Vascular Anatomy of the Medial Femoral Neck and Implications for Surface Plate Fixation: Preliminary Results

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Purpose: Vertical femoral neck fractures are frequently the result of high-energy trauma and often occur in young adults. Urgent reduction and internal fixation is recommended for these fractures, yet optimal fixation has not been defined and complications are frequent. The vertical orientation of these fractures is ideal for fixation with buttress plating along the medial neck, yet the medial blood supply to the femoral head via the inferior retinacular artery (IRA) must be preserved to minimize morbidity. This study aimed to describe the course of the IRA as encountered from an anterior approach to the hip and define the intra-articular position of the IRA relative to the medial femoral neck.

Methods: Eight hips of four fresh cadavers (three males and one female) were studied. Cadavers ranged in age from 73 to 90 years. The common femoral arteries of fresh cadavers were injected with India ink and blue latex. The hips were dissected via an anterior (Smith-Peterson) approach. The origination of the IRA from the medial femoral circumflex artery (MFCA) was identified, and its extra-articular course was carefully dissected. The intra-articular course of the IRA was followed along the medial femoral neck and was referenced using a clock-face system, where 12:00 is superior/lateral, 3:00 is anterior, 6:00 is inferior/medial (the expected position of the plate), and 9:00 is posterior.

Results: In all hips, the IRA originated from the MFCA. In all but one hip, the IRA was a single intra-articular vessel that traveled within Weitbrecht's ligament, a mobile fold of retinacular tissue along the medial femoral neck. In one hip, the IRA divided intra-articularly into two vessels traveling within Weitbrecht's ligament. The intra-articular position of the IRA was 7:00 in four hips, 7:30 in three hips, and 8:00 in one hip (Fig. 1). In all hips, the IRA was 30 minutes anterior to the lesser trochanter. The average intra-articular length of the IRA was 19 mm (range, 11-23), and the average extra-articular length of the IRA was 21 mm (range, 19-23).

Conclusion: Current methods of fixation for vertical femoral neck fractures have high rates of complications and unsatisfactory outcomes. A buttress plate along the medial femoral neck may enhance the stability of current fixation methods by better resisting the shear forces inherent in vertical fracture patterns. Our results demonstrate the intra-articular course of the IRA along the femoral neck would be posterior to the location of a medial buttress plate at the 6:00 position. As such, a medial buttress plate is not only potentially biomechanically advantageous in vertical femoral neck fractures, but is also a safe method of fixation that does not risk the contribution of the IRA to the blood supply of the femoral head.

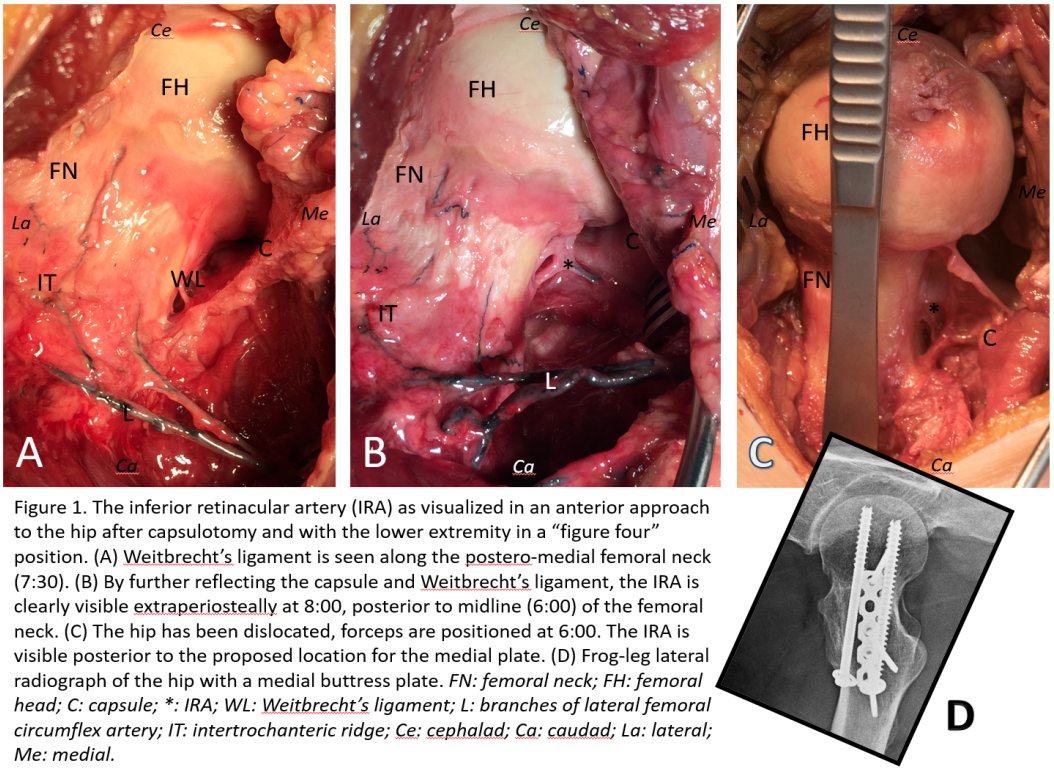

Figure 1. The inferior retinacular artery (IRA) as visualized in an anterior approach to the hip after capsulotomy and with the lower extremity in a "figure four" position. (A) Weitbrecht's ligament is seen along the postero-medial femoral neck (7:30). (B) By further reflecting the capsule and Weitbrecht's ligament, the IRA is clearly visible extraperiosteally at 8:00, posterior to midline (6:00) of the femoral neck. (C) The hip has been dislocated, forceps are positioned at 6:00. The IRA is visible posterior to the proposed location for the medial plate. (D) Frog-leg lateral radiograph of the hip with a medial buttress plate. *FN: femoral neck; FH: femoral head; C: capsule; *: IRA; WL: Weitbrecht's ligament; L: branches of lateral femoral circumflex artery; IT: intertrochanteric ridge; Ce: cephalad; Ca: caudad; La: lateral; Me: medial.*

See pages 49 - 106 for financial disclosure information.