Journal of Rehabilitation Sciences and Research

Journal Home Page: jrsr.sums.ac.ir

Original Article

Effects of Short Term and Long Term Usage of Patellar Kinesio Taping on Patellar Position in Women with Patellofemoral Pain Syndrome

Mahboobeh Banejad[1]*, Alireza Sarmadi[1], Firooz Maddadi[2]

[1]Department of Physiotherapy, Tarbiat Modares University, Tehran, Iran
[2]Department of Orthopedic Surgery, Shahid Beheshti University, Tehran, Iran

ARTICLE INFO

Article History:
Received: 14/1/2016
Revised: 9/2/2016
Accepted: 28/6/2016

Keywords:
Kinesio taping
Patella position
MRI
Short term effects
Long term effects

ABSTRACT

Background: Patellar mal tracking is responsible for pain and disability in patellofemoral pain syndrome (PFPS). Patellar kinesio taping may have different effects on short and long term usage. The aim of this study is to compare the effect of short term and long term patellar kinesio taping in patellar position on women with patellofemoral pain syndrome using Magnetic Resonance Imaging (MRI).
Methods: Thirty women with a mean age of 32.2 ± 6.18 years with one year history of PFPS participated in this study. All participants provided written, informed consent. MRI was taken three times from participant's patellofemoral joint: 1) Without taping, 2) Immediately after taping in the first session, 3) After 10 sessions of taping. The effectiveness of the interventions was determined by measuring the patellofemoral congruence angle (PFCA), lateral patellofemoral angle (LPFA), and lateral patellar displacement (LPD) on MRI images.
Results: Statistical analysis showed that utilizing kinesio taping in short time and after 10 sessions, significantly changed PFCA and LPD – except for PFCA after 10 sessions. Moreover, taping didn't have any significant effect to alter LPFA.
Conclusion: In short term, mechanical effects of kinesio taping influenced the patella position but in long term, neuromuscular effects may be more effective than each one separately to alter patella position.

Introduction

Patellofemoral pain syndrome (PFPS) is one of the most common knee complaints, especially among women [1]. This syndrome is characterized by initial retro patellar pain. Although its etiology has not been clearly established, PFPS has been correlated to several factors that cause patellar malalignment, such as lateral patellar tilt, lateral glide due to imbalance of the Vastus medialis oblique and Vastus lateralize muscles [2], rotation and posterior tilt of the inferior pole of the patella, and shortening of the Iliotibial tract [3]. These factors impair quadriceps activity and lead to an imbalance in gait biomechanics and pain [4].

In 30° flexion, patella surface is completely in contact with truclear groove. Therefore, in our study, this angle was chosen; because in this angle, the patella position can be perfectly evaluated. Under these altered biomechanical conditions, the odd facet of the patella comes into contact with the truclear groove of the femur sooner than usual during knee flexion [5].

In PFPS, the surface of the patellofemoral joint increases in order to adequately distribute forces on the knee and decreases pain [6]. Mechanical displacement of the patella occurs because of certain factors such as Vastus medialis oblique weakness, Iliotibial tract shortening [3], patellofemoral dysfunction, increased Q angle [7], and lower extremity dysfunction such as coxa Volga, coxa

*Corresponding author: Mahboobeh Banejad, MSc of Physiotherapy, Department of Physiotherapy, Tarbiat Modares University, Tehran, Iran.
Tel: +98 21 77461133
E-mail: physiotherapy1382@gmail.com

Vera, femoral ante version, and foot pronation [5]. In this research, factors related to PFPS, defined as dysfunction of the soft tissue around the knee were assessed.

In addition to conventional treatment methods, Taping method introduced by McConnell was involved. Taping leads to stretching of the shortened lateral knee compartment, improvement of knee proprioception, correction of abnormal patellar position, and facilitation of Vastus medialis oblique function [8,9]. Patellar taping has been reported to correct [3] and maintain the position of the patella and decrease mechanical stresses on the patellofemoral joint, facilitating normal patellar tracking [10].

In PFPS patients, patellar taping has been shown to significantly decrease joint pain [2,11] in a short time and during activities involving dynamic postural control [12]. The mechanism behind the pain reduction seems to involve increased skin excitability and changes in motor unit recruitment in the muscles around the knee joint [13], which improve muscle performance in PFPS patients. This improvement and the associated pain relief are related to the corrected patellar position [14], patellofemoral joint improvement [15], and central nervous system excitability [16]. Nevertheless, some authors have reported opposite results of taping on pain [6,17]. Moreover, some studies have stated that patellar taping does not affect the patellofemoral congruence angle (PFCA) in PFPS [18,19], while others have reported that taping significantly improves this angle, but the effect is reduced after 15 minutes of exercise [10,20].

There are controversies on the mechanism of taping effect on Patellofemoral pain syndrome. Some of the previous radiographic studies revealed that McConnell taping has mechanically corrected the patellar position while other studies failed to show this phenomenon. The kinesio tape was utilized in this study, while previous studies utilized McConnell taping. It is assumed that in the case of kinesio taping, the force applied by taping does not seem sufficient to make a mechanical change.

The other question is about the effect of taping based on its sensory stimulation on the skin. This effect can facilitate muscular activity and decrease the pain which can lead to correction of patellar position. Therefore, long term utilization of taping means sending sensory input to neuromuscular system for a period of time.

For a long period of time, taping can have neural effects on muscular system and make changes which differ from the effects of short term usage of taping.

To evaluate these theories, this study assessed the short and long term effects of kinesio taping on patellar position. Magnetic Resonance Imaging (MRI) was employed to evaluate patella tracking in a non-invasive manner during short and long term of taping.

The aim of this study is to evaluate the short-term and long term effects of kinesio taping on the patella position.

Methods

Thirty women with a mean age of 32.2±6.18 years and one year history of PFPS, with no history of neurological disorders, participated in this study. All participants provided written, informed consent. MRI was taken three times for participant's patellofemoral joint: 1) Without intervention, 2) Immediately after taping in the first session, 3) After 10 sessions of intervention in the second session. MRI of the patella was carried out in the imaging center of ERFAN Hospital. A 1.5-T Avento 2007 device (Siemens) was utilized for MRI, and axial images were obtained to accurately assess the patellar position. An echo pulse sequence with the following parameters was selected: repetition time, 400 ms; echo time, 41 ms; flip angle, 150; image matrix,320 m^2; slice thickness, 4–5 mm; interslice gap, 10 mm; field of view, 20 cm; number of signal averages, 2; and image acquisition time, 1.5 min.

The subjects lay in a supine position and a trained examiner applied goniometer to fix patient knee joint in 30° flexion passively; the other leg was positioned alongside the magnets. The patellofemoral joint of the test leg was imaged in this position. A second scan was performed after taping the knee by applying the medial glide technique (taping from lateral to medial border of the patella. Figure 1 showed immediately after first imaging to assess short term effects of taping.

Figure 1: Patellar taping

MRI was repeated after 10 sessions of treatment for all participants to assess the long term effect of taping. The most common radiographic measurements of patellar alignment, namely, lateral patellar displacement (LPD), lateral patellofemoral angle (LPFA), and patellofemoral congruence angle (PFCA) were utilized. The MRI slice with the largest patellar diameter was selected.

LPD is the displacement of the patella, in millimeters, in the frontal plane, relative to the position of the medial femoral condoyle [15] (Figure 1). The LPFA is the angle between a line joining the summits of the femoral condyles and a line joining the margins of the lateral facet of the patella. The PFCA is the angle between the apex of the intercondylar sulcus and the lowest aspect of the patellar ridge [15] (Figure 2).

While the patient was in a supine position, the physiotherapist placed the test knee in 30° flexion passively by utilizing a goniometer. Before taping, the extent to which the tape could be stretched was measured and the point on the knee that corresponded to 30% of the initial tape length was marked. The first 5 cm of the tape (unstretched) was placed over the knee; the rest part of the tape, except for the last 5 cm, was stretched to its full extent and applied to the knee employing a downward pressure technique so as to correct the patellar position. After taping, the range of knee flexion and extension was assessed to ensure that the joint movements were not restricted. The kinesio tape was replaced every 2 days by the trained examiner (Figure 1).

The axial MRI results collected in the ERFAN scan center were saved on a CD and processed with the SIGNO software. The aim was to assess the ability of kinesio taping utilizing the medial glide technique to first correct the lateralization of patella and then improve patellar tracking. For this purpose, the most common radiographic measurements of patellar alignment, namely, lateral patellar displacement (LPD), lateral patellofemoral angle (LPFA), and patellofemoral congruence angle (PFCA) were utilized. The MRI slide with the largest patellar diameter was selected.

Results

Summary of the participant's descriptive statistics obtained under 30° knee flexion before and after treatment are presented in Table 1.

Table 1: Summary of the participant's descriptive statistics obtained under 30° knee flexion before and after treatment

Variable	Mean±SD	Mean±SD
	First session	**Last session**
Dominant thigh diameter (meter)	46.23±5.66	46.15±6.62
CLARK test (Pain existing)	17 positive 13 negative	7 positive 23 negative
Quadriceps power (MMT)	3.9±3.3	4.11±0.33
Abductor muscle power (MMT)	3.6±0.36	4.1±4.4
VAS	5.33±2.44	3.8±2.57

The main factors analyzed were changes in PFCA, LPFA, and LPD. Repeated-measures analysis of variance (ANOVA) was utilized to test the effects of patellar taping in short time and after 10 sessions. The level of statistical significance was set at $P<0.05$ (Table 2).

Table 2 shows that utilizing taping in short time and after 10 s significantly changes PFCA and LPD ($P<0.05$) –except for PFCA after 10 sessions. Moreover, taping did not have significant effect to alter LPFA ($P>0.05$).

Discussion

The aim of this study was to compare the effectiveness of patellar taping in short term and long term usage on patellar position in women with patellofemoral pain syndrome.

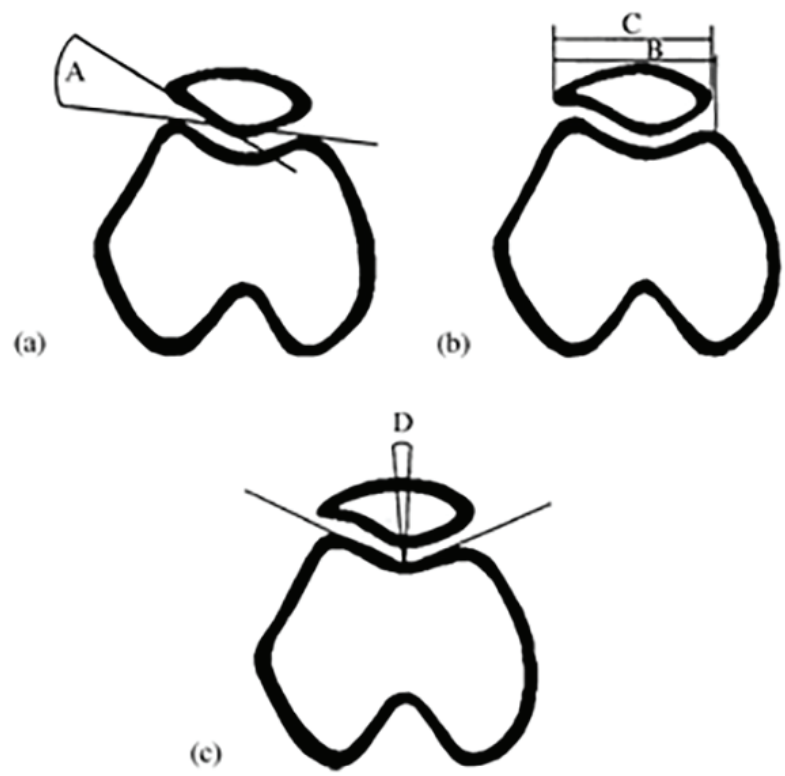

Figure 2: Radiographic measurements of patellar position. (a)Lateral patellofemoral angle (b) Lateral patellar displacement (c) Patellofemoral congruence angle

Table 2: Changes in the patellar parameters in short term and long term taping

Variable	F	Sig.
PFCA after taping	3.483	0.045
PFCA after 10 sessions	2.578	0.094
LPD after taping	3.460	0.046
LPD after 10 sessions	4.396	0.022
LPFA after taping	1749	0.193
LPFA after 10 sessions	0.334	0.719

Our results revealed that utilizing taping in short time and after 10 sessions significantly changed PFCA and LPD – except for PFCA after 10 sessions. Moreover, taping did not have a significant effect to alter LPFA.

These results may be affected by increased sensory input to muscles, skin and joint in short and long term. On one hand, the mechanical effect of taping influenced patella position in short term but on the other hand, neural effects may be more effective than each one separately in long term. By considering the results, it can be concluded that taping does not have adequate strength to affect LPFA, neither in short time, nor in long term.

Most studies that evaluated the effect of patellar taping on patellar tracking have employed the McConnell taping method [14,21,22]. This method has some limitations such as lower elasticity, the requirement of applying a pre-wrap tape under the main tape, and restriction of muscles and joint range of motion. The kinesio tape, invented by Kenzo Kase in 1996, has some benefits over the McConnell method, as it is thin and elastic, which does not restrict movement, thus it is easy to apply. Furthermore, kinesio taping loads forces onto the skin, allowing full range of motion of the joints and the muscles around the joint. Patellar tracking after kinesio taping has been assessed in a previous study [23]; nevertheless, more research is needed to determine which taping method is optimal.

Conflict of Interest: None declared.

References

1. Naseri N. *Physiotherapy in orthopedic disorder.*2nd ed. sobh-esaadat. 1384.
2. Powers CM, Landel R, Sosnick T,et al. *The effect of patellar taping on stride characteristics and joint motion in subjects with PFPS.*J Orthop Sport Phys Ther 1997; **26:** 286-91.
3. Piniella. *Iliotibial band tightness and medial patellar glide in patient with patellofemoral dysfunction.* J Orthop Sports Phys Ther1993; **17**(3):144-8.
4. Neumann DA. *Kinesiology of the musculoskeletal system, foundation for physical rehabilitation.1st* ed. 2004.
5. Connolly KD. *Differences in patellofemoral contact mechanics associated with patellofemoral pain syndrome.* J Biomechanics 2009; **42:2802**-7.
6. Wen-ChiChen. E*ffects of Kinesio taping on the timing and ratio of Vastus medialis oblique and Vastus lateralis muscle for person with patellofemoral pain.* J Biomechanics 2007;**40** (4):318.
7. Ingersoll. P*atellar location changes following EMG biofeedback or progressive resistive exercises.* Med Sci Sports Exerc 1991; **10**(23):p.1122-7.
8. McDonald R. *Tapingtechniques.*2nd ed. London. 2004.
9. Christou E. *Patellar taping increases VMO activity in the presence of patellofemoral pain.* J Electromyography Kinesio 2004; **14:** 495-504.
10. Salsich GB, Brechter JH, Farwell D, Powers CM. *The effects of patellar taping on knee kinetics, kinematics and VLactivity during stair ambulation in individuals with PFPS.* J Orthop Sport Phys Ther 2004; **32:3**-10.
11. Cowan SM, Bennell KL, Hodgos PW. *Therapeutic patellar taping changes the timing of VM activation in people with PFPS.* Clin J Sport Med 2002; **12:** 339-47.
12. Aminaka N, Gribble PA. *Patellar taping, patellofemoral pain syndrome, lower extremity kinematics, and dynamic postural control.* J Athl Train 2008; **43**(1):21-8.
13. Gigante A. *The effects of patellar taping on patellofemoral incongruence: a computed tomography study. A*m J Sport Med 2001**; 29:88**-92.
14. Herington L. *The effect of patellar taping on quadriceps strength and functional performance in normal subjects.* Phys Ther Sport 2004; **5:33**-6.
15. Crossly K. *Patellar taping: is clinical success supported by scientific evidence?* Manual Ther 2000; 5(3):142-50.
16. Tieh-Cheng F. *Effect of Kinesio taping on muscle strength in athletes-a pilot study.*J Sci Med Sport 2007; 11:198-201.
17. Keet HL. *The effect of medial patellar taping on pain, strength and neuromuscular recruitment in subjects with and without patellofemoral pain.* Physiotherapy 2007; **93:**.45-52.
18. Bockrath K, Wooden C,Worrell T, Ingersoll CD, Farr J ,Farr. *Effects of patellar taping on patella position and perceived pain.* Med Sci Sport Exerc 1993; **25:989**-92.
19. YFNG G, Cheng J MF. *The effect of patellar taping on pain and neuromuscular performance in subjects with patellofemoral pain syndrome.* Clin Rehab 2002; **16:821**-827.
20. Doucette SA. *The effect of open and closed chain exercise and knee joint position on patellar tracking in lateral patellar compression syndrome.* J Orthop Sports Phys Ther 1996; **2**(23):104-10.
21. Pfeiffer RP, DeBeliso M, Shea KG, Kelley L, Irmischer B, Chad H. *Kinematic MRI assessment of McConnell taping before and after exercise.* Am J Sport Med 2004; **32**(3):621-7.
22. Guner S, Alsancak S, Koz M. Effect of two different Kinesio taping techniques on knee kinematics and kinetics in young females J phys Ther Sci 2015;27:3093–3096.
23. Halseth T, McChesney JW, Debeliso M, et al. The effects of kinesio™ taping on proprioception at the ankle. J Sports Sci Med 2004; 3:1–7.