

# Should trochanteric osteotomy be always avoided during safe hip dislocation?

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In a recent article published in the *Journal of Bone and Joint Surgery*, Sculco and colleagues report on a new potentially useful approach for surgical hip dislocation (1). “Safe” surgical dislocation has been proposed by Prof. Ganz (2) as a technique to expose the full acetabulum and to treat pathologies like femoroacetabular impingement. In the last decade, the indications for this technique have become wider and, at present, selected cases (Pipkin and acetabular fractures) (3,4), Perthes’ disease and Slipped capital femoral epiphysis (SCFE) (5) are commonly treated via surgical dislocation.

Standard surgical hip dislocation has been previously described by Siebenrock *et al.* (6) and consists in trigastric trochanteric flip osteotomy maintaining the insertion of the gluteus medius, vastus lateralis and the long tendon of the gluteus minimus muscle. Only the superior border of the piriformis tendon is dissected, in order to show the interval between the piriformis and the gluteus minimus. This area is safe regarding vessel risk, avoiding damage to the main branch of the arteria circumflexa femoris medialis (MFCA), which is the most important source for the blood supply to the femoral head. The whole flap is retracted and slid antero-superiorly to expose the capsule. The leg can be dislocated after an anterior capsulotomy avoiding damage to MFCA, which runs posterior to the lesser trochanter. This technique allows a complete view of the femoral head and the acetabulum respecting the integrity of most of the external rotator muscles. Prof. Ganz’s team (7,8) reported how, all the external rotator muscles kept intact help to avoid iatrogenic avascular necrosis of the femoral head, demonstrating that the deep branch of the medial femoral circumflex artery runs and is protected from being stretched during dislocation by the obturator externus tendon (2).

During this procedure is possible to prove the head vitality with “the bleeding sign” (9): the observation of blood spilling out from a drill hole in the femoral head.

In his article (1), Sculco proposed variation of surgical hip dislocation with transection of external rotator muscles, avoiding trochanteric flip osteotomy. In this approach, the quadratus femoris is tenotomized at 2.5 cm medial to the posterior border its insertion on the greater trochanter. The piriformis tendon too is released off its greater trochanter insertion; conjoined tendon and obturator externus are tenotomized perpendicular to the muscle fibers from posterior to anterior at 2.5 cm off trochanteric insertion. The preservation of femoral head and head-neck junction perfusion was demonstrated either with quantitative and qualitative magnetic resonance imaging (MRI) analysis after gadolinium injection, either with gross dissection after polyurethane compound injection.

The technique proposed by Sculco is interesting and, since malunion and nonunion of the trochanteric osteotomy have been reported (10,11), avoiding this step of the technique may eliminate those complications. In our opinion, not all the indications for surgical dislocation may benefit from this variation: nonunion and malunion of the greater trochanter so far have not been reported in SCFE cases; for this reason we think that avoiding this complication in those patients presents poor significance. Furthermore, the proposed variation of the technique has an important invasivity to tendons and muscles that should be avoided in young patients as the SCFE patients are.

In trauma patients, the surgical dislocation technique a 360° view of the acetabulum and full view of the femoral head and may be helpful to ease an anatomic reduction in selected fracture patterns (4). Classic technique allows an

optimal view of the articular surface of the acetabulum, however the modified approach may have some benefits in those patients: it may simplify the access to the ischium and posterior column and, as previously said, it avoids the risk of trochanteric malunion or nonunion. On the other hand, some risks are present. First, as mentioned above, it may increase the rate of heterotopic ossification (12) increasing the volume of damaged muscles. Secondly, it may not be easy to perform: a perfect muscles dissection may not be possible since the trauma and the subsequent hematoma may have altered the anatomic landmarks (i.e., in fracture associated with posterior dislocation of the femoral head). Furthermore the operative time is longer in trauma patients (3,4) and the effects of prolonged operative time on a stretched vessel are unknown. In fact MRI and gross dissection can prove only the vessel integrity but do not quantify the vessels vasospasm and a longer procedure may increase this risk leading to higher rate of necrosis. Finally, in this kind of fractures, the anatomic relationships are modified and a relevant traction on the vessels is possible during the reduction steps. Gautier (7) emphasized how the obturator externus protects MFCA from over-distraction during dislocation. In this modified surgical technique the obturator externus tendon is released in a safe zone 2.5 cm off the greater trochanter, without osteotomy. Hence, the MFCA stays and rotates with femur during dislocation, increasing the risk of over-distraction and subsequent damages. Therefore caution should be used during the surgical steps because the obturator externus does not act as a stopper to vessels stretching and this may create vessels damage and increase the necrosis rate.

In femoro-acetabular impingement patients, the proposed variation may presents advantages, avoiding the risk of malunion reported as high as 1% to 2% (10). On the other hand, the mentioned risks (vessels stretching, damage to external rotators muscles and the potential increase of heterotopic ossifications) should be balanced with this benefit.

We agree with the authors about the potential benefits of this variation used in hip resurfacing procedure and in hip arthroplasty with neck preserving stems. The respect of the neck vascularization is essential to reduce potential catastrophic failure. Steffen *et al.* described how in those femoral neck fractures, about one-third shows osteonecrosis on histological analysis (13). According to these results, procedures, that preserve femoral neck blood supply, may be able to decrease the risk of osteonecrosis and the subsequent failure from femoral neck fracture (14,15).

The suggested vessel-sparing modifications present several benefits: they can be performed with no risk of trochanteric nonunion, standard surgical setup, exposure, and do not require dedicated instrumentation, as postero-lateral approach is used for hip resurfacing or hip arthroplasty with neck preserving stems.

Before intramuscular transection can be considered as a convincing alternative to standard surgical dislocation, *in vivo* data and clinical researches on osteonecrosis rate are needed. Furthermore the advantages of this technique modification should be balanced with the risks and, according to our point of view not all the indications for classic technique, may benefit from this variations.

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