Letter to the Editor

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Letter: Wind-shield wiper effect of the ligamentum teres femoris: is it for real?

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Dear Editor,

Through this letter, we try to clarify the long-contested function of the ligament of the ligamentum teres femoris (LTF); or the ligament of the head of femur (LHF), as it is known by anatomists. The LTF is an intra-articular ligament of the hip joint.[1] In adults, there is evidence that the ligament has a vascular and mechanical function at the hip joint.[2-4] It is often mentioned that the LTF aids joint lubrication by spreading synovial fluid over the head of femur.[5-10] These works refer back to Gray and Villar,[11] who are said to have hypothesized a 'wind-shield wiper' action of the ligament that helped joint lubrication. However, this original reference[11] does not mention any specific wiper action in its text, and the concept remains theoretical. Reviewing the literature on the LTF anatomy, and from our previous dissection findings, we propose that the anatomical features of the LTF in situ limit its intra-articular mechanics, and that it might not contribute to a wind-shield wiper action.[12]

The only mention of the lubrication functions of the LTF identified in the historical literature is by Cheselden[13] and Welcker.[14] It is stated that the LTF could press the synovial tissue at the bottom of the acetabular fossa[13] and that the LTF could provide a 'brushing action' to distribute the synovial fluid.[14] An absence of this brushing mechanism could render the articular surfaces dry during walking due to inadequate flow of synovial fluid.[14] However, from our current understanding of the LTF anatomy, this brushing action appears to be limited for the following reasons: the LTF always stays within the acetabular fossa and does not have contact with the weight bearing surfaces of the hip joint during any range of movement. This anatomical arrangement aids the ligament and the indwelling vessels to be protected throughout the joint range of motion.

Our previous dissections have shown that the mean length of the LTF is 22.3±4 mm and does not exceed the dimensions of the acetabular fossa (26.1±7×33.9±7 mm).[12] The shorter length, and its fixed proximal attachments at the inferior aspect of the fossa restricts the ligament from exiting the acetabular fossa during any movement; the LTF could travel over the head of femur but only a little more than a quarter of its surface area.[14,15] This extent of the LTF's travel over the head of femur could be visualised by exposing the medial aspect of the acetabulum and applying a contrast such as Indian ink around the ligament (**Figure 1**).

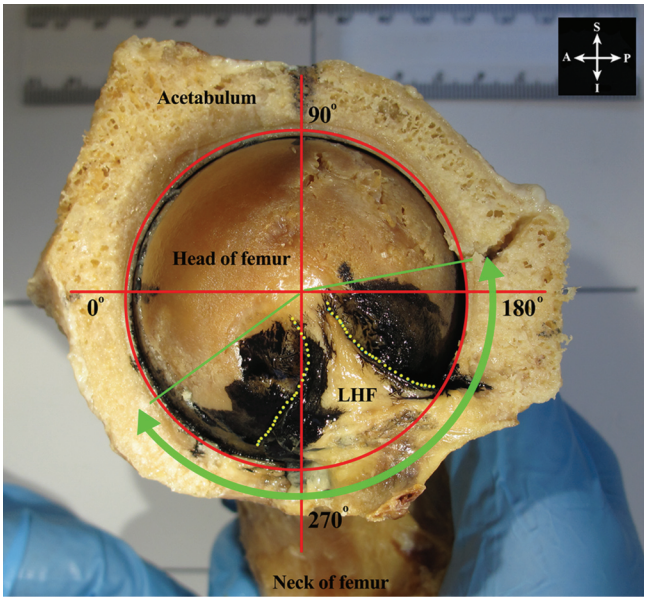

Figure 1. Left hip joint opened from the medial aspect showing the ligament of head of femur (**LHF**) in situ (dotted outline). Indian ink was injected around the ligament and the joint was moved in its full range in all orthogonal planes. The extent of Indian ink distribution on the head of femur is marked in green.

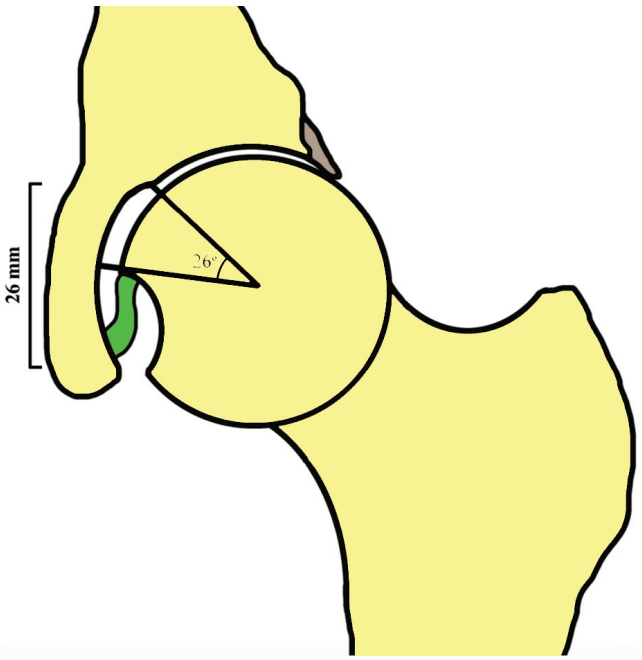

Figure 2. Schematic representation of the hip joint showing the relative positions of the acetabular margins, fovea capitis and the ligamentum teres femoris (ligament of head of femur). The ligament (**green**) is slack in neutral hip position.

Our hypothesis also draws further evidence from clinical studies. Radiological investigations of the hip joint show that in neutral position, there is a distance of up to 26° from the superior foveal margin to the central acetabular margin.[16–18] (**Figure 2**). Even during full adduction, where the ligament might potentially tense,[12] the fovea capitis resides within the acetabular fossa.[15] Thus, the LTF could not reach the superior weight bearing surface of the hip where the need for joint lubrication would be higher. Any inadvertent contact to the articular surface would either immediately injure the ligament or compress the blood vessels traveling through it.[2,19,20]

These observations suggest that the LTF at no point could contact the articular cartilage surface of the hip joint, could not travel throughout the articular surfaces, and it is evident that the LTF could not perform a brushing or 'wind-shield wiper' action to aid joint lubrication. While our works did not explore the effect of negative pressure and potential capillary action of the synovial fluid within the hip joint in situ, any contribution from these factors would still fail to justify the brushing action of the LTF.

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