

Correlation Between Functional Quadriceps to Hamstring Ratio with Painful Daily Activities and Functional Outcomes in Patellofemoral Pain Syndrome

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Summary:

Functional quadriceps to hamstring ratio determination is an important tool in Patellofemoral Pain Syndrome

Abstract:

SUMMARY

Decreased quadriceps strength relative to the hamstring is implicated as a potential mechanism for increased patellofemoral pain syndrome (PFPS). The quadriceps to hamstring (Q:H) ratio has been used to examine the similarity between quadriceps and hamstring strength and also to assess knee functional ability and muscle balance in PFPS.

BACKGROUND

This ratio has conventionally been expressed as concentric quadriceps to concentric hamstring strength and recently as functional ratio expressed as eccentric quadriceps to concentric hamstring ratio. The activities, which compose of eccentric quadriceps to concentric hamstring contractions such as kneeling, prolonged sitting, squatting and ascending or descending stairs, are mostly painful in PFPS patients. Thus, the functional Q:H ratio should be taken into account to determine the knee muscle imbalance in PFPS.

PURPOSE

To determine the relationship between conventional and functional Q:H ratio with the painful activities and functional outcomes in patients with PFPS.

METHOD

Forty-six females with unilateral PFPS (age:32.4±6.2 years) (BMI: 25.8±3.3 kg/m²) were included in the study. Peak concentric and eccentric knee extensor and flexor torques were determined with the use of Biodex System 3 Dynamometer (Biodex Corp., Shirley, NY, USA). Conventional ratio was calculated by dividing patient's quadriceps concentric peak torque by the hamstring concentric peak torque. Functional ratio was calculated by dividing patient's quadriceps eccentric peak torque by the hamstring concentric peak torque. All ratios were calculated at 60°/s and 180°/s velocities. Visual analogue scale was used to assess pain during stair ascent, stair descent, squatting, and prolonged sitting. Kujala patellofemoral disorder score was used to determine patients' perceived knee function capability. The relationship among conventional and functional Q:H ratios with Kujala score and pain levels were evaluated using Spearman's correlation coefficient.

RESULTS

Conventional ratio correlations: The only significant correlation of conventional ratio was with pain during sitting at 60°/s ($r=-0.33$, $p=0.023$) and 180°/s ($r=-0.31$, $p=0.038$). No relationship was found between the pain during ascending stairs, descending stairs and squatting with conventional ratio (all $p>0.05$). Kujala score results were significantly

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correlated with conventional ratio at 60°/s ($r=0.49$, $p=0.001$)

Functional ratio correlations: While the correlation between pain during descending stairs ($r=-0.38$, $p=0.009$) and sitting ($r=-0.48$, $p=0.001$) with functional ratio were significant at 60°/s, there were no correlation at 180°/s (all $p>0.05$). The correlation were significant between pain during squatting and functional ratio at 60°/s ($r=-0.33$, $p=0.024$) and 180°/s ($r=-0.33$, $p=0.024$). No relationship was found between the pain during ascending stairs and functional ratio (all $p>0.05$). Kujala score results were significantly correlated functional ratio at 60°/s ($r=0.69$, $p=0.001$)

DISCUSSION

This study showed that functional Q:H ratio is the best way to determine the relationship between painful daily activities and functional outcomes in patients with PFPS. Considering that eccentric quadriceps strength loss is one of the main reason for PFSP, the functional Q:H ratio should be taken into account to evaluate the PFPS patients.