Fragility fractures of the acetabulum

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Abstract

There are limited epidemiological data dedicated to geriatric acetabular fractures. The incidence in individuals older than 60 years of age has more than doubled in the past three decades and expected to double further over the next 20 years. These fractures represent a challenging subset of acetabular trauma patients to treat. Conservative treatment is a valid option in those with minimal displaced fractures and a preserved congruent hip joint. Similarly the frail patient with multiple medical co-morbidities and those unlikely to tolerate surgical intervention should have appropriate analgesia and their fracture managed or ignored by watchful neglect. Surgical treatment options include percutaneous fixation or open reduction and internal fixation techniques. Good outcomes may be expected should a concentric reduction be achieved. Age-related involutional osteoporosis associated with fracture comminution and acetabular dome impaction complicate surgical fixation with higher complication rates and the need for further surgery recognised. Historically described as central fracture dislocations, stoved in hip or burst fracture, acute arthroplasty is advocated in the setting of femoral head damage and in significant acetabular impaction injuries. Controversy remains whether geriatric patients should be treated by open reduction and internal fixation or total hip arthroplasty either acute or delayed and needs to be assessed based on the patient and personality of the fracture.

Keywords acetabulum; arthroplasty; elderly; fragility fracture; frailty; osteoporosis; reconstruction

Introduction

The threat of loss of mobility and consequent disability is the feature of the osteoporotic acetabular fracture in the elderly and frail patient.

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The historical clinical interest in acetabular fractures originated from the many acetabular fractures that were sustained in major trauma and motor vehicle accidents. Today, however, the majority of acetabular fractures seem to have an osteoporotic origin, and they occur as a consequence of a moderate or minimal trauma (most typically simple falls in elderly people). Similar to hip and pelvic fractures the incidence of acetabular fractures in the elderly is expected to rise with the increase in the ageing population.

Osteoporosis and its epidemic has occurred. Globally, the World Health Organization (WHO) estimates a further doubling of the population aged over 60 years by 2050 and in the USA projected costs related to fracture neck of femur alone are expected to exceed $16 billion by 2040.

Ageing, an inevitable process, is commonly measured by chronological age and, as a convention, a person aged 65 years or more is often referred to as 'elderly'. Many aged continue to stay highly active. Although age is used as a surrogate for functional impairment and medical co-morbidities, a wide variety in physiological age of an elderly individual and corresponding diversity in the quality of bone is recognised.

Frailty and disability are terms used interchangeably to identify vulnerable older adults (old). Disability is defined as difficulty or dependency in carrying out activities essential to daily living and relate either to self-care or household management tasks. Loss of mobility and dependency define need for long-term care.

Displaced acetabular fractures should be treated surgically applying the same indications used for younger patients and gross subluxation of the joint and significant fracture displacement should not be accepted. The goals of treatment should be the same as in any other trauma patient: rapid mobilization and restoration of the pre-injury level of function.

Mechanism of injury

The evolution of the Letournel fracture classification is on basis of a better understanding of the architecture of the innominate bone and it regards the acetabulum as being located within the open arms of an inverted V or Y formed by two columns of bone. These columns bear a close correlation between the fundamental sacro-acetabular, sacro-pubic and sacro-iliac trabecular systems and radiological study of the bone. The mechanics of acetabular fractures describes a force acting between the acetabulum and the head of the femur and being the last link of a chain of transmission from the greater trochanter, the knee or the foot. The point of impact in the acetabulum is determined by the degree of abduction or rotation of the femur. A blow on the back of the pelvis can have the same effect.

Given their osteoporotic bone, elderly patients are much more likely than younger people to sustain an acetabular fracture as the result of a low-energy mechanism, such as a fall from standing. The injury described is that of a fall onto the posterolateral hip in the region of the greater trochanter. This type of injury drives the femoral head into the acetabulum with an anteromedially directed force, typically causing fracture of the anterior column, medialization of the femoral head, disruption of the quadrilateral plate, and impaction of the posteromedial dome. The 'senior' acetabular fracture has a relatively

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predictable radiographic pattern which includes a low exiting-anterior column component, a large portion of the quadrilateral surface displaced medially and cranially with varying degrees of posterior column involvement[1] (Figure 1).

Frailty and surgery

The frequency of individual chronic conditions and frailty rises with age. A common pathway including loss of muscle mass and strength, weight loss, loss of endurance, decreased balance and mobility, slowed performance, relative inactivity and decreases in cognitive function is recognised. Approximately half of disability in older adults develops in association with progression of their underlying comorbidities; the other half develops acutely, or catastrophically, in association with acute events such as hip fracture or stroke.[2]

Older and frail people are vulnerable to adverse health outcomes due to decreased physiological reserve.

Co-morbid conditions considered to be significant for increased mortality include diabetes mellitus, congestive heart failure, cardiac arrhythmias, ischemic heart disease, valvular heart disease, previous cerebrovascular accident, renal disease, cancer, Parkinson's disease, hypertension, chronic obstructive pulmonary disease, peptic ulcer disease, peripheral vascular disease, seizure disorder, syncope, and need for ongoing anticoagulation.

Cardiovascular disease and chronic lung disease are shown to predispose neck of femur fracture patients to the most common and serious postoperative complications. Within 30 days of surgery, 65% of patients with heart failure and 43% with post-operative chest infection died.[3]

Enumeration of perioperative morbidity and mortality risk using physiological and operative severity scores are useful adjuncts in terms of patient assessment and highlight risk, however the decision for operative versus non-operative treatment of geriatric acetabular fractures should not be justified based on the concern for increased or decreased mortality risk alone. Early mobilization of these patients is of primary importance in restoring them to their pre-injury level of function, as well as preventing complications from prolonged recumbency. The surgical risk analysis is balanced against the need to maximize quality of life.

When discussing the surgical option with the patient and their family a tangible representation of risk is helpful. The American Society of Anaesthesiologists score (ASA), POSSUM, APACHE, and Charleston Co-morbidity and Frailty Index scores may all be used to this end. Similarly these tools can be used to audit practice.

To reduce mortality, attention must focus on optimising health status preoperatively, preventing postoperative complications, and, when these complications develop, providing optimal specialist medical care.

Radiology

Radiographic evaluation begins with an anteroposterior pelvic radiograph. Judet views — although usually considered a standard part of the radiological work-up, are of limited value in this patient population. The poor projection of osteoporotic bone and the awkward position that needs to be adopted to obtain these films, makes their relative value quite underwhelming. The fracture should be investigated with computed tomography scans and three-dimensional reconstructions to gain a better understanding of the personality of the fracture and assess articular displacement. Axial, coronal and sagittal reformats are used to identify dome and postero-medial impaction.

Classification

Classification systems of musculoskeletal injuries must be comprehensive, simple, inter and intra-observer reliable, related to the severity of the injury and connected with treatment strategies and outcome.

In patients with normal bone quality who are involved in high-energy trauma, fracture patterns are typical of those described by Letournel. This classification describes elemental fracture patterns depending on anterior or posterior wall or column involvement and transverse types and associated both column pattern injuries. The classification guides surgical approach. Fragility fractures characterized by comminution and punched marginal impaction are difficult to define fully by the Letournel system and therefore may be further described as 'transitional or osteoporotic intermediate types'.

The AO/OTA alpha-numberic classification is based on the anatomic site of the fracture, the segment, the type, the group, and sub-group. The acetabulum is anatomic location 62 and fractures may be divided into partial or complete articular fractures, that is, 62A-partial articular, 62B-transverse or T and 62C-complete articular. While used for research purposes the AO/OTA system is not routinely used in everyday practice.

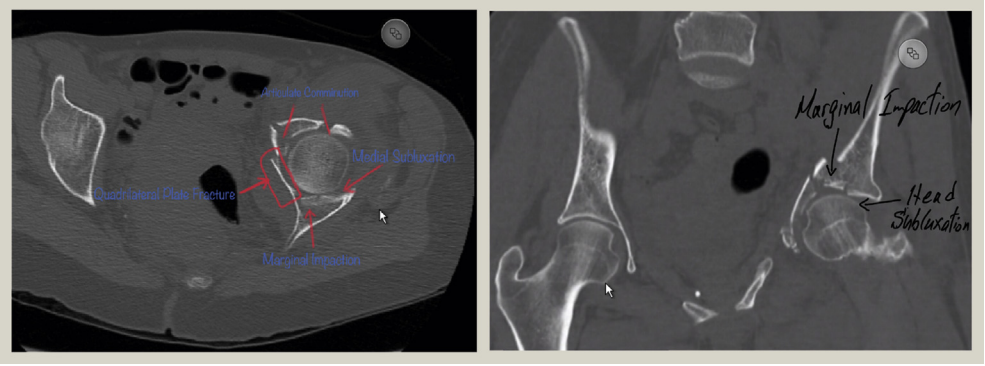

Figure 1 Axial and coronal CT scan cuts demonstrating key features of osteoporotic acetabular fractures.

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