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Original article

Inefficacy of Kinesio-Taping® on early postoperative pain after ACL reconstruction: Prospective comparative study

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ABSTRACT

Introduction: Kinesio-Taping® (K-Tape) is used in sports traumatology with the aim of reducing pain and improving blood and lymph circulation. The main objective of the present study was to assess the efficacy of K-Tape on early postoperative pain after anterior cruciate ligament (ACL) reconstruction. The study hypothesis was that K-Tape significantly decreases pain.
Method: A prospective non-randomized comparative study was conducted in 2013–2014 and included all patients who underwent primary ACL reconstruction by hamstring graft. Analgesia was standardized. Two groups, "K-Tape" and "controls", were formed according to the days on which the study physiotherapist was present. The K-Tape compression/decompression assembly was applied immediately postoperatively and maintained for 3 days. Patients filled out online questionnaires. The main assessment criterion was mean postoperative pain (D0–D3) on a 0-to-10 scale. Secondary criteria were analgesia intake on the three WHO levels, awakening during the night of D0 due to pain, signs of postoperative discomfort, and patient satisfaction.
Results: Sixty patients (30 per group) were included, 57 of whom could be assessed: 28 K-Tape, 29 controls; 44 male, 13 female; mean age, 30.9 ± 8.9 years. At inclusion, the two groups were comparable. There was no significant difference in mean (D0–D3) knee pain intensity: 3.8 ± 2.2 for K-Tape, and 3.9 ± 2 for controls ($P = 0.93$). Analysis of variance (ANOVA) found no significant intergroup difference in evolution of pain ($P = 0.34$). There were no other significant differences on the other assessment criteria.
Conclusion: K-Tape showed no efficacy on early postoperative pain following ACL reconstruction.
Level of evidence: III; prospective non-randomized comparative study.
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1. Introduction

In 2014 in France, 43,792 arthroscopic cruciate ligament procedures (Diagnosis-Related Group 08C34) were performed [1]. Day surgery has recently been developed in this context in France, encouraged by the health administration [2]. Planning for and optimization of postoperative pain control increases patient satisfaction, facilitates early mobilization and allows same-day discharge home [3,4].

Knee surgery causes pain, which may be poorly controlled by standard analgesia. Some physicians have assessed alternative techniques. Acupression proved effective versus placebo in pain control after day knee surgery [5], and cryotherapy with dynamic intermittent versus static permanent compression reduced analgesic intake after knee ligament reconstruction [6].

Kinesio-Taping® (K-Tape) is a therapeutic contention method developed by a Japanese physician in 1973 which is very popular with athletes. It is intended to prolong the impact of physiotherapy by applying fringed strips to create areas of compression and decompression. Efficacy on lower-limb drainage was demonstrated in animals [7] and patients managed by the Ilizarov technique [8], and in the forearm in patients with lymphedema after breast cancer surgery [9]. A recent meta-analysis found K-Tape to be significantly more effective on chronic musculoskeletal pain of more than 4 weeks' duration than was standard minimalist treatment, although less than conventional analgesia [10]. A randomized comparative study of total knee replacement found significantly better pain control with K-Tape from postoperative week 2 to end of physiotherapy [11].

To the best of our knowledge, K-Tape has not been studied in anterior cruciate ligament (ACL) reconstruction. The principal objective of the present study was therefore to assess efficacy

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on early postoperative pain following ACL reconstruction, on the hypothesis of significant alleviation.

2. Material and methods

A prospective non-randomized comparative study was conducted in 2013–14. Review Board approval (CPP IDF VI, La Pitié Salpêtrière Hospital, Paris, France) was secured for a non-interventional study.

2.1. Inclusion criteria

The study included a continuous series of patients undergoing primary ACL reconstruction by hamstring graft, performed by 3 senior surgeons, with conventional (non-daycare) admission. Exclusion criteria were multi-ligament involvement, body-mass index > 29, cardiovascular history, day surgery management, and patient's refusal. Two groups were formed, "K-Tape" and "control" (without contention) according to the days on which the physiotherapist was present in the operative room.

2.2. Anesthesia and analgesia protocols

Both groups received the department's usual anesthesia-analgesia protocol. Surgery was performed under general or spinal anesthesia, depending on the patient's and/or anesthetist's preferences. Ultrasound-guided crural block comprising 20 ml 0.475% naropeine was available in the induction room in either case. Prophylactic antibiotherapy was systematic.

Postoperative analgesia comprised i.v. paracetamol 1 g and naproxen 100 mg when non-steroidal anti-inflammatory drugs were not contraindicated, with or without associated tramadol 50 mg at 300 mg/day, followed by standard-dose oral relay. Morphine titration was initiated in the surveillance room in case of pain exceeding 5 on a 10-point visual analog scale, with anti-emetics (dexamethasone or ondansetron) in case of nausea or vomiting. During hospital stay, morphine was also available on demand.

At discharge, analgesia was systematically prescribed, with paracetamol associated to naproxen and an anti-gastric-secretion drug. In case of residual pain, the paracetamol tablet could be replaced by tramadol–paracetamol 37.5 mg/325 mg or paracetamol–codeine 500 mg/30 mg.

2.3. Application of K-Tape

A single specifically trained physiotherapist applied K-Tape, in the operative room after surgery. The blue cotton strips were cut into 5 bands, with edges rounded to prevent them coming unstuck. A fan-strip assembly (Fig. 1) was applied with the knee in 90° flexion, above the patella and at the gracilis and semitendinosus tendon donor site. 0–15% tension was exerted on application and checked by measuring the strip before and after application. The K-Tape was maintained for 3 days then removed by the patient following the physiotherapist's instructions. A single application was made in the K-Tape group.

2.4. Assessment criteria

The main assessment criterion was mean knee pain intensity from D0 (evening and night) to D3 on a VAS ranging from 0 (no pain) to 10 (worst imaginable pain).

Secondary assessment criteria were comprised of:

- daily pain intensity from D0 to D3;
- analgesia intake (WHO levels 1–3) from recovery room to D3;
- awakening due to pain during the night of D0;
- signs of postoperative discomfort (nausea and vomiting, dizziness, malaise, anxiety, stomach pain) from D0 to D3;
- allergic reaction to K-Tape;
- overall patient satisfaction.

Self-assessment used WebSurvey.fr® software following an email on D4 with a link to the online questionnaire.

2.5. Statistical analysis

Statistical analysis used STATA.10 software. Calculation of power indicated two groups of 22 patients to detect a 10% difference with 10% standard deviation, alpha risk of 0.05 and 0.90 power. Allowing for 10% incomplete files, it was decided to include at least 24 patients per group. Normal distribution was checked on Shapiro-Wilk test and homogeneity of variance on Bartlett test. Quantitative variables were analyzed on Student test and qualitative variables on Chi^2. Analysis of variance (ANOVA) was performed for multiple comparison of means, with Bonferroni correction.

3. Results

3.1. Description of patients

Sixty patients were included: 30 per group. Three (2 in the K-Tape group, 1 control) failed to provide postoperative data; 57/60

Table 1
Baseline demographic data.

Preoperative variables	K-Tape group (N = 28)	Control group (N = 29)	P
Gender	7 F/21 M	6 F/23 M	0.69
Age (years)	29.2 ± 8.6	32.6 ± 9.1	0.14
BMI	23.8 ± 2.6	24.5 ± 3.1	0.37
Sports level	Professional 2 (7.1%) Competition 11 (39.3%) Regular leisure 15 (53.6%) Occasional leisure 0 No sport 0	Professional 0 Competition 16 (55.2%) Regular leisure 11 (37.9%) Occasional leisure 2 (6.9%) No sport 0	0.14
Subjective IKDC score	61.4 ± 12.8	58.7 ± 11	0.4
Objective IKDC score	A 0 B 0 C 21 (75%) D 7 (25%)	A 0 (0%) B 6 (20.7%) C 16 (55.2%) D 7 (24.1%)	0.1
Differential laxity on GNRB[a] 200 N (mm) [12]	4.3 ± 2.2	4.2 ± 2.2	0.91

BMI: Body-mass index; IKDC: International Knee Documentation Committee.
Results expressed as mean ± standard deviation, and percentage.
[a] GeNouROB laximeter.

Table 2
Surgery data.

Surgical variables	K-Tape group (N = 28)	Control group (N = 29)	P
Spinal anesthesia	27 (96.4%)	22 (75.9%)	0.02
Associated crural block	15 (53.6%)	15 (51.7%)	0.88
Tourniquet time (minutes)	41.8 ± 5.9	43.9 ± 9.5	0.49
Cartilage lesions	2 (7.1%)	11 (37.9%)	0.006
Cartilage lesions treated	0	2 (6.9%)	0.48
Medial meniscus lesions	7 (25%)	10 (34.5%)	0.43
Medial meniscus lesions treated	5 (17.8%)	7 (24.1%)	0.11
Lateral meniscus lesions	6 (21.4%)	10 (34.5%)	0.27
Lateral meniscus lesions treated	4 (14.3%)	7 (24.1%)	0.77
Hospital stay (days)	2.7 ± 1.4	2.5 ± 1.2	0.64

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