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자기 공명 영상을 이용해 측정한 한국 성인의 슬개골 및 슬개건의 형태 계측
THE GEOMETRY OF PATELLA AND PATELLAR TENDON OF KOREAN ADULT MEASURED ON KNEE MRI

National Police Hospital, Seoul, Korea

Jae Ho Yoo · Sung Ho Hahn · Bo Kyu Yang · Seung Rim Yi
Young Jun Ahn · Dong Jin Yoon · Jin Ho Kim

INTRODUCTION:

The geometry of patella and patellar tendon is important in modern surgical practice but. there has been relative paucity of quantitative anatomical information on it. We aimed to provide the data on the geometry of patella and patellar tendon of Korean adult measured on magnetic resonance imaging (MRI).

MATERIALS AND METHODS:

Subjects

One hundred seventy-two knees (male 142, female 30) of 163 subjects (male 135, female 28) were included in this study. Subjects with muscle injury. cruciate or collateral ligament injury, or contusions around knee were included. and those with deformity or mal-alignment, bipartite patella, old or new patellar fracture, previous sepsis or surgery, or tumor around knee were excluded. The mean age of the subjects was 26.7 (SD 8.7, range 18~50). The height, weight, and body-mass index (BMI) of the subjects were 173.4 cm (SD 7.1, range 150~190), 69.4 kg (SD 11.5, range 44~103), and 23.0 m/kg2(SD 2.8, range 16.1~32.1). respectively.

Measurement

On sagittal and axial MRIs of the knees, the morphological parameters of the patella and patellar tendon were measured with a digital caliper.

As for patella, the longitudinal length of patella, and the longitudinal length of the articulating surface of patella were measured on sagittal image. The thickness of the patella, mediolateral width of the patella, and the location of the ridge from the medial border of the patella were measured on axial image.

As for patellar tendon, the longitudinal length of patellar tendon was measured on sagittal image. The width and thickness of proximal and distal part of patellar tendon were measured on axial image.

Statistical Analysis

For all data, the mean, standard deviation, and range were documented. We compared the data between male and female subjects by t-test and performed the correlation and regression test with the anthropometrical data such as weight, height, and BMI using a statistical program (SPSS, version 11.5, Chicago, Illinois, USA).

RESULTS:

Descriptive analysis

As for patella, the longitudinal length of the whole and articulating surface of patella were 44.6 mm (SD 3.7, range 34.1~52.3), 32.9 mm (SD 2.5, range 27.2~40.6), the ratio of which was 0.74 (SD 0.05, range 0.58~0.89). The mediolateral width of the whole patella was 45.8 mm (SD 3.6, range 36.5~53.9), and the central ridge of the patella was located 19.9 mm (SD 1.9, range 14.3~26.0) lateral from the medial border of patella, or 0.43 (SD 0.03, range 0.34~0.49) lateral from the medial border. The thickness was 22.3 mm (SD 1.9, range 17.9~28.4). The male patella was bigger and the differences were statistically significant ($p < 0.001$) except the proportional location of the central ridge ($p = 0.167$).

As for patellar tendon, the longitudinal length of the whole patellar tendon was 40.2 mm (SD 4.2, range 31.3~52.6). The width of proximal and distal part of patellar tendon were 30.3 mm (SD 2.7, range 23.3~36.8), and 24.0 mm (SD 2.8, range 18.5~30.3). The thickness of proximal and distal part of patellar tendon were 3.2 mm (SD 0.5, range 2.4~4.9), and 5.0 mm (SD 0.7, range 3.4~6.9). The male patellar tendon showed larger value and the differences were statistically significant ($p < 0.001$).

Inferential analysis

We focused on the thickness of patella and the longitudinal length of patellar tendon for those had most clinical relevance. While the overall geometry of patella corresponded well to the height, weight, and BMI, that of patella tendon did not. The thickness of patella increased 0.602 mm according to each 1kg increase of weight (R^2=0.363, $p<0.001$), 0.147 to each 1cm of height(R^2=0.299, $p<0.001$), 0.321 to each unit of BMI (R^2=0.224, $p<0.001$). The length of patellar tendon showed R^2 from 0.015 to 0.061 on regression test.

DISCUSSION:

We described the geometry of patella and patellar tendon of Korean adult, which is fundamental data in understanding various knee conditions and performing reconstructive surgeries. Men have larger patella and patellar tendon than women. Height, weight and the BMI had proportional relationship on the geometry of patella, but not with patellar tendon.