An MRI study of the meniscofemoral and transverse ligaments of the knee

Received: 11 July 2001 / Accepted: 29 December 2001 / Published online: 8 June 2002 © Springer-Verlag 2002

Abstract Our aim was to assess the anatomic localization, dimensions and incidence of the transverse and meniscofemoral ligaments, which can show anatomic variations or be mistaken for some pathologic conditions. In 100 healthy subjects (52 female, 48 male) whose ages ranged from 12 to 84 years, sagittal and coronal magnetic resonance images of the knee were obtained. There was at least one anterior or posterior meniscofemoral ligament in 82 cases. The anterior meniscofemoral ligament was present in 8 of the female and 4 of the male subjects. The posterior meniscofemoral ligament was found in 20 female and 22 male subjects. Both the anterior and posterior meniscofemoral ligaments were present in 15 female and 13 male subjects. The transverse ligament of knee was encountered in 19 female and 12 male subjects. In the females, average lengths of the anterior and posterior meniscofemoral ligaments were 9.87 ± 4.79 mm and 25.60 ± 5.50 mm, respectively. The corresponding values in the males were 11.11 ± 2.57 mm and 28.80 ± 5.49 mm, respectively. In the females, average width of the anterior and posterior meniscofemoral ligaments were 2.45 ± 1.02 mm and 2.30 ± 1.15 mm, respectively. The corresponding values in the males were 2.52 ± 0.87 mm and 2.30 ± 1.15 mm, respectively. On MRI assessment, in order to differentiate intra-articular lesions such as osteochondral fragments or pseudotear of the lateral meniscus from the normal ligamentous anatomy of knee, the orientation and characteristic localization of the meniscofemoral ligaments should be taken into account. The French version of this article is available in the form of electronic supplementary material and can be obtained by using the Springer LINK server located at http://dx.doi.org/10.1007/s00276-002-0023-8.

Etude en IRM des ligaments ménisco-fémoraux et du ligament transverse du genou

Résumé Notre objectif était de préciser la situation anatomique, les dimensions et la présence des ligaments transverse du genou et ménisco-fémoraux. Ceux-ci peuvent présenter des variations anatomiques ou être confondus avec une lésion. Les genoux de 100 sujets sains (52 femmes, 48 hommes), âgés de 12 à 84 ans, ont été étudiés en imagerie par résonance magnétique (IRM) par coupes sagittales et coronales. Un ligament ménisco-fémoral antérieur ou postérieur au moins était présent dans 82 cas. Le ligament ménisco-fémoral antérieur était présent chez 8 hommes et 4 femmes. Le ligament ménisco-fémoral postérieur était observé chez 20 femmes et 22 hommes. Les deux ligaments étaient présents chez 15 femmes et 13 hommes. Le ligament transverse du genou a été observé chez 19 femmes et 12 hommes. Chez la femme, la longueur moyenne des ligaments ménisco-fémoraux antérieur et postérieur était respectivement de 9.87 ± 4.79 mm et 25.6 ± 5.5 mm. Les dimensions chez l'homme étaient respectivement de 11.11 ± 2.57 mm et 28.8 ± 5.49 mm. Chez la femme, la longueur des ligaments ménisco-fémoraux antérieur et postérieur était de 2.45 ± 1.02 mm et 2.3 ± 1.15 mm. Les dimensions retrouvées chez l'homme étaient de 2.52 ± 0.87 mm et 2.3 ± 1.15 mm. En IRM du genou, il est important de connaître l'orientation, la localisation des ligaments ménisco-fémoraux, afin de ne pas confondre l'aspect de l'anatomie ligamentaire normale du genou avec celui des lésions intra-articulaires, tels des fragments ostéochondraux ou méniscaux, ou des pseudo-ruptures du ménisque latéral.
Keywords  Meniscofemoral ligament · Transverse ligament of knee · MRI · Knee

Introduction

The meniscofemoral lig. of the knee have both functional and clinical importance. This strong fascicle arises from the lateral meniscus, close to its posterior attachment, and passes proximally and medially to insert onto the medial condyle of the femur [1, 11, 13]. The normal anatomy of the meniscofemoral lig. varies greatly. The ligament may consist of one or two branches. The more constant branch is known as the ligament of Wrisberg or posterior meniscofemoral lig. [11, 12]. The posterior meniscofemoral lig. is a small and ovoid low-signal focus on MR images immediately posterior to the posterior cruciate lig. on sagittal images [4, 11, 12]. The anterior branch of the meniscofemoral lig., known as the ligament of Humphrey, originates from the posterior aspect of the lateral meniscus, and extends obliquely and medially, anterior to the posterior cruciate lig., to insert onto the medial femoral condyle [3, 11, 12]. Understanding of the characteristic location and orientation of the meniscofemoral lig. on MR images may help to distinguish them from a true meniscal tear and rupture of the posterior cruciate lig.

The transverse lig. of the knee lies anterior to the joint capsule of the knee and posterior to the patellar fat pad, and connects the anterior convex margin of the lateral meniscus to the anterior aspect of the medial meniscus [6, 11]. It may be absent or mistaken for an oblique tear within the anterior horn of the lateral meniscus [6, 11, 12].

In this study, the aim was to evaluate the anatomic localization, dimensions and incidence of the meniscofemoral and transverse ligg. on MR images.

Material and methods

Sagittal and coronal MR images of the knee were obtained in 100 healthy subjects (52 female, 48 male) whose ages ranged from 12 to 84 years (mean 48 years). It is possible that persons who do not have any complaint or clinical evidence of knee disorder can nevertheless have anterior and posterior cruciate ligg. or meniscal pathologies. Therefore, the subjects in this study were considered healthy as far as their complaints and clinical findings were concerned with regard to knee pathology.

The sections were obtained in the appropriate plane and with the correct angulation in order to assess the meniscofemoral ligg. in the subjects, who did not have any pathology in the menisci and ligaments, joint spaces and synovium on MR assessment. In the sagittal sections, anterior and posterior meniscofemoral ligg. were detected in the form of a pseudotear below the angulation of the posterior meniscofemoral lig. and near the posterior horn of the lateral meniscus, respectively. Successive oblique and thin sections were obtained in the coronal plane. The anterior and posterior meniscofemoral ligg. were measured in these coronal sections after complete and adequate visualization. Although the anterior meniscofemoral lig. can be shown in the sagittal plane, this plane is not adequate to visualize the ligament as a whole in studies where measurements are to be taken. In other words, although the width of the ligament can be measured on the sagittal sections, its length cannot be measured precisely. Unless appropriate sagittal sections are obtained, the anterior meniscofemoral lig. cannot be visualized due to the superimposed anterior cruciate lig. and posterior cruciate lig. Even the anterior cruciate lig. cannot be visualized unless adequate sagittal sections are obtained. Because of these limitations, the anterior meniscofemoral lig. was visualized in the sagittal sections while the measurements were performed on coronal sections. The posterior meniscofemoral lig. can be visualized properly in the coronal plane. The origin and insertion points of the posterior meniscofemoral lig. can be seen readily with fine MR sections obtained at adequate angulation.

The measurements of the ligament dimensions were based on the following criteria: Sagittal images were used to visualize the anterior and posterior portions of meniscofemoral lig. in the coronal plane. In the sagittal sections, meniscofemoral ligg. were seen with low signal intensity. After determining the ones that did not show increased signal intensity, fine images parallel to these ligaments were obtained in the oblique coronal plane. The ligament measurements were performed on the coronal images in which proper visualization was achieved. The anterior portion of meniscofemoral lig. could not be visualized completely in the sections obtained in the coronal plane. Therefore, the sections in which the ligament was visualized in its maximum length were used for the measurements. A thorough measurement was performed in the sections that were obtained after visualizing the origin and insertion points of the posterior meniscofemoral lig.

For the MRI examination (Siemens Magnetom impact model), the knee was placed in neutral position in an extremity coil. The coronal and sagittal images were obtained using conventional spin-echo techniques (TR: 600 ms, TE: 15 ms, NEX: 1, matrix: 256x256, 4 mm thick slices with 1 mm gap) while the knee was resting naturally with 10° to 15° of external rotation.

Results

The incidences of meniscofemoral and transverse ligg. are shown in Table 1. There was at least one anterior or one posterior meniscofemoral lig. in 82 (82%) subjects. The anterior meniscofemoral lig. was present in 8 (8%) female and 4 (4%) male subjects. The posterior meniscofemoral lig. was found in 20 (20%) female and 22 (22%) male subjects. Both the anterior and posterior meniscofemoral ligg. were found in 15 (15%) female and 13 (13%) male subjects (Fig. 1). The transverse lig. was seen in 19 (19%) female and 12 (12%) male subjects (Fig. 2). The dimensions of the meniscofemoral lig. are shown in Table 2. The posterior meniscofemoral lig. was larger than the anterior meniscofemoral lig. in both sexes.

Discussion

According to Hassine et al. [4], the meniscofemoral lig. was first described by Poirier and Charpey in 1892, and referred to as the third cruciate lig. Although the