Effect of Patellar Taping on Quadriceps Muscle of Knee Joint

This study aims to examine the effect of patellar taping common to patients with patellofemoral pain syndrome on the change of knee joint location. The total number of participants is 12 patients with no pain in their knee. There are three different experiments: no-taping, placebo taping, and patellar taping. After application, they squat on their hams. As a result, both the muscle activity of vastus medialis and that of vastus lateralis increased in placebo taping compared to no-taping, which wasn’t statistically significant. However, the muscle activity of vastus medialis and that of vastus lateralis decreased in patellar taping compared to no-taping, which was statistically significant. This suggests that patellar taping causing the lateral attraction of knee joint is more influential to the dynamics of knee joint than skin afferent input in placebo taping. Therefore, patellar taping is effective to change the location of knee joint, affect the muscle activity of quadriceps muscle of thigh, and thus correct the misalignments of the knee joint.

Key words: Patellofemoral Pain Syndrome, McConell Taping, Quadriceps

INTRODUCTION

The pain appeared on the front or rear of the knee is a major symptom of patellofemoral pain syndrome regardless of age, and a common knee disease corresponding to 20–40% of all knee pains(1), 10–19% of all athletes have this disease and especially women experience this about 25% in their entire life(2). Patellofemoral pain syndrome has a risk of developing into chronic diseases such as chondromalacia or arthritis and so proper care and treatment is needed(3). The factors causing patellofemoral pain syndrome include misalignment of lower limb, imbalance of muscles, stiffness of lateral part, increase in Q-angle of quadriceps muscle, and overuse and abnormal movement of hip joint(4, 5) and it is associated with the hypofunction of patellofemoral joint(6). Particularly if there is an imbalance of quadriceps muscle of thigh and a shortening of the lateral support attached to the lateral side of knee joint, patellar is an occurrence of tilting to the lateral side in the knee joint, which is a common symptom of patellofemoral pain syndrome(7).

Vastus medialis and vastus lateralis of quadriceps muscles are countervailing to adjust the location of knee joint and finally enhance the dynamic efficiency in knee function(8). The tilting of knee joint to the lateral side prevents the stability of vastus medialis during the knee functional activity and changes the normal mechanism of knee extending, which brings about pathological changes of patellofemoral joint(9). To recover the mechanism of patellofemoral joint extending, locating an exact location of knee joint is important to increase the activity of vastus medialis and recover the start time, and more important to treat the patient with patellofemoral pain syndrome(10). The common treatments of patellofemoral pain syndrome include conservative physical therapy and taping to adjust the misalignment of lower limbs, strength of lower limbs, neuromuscular control training of quadriceps muscle of thigh, particularly vastus medialis and vastus lateralis.

A direct patellar taping is known to be effective to
patients with patellofemoral pain syndrome. It relocates knee joint, reduces the pressure and pain of patellofemoral joint, and finally improves the functional activity of knee[11]. The representative way of patellar taping is McConell’s[12] method which induces medial attraction in the lateral attraction induced knee joint resulting from pathological cause to normalize the position of patellofemoral joint. At this time, inelastic tape is used to increase fixation, which is called McConnell Taping. If we look at the application of patellar taping into the patients with patello- femoral pain syndrome, Evangelos[13] applied patellar taping to normal experimentee and patient with patellofemoral pain syndrome and used isokinetic measuring instrument to see how active the muscle activity of vastus medialis and that of vastus lateralis is in terms of knee angle.

As a result, the activity of vastus medialis increased, but that of vastus lateralis decreased in patients with patellofemoral pain syndrome. On the other hand, the activity of vastus medialis decreased, but that of vastus lateralis increased in normal person. In addition patellar taping was applied in 20 adults with patellofemoral pain syndrome: the perceived pain reduced by 13%. The muscle activity was measured at knee flexion angle of 120°, 90°, 60° and 0° and the vastus medialis and vastus lateralis ratio increased. Many several studies showed that patellar taping is effective to reduce pain, increase the muscular strength of quadriceps muscle of thigh[14], improve the neuromuscular mobilization, and correct the muscular contracture start time of vastus medialis against vastus lateralis[10].

The effect of patellar taping on patellofemoral pain syndrome is well-known from many studies, and the causes of increasing the activity of vastus medialis include reduction in pain, change of location in patellofemoral joint, and increase in skin afferent stimulation[15,16]. However, there is still few biomechanical researches on the effect of patellar taping. So this study aims to apply the patellar taping to the normal person who shows no pain to see the impact of squatting down on the activity of vastus medialis. Ultimately, it is to see if patellar taping is actually inducing medial attraction of patellofemoral joint and to which patellar taping is influential, proprioception of skin or correction of misalignment of patellofemoral joint.

METHODS

Subjects

The number of participants in this study is 12 healthy adults(6 males, 6 females) working in Hospital P in Daegu-si in November, 2011. The average age is 32.23±4.31years, height 168,55±7.85cm, and weight 65,74±13.72kg. After explaining about the purpose and content of this study prior to experiment to each and every participant, they are given a consent form. The requirement for experimental subjects are as follows:

First, they should be healthy male and female adults with no pain around the knee joint and no tenderness on pressure when in palpation.

Second, they should have no clicking in the knee when doing some sports activities or in everyday lives,

Third, they should have no difficulty in squatting down.

Fourth, they should be no history of knee, hip joint, ankle, and foot joint dysfunction.

Measurement

Experimental procedure

12 participants squat in the following three conditions: no-taping, placebo taping with no tilting of knee joint, and patellar taping with medial tilting of knee joint. In no-taping, they squat with no taping attached. In placebo taping, they are taped at the same place as patellar taping without inducing the medial attraction of knee joint. In patellar taping, McConnell taping[12] is applied, the knee joint is pushed toward the inside to induce medial attraction, and then they are taped before they squat.

The advanced fixing tape(Endura–FIX, China) is attached to prevent the skin slipping and then non–elastic tape(Endura–FIX, China) is attached on it. A skilled physical therapist with more than 10 years of experiences helped to tape it.

When squatting down, their two foot angle is 120% on the basis of their shoulder[17], their two arms folded in the front, and trunk stood up to avoid lumbar flexion. For the knee angle, a semi-squatting posture is adopted as it is widely common to patients with patellofemoral pain syndrome: 50° angle[8]. Before exercise, 50° is measured and then a bar is installed so that each participants can participate in the experiment at the same angle. For the order of exercise, the order is distributed randomly by drawing cuts. When doing each movement, they should