CAN THE PATELLAR TENDON MOMENT ARM LENGTH BE PREDICTED FROM ANTHROPOMETRIC CHARACTERISTICS?

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INTRODUCTION

It has been suggested that muscle moment arms are related to anatomical differences and could be predicted from anthropometric characteristics [e.g. 1-2]. If moment arms can be predicted from easily measured anthropometric variables then analysis of muscle and joint forces could become significantly easier without the need for complicated imaging techniques. More recently, Krevolin et al. [3] reported that when the patellar tendon moment arm was normalized to femoral condyle width, it remained roughly constant across individuals, suggesting that prediction of patellar tendon moment arm length from relevant anatomical or anthropometric measurements would be possible.

The purpose of this study was to examine the relationship between patella tendon moment arm and relevant anthropometric characteristics.

METHODS

Twenty-two males (age: 25.7±5.7 years) without any musculoskeletal injuries in the lower limbs volunteered to participate after the study was approved by the local Ethics Committee. The patella tendon moment arm was measured at rest with a 0.2 T MRI system (Esaote Medical, Italy) with the knee in full extension. The 3D MRI images (52 slices 1.7 mm apart) were analysed as follows to determine the patellar tendon moment arm. The contact points of the lateral and medial condyles were first determined as the midpoint of the shortest distance between the condyles and the tibial plateau. The specific sagittal plane slices in the medial and lateral side were chosen by examining the condyle-tibial plateau distances in the frontal plane slices. The knee contact point was calculated as the midpoint of the line connecting the medial and lateral condyle contact points. The sagittal slice corresponding to that point was used to measure the moment arm as the length of the perpendicular (shortest) line between the patella tendon and the knee contact point in the sagittal plane. In addition the following anthropometric measurements were taken: Height, mass, knee circumference, mediolateral (M-L) knee width, anteroposterior (A-P) knee width, femur (greater trochanter-tibial plateau) length, tibia (tibial plateau-malleolus) length and leg length (greater trochanter-malleolus) length. Pearson correlation coefficients and multiple regression were used to examine the relationships between the anthropometric measurements and the patellar tendon moment arm.

RESULTS AND DISCUSSION

The Pearson correlation coefficients obtained ranged from -0.04 to 0.42 (Table 1). None of the correlations examined was statistically significant (P>0.01), The variable with the best correlation with the moment arm was knee circumference (r=0.49, P<0.05) but the coefficient of determination R^2 was only 0.179 (Figure 1) indicating that only about 18 % of the variance in PT moment arm can be explained by knee circumference.

Table 1. Descriptive statistics of the anthropometric parameters examined and correlation coefficients with patella tendon moment arm.

	Mean±sd	r	P
Height (cm)	181.90±7.98	0.31	0.076
Mass (kg)	79.19±7.56	0.40	0.036
Knee Circumference (cm)	37.52±1.66	0.42	0.024
Knee Width (M-L) (cm)	11.04±0.47	0.25	0.133
Knee Width (A-P) (cm)	12.66±0.54	0.21	0.166
Leg length (cm)	86.91±4.30	0.18	0.201
Femur Length (cm)	43.12±3.09	-0.04	0.419
Tibia Length (cm)	42.24±2.99	0.30	0.086

Multiple regression entering all the above anthropometric variables generated a slightly higher multiple correlation coefficient (R=0.52) with the overall coefficient of determination R^2=0.27. These results indicate that the anthropometric variables examined in this study cannot be used for accurate prediction of the patellar tendon moment arm.

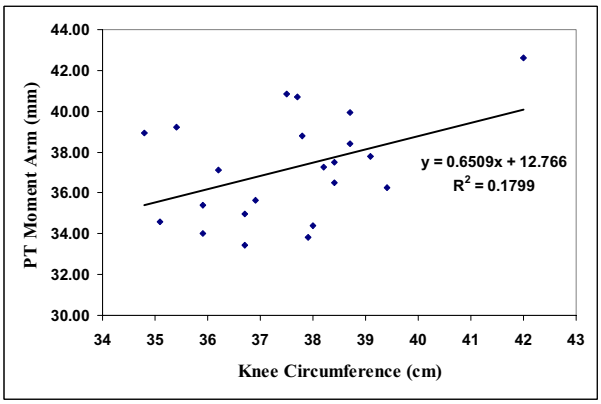

Figure 1: Scatter plot and linear regression between Patellar Tendon (PT) moment arm and knee circumference.

REFERENCES

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