Acute effect of Kinesio Taping on knee pain and stability. Case report

Efeito agudo da Kinesio Taping na dor e estabilidade do joelho. Relato de caso

Alexsandro da Silva Oliveira[1], Débora Pedroza Guedes da Silva[2], Júlio Guilherme Silva[2]

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ABSTRACT

BACKGROUND AND OBJECTIVES: Knee stability is critical for the execution of functional tasks, maintaining the joint within physiologic limits and preventing possible mechanical loads. A type of taping being increasingly used in recent years is Kinesio Taping, which is often used as resource to improve joint stability and decrease pain. This study aimed at evaluating the acute effect of Kinesio Taping on stability and pain in a patient with chronic knee instability.

CASE REPORT: Male patient, 46 years old, with chronic knee instability due to late postoperative period of Anterior Cruciate Ligament injury, was evaluated during two functional activities (up/ down a stair and squat), before and immediately after Kinesio Taping. Evaluation tools were visual analog scale and videometry to evaluate knee varus angle peak during functional activities. There has been significant decrease ($p<0.001$) in mean knee varus angle peak during functional activities up/ down a stair (Pro-Kinesio: 189.4; Post-Kinesio: 186.2) and squat (Pre-Kinesio: 198.2; Post-Kinesio: 189.6). There has also been decrease in the visual analog scale for up/down a stair (Pre-Kinesio: 4; Post-Kinesio: 0) and squat (Pre-Kinesio: 3; Post-Kinesio: 0).

CONCLUSION: Our results suggest that Kinesio Taping was effective to improve knee dynamic stability and decrease pain during functional activities of going up/down a stair and squat.

Keywords: Anterior cruciate ligament, Joint stability, Physiotherapy, Rehabilitation.

RESUMO

JUSTIFICATIVA E OBJETIVOS: A estabilidade do joelho é fundamental para a execução de tarefas funcionais, mantendo a articulação dentro dos limites fisiológicos e evitando possíveis sobrecargas mecânicas. Um tipo de bandagem que vem ganhando destaque nos últimos anos é a Kinesio Taping, que é frequentemente usada como um recurso para melhorar a estabilidade articular e diminuir o quadro álgico. O objetivo deste estudo foi avaliar o efeito agudo do uso da Kinesio Taping na estabilidade e dor em paciente com instabilidade crônica de joelho.

RELATO DO CASO: Paciente do sexo masculino, 46 anos, com instabilidade crônica de joelho, decorrente de pós-operatório tardio de lesão do ligamento cruzado anterior foi avaliado durante duas atividades funcionais (subida/descida no degrau e agachamento), antes e imediatamente após a Kinesio Taping. Os instrumentos de avaliação usados foram a escala analógica visual e a videometria para análise de pico do ângulo varo do joelho durante as atividades funcionais. Observou-se diminuição significativa ($p<0,001$) da média do pico de ângulo varo do joelho durante as atividades funcionais, subida/descida no degrau (Pré-Kinesio: 189,4; Pós-Kinesio: 186,2), e agachamento (Pré-Kinesio: 198,2; Pós-Kinesio: 189,6). Também houve diminuição da escala analógica visual, subida/descida no degrau (Pré-Kinesio: 4; Pós-Kinesio: 0) e agachamento (Pré-Kinesio: 3; Pós-Kinesio: 0).

CONCLUSÃO: Os resultados do presente trabalho sugerem que a Kinesio Taping se mostrou eficaz na melhora da estabilidade dinâmica do joelho e diminuição da dor durante as atividades funcionais de subida/descida no degrau e agachamento.

Descritores: Fisioterapia, Instabilidade articular, Ligamento cruzado anterior, Reabilitação.

INTRODUCTION

Knee stability is critical for the performance of functional tasks, maintaining the joint within physiological limits and preventing possible mechanical overloads[1,2]. The anterior cruciate ligament (ACL) helps knee stability acting as major stabilizer and especially preventing excessive anterior translation of tibia with regard to femur, in addition to limiting tibial rotational movements and excessive knee varus and valgus[3-7].

ACL injury is very prevalent in the knee, with incidence of approximately 80 thousand injuries per year[8-10]. A major complication of this injury is joint instability which, in the long run, may favor knee cartilage wear and generate early

1. Centro Universitário Augusto Motta, Rio de Janeiro, RJ, Brasil.
2. Centro Universitário Augusto Motta, Ciências da Reabilitação, Rio de Janeiro, RJ, Brasil.

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Correspondence to:
Av. Paris, 84 – Bonsucesso
21041-020 Rio de Janeiro, RJ, Brasil.
E-mail: alexoliveira06@hotmail.com

arthritis and possible functional changes, such as difficulties during gait and relatively simple tasks such as going up and down stairs[11,12].

Some authors have suggested that biomechanical changes in lower limbs, especially in the knee, may influence joint cartilage degenerative process[1,13]. Knee alignment plays important role on joint mechanical overload and may influence cartilage degenerative process, especially in medial compartment, cases when there is increased knee varus angle[13].

In search for effective techniques to improve joint stability, proprioception and alignment, some therapeutic intervention proposals have been used, such as the use of therapeutic tapings, especially rigid and elastic[14-17].

A taping becoming popular in recent years is Kinesio Taping (KT) which is often used as resource to improve segmental stability in different joints, with the advantage of not limiting functional movements, in addition to helping improving pain and resolution of edema[14,15,18-21].

KT was developed during the 1970s by Dr. Kenso Kase, aiming at providing patients with constant therapeutic stimulation which would help muscles and other tissues to search for homeostasis in the intervals between chiropractic sessions. Today it is widely used in ambulatory and sports settings by different health professionals[14,22,23].

This study aimed at evaluating the acute effect of KT on stability and pain of a subject with chronic knee instability caused by late postoperative period of ACL injury.

CASE REPORT

Male patient, 46 years old, in outpatient follow up by the physiotherapy department, Clínica Escola Amarina Motta (CLESAM), Centro Universitário Augusto Motta (UNISUAM) - RJ, with chronic right knee instability caused by late postoperative period (7 years) of ACL injury, confirmed during evaluation with anterior drawer and Lachman tests, in addition to presenting level II arthritis in right knee medial compartment, confirmed by X-rays.

Patient was evaluated during two specific functional activities, up and down a 15-cm step with evaluated lower limb fixed on step, and free squat. Evaluation tools were visual analog scale (VAS) to measure pain level and videometry for angular cinematic analysis.

Images were captured in the frontal plane with a Sony model HDR-SR10 HD, compact digital camera with frequency of 60 frames per second, positioned on a leveled tripod with distance of 3.00m and height of 92cm. Anatomic points used for knee varus angle measurement were anterior-superior iliac spine, anterior tibial tuberosity and center of joint interline of the tibiotarsal joint, characterized with red Styrofoam round passive markers with diameter of 30mm. Patient was oriented to perform a series of five repetitions of each task and then mean knee varus angle peak for both activities was measured, in addition to being oriented to report pain level during each task. Both measures (VAS and varus angle) were performed before and immediately after the application of therapeutic elastic taping.

Technique of choice to apply KT (Kinesio® Tex Gold 5cmx5m – color beige) was ligament correction with tape tension between 75 and 100%, with three "I" cuts to promote assistance for joint stabilization[14]. Some care was taken before applying KT, such as application site trichotomy and skin cleaning with 70% alcohol. Participant was positioned in supine position, with knee flexed to 90^0, with the foot resting on the stretcher during KT application. A tape was transversally applied to patellar ligament, with tape ends over knee collateral, medial and lateral ligaments. The other two tapes were applied on the skin with distal ends of each one on anterior knee and proximal ends on medial and lateral thigh, with therapeutic zone on the region corresponding to collateral, lateral and medial ligaments.

Knee varus angle cinematic analysis was performed with the software Kinovea 8.15 and program Sigma Stat 3.5 was used for statistical analysis, through a comparison study (test-t) of analysis parameters of tasks before and after treatment. Safety margin was 95% reliability and tests were according to sample and proposed objectives.

Comparison of variables before and after KT application has shown changes with applied intervention. Values of each variable are shown in table 1.

Table 1. Variables (varus angle and visual analog scale before and after Kinesio Taping during functional tasks (up/down step and squat)).

Tasks	Pre-KT	Post-KT	p value
Step (Mean±SD)	189.4±0.55	186.2±1.30	<0.001*
Squat (Mean±SD)	198.2±1.30	189.6±0.55	<0.001*
VAS (Step)	3	0	--
VAS (Squat)	4	0	--

KT = Kinesio Taping; VAS = visual analog scale; SD = standard deviation; * = statistically significant value.

There has been significant decrease ($p<0.05$) of mean knee varus angle peak in both functional activities, especially during squat (pre-KT: 198.2±1.30; post-KT:189.6±0.55). There has also been VAS decrease during both activities up/down step (pre-KT: 4; post-KT: 0) and squat (pre-KT: 3; post-KT: 0).

DISCUSSION

Our results give subsidies that the therapeutic intervention proposal with KT has possibly had a positive influence of knee alignment and decreased pain during functional activities of going up/down stair and squat.

It was possible o observe that knee varus angle peak has decreased both during up/down step and squat, thus suggesting improvement in knee stability and alignment during functional tasks with KT. This might have influenced pain improvement but considerations induced by such results should be evaluated with caution.

Joint instability and pain are common findings in individuals with ligament injuries[4,24,25]. KT has been frequently used, alone or in combination with other techniques, to provide external support, thus helping joint stability and decreasing pain in individuals with different types of injuries[24-26].

Evidences about the use of KT and its applicability in the clinical practice are still far from being a consensus, still with many studies with contradictory results[25-28].

Our results are similar to other authors who have also observed benefits with the use of KT. A study by Campolo et al.[18] has evaluated the effects of two different taping techniques, KT and NcConnell Taping (MT), in patellofemoral pain syndrome during functional activities of going up and down stairs and free squat. Subjects were divided in three groups (KT, MT and placebo) and evaluation tool was VAS. Results have shown that both groups (KT and MT) had significant VAS difference ($p<0.05$) during tasks as compared to the placebo group.

These data are in line with our study, considering that significant VAS difference was also observed during functional activities with KT[27]. However, it is important to stress that study samples[18] and those of this report are different. In our study, participant was a patient with joint stability caused by late postoperative period of ACL, and in the mentioned study[18] sample was made up of subjects with patellofemoral pain syndrome.

With regard to joint stability, Nakajima & Baldridge[29] have observed the effect of KT on vertical jump and dynamic postural control in young and healthy individuals. Participated in the study 52 healthy individuals without ankle or lower limbs injury. Participants were randomly distributed to experimental group (KT with injury) and control group (KT without injury). Vertical jump was measured with the VertiMetric device and dynamic postural control was evaluated with Balance Test Star Excursion (BTSE).

Results have shown that, in general, there were no differences between groups in maximum vertical jump height, mean vertical jump height or BTSE scores. Follow-up analyses, however, have indicated that females of the KT group have significantly increased BTSE scores as compared to control group.

Authors have concluded that KT application on ankle has neither increased or decreased vertical jump height in young and healthy individuals, but has improved dynamic postural control in females.

Although being different segments (ankle and knee) and different health conditions (healthy individuals and injured individuals), our results may somewhat be compared to those of Nakajima & Baldridge[29]. In this study[29], KT has influenced body dynamic stability of female participants during BTSE. In our report, by means of angular analyses before and after KT, there has been positive influence on knee joint segmental stability, with significant decrease of varus angle peak during functional tasks. This might be attributed to sensory KT effects, such as improved proprioception due to sensory stimulation by means of the tape[30] as well as mechanical effects, giving external support and stabilizing the joint[14].

Conversely, Shields et al.[26] have evaluated acute and late effects of KT on postural control in healthy individuals and those with ankle instability. Study results have not shown relevant changes after application of KT on the ankle. This suggests that, although KT is a popular clinical intervention resource, results do not justify its use on individuals with postural control deficits due to ankle joint instability.

So, it is clear that the use of KT is still far from agreement about is use in the clinical practice.

Within this context, our study has shown satisfactory results, both with clinical relevance (decreased pain during functional activities), and statistical significance, thus confirming the good use of therapeutic elastic taping in the clinical practice.

CONCLUSION

Kt was effective to improve knee joint stability, decreasing varus angle peak during functional activities of going up/down step and squat, in addition to having decreased pain level during the performance of tasks.

REFERENCES

1. Lee SH, Lee JH, Ahn SE, Park MJ, Lee DH. Correlation between quadriceps endurance and adduction moment in medial knee osteoarthritis. PLoS ONE. 2015;10(11):e0141972.
2. Deep K, Picard F, Clarke JV. Dynamic knee alignment and collateral knee laxity and its variations in normal humans. Front Surg. 2015;25(2):62.
3. Dagnoni CI, Bilibiu J, Stiehler S, Preis C, Bertassoni Neto L. Flexor-extensor relationship knee after reconstruction of the anterior cruciate ligament. Fisioter Mov. 2014;27(2):201-9.
4. Kim DK, Park WH. Sex differences in knee strength deficit 1 year after anterior cruciate ligament reconstruction. J Phys Ther Sci. 2015;27(12):3847-9.
5. Tamura A, Akasaka K, Otsudo T, Sawada Y, Okubo Y, Shiozawa J, et al. Fatigue alters landing shock attenuation during a single-leg vertical drop jump. Orthop J Sports Med. 2016;4(1):2325967115626412.
6. Han F, Benerjee A, Shen L, Krishna L. Increased compliance with supervised rehabilitation improves functional outcome and return to sport after anterior cruciate ligament reconstruction in recreational athletes. Orthop J Sports Med. 2015;3(12):2325967115620770.
7. Hall MP, Paik RS, Ware AJ, Mohr KJ, Limpisvasti O. Neuromuscular evaluation with single-leg squat test at 6 months after anterior cruciate ligament reconstruction. Orthop J Sports Med. 2015;3(3):2325967115575900.
8. Silva Júnior OM, Ohashi BN, Almeida MO, Gonçalves MR. Resultado funcional relacionado ao posicionamento do enxerto na reconstrução do ligamento cruzado anterior. Rev Bras Ortop. 2015;50(1):57-67.
9. Shi D, Li N, Wang Y, Jiang S, Li J, Zhu W. Gait modification strategies of trunk over left stance phase in patients with right anterior cruciate ligament deficiency. Int J Clin Exp Med. 2015;8(8):13424-34.
10. Buller LT, Best MJ, Baraga MG, Kaplan LD. Trends in anterior cruciate ligament reconstruction in the United States. Orthop J Sports Med. 2014;3(1):2325967114563664.
11. Samitier, G, Marcano AI, Alentorn-Geli E, Cugat R, Farmer KW, Moser MW. Failure of anterior cruciate ligament reconstruction. Arch Bone Jt Surg. 2015;3(4):220-40.

12. Farber J, Harris JD, Kolstad K, McCulloch PC. Treatment of anterior cruciate ligament injuries by major league soccer team physicians. Orthop J Sports Med. 2014;2(11):2325967114559892.
13. da Silva HG, Cliquet Junior A, Zorzi AR, Batista de Miranda J. Biomechanical changes in gait of subjects with medial knee osteoarthritis. Acta Ortop Bras. 2012;20(3):150-6.
14. Kase K, Lemos TV, Dias EM. Kinesio Taping: Introdução ao Método e Aplicações Musculares. 2ª ed. São Paulo: Andreoli; 2013.
15. Chang WD, Chen FC, Lee CL, Lin HY, Lai PT. Effects of Kinesio Taping versus McConnell Taping for patellofemoral pain syndrome: a systematic review and meta-analysis. Evid Based Complement Alternat Med. 2015;471208.
16. Santos JC, Giorgetti MJ, Torello EM, Meneghetti CH, Ordenes IE. A influência da Kinesio Taping no tratamento da subluxação de ombro no acidente vascular cerebral. Rev Neurocienc. 2010;18(3):335-40.
17. 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(10):3093-6.
18. Campolo M, Babu J, Dmochowska K, Scariah S, Varughese J. A comparison of two taping techniques (kinesio and mcconnell) and their effect on anterior knee pain during functional activities. Int J Sports Phys Ther. 2013;8(2):105-10.
19. Simsek HH, Balki S, Keklik SS, Ozturk H, Elden H. Does Kinesio taping in addition to exercise therapy improve the outcomes in subacromial impingement syndrome? A randomized, double-blind, controlled clinical trial. Acta Orthop Traumatol Turc. 2013;47(2):104-10.
20. Pop TB, Karczmarek-Borowska B, Tymczak M, Hałas I, Banaś J. The influence of Kinesiology Taping on the reduction of lymphoedema among women after mastectomy – preliminary study. Contemp Oncol (Pozn). 2014;18(2):124-9.
21. Donec V, Krisciunas A. The effectivenes of kinesio taping after total knee replacement in early postoperative rehabilitation period. A randomized controlled trial. Eur J Phys Rehabil Med. 2014;50(4):363-71.
22. Choi YK, Nam CW, Lee JH, Park YH. The effects of Taping Prior to PNF treatment on lower extremity proprioception of hemiplegic patients. J Phys Ther Sci. 2013;25(9):1119-22.
23. Zanchet MA, Del Vecchio FB. Efeito da Kinesio Taping sobre força máxima e resistência de força em padelistas. Fisioter Mov. 2013;26(1):115-21.
24. Solecki TJ, Herbst EM. Chiropractic management of a postoperative complete anterior cruciate ligament rupture using a multimodal approach: a case report. J Chiropr Med. 2011;10(1):47-53.
25. Ho YH, Lin, CF, Chang CH, Wu HW. Effect of ankle kinesio taping on vertical jump with run-up and countermovement jump in athletes with ankle functional instability. J Phys Ther Sci. 2015;27(7):2087-90.
26. Shields CA, Needle AR, Rose WC, Swanik CB, Kaminski TW. Effect of elastic taping on postural control deficits in subjects with healthy ankles, copers, and individuals with functional ankle instability. Foot Ankle Int. 2013;34(10):1427-35.
27. Lee JH. The Kinesio Taping technique may affect therapeutic results. J Physiother. 2015;61(4): 231-2.
28. Nunes GS, Vargas VZ, Wageck B, Hauphental DP, da Luz CM, de Noronha M. Kinesio Taping does not decrease swelling in acute, lateral ankle sprain of athletes: a randomised trial. J Physiother. 2015;61(1):28-33.
29. Nakajima MA, Baldridge C. The effect of kinesio® tape on vertical jump and dynamic postural control. Int J Sports Phys Ther. 2013;8(4):393-406.
30. Callaghan MJ, McKie S, Richardson P, Oldham JA. Effects of patellar taping on brain activity during knee joint proprioception using functional magnetic resonance imaging. Phys Ther. 2012;92(6):821-30.