

## CLINICAL PRACTICE

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## Management of Acute Hip Fracture

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*This Journal feature begins with a case vignette highlighting a common clinical problem. Evidence supporting various strategies is then presented, followed by a review of formal guidelines, when they exist. The article ends with the authors' clinical recommendations.*

A 65-year-old woman who has been healthy and active presents to the emergency department several hours after a slip and fall. She is unable bear any weight on her right leg and reports that she has pain with any attempt to move. On inspection, her right leg is shortened and externally rotated. A plain radiograph of her pelvis and hip confirms a nondisplaced fracture of the femoral neck. Careful review of the radiograph determines that her fracture is located at the base of the femoral neck (sometimes called a basicervical fracture) with a more vertically oriented fracture line. How should her case be managed?

## THE CLINICAL PROBLEM

WORLDWIDE, 4.5 MILLION PEOPLE ARE DISABLED FROM HIP FRACTURES each year, with an expected increase to 21 million persons living with this disability in the next 40 years.<sup>1</sup> Globally, hip fracture ranks among the top 10 causes of disability.<sup>1</sup> By the year 2040, the estimated annual health care costs will reach \$9.8 billion in the United States and \$650 million in Canada.<sup>2</sup> However, given that three quarters of the world population live in Asia, it is projected that Asian countries will contribute more to the pool of hip fractures in coming years. It is estimated that by 2050, more than 50% of all osteoporotic fractures will occur in Asia.<sup>3</sup>

Hip fractures are anatomically classified in relation to the hip capsule as intracapsular fractures (i.e., at the femoral neck) or extracapsular fractures (i.e., intertrochanteric or subtrochanteric fractures) (Figs. 1 and 2). Intertrochanteric fracture and femoral-neck fracture represent the majority of hip fractures and occur with similar frequency. Femoral-neck fractures may be either nondisplaced (i.e., very little separation at the fracture site, which occurs in approximately one third of femoral-neck fractures) or displaced (i.e., greater separation). By convention, fractures of the femoral neck can be further classified as Garden type I or II, representing nondisplaced or impacted fracture patterns, and Garden type III or IV, representing displaced fracture patterns.<sup>4</sup> Fractures below the femoral neck are referred to as intertrochanteric fractures, and those below the lesser trochanter as subtrochanteric fractures (Fig. 1).

The natural history of hip fractures is dismal if they are left untreated. Patients who have had a hip fracture are at risk for cardiovascular, pulmonary, thrombotic, infectious, and bleeding complications.<sup>5,6</sup> These complications can result in death. Therefore, timely surgery for hip fracture remains the mainstay of treatment. However, functional decline and a diminished quality of life are common after

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N Engl J Med 2017;377:2053-62.

DOI: 10.1056/NEJMc1611090

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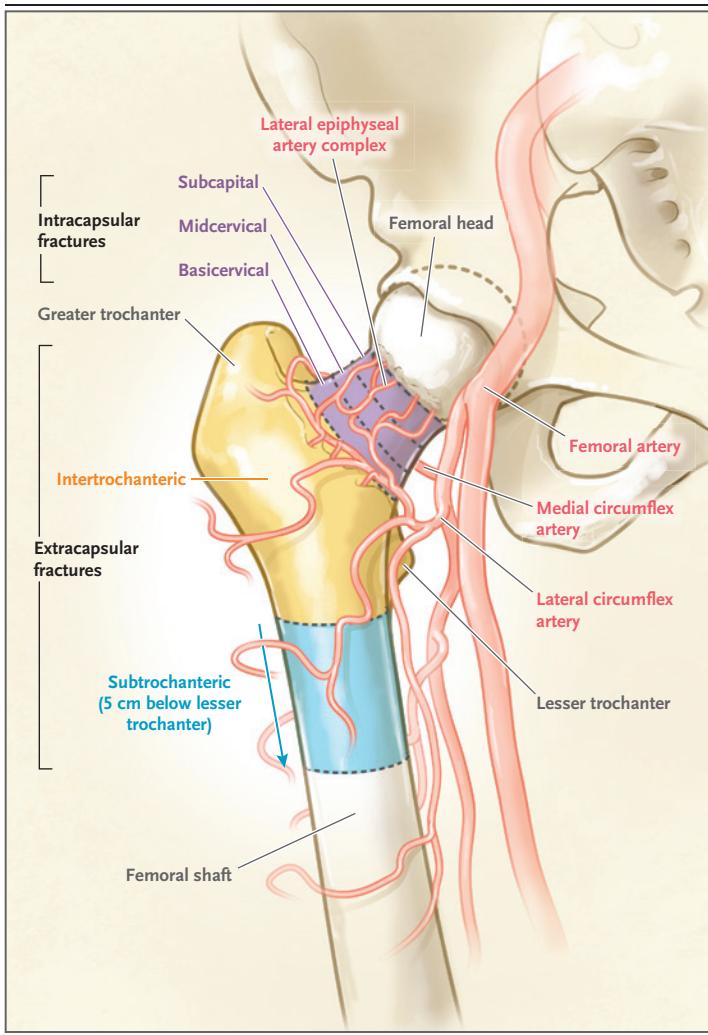


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## KEY CLINICAL POINTS

## ACUTE HIP FRACTURE

- Hip fractures (categorized according to anatomical location as a femoral-neck fracture or an intertrochanteric or subtrochanteric fracture) can have a devastating effect on quality of life and function, with a high risk of death at 1 year.
- Femoral-neck fractures, if nondisplaced or in a young patient, are typically treated with internal fixation.
- For fractures at the base of the femoral neck (sometimes called basicervical fractures), displaced fractures, and those with a more vertically oriented fracture line, reoperation rates are lower when a sliding hip screw is used than when multiple cancellous screws are used.
- Approaches to displaced femoral-neck fractures remain controversial, but evidence currently favors arthroplasty over internal fixation, especially in persons 65 years of age or older.
- Unstable intertrochanteric and subtrochanteric fractures of the femur are treated with the use of intramedullary nails, whereas stable fractures of these types are typically treated with the use of a sliding hip screw.
- Perioperative multidisciplinary care is important in regard to osteoporosis assessment and treatment as well as to postoperative functional mobility.

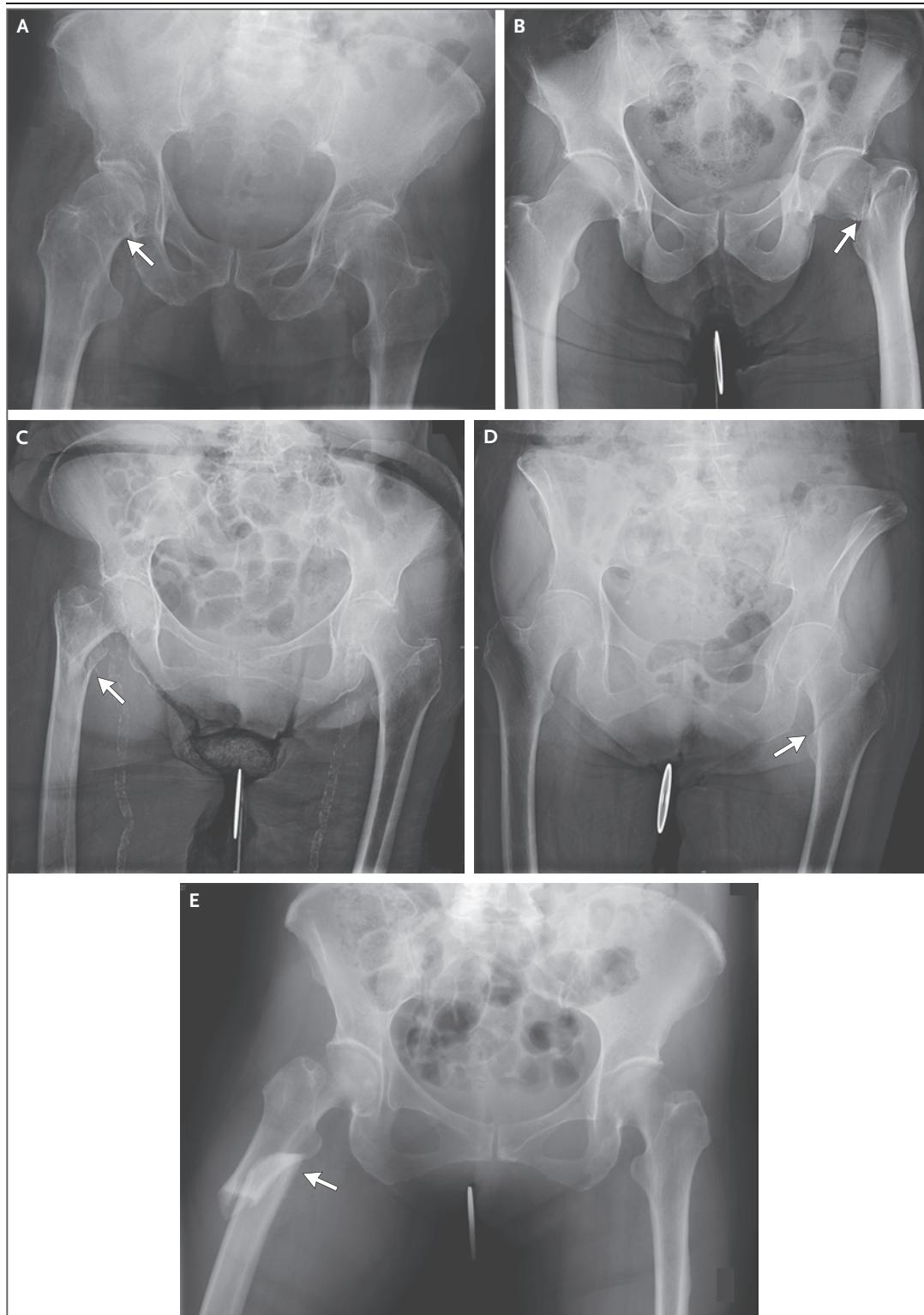


operative management.<sup>7</sup> Mortality at 1 month after hip-fracture surgery approaches 10%.<sup>7</sup> Patients who survive to 30 days are at substantial risk for disability. Even among patients who were community-dwelling before their hip fracture, 11% are bedridden, 16% are in a long-term care facility, and 80% are using a walking aid 1 year after the hip fracture.<sup>7,8</sup>

The mortality rate within 1 year after hip fracture is as high as 36% despite aggressive management including surgery and rehabilitation<sup>9</sup>; this rate has remained relatively stable over time, in contrast to declining mortality rates associated with other causes, such as acute myocardial infarction.<sup>10</sup> The unacceptably high risk of reoperation, ranging from 10 to 49%, after the initial hip-fracture surgery has fueled research that is intended to identify evidence-based management strategies.<sup>9,11</sup>

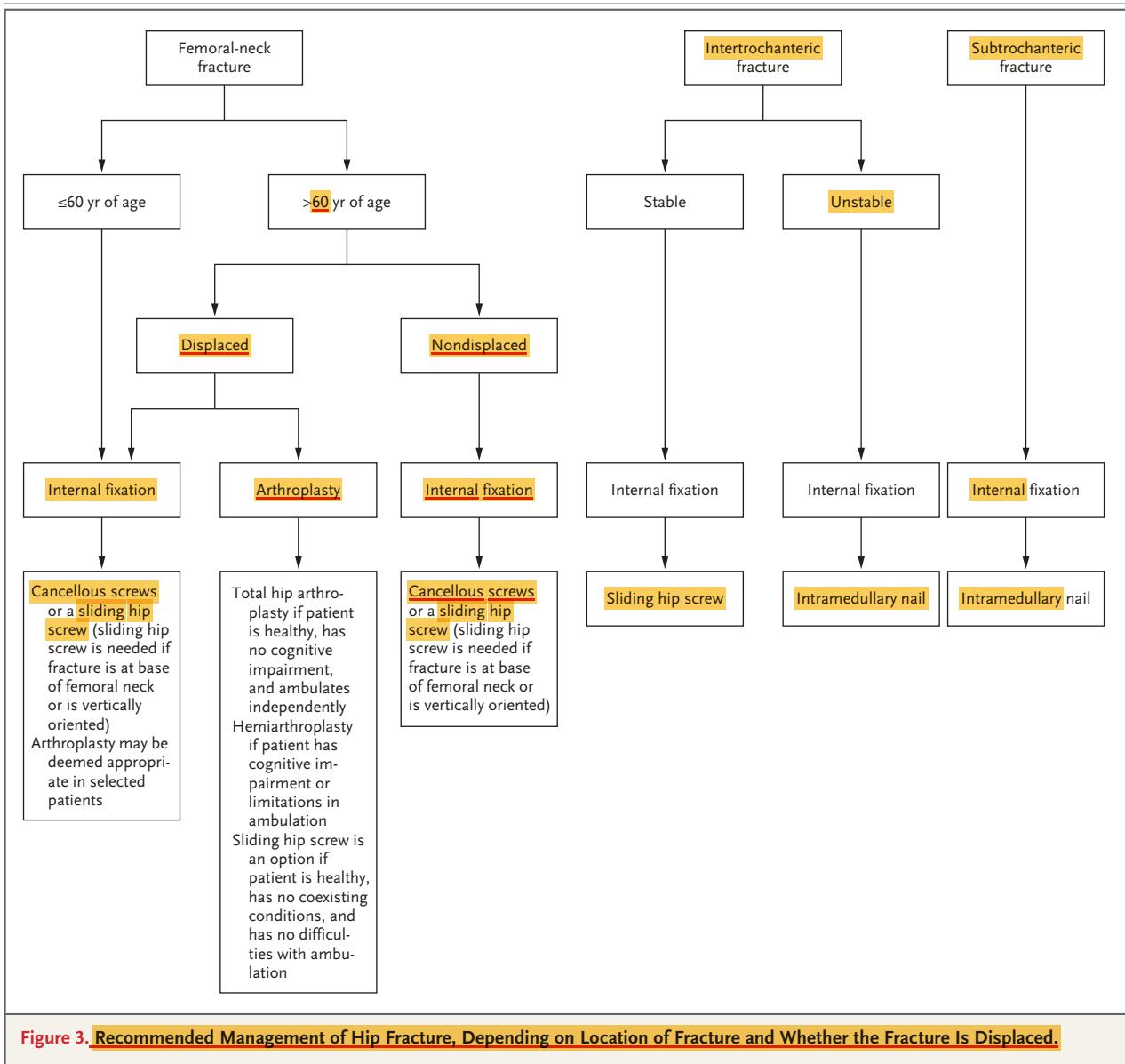
**Figure 1. Classification of Hip Fracture According to Anatomical Fracture Site.**

Hip fractures are anatomically classified in relation to the hip capsule as intracapsular (i.e., at the femoral neck) or extracapsular (i.e., intertrochanteric or subtrochanteric). Femoral-neck fractures may be nondisplaced (i.e., very little separation at the fracture site, occurring in approximately one third of femoral-neck fractures) or displaced (i.e., greater separation). Fractures below the femoral neck are referred as intertrochanteric fractures, and those below the lesser trochanter as subtrochanteric fractures.



**Figure 2.** Plain Films Showing Various Types of Hip Fractures.

Panel **A** shows a **nondisplaced** femoral-neck fracture, and Panel **B** a **displaced** femoral-neck fracture. Panel **C** shows a displaced intertrochanteric fracture, Panel **D** an intertrochanteric fracture at the base of the femoral neck (the case presentation in this article), and Panel **E** a subtrochanteric fracture. An arrow indicates the location of the fracture in each panel.



## STRATEGIES AND EVIDENCE

Evidence-based management of hip fractures includes the consideration of surgical options and perioperative care (Fig. 3). Observational studies have identified several risk factors for short-term and intermediate-term death in patients who have a hip fracture, including age, male sex, socioeconomic deprivation, coexisting conditions, dementia, and nursing home residency. Unfortunately, most risk factors are not modifiable.<sup>12</sup>

## OPERATIVE MANAGEMENT

Surgeons are faced with three major decisions in the treatment of a patient with an acute hip fracture. Is surgery an option, given the patient's health status? If so, how quickly can it be performed and what type of operation is needed, given the anatomical location, degree of fracture displacement, and the physiological condition of the patient?

Unless the patient's health status is such that there is high risk of intraoperative death or if access to surgical care is difficult, operative

treatment for most hip fractures is recommended. In a single-center retrospective study, patients with hip fracture who were treated nonoperatively had a risk of death at 1 year that was 4 times as high, and a risk of death at 2 years that was 3 times as high, as the risk among patients who underwent surgery.<sup>13</sup> In another retrospective study, patients undergoing nonoperative treatment with bed rest had a risk of death at 30 days that was 3.8 times as high (absolute risk, 73%) as those who had early mobilization.<sup>14</sup> The observation that mortality rates did not differ significantly among patients who were treated operatively and those who were treated nonoperatively but who mobilized early<sup>14</sup> argues for early mobilization in patients who are too sick to undergo surgery.

#### *Time to Surgery*

Guidelines recommend that surgery for hip fracture be performed within 48 hours after the event. This recommendation is based on observational studies suggesting that a shorter time to surgery is associated with improved outcomes in patients.<sup>15,16</sup> In addition, physiological data indicating that the pain, bleeding, and immobility that are associated with an acute hip fracture result in inflammation, hypercoagulability, and catabolism provide further support for early surgery.

Recent evidence suggests that minimizing the time from hospital admission to surgery to as little as 6 hours is associated with a greater reduction in the incidence of postoperative complications at 30 days than is a time of more than 6 hours.<sup>17</sup> In a meta-analysis of observational studies (involving 4208 patients and 721 deaths) that was adjusted for the American Anesthetists Society score (a measure of a patient's fitness for surgery), age, and sex, earlier surgery ( $\leq 24$  hours after admission) was associated with significantly lower mortality than was later surgery (relative risk, 0.81; 95% confidence interval [CI], 0.68 to 0.96;  $P=0.01$ ).<sup>8</sup> In unadjusted analyses, earlier surgery was also associated with lower risks of in-hospital pneumonia.<sup>8</sup> However, a key confounder in these studies is that surgery is more likely to be delayed (or not performed at all) in patients who are sicker on admission (and thus more likely to die, independent of surgery). In a small, randomized, pilot trial (Hip Fracture Accelerated Surgical Treatment and Care Track

[HIP ATTACK]; ClinicalTrials.gov number, NCT01344343) involving 60 patients, the rate of major perioperative complications was 30% with accelerated hip-fracture surgery ( $\leq 6$  hours after hospital admission) and 47% with standard care (hazard ratio, 0.60; 95% CI, 0.26 to 1.39;  $P=0.20$ )<sup>17</sup>; a large, international trial of early ( $\leq 6$  hours) versus later surgery for hip fractures is currently under way (NCT02027896).

#### *Femoral-Neck Fracture*

Surgical options for femoral-neck fractures include internal fixation (i.e., multiple cancellous screws or a single large screw and side plate, often called a sliding hip screw) or arthroplasty (a hemiarthroplasty or total hip arthroplasty) (Fig. 4). Hemiarthroplasty involves the insertion of a metal prosthesis in the proximal femur, whereas total hip arthroplasty includes the insertion of a metal femoral prosthesis and the addition of an acetabular component for the hip socket.

The choice of implant depends largely on the degree of displacement and the physiological condition of the patient. A greater degree of fracture displacement is associated with a higher risk of disruption of the critical blood supply to the femoral head, which is largely provided by the lateral circumflex femoral artery, a branch of the medial circumflex femoral artery.<sup>18</sup> Bleeding from an intracapsular fracture can result in a tamponade effect that may also affect femoral-head microcirculation by compromising venous drainage. Compromise of blood supply can lead to avascular necrosis of the femoral head and to failure of the fracture to unite. Surgical decision making must account for the likelihood of restoring blood supply to the femoral head through anatomical fracture reduction, stable implant fixation, and consideration of intracapsular pressure-reducing capsulotomy.<sup>18</sup>

In patients with a nondisplaced fracture (Garden type I or II), internal fixation is the treatment of choice. Regardless of the age of the patient, small, randomized trials have shown similar outcomes after internal fixation with multiple cancellous screws and after internal fixation with a single large compression screw with a side plate. A recent large trial (Fixation Alternatives in the Treatment of Hip Fractures [FAITH]), in which 1079 patients with a femoral-







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