PATELLAR ALIGNMENT BY QUADRICEPS CONTRACTION CAN PREDICT THE PAIN RELIEF FOLLOWING LEG PRESS EXERCISE TRAINING OF PATELLOFEMORAL PAIN

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INTRODUCTION

Patellofemoral pain, which was often considered to be in association with lateral malaligned patella, was one of the most prevalent knee disorder in both young and sporty populations. Leg press, as a manner of closed chain exercises, had been widely used for quadriceps strengthening to deal with this problem. The effectiveness was well documented, however, very little was known about which factors could predict the treatment outcome, or which patients were more likely to response to the treatment program. The purpose of this study was to investigate if the patellar alignment had a predictive value on the treatment outcome in leg press exercise training of patellofrmoal pain.

METHODS

Forty three female with patellofemoral pain (mean age: 34.1 ± 10.2 y/o, height: 160.0 ± 4.7 cm, weight: 54.3 ± 7.2 kg, all with sedentary life style) underwent 8-wk progressive leg press training with static stretching of quadriceps, hamstring, calf, and iliotibial band. The treatment outcome was measured by 10-cm visual analogue scale (VAS), where the decreasing amount of VAS score equal to or more than 1.5 points was used as an indicator for successful outcome [1].

Prior to the treatment, all subjects were evaluated by axial computed tomography (CT) in supine and knee straight position. The patellar tilt angle of Sasaki (PTA-S) (Figure 1) was measured with both quadriceps relaxation (Qr) and maximal voluntary isometric contraction (Qc). The greater the PTA-S was, the more lateral tilt the patella was. The change of PTA-S (Qc-Qr), as an indicator of quadriceps function to realign the patella, was then chosen as a predictor for the treatment outcome. That is, if the value of PTA-S change was negative, it represented the quadriceps contraction help reposition of the patella.
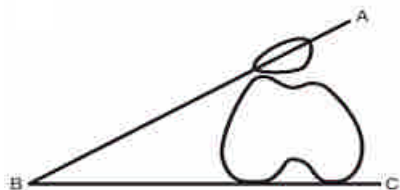

Figure 1: Measurement of lateral patellar tilt angle (θ).

The independent-t test was used to compare the changes of PTA-S and VAS between patients with successful and unsuccessful treatment outcome. The relationship between the changes of PTA-S and VAS was determined by the Pearson correlation. The logistic regression was performed to identify if the change of PTA-S was a predictor for the treatment outcome (successful or unsuccessful by VAS decrease ≥ 1.5 or <1.5cm). Differences were considered significant when $P< 0.05$.

RESULTS AND DISCUSSION

Of all 43 patients, 24 reached the successful outcome, while the other 19 patients remained the same or unimproved after 8-wk training. The change of VAS score was significantly different between groups ($P< 0.005$, Figure 2b). The change of PTA-S was significantly more negative in patients with successful outcome ($P=0.014$, Figure 2a). There was a positive correlation between the PTA-S change and the pain decrease ($r=0.329$, $P< 0.031$). The PTA-S change could significantly predict the treatment outcome. The odds ratio for having a unsuccessful outcome was 1.19 (95% CI, 1.03-1.39, $P< 0.021$) per degree increment of the PTA-S change.
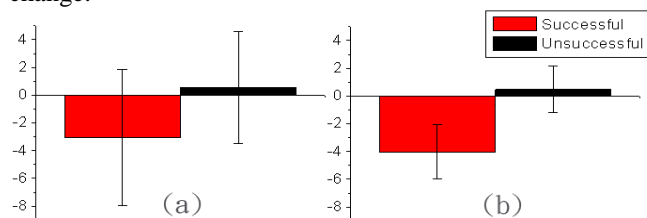

Figure 2: The changes of PTA-S (a) and VAS (b) between patients with successful and unsuccessful outcome.

The results of the present study indicated that the patellar realignment as a result of quadriceps contraction at pre-training was significantly associated with better treatment outcome in leg press exercise training of female with patellofrmoal pain. Previous studies found some other parameters of quadriceps function (i.e. reflex response time of vastus medialis obliquus and quadriceps strength) were the significant predictors of functional outcomes in athletic populations with patellofemoral pain [2,3]. However, one must bear in mind that the measurements and subject population differed from the current study.

CONCLUSIONS

Female patients with patellofemoral pain whose quadriceps contraction could reduce the lateral patellar tilt prior to the exercise treatment would have better opportunity of gains of pain relief following leg press exercise training. It seems clinically important to check patellar tilt characteristic by dynamic imaging before treatment.

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