Title: Can We Palpate the Psoas Major Muscle? Analysis of Manual and Tool-Assisted Palpation Using MR Imaging; a Pilot Study

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Abstract:

Background

The psoas major (PM) muscle is a key stabilizer of the lumbopelvic region and is frequently implicated in low back pain (LBP) [1]. The unique position of its myofascial fibers in relation to the lumbar spine may result in increased stress to these tissues when other lumbar stabilizers undergo atrophy and fatty infiltration, as commonly observed in persons with chronic low back pain [2]. However, due to its anatomical position deep to abdominal structures, the feasibility of palpating or treating the PM manually or with assistive tools remains a topic of debate. This study investigates the ability to approximate the psoas major using self-palpation versus a PSO-RITE tool, analyzing the depth of approximation and the potential influence of body composition on those techniques. The null hypothesis is that manual therapy approaches will not approximate the PM or change its shape based on MRI.

Methods

Two asymptomatic activity- and age-matched participants, screened for any previous lumbar injury or structural deformities, participated in the study: one 32 year-old female with BMI=19 and one 30 year-old female with BMI=29. For each participant, 3 Tesla MRI was used to visualize anatomical structures during manual palpation in supine position and tool intervention in prone position. Participants were assisted by the investigator on the location for palpation or tool placement, targeting the level of the L4/5 interspace. Images were analyzed using Horus imaging software, tracking the magnitude of effects as the distance from the skin surface to the anterior ridge of the PM myofascia.

Results

T1 weighted images from participants can be found in Fig 1 and 2, with each intervention measuring self-palpation achieving a maximal tissue displacement depth of 8.2mm to the PM in the subject with a BMI of 19 and 10.9 mm in the subject with a BMI of 29, while the PSO-RITE tool achieved a maximum approximation of 7.2mm and 9.0mm respectively.

Conclusion

This is the first study to image the PM during self-palpation and when using a tool. Our preliminary work challenges the assumption that abdominal muscle, viscera, and adipose tissue significantly hinder psoas palpation, and suggests that individuals across different body compositions may still effectively achieve approximation to the muscle. Contrary to our null hypothesis, the approximation of both the self-palpation and tool was within millimeters of the PM and resulted in substantial changes in the shape of the PM. The PSO-RITE tool may offer additional benefits in reaching deeper tissues, potentially improving therapeutic outcomes for LBP. Further research with larger sample sizes and a controlled intervention protocol is needed to validate these findings and explore the long-term impact of targeted psoas palpation on musculoskeletal pain. Future studies should focus on applying protocols to those with specific lumbar pathology to further understand the effects of manual palpation on myofascial structures.

Figure 1. Axial T1

A. Low BMI Self

Distance to PM = 8.2mm

B. High BMI Self

Distance to PM = 10.9mm

C. Low BMI PSO-RITE

Distance to PM = 7.2mm

D. High BMI PSO-RITE

Distance to PM = 9.0mm

PM= psoas major

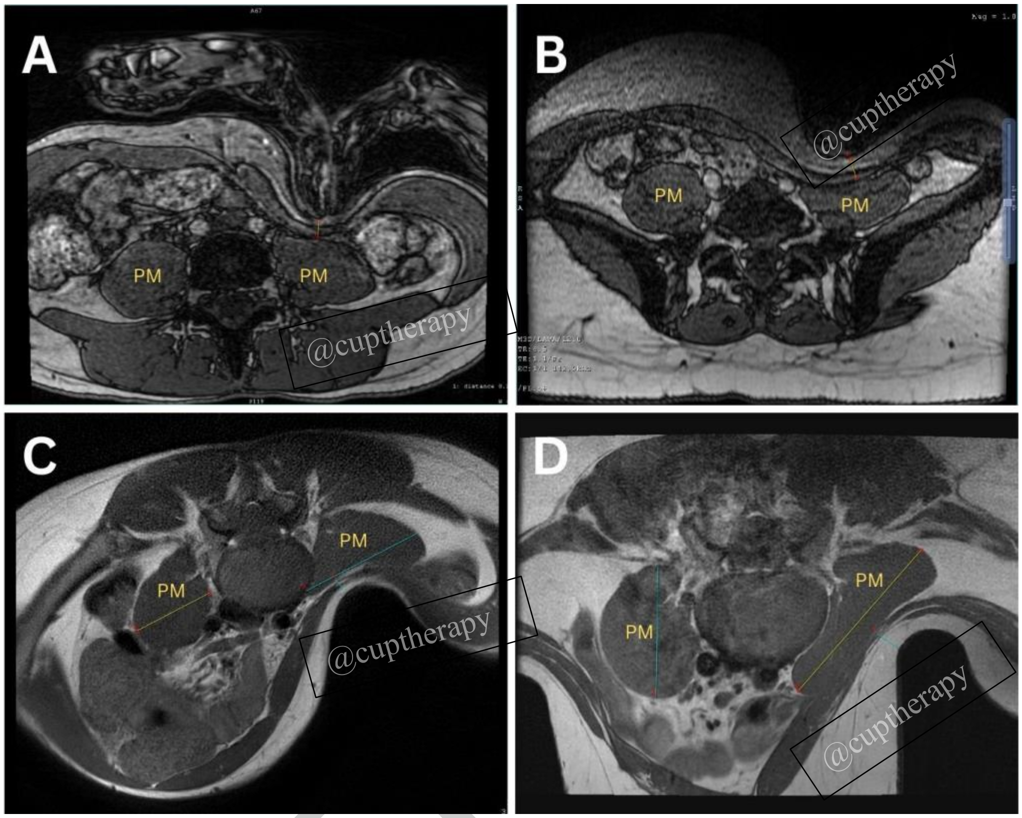

Figure 2. Sagittal T1 PSO-RITE tool

A. Low BMI. Distance to PM = 7.2mm

B. High BMI. Distance to PM = 11.1mm

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Fig 1. Axial T1 weighted, manual palpation, higher BMI. Distance to PM = 10.9mm

Fig 2. Axial T1 weighted, manual palpation, low BMI. Distance to PM = 8.2mm

Fig 3. Axial T1 weighted, Psorite tool, higher BMI. Distance to PM = 9.0mm

Fig 4. Axial T1 weighted, Psorite tool, low BMI. Distance to PM = 7.2mm

Fig 5. Sagittal T1 weighted, Psorite tool, higher BMI. Distance to PM = 11.2mm

Fig 6. Sagittal T1 weighted, Psorite tool, low BMI. Distance to PM = 7.1mm