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The Link between the Structure and Function of the Infrapatellar Plica and Anterior Knee Pain

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INTRODUCTION: Wachtler[3] in 1979 described the histology of the IPP and discussed its function. Beyond the histology, he injected the fat pad (FP) and noted from his observations that "…from a mechanical and teleological point of view, the IPP may have little relevance…" By contrast, anterior knee pain has been relieved by resection of the infrapatellar plica (IPP)[1,2]. The question is: How? The hypothesis is: that the IPP acts as an intra-articular ligament, a mechanical link between the motors of knee motion, the fat pad (FP) and the distal femur, holding the FP captive through the arc of motion. Release of the IPP severs this link, allowing the highly innervated FP to move freely. This study reports on replication of Wachtler's study with the addition of in-vivo verification. The remarkable videos are at variance with Wachtler's opinion and suggest a distinct mechanical role for this structure.
OBJECTIVES: In cadaver knees to inject the FP and IPP with radiographic contrast, and observe passive motion through lateral fluorscopy.
In awake volunteers undergoing arthroscopy, to repeat the experiment with active motion and a quads set manouevre.
METHODS:
Cadaver studies: In 2 embalmed cadaver knees arthroscopy was performed to verify normal anatomy and the presence of an IPP. Direct arthroscopic visualization was used to control implantation of contrast material in the FP and IPP. The knee was taken through the arc of motion and recorded through lateral fluoroscopy. The femoral attachment of the IPP was then released and knee motion repeated and recorded.
In-Vivo Study: In an IRB approved study of 12 volunteers undergoing planned knee arthroscopy under local anesthesia, contrast was placed in the FP and IPP under lateral fluoroscopic control. Passive, then active motion then a quads-set manoeuvre was performed. The IPP was resected and knee motion again recorded.
RESULTS: Videos from the cadaver studies demonstrated that the IPP elongated with FP distortion as the knee approached full extension and flexion, and that the IPP was lax through mid arc. Release of the IPP at the femur eliminated almost all of the distortion through the full arc.
Success was achieved in only 4 patients in the In-Vivo Study. However, the videos replicated the cadaver observations for passive and, for the first time in living patients, active motion. The quads set manoeuvre caused further distortion of the FP with the patella moving one cm proximally. Release of the IPP eliminated FP distortion.
CONCLUSION: Knee motion was recording by lateral fluoroscopy in 2 cadaver, and 4 in-vivo knees. The videos showed in all instances stretch and deformation of the FP and IPP as the knees approached full extension and flexion. This unexpected non-isometric mechanical behaviour of the IPP shows that by virtue of is central attachment it holds the FP captive against the femur. Release of the IPP eliminates the mechanical effect of the IPP on the FP. Pain relief can be through denervation, or through release of the innervated central body of the FP.

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