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Disclosure of Financial Interests

Patricia I. Wolfe, PT, MS., and Christine Lourenco, SPT, and their spouses/significant others have no financial interests to disclose.

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Hip Fracture Surgical Treatment and Rehabilitation

Craig Lareau, MD, and Gregory Sawyer, MD

Approximately 325,000 people will have a hip fracture each year in the United States.¹ In elderly patients, they result in a one-year mortality rate of 18-33% and in-hospital mortality of 2.7%.¹ Hip fractures are more common in patients with pre-existing cardiac disease, chronic renal failure, diabetes mellitus, stroke, malignancy, and chronic obstructive pulmonary disease,² which also are major factors in the recovery process. Many patients experience a significant functional decline and inability to perform activities of daily living (ADLs).¹ Therefore, rehabilitation is a vital component of the patient's recovery in order to regain the previous functional level, whether as an independent community ambulatory or a full-assist nursing home resident. Only 14% of hip fracture patients return home after their hospital course;¹ the rest require some level of inpatient rehabilitation.

The population of individuals older than age 65 is expected to grow from 35 million to 77 million between 2000 and 2040.³ Although hip fracture rates are declining in this age group—due to bisphosphonates, calcium and Vitamin D intake, weight-bearing exercises, and better prevention of falls⁴—the annual number of hip fractures will undoubtedly rise based upon changing demographics.

CLINICAL PRESENTATION/WORK-UP

Hip fracture patients are typically older than age 65, with a mean age of 85.¹ They usually present after a fall with

complaints of pain on the affected side and an inability to ambulate. The affected limb is often shortened and externally rotated due to the muscular forces on the fracture fragments. Radiographs confirm the diagnosis, with standard views including an AP Pelvis and AP and lateral of the affected hip. Rarely is a CT or MRI needed to make the diagnosis. MRI can identify occult fractures in the patient with persistent pain and inability to ambulate with normal radiographs.⁵ Once the diagnosis has been established, a discussion with the patient, family, and orthopedic surgeon should take place to determine the course of action. Currently, the vast majority of hip fractures are treated operatively with surgical techniques depending upon the fracture pattern. Rarely, in an elderly patient with

multiple serious medical co-morbidities, non-operative treatment may provide the best outcome.

NON-OPERATIVE MANAGEMENT AND REHABILITATION

Non-operative treatment involves either early mobilization or a period of bed rest and/or traction followed by progressive weight-bearing. This is usually reserved for two subsets of patients. First, for patients with severe co-morbidities, the risks of the procedure and anesthesia outweigh the benefits. Second, for patients who are non-ambulatory or bedridden at baseline, fracture fixation will not improve their ambulatory status. Nevertheless, some centers prefer to operate on this population for improved pain control. Because about 90% of hip fractures are



Figure 1.



Figure 2.



Figure 3.



Figure 4.

managed operatively,⁶ the literature regarding the success of non-operative management is limited. In a recent study, mortality was 2.5 times higher with bed rest compared to operative treatment.⁶ Since the non-operative cohort tends to have a higher morbidity, an accurate comparison is difficult; it is unclear whether the difference in mortality is due to patient factors or choice of treatment. Mortality with non-operative treatment is higher with bed rest, compared to early mobilization, because of an increased incidence of complications such as venous thromboembolism. Interestingly, this study showed no significant difference in mortality between patients treated with surgery and those managed non-operatively, but with early mobilization.⁶

OPERATIVE MANAGEMENT AND REHABILITATION

Femoral Neck Fractures

Approximately 50% of all hip fractures are at the femoral neck, typically due to a direct fall onto the greater trochanter.⁷ These fractures are classified based on the degree of displacement (Fig-

ure 3), and this impacts the type of surgical fixation. The three major types of surgical fixation for this fracture pattern are *in situ* fixation, hemi-arthroplasty, and total arthroplasty.

a) In Situ Fixation

This technique is chosen for impacted, minimally displaced fractures. The surgical technique consists of the placement of three large cannulated screws across the fracture site into the femoral head. (Figure 2) Weight-bearing status after this procedure is surgeon-dependent. Classically, patients were instructed to be touch-down weight bearing with a walker for approximately 8-12 weeks. However, many older patients are unable to comply with this and are allowed weight-bearing as tolerated with a walker.⁸ Rehabilitation should focus on gait training and strengthening, without requiring any precautions.

b) Hemi-arthroplasty

This technique consists of surgical replacement of the proximal femur (Figure 4) and is chosen for displaced femo-

ral neck fractures in relatively low demand patients. The most common surgical approaches for a hemi-arthroplasty are lateral and posterior. The lateral approach involves splitting the hip abductors and precautions include no active abduction against resistance, no adduction past neutral, no external rotation and no extension. The posterior approach involves releasing the short external rotators of the hip and then repairing these muscles. Posterior precautions consist of no hip flexion >90 degrees, no adduction past neutral, and no internal rotation beyond neutral.⁹ Post-operatively, regardless of the surgical approach used, patients can bear weight as tolerated on this stable prosthesis. The overall dislocation rate is approximately 3%, with an increased risk with the posterior approach.¹⁰ There was no significant difference in the dislocation rate between unipolar and bipolar hemi-arthroplasties.¹⁰ Rehabilitation needs to follow the set precautions to avoid dislocating while performing strengthening, gait training, range of motion exercises and ADLs.



Figure 5.



Figure 6.

c) Total Hip Arthroplasty

This technique is primarily used for the elective replacement of hip joints affected by degenerative joint disease. However, it also plays a role in femoral neck fractures in active elderly patients with pre-existing hip arthritis. The approaches used are the same as previously described, with the same precautions. Classically, it was thought that total hip arthroplasty was associated with higher dislocation rates than hemi-arthroplasty, but recent studies have shown no significant difference.^{11, 12}

INTERTROCHANTERIC HIP FRACTURES

This pattern makes up the other 50% of hip fractures in the elderly population.⁷ The fracture line runs between the greater and lesser trochanter (Figure 5), a well-vascularized area of the hip, reducing the risk of non-union and osteonecrosis compared to femoral neck fractures.⁷ As a result, this fracture can be treated with internal fixation, opposed to the hip replacements for displaced femoral neck fractures. The two main

surgical techniques for this fracture type are cephalomedullary nailing and a sliding hip screw with side plating.

a) Cephalomedullary Nail

This fixation technique consists of placing an intramedullary rod down the femoral shaft in combination with a sliding hip screw directed into the center of the femoral head. (Figure 6) The surgical technique involves several small incisions along the lateral thigh and requires no post-operative precautions. Patients are typically permitted weight bearing as tolerated, although difficult fracture patterns may warrant non-weight-bearing or partial weight-bearing status. Rehabilitation focuses on gait training, strengthening, and range of motion.

b) Sliding hip screw with side plate

This surgical technique consists of a stabilizing side plate along the lateral aspect of the proximal femur in conjunction with a sliding hip screw into the femoral head. This requires a small incision along the lateral proximal femur, for

placement of the side plate. No post-operative precautions must be followed. Once again, patients are typically made weight-bearing as tolerated, although difficult fracture patterns may require limited weight-bearing initially. Rehabilitation focuses on gait training, strengthening, and range of motion.

POST-OPERATIVE COMPLICATIONS

It is essential to consider the complications associated with operative versus non-operative treatment. These potential complications in the context of patient factors will determine whether operative fixation is appropriate. The goal of treatment, whether operative or non-operative, is to minimize the likelihood of complications based on a patient's underlying comorbidities. Complications associated with surgical management of hip fractures include, but are not limited to, cardiopulmonary arrest, wound infection, acute blood loss anemia, damage to surrounding blood vessels or nerves, **venous thromboembolism (VTE)** and anesthetic complications such as aspiration and pneumonia. In general, hip

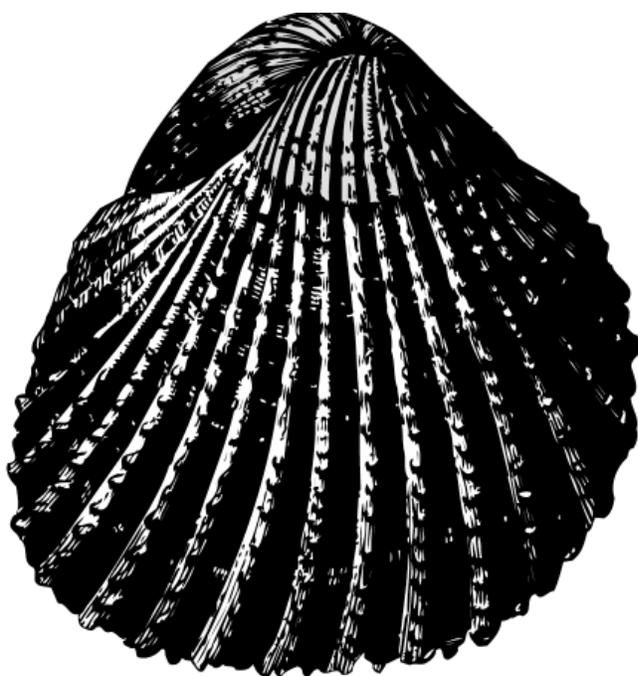
arthroplasty to treat fracture is associated with almost a ten-fold higher rate of peri-operative mortality compared to elective hip arthroplasty for degenerative joint disease.¹³ Complications associated with non-operative management and bed rest include VTE, pneumonia, and decubitus ulcers.

Post-operative pain control is often challenging in the elderly hip fracture patient. These patients are often in moderate to severe pain and require narcotic pain medications to allow participation in post-operative rehabilitation programs. Pain control also plays a role in the prevention of complications. For example, a patient in significant discomfort will often be tachycardic, putting an additional strain on the cardiac system. Narcotic pain medications have multiple side effects, especially with elderly patients, including constipation, urinary retention, respiratory depression, and acute delirium.⁹ Oral narcotics such as Percocet or Vicodin provide adequate pain control and may need to be scheduled before therapy. In patients who are sensitive to narcotics, a combination of Toradol and Tylenol can be used, although these medications also have side effects in the elderly patient.

The timing of surgical fixation in hip fracture patients is a debated topic. Some studies show an increase in mortality when surgery is delayed greater than four days,¹⁴ while others show no significant difference in mortality before 48 hours and later.¹⁵ Surgical fixation should occur when the patient is deemed medically fit to undergo a procedure.

CONCLUSIONS

As the mean age of the world's population rises, the prevalence of hip fractures will increase. The elderly patient group, in which this injury most frequently occurs, typically has multiple medical comorbidities, making their pre-operative and post-operative (or non-operative) care both challenging and rewarding. Hip fracture care requires surgical and medical teamwork to optimize outcomes and facilitate the return of the patient to his or her pre-injury level of function.



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