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Approach towards psoas syndrome risk modeling in preoperative planning for THA

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Abstract

Psoas syndrome after THA has received much attention in recent years. In some cases, the cause of pain cannot be found in a critical overhang of the implant cup, but is mainly unknown. We developed an approximation of modeling the medial part of the tendon of m. iliacus in 201 THA patients. We found length changes of the tendon of 7,73 mm ± 8,55 mm (range: -26,37 mm to 30,30 mm) and angular changes at the PSIS of 2,58 ° ± 1,72 ° (range: 0 to 7,91 °) and at the lesser trochanter of 10,53 ° ± 7,70 ° (range: 0,27 ° to 41,19 °). Furthermore, we identified 19 cases in whom the tendon wrapped over different bony structures than the acetabular region.

Hence, we think that the m. iliacus tendon should be considered for analysis of risk factors in the preoperative planning process for THA.

1 Introduction

Iliopsoas impingement (IPI) is in about 4 % of patients a cause of pain after THA [1]. In most cases anterior overhang of the acetabular component is the cause of irritation of the iliopsoas tendon [2]. Integration of anterior overhang in the preoperative planning process has already been published [3]. Nevertheless, there are THA patients showing a psoas syndrome without critical overhang of the cup [4,5,6]. Therefore, adequate modeling of the psoas tendon is a reasonable aspect in preoperative planning.

2 Material & Methods

An existing database with pre- and postoperative CT imaging of 201 Japanese patients that underwent primary THA was used. Pelvic and femoral bones were segmented and landmarks were detected as described by Fischer et al. [7]. The medial and superior part of the tendon of m. iliacus was chosen for modelling. The tendon was modeled with a width of 8mm in coronal plane [8], going from PSIS to the lesser trochanter. In sagittal plane, wrapping was modeled with up to 7 wrapping points (WP7) (**Figure 1-A)**.

20 cases were excluded via visual inspection due to missing landmarks or artefacts in the mesh that lead to wrong determination of at least one wrapping point.

The tendon length change from preoperative to postoperative situation was measured as well as the angular change at the PSIS and the lesser trochanter. Additionally, cases in whom the tendon path not only wraps over the acetabular region, but over the femoral head/neck or the superior pubic ramus were identified.

3 Results

The change of tendon length between preoperative and postoperative situation was 7,73 mm ± 8,55 mm (range: -26,37 mm to 30,30 mm). The postoperative tendon was more than 5 % (10%) longer than the preoperative tendon in 64 (12) cases and more than 5 % (10%) shorter in 3 (1) cases.

The angular path change at the PSIS was 2,58 ° ± 1,72 ° (range: 0 to 7,91 °), at the lesser trochanter the angular path changed by 10,53 ° ± 7,70 ° (range: 0,27 ° to 41,19 °). In 13 cases, the tendon wrapped not only over the acetabulum area but over the superior pubic ramus (**Figure 1-B**), in 6 cases the tendon wrapped over the femur head/neck (**Figure 1-C**).

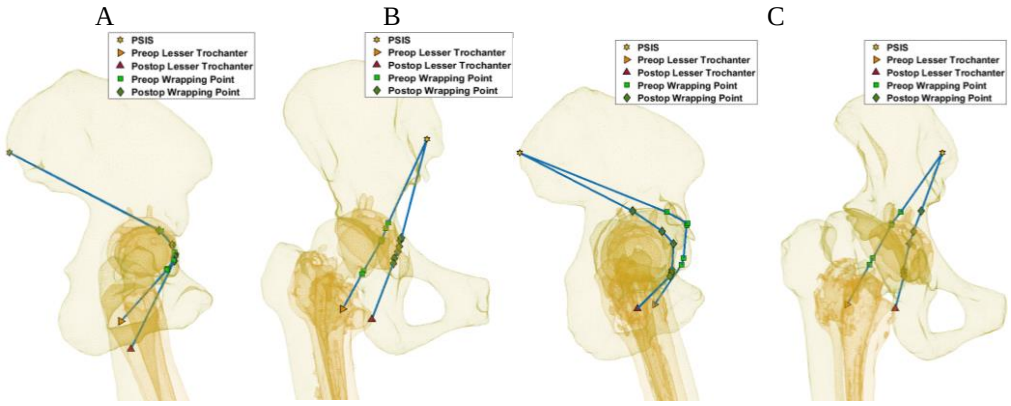

Figure 1: (A) Sagittal View of WP7; **(B)** Coronal view of a case that shows postoperative tendon wrapping over superior pubic ramus; **(C)** Sagittal and coronal view of a case that shows preoperative tendon wrapping over femur head/neck.

4 Discussion / Outlook

Earlier studies [9] analysed the behaviour of the psoas tendon in the acetabular region, but did not include other areas. As psoas syndrome occurs also in people that have not even received THA [10,11], there is need of identifying critical elements beyond cup overhang.

As the reason for psoas syndrome in cases without critical anterior overhang is only detected in singular cases, our approximation might be a first step into identifying critical tendon path behaviour. The high variety in length changes, angular changes and unphysiological tendon path underline the importance of psoas tendon modelling. Further research is needed whether critical values for length change or angular path change exist in terms of irritation of the psoas tendon.

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