid and lockable plates with optional cable augmentation has supplanted the need for structural allografts in nearly all cases.

Rehabilitation begins with hip/knee range-of-motion and straight leg raises to minimize quadriceps atrophy. Touch-down weight-bearing should be maintained for a minimum of 6 weeks or longer when comminution is greater or fixation less secure. A longer period of protected weight-bearing is necessary when fracture vascularity has been compromised by the previous surgery or by current repair techniques. Periosteal new bone formation



Above: Fracture repaired using a locking plate, with fixation utilizing both standard bicortical and locking screws, augmented with a single cable proximally. The comminuted fracture zone has been bridged, and the medullary cement removed. Callus is seen forming medially at 6 weeks post-op.

may be late to appear and may never be visible in cases where the surgeon achieved anatomic reduction.

Prognosis for healing of periprosthetic fractures is good if the above principles are maintained during treatment. Risk of subsequent implant loosening is increased, with the Swedish national hip arthroplasty registry showing a 30% loosening rate at 10 years following periprosthetic fracture.³

References:

1. Berry DJ, *Epidemiology: Hip and Knee*. Orthop Clin North Am 1999; 30:183-190.
2. Ricci WM, et al, *Indirect Reduction and Plate Fixation Without Grafting, for Periprosthetic Femoral Shaft Fractures About a Stable Intramedullary Implant*. J Bone Joint Surg Am 2006; 88:275-282.
3. Lindahl H, et al., *Risk Factors for Failure After Treatment of a Periprosthetic Fracture of the Femur*. J Bone Joint Surg Br 2006; 88:26-30.

**New England Regional Fracture Summit
Jan 14 - 17, 2011, Stowe, VT**

The AO Fracture Summit will be held January 14 - 17, 2011 in Stowe, VT. The course features Trauma Rounds Editor Dr Mark Vrahas, as well as Drs Jesse Jupiter and Raymond White as course co-chairs. The legendary Dr Augusto Sarmiento will be the course's Guest Sage.

The purpose is to inform and educate community orthopaedic surgeons who are actively involved in the treatment of patients with fractures. The format is informal, discussion-based, and highly interactive. Participants are invited to bring their own cases for discussion.

Registration is still open!

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Trauma Faculty

Mark Vrahas, MD — 617-726-2943
Partners Chief of Orthopaedic Trauma
mвраhas@partners.org

Mitchel B Harris, MD — 617-732-5385
Chief, BWH Orthopaedic Trauma
mbharris@partners.org

R Malcolm Smith, MD, FRCS — 617-726-2794
Chief, MGH Orthopaedic Trauma
rmsmith1@partners.org

David Lhowe, MD — 617-724-2800
MGH Orthopaedic Trauma
dllhowe@partners.org

Michael Weaver, MD — 617-525-8088
BWH Orthopaedic Trauma
mjweaver@partners.org

David Ring, MD — 617-724-3953
MGH Hand & Upper Extremity Service
dring@partners.org

George Dyer, MD — 617-732-6607
BWH Hand & Upper Extremity Service
gdyer@partners.org

Please send correspondence to:
Mark Vrahas, MD / Trauma Rounds
Yawkey Center for Outpatient Care, Suite 3C
55 Fruit Street, Boston, MA 02114

www.MassGeneral.org/ortho
www.BrighamAndWomens.org/orthopedics

Editor in Chief

Mark Vrahas, MD

Program Director

Suzanne Morrison, MPH
(617) 525-8876
smmorrison@partners.org

Editor, Publisher

Arun Shanbhag, PhD, MBA

