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CONTROLLED GANZ DISLOCATION

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SUMMARY

***Introduction:** femoral head fractures are rare and typically result from high-energy trauma, such as traffic accidents, often requiring hospital care. Traditional surgical approaches like Kocher-Langenbeck and Smith-Petersen have limitations. The Ganz controlled dislocation technique, introduced in the 1990s, allows full visualization of the femoral head with minimal risk to its blood supply, facilitating direct reduction and fixation. However, there is limited literature evaluating its outcomes in femoral head fractures.*
***Objective:** to detail current information related to Ganz controlled dislocation.*
***Methodology:** a total of 22 articles were analyzed in this review, including review and original articles, as well as cases and clinical trials, of which 12 bibliographies were used because the information collected was not sufficiently important to be included in this study. The sources of information were Cochrane, PubMed and Google Scholar; the terms used to search for information in Spanish, Portuguese and English were: femoral head fractures, hip dislocation, Ganz controlled dislocation, hip anatomy.*
***Results:** conventional surgical approaches have limited visualization and carry higher risks of complications. The Ganz controlled dislocation technique offers enhanced exposure of the femoral head while preserving its vital blood supply, significantly reducing the risk of osteonecrosis. This method allows precise reduction and stable fixation of fracture fragments, leading to improved functional outcomes and fewer complications when performed with meticulous anatomical and technical care.*
***Conclusions:** femoral head fractures are rare and complex injuries that require careful surgical management. The Ganz controlled dislocation technique provides improved visualization and preserves blood supply, reducing complications like osteonecrosis. Although evidence is limited, this approach offers better functional outcomes and fewer complications compared to traditional methods, representing a significant advancement in surgical treatment.*
KEYWORDS: *Dislocation, Ganz, Femur, Fracture.*

INTRODUCTION

Fractures of the femoral head are uncommon injuries, highly related to high intensity trauma, such as traffic accidents. About 95% of cases require hospital care, either because of the need for direct intervention of the fracture or because of concomitant injuries. Traditionally, the two routes of approach used for the reduction and stabilization of these fractures are the Kocher-Langenbeck posterior access and the Smith-Petersen anterior access(1-3).

In more recent times, the technique of controlled dislocation of the hip has been incorporated to address traumatic injuries of this joint. This approach was first described in the early 1990s by Reinhold Ganz in the context of surgical treatment of femoroacetabular impingement. This technique allows comprehensive visualization of the entire surface of the femoral head, with a very low risk of compromising its blood supply. Its benefits also include the ease of direct reduction of the bone fragments and their fixation using the appropriate implants. This surgical access is based on the osteotomy of the greater trochanter and controlled anterior dislocation of the femoral head. Currently, there are few studies in the medical literature that analyze the results and follow-up of this technique in femoral head fractures(1,4).

METHODOLOGY

A total of 22 articles were analyzed in this review, including review and original articles, as well as cases and clinical trials,

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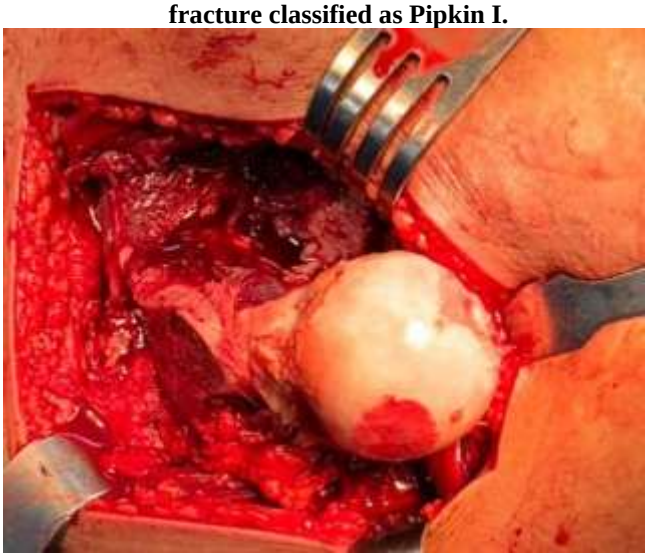
of which 12 bibliographies were used because the information collected was not sufficiently important to be included in this study. The sources of information were Cochrane, PubMed and Google Scholar; the terms used to search for information in Spanish, Portuguese and English were: femoral head fractures, hip dislocation, Ganz controlled dislocation, hip anatomy.

The choice of the bibliography exposes elements related to the controlled dislocation of Ganz in addition to this factor, description, anatomy, surgical technique, discussion and recommendations are presented.

DEVELOPMENT

Fracture of the femoral head is an uncommon injury that usually results from high-energy trauma, frequently associated with traumatic dislocations of the hip. Late diagnosis often leads to severe complications that may require arthroplasty. Due to its low incidence, there are few studies with small samples. The association between femoral head fracture and hip dislocation was first reported in 1869, and a specific classification for this type of fracture was developed in 1957. Although several surgical approaches have been used for its treatment, they have high complication rates and do not allow complete visualization of the femoral head. Surgical dislocation of the hip, described by Reinhold Ganz, improves access to the femoral head and preserves its blood supply, reducing the risk of osteonecrosis. A review of the anatomy of the hip joint is included to facilitate understanding of the technique proposed by Ganz(5).

Figure 1. Controlled Ganz dislocation due to femoral head fracture classified as Pipkin I.



Source: The Authors.

Anatomy

The hip joint is an enarthrosis whose stability depends on its bony structure, in addition to the restrictive ligaments and the congruence between the femoral head and the acetabulum. The acetabulum is formed by the union of the ischium, ilium and pubis in the triradiate cartilage. About 40% of the femoral head is covered by the acetabular bone. The labrum deepens the acetabulum and contributes to increased joint stability.

The hip joint capsule consists of thick longitudinal fibers, reinforced by more robust ligamentous thickening (the iliofemoral, pubofemoral and ischiofemoral ligaments), which are arranged in a spiral and limit hyperextension of the hip. The capsular ligaments of this joint play a fundamental role in functional mobility and joint stability.

The main supply to the femoral head comes from the medial and lateral femoral circumflex arteries, branches of the deep femoral artery. At the base of the femoral neck, an extracapsular vascular ring is formed that gives rise to ascending cervical branches, which cross the joint at the capsular insertions. These branches traverse the femoral neck and penetrate the bone just below the articular cartilage of the femoral head.

The artery of the round ligament, derived from the obturator artery, may supply the epiphyseal region of the femoral head. The sciatic nerve emerges from the pelvis through the greater sciatic notch. The relationship of the nerve to the piriformis muscle and the short external rotator muscles of the hip may vary, although generally the sciatic nerve exits the pelvis below the muscular belly of the piriformis(6).

Surgical dislocation of the hip has traditionally been considered a risky maneuver for the femoral head supply. The internal circumflex artery, a branch of the deep femoral artery, provides the major supply through the superior and inferior retinacular vessels, and could be compromised by this technique. Gautier et al. described the anatomy of this artery through cadaver dissections, demonstrating that the obturator externus muscle protects its deep branches during hip dislocation. Ganz developed a safe surgical dislocation technique that allows extensive visualization of the acetabulum, femoral head and femoral neck. This approach is gaining popularity for the treatment of different pathologies, such as labral injuries, osteochondroplasties, focal fractures of the femoral head or acetabulum, and joint debridements(7).

Figure 2. Ganz controlled dislocation due to femoral head fracture, showing the osteotomy and bone fragment removal.

Source: The Authors.

Surgical Technique

The patient is placed in lateral decubitus. After performing routine asepsis and antisepsis and preparing the lower limbs, a

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20 cm incision is made centered at the apex of the greater trochanter. The subcutaneous cellular tissue is dissected and the fascia lata is opened. Superficial muscle dissection is performed in the intermuscular plane between the tensor fascia latae and the anterior border of the gluteus maximus muscle. Internal rotation of the hip will expose the posterior border of the greater trochanter, the external rotator muscles and the posterior portion of the gluteus medius(1,8).

The osteotomy is delimited from the posterosuperior border of the greater trochanter to the edge of the vastus lateralis. The trochanteric osteotomy is performed along this line. The bony cut is made with an osteotome or electric saw, in a posterior to anterior direction. The thickness of the cut should be between 1 and 1.5 cm. The external rotator muscles are preserved and remain inserted in the greater trochanter during the procedure. The main branch of the medial femoral circumflex artery is distal to the obturator externus muscle, and it is essential to protect it throughout the procedure(1,8).

The osteotomized fragment is mobilized forward, releasing the gluteus medius remnant from the apex of the greater trochanter, and the superior border of the piriformis tendon is identified. The gluteus minimus is then dissected from the posterior capsule. The hip is progressively flexed and externally rotated to make the joint capsule visible. The capsule is incised from the acetabular rim. A Z-shaped capsulotomy is performed, with the flap directed toward the medial edge of the femoral neck. The incision begins at the anterior edge of the acetabulum and curves posteriorly along the acetabular rim, proximal to the labrum. At this point, the joint is exposed. The round ligament is cut and, using a combined external rotation and flexion maneuver, controlled dislocation of the hip is performed. A hook may be used to facilitate dislocation of the femoral head. Once dislocated, the femoral head is inspected through 360° and fragments remaining in the acetabulum are identified. In the acetabular region, possible rim impactions or labral lesions, which may be adjacent to the fracture edges, are detected. Displaced fragments are reduced manually or with the aid of bone forceps and provisionally fixed with steel wires, which can be used for the insertion of cannulated headless screws. Comminuted and intra-articular fragments are debrided. Avulsions of the labrum in the acetabulum are repaired(1,8).

The femoral head is repositioned in the acetabulum by internal rotation and hip extension. The joint capsule is repaired with vycril sutures. The greater trochanter is fixed with two 4.5 mm cortical screws. The fascia lata and subcutaneous cellular tissue are closed with resorbable sutures and the skin with non-resorbable sutures(1).

DISCUSSION

There is debate as to the most appropriate approach for the treatment of femoral head fractures. Surgical dislocation of the hip provides better visualization and facilitates identification of associated injuries such as labral tears. The most common surgical approaches include Kocher-Langenbeck (posterior), Watson-Jones (anterolateral), Smith-Petersen (anterior), and Ludloff (medial). Mostafa et al. reported that surgical dislocation with trochanteric osteotomy is associated with less blood loss and shorter surgical duration compared to the posterior approach, as well as a lower rate of osteonecrosis. However, this technique may present complications such as pseudarthrosis and trochanteric bursitis. Due to the low incidence of this injury, there are few studies on the use of surgical dislocation in traumatic fractures of the femoral head. Different types of screws are used for fixation of these fractures; cannulated screws provide greater compression than Herbert screws. This compression is essential to promote bone healing and prevent fragment displacement(5,9,10).

Femoral head fractures, commonly originating from high-energy trauma, are usually managed surgically. The Ganz technique is distinguished by providing comprehensive visualization of the femoral head, reducing the risk of vascular damage, and showing good functional results. Although the number of patients studied is limited, the evidence supports the Ganz approach as an effective option over conventional approaches(11).

Figure 3. Immediate postoperative fluoroscopy after bone fragment removal and osteosynthesis in controlled Ganz dislocation.

Source: The Authors.

Recommendations

Gibson's interval can be used to preserve the gluteus maximus, between the gluteus maximus (posterior) and the tensor fascia lata (anterior).

Locate all posterior structures, starting proximally from the posterior border of the gluteus medius and extending to the piriformis, triceps coxae, quadratus femoris and vastus lateralis.

When performing the osteotomy, ensure a thickness between 1 and 1.5 cm; an osteotomy that is too thick or too thin may detract from the results. The osteotomy should begin just anterior to the posterior fibers of the gluteus medius, ensuring that it is anterior to the piriformis tendon. It should extend distally beyond the origin of the vastus lateralis.

Carefully elevate the posterior margin of the gluteus minimus from the capsule to avoid creating an anchoring effect during anterior translation of the osteotomized fragment.

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Capsular tears during initial dislocation are common and should be integrated into the anterior capsulotomy.

Repair of significant posterosuperior labral tears can optimize outcomes. Fracture fixation can be performed with minifragment screws or headless screws. Small fragments not amenable to fixation can be excised.

The osteotomy should be reduced and firmly fixed to avoid trochanteric pseudarthrosis and to preserve abductor function(12).

CONCLUSIONS

Femoral head fractures are uncommon but complex injuries, usually resulting from high-energy trauma that require careful surgical management. The Ganz controlled dislocation technique is presented as an advanced option that allows comprehensive visualization of the femoral head and a safe approach, preserving the critical vascular supply and reducing the risk of complications such as osteonecrosis. Although the available evidence is limited due to the low frequency of these lesions, existing studies indicate that this approach offers better functional results and less morbidity compared to conventional techniques. The precise application of this technique, based on a thorough anatomical knowledge and specific surgical recommendations, is key to achieve adequate reduction, stable fixation and preservation of joint function. Finally, Ganz controlled dislocation represents a significant advance in the surgical treatment of femoral head fractures, optimizing the prognosis for patients affected by this complex injury.

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Conflict of Interest Statement

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