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# The effectiveness of Kinesio Taping® after total knee replacement in early postoperative rehabilitation period. A randomized controlled trial

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***Background.*** **The number of total knee replacements performed each year is increasing. Among the main impediments to functional recovery after these surgeries include postoperative edema, pain, lower limb muscle strength deficits, all of which point to a need to identify safe, effective postoperative rehabilitation modalities.**
***Aim.*** **The aim of this paper was to evaluate the effectiveness of Kinesio Taping® (KT) method in reducing postoperative pain, edema, and improved knee range of motion recovery after total knee replacement (TKR) operation in early postoperative rehabilitation period.**
***Design.*** **Randomized clinical trial.**
***Setting.*** **Inpatient rehabilitation facility.**
***Population.*** **Ninety-four patients, who underwent primary TKR surgery.**
***Methods.*** **Using simple randomization, participants were divided into KT group and control group. Both groups received same rehabilitation program and procedures after surgery, except KT group also received KT applications throughout all rehabilitation period. Postoperative pain, edema, restoration of the operated knee flexion and extension were evaluated. The chosen level of significance was $P<0.05$; in evaluation power of the test $\beta \leq 0.2$. Groups were homogenous to sex, age, BMI, comorbidities, preoperative knee flexion/extension impairment, preoperative pain intensity, anaesthesia, prosthesis implanted ($P>0.05$).**
***Results.*** **In both groups postoperative pain decreased significantly during rehabilitation period, however less pain was found in KT group from the second postoperative week till the end of inpatient rehabilitation ($28^{th}$ postoperative day) ($P<0.05$; $\beta \leq 0.2$). Postoperative edema was less intense and subsided more quickly in KT group as well ($P<0.05$; $\beta \leq 0.2$). No difference was found in improvement of knee flexion ($P>0.05$). Operated knee extension was found better in KT group then in control at the end of in-patient rehabilitation ($P<0.05$; $\beta \leq 0.2$). KT was well tolerated by patients.**
***Conclusion.*** **KT technique appeared to be beneficial for reducing postoperative pain, edema, improving knee extension in early postoperative rehabilitation period.**
***Clinical Rehabilitation Impact.*** **This finding implies for health care professionals working in the field of physical medicine and rehabilitation that Kinesio Taping® method is safe and can be used as additional rehabilitation means for patients after TKR.**

**KEY WORDS:** Arthroplasty, replacement, knee - Kinesio taping - Rehabilitation - Edema - Pain.

The number of total knee replacements (TKR) performed each year is increasing. Among the main impediments to functional recovery after TKR are postoperative edema, pain, lower limb muscle strength deficits, with imbalances between knee extensor and flexor forces.[1-3] Poor ligamentary and neuromuscular control may result in destructive mechanical stresses and reduced control over anterior shear forces on the knee implant, potentially limiting implant longevity.[1] Proper management of postoperative pain is essential for the basic human concern of freeing patients from suffering for successful TKR outcome in terms of improving patient satisfaction

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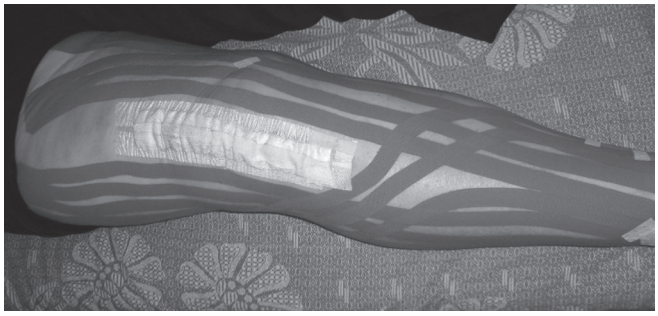

Figure 1.—Lymphatic correction application in early postoperative phase (applied first two weeks after surgery).

and quality of life and prevention of complications.[4] Adverse effects of analgesic medications lead us to pursue safe, patient-friendly postoperative pain management modalities.

Kinesio Taping® (KT) method was found by Japanese Dr. Kenso Kase in 1973. This method differs from other taping techniques by specially designed elastic tape – Kinesio® Tex Gold™ – which is used and applied directly on the skin in special manner in order to achieve various therapeutic effects such as mechanical correction, restoration of normal fluid perfusion, removing congestion of lymphatic fluid or hemorrhages, support for muscular activity, correction of misalignment of joints, analgesic system activation (elimination of pain cause, activation of pain inhibitors).[5-7]

The aim of our study was to evaluate the effectiveness of KT in reducing postoperative pain, edema, improving knee range of motion recovery after TKR in early postoperative rehabilitation period.

## Materials and methods

The study protocol and patient information form was approved by the relevant local ethics committee. The study was carried out from 2010 June to 2012 January; 542 patients, who were admitted to orthopedic-traumatology department for primary TKR surgery, were assessed for eligibility and ninety four, who agreed to participate in the study, had no contraindications to participate (III-IV$^0$ heart failure; III-IV$^0$ renal failure; fragile, very hairy or very sensitive skin; present, not healed infectious disease; skin lesions in area where kinesio tapes were to apply; lymphedema prior to surgery; cancer in history), were enrolled. After signing written consent, patients were randomized into two groups: the KT group and control group. Sealed envelopes were prepared and one randomly was chosen in order to assign patient to a group.

For all participants postoperative rehabilitation program included early mobilization and physical therapy once a day during the stay in orthopedic traumatology department, early transfer (on 5-7$^{th}$ postoperative day) to inpatient rehabilitation department. In rehabilitation department, inpatient rehabilitation was carried out by standardized protocol which included physical therapy twice a day, occupational therapy once a day, intermittent pneumatic compression, massage, transcutaneous electrical nerve stimulation (TENS), laser therapy, paraffin therapy, psychologist and social worker procedures. Above mentioned rehabilitation measures were standardized in study protocol. The amount and methods of application of rehabilitation methods did not differ between groups and were administered by the same rehabilitation team, except KT group patients also received KT applications throughout all rehabilitation period with Kinesio® Tex Gold™ tapes. In early postoperative phase (on the second and 8$^{th}$ postoperative day) lymphatic correction was applied for KT group patients. Depending on the size of the leg two or three fan cut tapes were applied with light paper-off tension on the frontal, medial and lateral aspects of the limb (Figure 1). Later, in rehabilitation department, lymphatic correction applications were continued together with Kinesio Y strip technique (light paper-off tension) for *rectus femoris* facilitation (applied from muscle origin to insertion), and Kinesio I strip technique (moderate – approximately 50% tension) for medial knee ligaments (seeking, as according to the founder, for increased stimulation of mechanoreceptors over the area, proprioception improvement and pain reduction) (Figure 2). Kinesio tapes were applied by certified KT practitioner once a week (4 applications during rehabilitation period) with one "day off" (tapes were removed from the skin) for skin rest in between applications.

The evaluation of chosen criteria (pain, active knee flexion and extension, leg circumference) was performed on preoperative day, and on the 2$^{nd}$, 8$^{th}$, 16$^{th}$ and 24$^{th}$ day after operation and at the end of in-patient rehabilitation (which was the 28$^{th}$ post-

Figure 2.—Lymphatic correction application with Kinesio Y strip technique for m. rectus femoris facilitation and Kinesio I strip technique for medial knee ligaments (from the third postoperative week till the end of inpatient rehabilitation).

operative day). Knee pain intensity was evaluated by numeric pain rating scale (NPRS), active knee flexion and extension – by goniometer (except on 2nd postoperative day no measurements with goniometer were done due to range of motion limitations caused by postoperative knee drainage for all participants). In order to evaluate postoperative edema, its dynamics, leg circumference measurements with tape before surgery and afterwards were done in four standardized points of the limb: over the knee (10 cm above the superior pole of the patella); at the middle line of knee articular space; in the calf (25 cm above the lateral malleolus inferior pole); and 2 cm above the medial malleolus. To increase reliability of tape measurements, they were performed by the same researcher, under same conditions and time of the day. The difference of circumference exceeding 0.5 cm was held as clinically important change in edema dynamics. Therefore, when performing data analysis, patients were divided into two groups: 'clinically significant edema present' (difference of circumference from preoperative values of the same limb exceeds 0.5 cm) and "no clinically significant edema" group (measured circumference difference was lower than 0.5 cm).

Data from patient case histories about the need of analgesic medications were collected after rehabilitation.

Four patients from KT group were excluded from research due to change in attitude toward their participation and unwillingness to follow study protocol. One patient from control group also didn't finish study due to septic arthritis postoperatively. Only those patients, who fully completed study protocol, were included in data analysis. Study design is presented in flow chart diagram Figure 3.

*Statistical analysis*

Statistical analysis was performed using software IBM SPSS Statistics 21.

Data are presented as mean±standard deviation (SD). After testing for normality, parametric and nonparametric criteria, the Student's t-test or repeated measures ANOVA and Mann-Whitney U test or Friedman test were used to compare quantitative samples. Odds ratios (OR) and corresponding 95% confidence intervals (CI) for postoperative edema in relation to kinesio taping and control group were calculated. The significance level of 0.05 was chosen for testing statistical hypotheses. The size of the difference between the means of the groups were evaluated by estimation of type I and type II errors ($\alpha$ and $\beta$) of the tests. The size of the difference was considered to be significant if $\alpha$=0.05, $\beta \leq 0.2$.

## Results

Groups were homogenous according to sex ($\chi^2$=0.259; df=1; P=0.611), age (P=0.438), BMI (P=0.121), preoperative knee flexion (P=0.523)/extension (P=0.341), preoperative knee pain intensity (P=0.255), number of comorbidities (chronic non-infectious diseases) ($\chi^2$=5.94; df=3; P=0.115), kind of prosthesis implanted ($\chi^2$=4.709; df=3; P=0.194). All patients underwent combined spinal-epidural anaesthesia during surgery. Before kinesio taping applications were started (on the second postoperative day), no difference between groups in postoperative pain intensity (P=0.568) or edema (P>0.05) was detected. Main descriptive characteristics of the participants are presented in Table I.

KT applications were well tolerated by patients and did not interfere with their active participation in physical therapy exercises and other rehabilitation procedures. No side effects of the method were noticed, except two patients, who withdrew voluntarily from the study due to unwillingness to follow study protocol noting that kinesio tapes caused mild skin irritation. However they did not seek for medical personnel help, but removed tapes from the

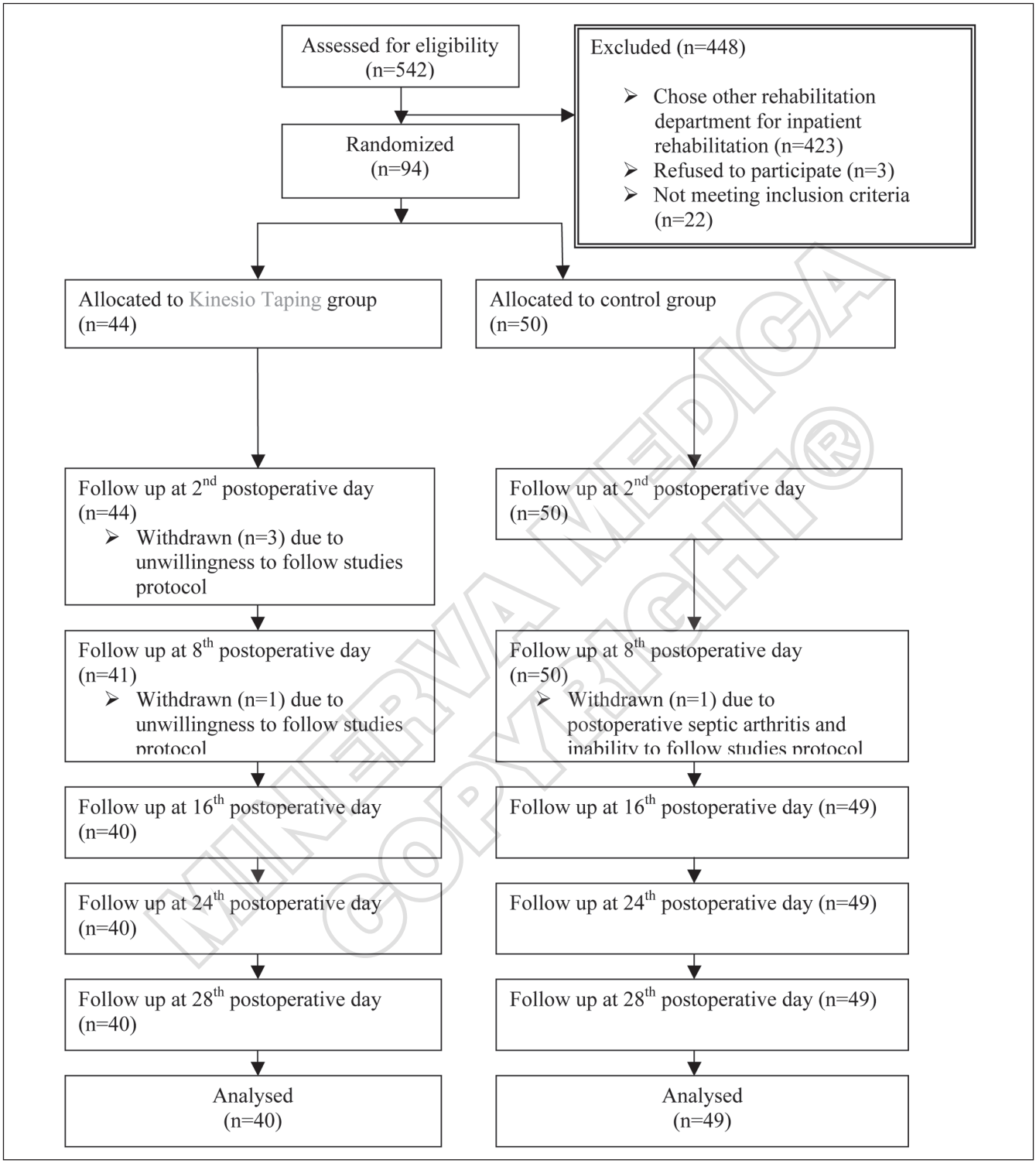


Figure 3.—Study's flow chart diagram.

TABLE I.—*Main descriptive characteristics of the participants.*

| | Kinesio Taping Group | Control Group |
|---|---|---|
| Number of patients | 40 | 49 |
| Gender (number of patients and % within group): | | |
| male | 5 (12.5%) | 8 (16.3%) |
| female | 35 (87.5%) | 41 (83.7%) |
| Age (mean±SD) | 66.6±10.5 | 68.1±7.8 |
| BMI (mean±SD) | 31.7±5.8 | 33.7±6.1 |
| Preoperative knee flexion (mean±SD) | 107±13.5° | 105±16.1° |
| Preoperative knee extension (mean±SD) | 172±13.5° | 174±7.5° |
| Preoperative knee pain intensity according NPRS* (mean±SD) | 6±1.3 points | 6.3±1.7 points |
| Comorbidities (number of patients and % within group): | | |
| None | 7 (17.5%) | 2 (4.1%) |
| 1 | 12 (30%) | 12 (24.5%) |
| 2 | 13 (32.5%) | 25 (51%) |
| >2 | 8 (20%) | 10 (20.4%) |

*The NPRS is an 11-point scale from 0-10, where "0" = no pain and "10" = the most intense pain imaginable.

TABLE II.—*Knee pain intensity changes according NPRS.*

| Postoperative day | KT group (mean±SD) | P values within KT group[a] | Control group (mean±SD) | P values within control group[b] | P values KT group *vs.* control group |
|---|---|---|---|---|---|
| 2nd | 5.2±1.8 | - | 5.5±1.4 | - | 0.362 |
| 8th | 4.75±1.4 | 1.00 | 5.2±1.3 | 1.00 | 0.083 |
| 16th | 3.6±1.4 | <0.001* | 4.3±1.5 | 0.004* | 0.011* |
| 24th | 2.7±1.2 | <0.001* | 3.5±1.4 | <0.001* | 0.015* |
| 28th | 2.2±1.2 | <0.001* | 2.9±1.2 | <0.001* | 0.006* |

*Difference is statistically significant. [a] KT group data at 2nd postoperative day *vs.* KT group data on 8th (16th, 24th, 28th) postoperative day. [b] Control group data on 2nd postoperative day *vs.* control group data on 8th (16th, 24th, 28th) postoperative day.

skin by themselves, and at the time researches were made aware of their complaint towards tapes (about 24 hours after actual discomfort) no objective signs of skin irritation, which might have been provoked by kinesio tapes, were noticed.

### *Postoperative pain*

Despite pharmaceutical and non- pharmaceutical pain management, patients complained of intermittent pain at the knee in early postoperative rehabilitation period. In both groups pain decreased significantly from the second week postoperatively, however pain intensity was found to be less in KT group from the second postoperative week till the end of inpatient rehabilitation. Detailed data about changes in pain intensity during rehabilitation is presented in Table II. No difference between groups in the usage of analgesic medications during the entire rehabilitation period (P>0.05) was found.

### *Postoperative edema*

Postoperative edema in all measured levels of the limb in both groups reached its peak at the first postoperative week, however, in KT group, edema was less intense and regressed quicker in thigh, knee and calf ($P<0.05$; $\beta \leq 0.2$) during rehabilitation. No difference in circumference dynamics at the ankle was detected (Table III). When analyzing the percentage of patients, to whom postoperative edema influenced the increase of circumference more than 0.5 cm from preoperative values (such change was interpreted as clinically significant dynamics in edema by authors), fewer patients in KT group were found to have edema in the thigh, knee and calf region from the second postoperative weak (data presented in Table IV). Significant difference in edema presence at the above mentioned limb levels remained till the end of inpatient rehabilitation. No difference according this criterion was found at the ankle (P>0.05).

The risk for control group patients to have clinical

TABLE III.—*Dynamics of leg circumference difference in cm.*

| Level of measurement | Post-operative day | KT group (mean±SD) | P values within KT group[a] | Control group (mean±SD) | P values within control group[b] | P values KT group *vs.* control group |
|---|---|---|---|---|---|---|
| *Thigh* | 2nd | 1±0.7 | - | 1±0.5 | - | 0.778 |
| (10 cm above the superior | 8th | 1.4±1.2 | 1 | 2.7±1.8 | **0.001*** | **<0.001*** |
| pole of the patella) | 16th | 1.6±0.8 | 0.08 | 1.8±1.5 | 1 | **<0.001*** |
| | 24th | 0.4±0.8 | **0.02*** | 1.6±1.5 | 1 | **<0.001*** |
| | 28th | 0.5±0.7 | **0.005*** | 1.5±1.4 | 0.476 | **<0.001*** |
| *Knee* | 2nd | 1.3±0.9 | - | 1.1±0.3 | - | 0.57 |
| (in the middle line of knee articular | 8th | 1.4±1.2 | 1 | 2.2±1.5 | **0.001*** | **0.009*** |
| space) | 16th | 0.7±1 | **0.002*** | 1.4±1 | 1 | **0.001*** |
| | 24th | 0.4±0.7 | **0.001*** | 1.2±1.1 | 1 | **<0.001*** |
| | 28th | 0.3±0.6 | **0.001*** | 0.8±1 | 1 | **0.776** |
| *Calf* | 2nd | 0.4±0.9 | - | 0.3±0.6 | - | 0.531 |
| (25 cm above the lateral malleolus | 8th | 1±1.1 | **0.004*** | 1.4±1.4 | **<0.001*** | 0.193 |
| inferior pole) | 16th | 0.3±0.6 | 1 | 0.9±1 | **0.033*** | **0.001*** |
| | 24th | 0.2±0.3 | 0.477 | 0.8±1.1 | 0.905 | **0.001*** |
| | 28th | 0.1±0.3 | 1 | 0.6±0.8 | 0.967 | **0.001*** |
| *Ankle* | 2nd | 0.1±0.3 | - | 0.2±0.3 | - | 0.693 |
| (2 cm above medial | 8th | 0.6±0.6 | **<0.001*** | 0.7±0.9 | **<0.001*** | 0.516 |
| malleolus) | 16th | 0.4±0.6 | 0.121 | 0.7±0.9 | **<0.001*** | 0.063 |
| | 24th | 0.3±0.5 | 1 | 0.4±0.6 | **0.022*** | 0.113 |
| | 28th | 0.3±0.5 | 1 | 0.4±0.6 | **0.024*** | 0.153 |

*Difference is statistically significant. [a] KT group data at 2nd postoperative day *vs.* KT group data on 8th (16th, 24th, 28th) postoperative day. [b] Control group data on 2nd postoperative day *vs.* control group data on 8th (16th, 24th, 28th) postoperative day.

TABLE IV.—*Evaluation of clinically significant edema.*

| Region & postoperative day | Clinically significant edema [1] present | | No clinically significant edema | | $\chi^2$, P values |
|---|---|---|---|---|---|
| | KT group number of patients (%) | Control group number of patients (%) | KT group number of patients (%) | Control group number of patients (%) | |
| Thigh | | | | | |
| 2nd | 30 (75%) | 39 (79.6%) | 10 (25%) | 10 (20.4%) | $\chi^2$=0.3, P=0.606 |
| 8th | 26 (65%) | 40 (81.6%) | 14 (35%) | 9 (18.4%) | $\chi^2$=3.2, P=0.075 |
| 16th | 15 (37.5%) | 34 (69.4%) | 25 (62.5%) | 15 (30.6%) | $\chi^2$=9.1, P=0.003* |
| 24th | 9 (22.5%) | 34 (69.4%) | 31 (77.5%) | 15 (30.6%) | $\chi^2$=19.4, P<0.001* |
| 28th | 12 (30 %) | 32 (65.3%) | 28 (70 %) | 17 (34.7%) | $\chi^2$=11, P=0.001* |
| Knee | | | | | |
| 2nd | 38 (95%) | 48 (98%) | 2 (5%) | 1 (2%) | $\chi^2$=0.6, P=0.442 |
| 8th | 29 (72.5%) | 40 (81.6%) | 11 (27.5%) | 9 (18.4%) | $\chi^2$=1.1, P=0.305 |
| 16th | 14 (35%) | 37 (75.5%) | 26 (65%) | 12 (24.5%) | $\chi^2$=14.8, P<0.001* |
| 24th | 6 (15%) | 32 (65.3%) | 34 (85%) | 17 (34.7%) | $\chi^2$=22.8, P<0.001* |
| 28th | 7 (17.5%) | 24 (49%) | 33 (82.5%) | 25 (51%) | $\chi^2$=9.6, P=0.002* |
| Calf | | | | | |
| 2nd | 8 (20%) | 9 (18.4%) | 32 (80%) | 40 (81.6%) | $\chi^2$=0.04, P=0.845 |
| 8th | 19 (47.5%) | 30 (61.2%) | 21 (52.5%) | 19 (38.8%) | $\chi^2$=1.7, P=0.195 |
| 16th | 6 (15%) | 21 (42.9%) | 34 (85%) | 28 (57.1%) | $\chi^2$=8.1, P=0.004* |
| 24th | 3 (7.5%) | 19 (38.8%) | 37 (92.5%) | 30 (61.2%) | $\chi^2$=11.6, P=0.001* |
| 28th | 3 (7.5%) | 18 (36.7%) | 37 (92.5%) | 31 (63.3%) | $\chi^2$=10.4, P=0.001* |
| Ankle | | | | | |
| 2nd | 3 (7.5%) | 4 (8.2%) | 37 (92.5%) | 45 (91.8%) | $\chi^2$=0.01, P=0.908 |
| 8th | 16 (40%) | 20 (40.8%) | 24 (60%) | 29 (59.2%) | $\chi^2$=0.01, P=0.938 |
| 16th | 10 (25%) | 19 (38.8%) | 30 (75%) | 30 (61.2%) | $\chi^2$=1.9, P=0.168 |
| 24th | 6 (15%) | 14 (28.6%) | 34 (85%) | 35 (71.4%) | $\chi^2$=2.4, P=0.127 |
| 28th | 8 (20%) | 12 (24.5%) | 32(80%) | 37 (75.5%) | $\chi^2$=0.3, P=0.614 |

[1]The difference of circumference exceeds 0.5 cm preoperative value of the same limb.
*Difference is statistically significant.

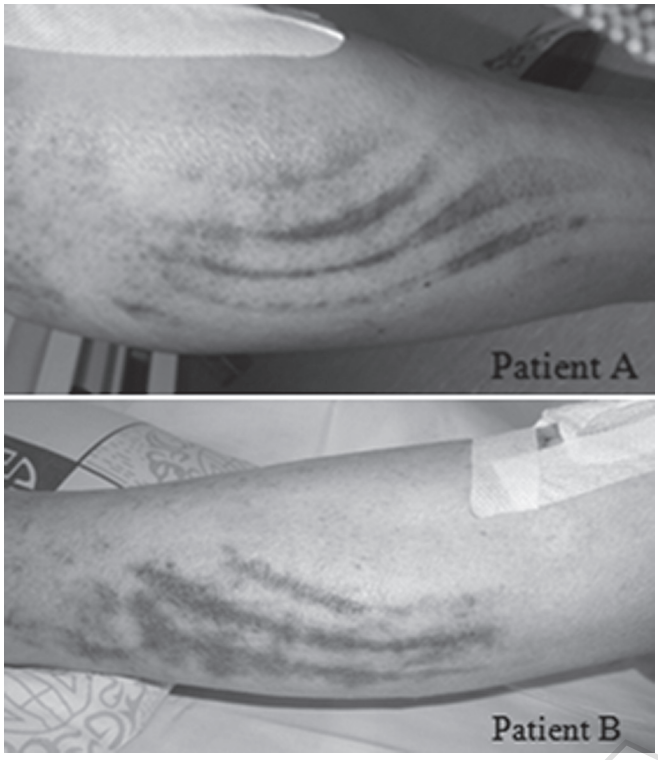


Figure 4.—The view of postoperative hematoma after removal of kinesio tapes at the 8th postoperative day.

significant edema in thigh at the 16th postoperative day was 3,8 times [OR=3.778; PI (95%):1.56-9.13; P=0.003], at the 24th – 7.8 times [OR=7.807; PI (95%): 2.99-20.37; P<0.001], at 28th – 4.4 times [OR=4.392; PI (95%): 1.79-10.76; P=0.001] greater, then for Kinesio Taping group patients. In the knee region at 16th postoperative day the risk to have edema for control group was greater 5.7 times [OR 5.7; PI (95%): 2.282-14.37; P<0.001], at 24th – 10.7 times [OR 10.667; PI (95%): 3.74-30.4; P<0.001] and at 28th postoperative day – 4.5 times [OR 4.526; PI (95%): 1.68-12.17; P=0.003]. Risk for control group patients to have edema in calf was greater 4.3 times [OR 4.25; PI (95%): 1.51-11.98; P=0.006] at 16th postoperative day; 7.8 times [OR 7.811; PI (95%): 2.11-28.93; P=0.002] at 24th and 7.2 times (OR 7.16; PI (95%): 1.9-26.6; P=0.003) at 28th postoperative day. Noteworthy, though it was not the scope of this study, that in KT group was observed quicker reabsorption of postoperative hematomas in the regions where skin was covered with kinesio tapes in comparison with those areas, not covered. This phenomenon was best apparent after removal of tapes from the skin in between applications (Figure 4).

*Active range of motion*

Both groups patients significantly improved postoperative knee flexion and extension during rehabilitation (P<0.05). No difference was found in improvement of active knee flexion (P>0.05) between groups. Operated knee extension was found better in KT group at the end of inpatient rehabilitation (24th and 28th postoperative days) (P<0.05; β≤0.2) (Table V).

## Discussion

As far as we managed to find, when analysing the literature, this was the first study concerned with the effects of Kinesio Taping® after TKR. It is also one of the few studies where KT method was applied for aged population.

TABLE V.—*Knee flexion and extension changes during rehabilitation.*

| Postoperative day | KT group (mean±SD) | P values within KT group[a] | Control group (mean±SD) | P values within control group[b] | P values KT group *vs.* control group |
|---|---|---|---|---|---|
| Active 8th | 80±13.3° | — | 77.5±15.6° | — | 0.412 |
| Knee 16th | 93.2±10.4° | <0.001* | 87.9±13° | **0.001*** | 0.07 |
| Flexion 24th | 98.3±11.2° | <0.001* | 94.4±11.8° | **<0.001*** | 0.115 |
| Flexion 28th | 100.6±9.6° | <0.001* | 97.1±12.3° | **<0.001*** | 0.144 |
| Active 8th | 170.1±8.1° | — | 167.5±10.1° | — | 0.131 |
| Knee 16th | 172±8.1° | 0.455 | 170.1±6.4° | 0.276 | 0.209 |
| Extension 24th | 174.3±6.2° | **0.001*** | 170.7±7.7° | **0.01*** | **0.019*** |
| Extension 28th | 176.3±5.2° | **<0.001*** | 173.1±6.2° | **<0.001*** | **0.011*** |

*Difference is statistically significant. [a] KT group data at 8th postoperative day *vs.* KT group data on 16th (24th, 28th) postoperative day. [b] Control group data on 8th postoperative day *vs.* control group data on 16th (24th, 28th) postoperative day.

We found that Kinesio Taping®, applied together with other rehabilitation modalities, has pain reducing effect after TKR and this relates to the findings presented by several other authors, who analysed the effect of KT on pain.[8-12] However, according to the literature, the exact benefit of this method to pain reduction remains unclear.[13, 14] There also are studies whose results indicate that KT may have a placebo effect on pain or no effect at all. Due to one of the limitations of our study — the lack of placebo control group — we cannot estimate whether the KT influenced reduction of pain after TKR would be equal to placebo taping effect. This issue remains for further studies in this field. The fact that KT group patients had lower pain intensity after surgery, but the need for analgesic medications remained the same during rehabilitation, we think, implies the conclusion, that KT has pain relieving effect, however it should not be applied as a routine rehabilitation measure after TKR for this purpose exceptionally. In order to achieve sufficient pain relief, patients still needed other measures and drug treatment, thus making cost-effectiveness of KT for postoperative pain management an unsolved problem. However, because of its being patient-friendly, well-tolerated, with few known contraindications for its use, KT method, we think, may be considered for some patients after TKR as an additional rehabilitation measure for pain reduction, especially in contexts where other pain management means are contraindicated.

We found only one study, which analyzed KT effects on edema in orthopedic population. Authors of this study concluded KT to be beneficial in reducing lower limbs edema in patients treated with Ilizarov method. In their research, KT produced a significantly faster reduction of the edema compared to standard lymphatic massage.[19] Our results also support KT use as edema reduction rehabilitation mean in early postoperative period after TKR, for it notably decreased the risk of having clinically significant edema from the second postoperative weak; also edema was less intense and regressed quicker in KT group. However, the absence of double blinded placebo control and longer follow up in our study, makes these results as a preliminary support for KT use, where further investigation is needed. Still, the fact that other authors, who evaluated KT effects on lymphedema in cancer population also found KT lymphatic applications to accelerate lymphatic and venous microcirculation, to evoke reduction of the stasis of lymph in intercellular spaces and therefore reduction of lymphedema;[7, 20-22] also the better acceptance of KT method than the short stretch bandaging, where benefits included longer wearing time, less difficulty in usage, and increased comfort and convenience;[7] we think, KT could be considered as a safe and most likely effective measure for patients after TKR and can be applied as a means of rehabilitation for postoperative edema reduction.

We found that KT technique, applied during the study, was beneficial for improving recovery of knee extension. The exact impact of KT on muscular function is still a matter of controversy in the existing literature. Some recent studies would support, the view that better recovery of the knee extension might have been evoked by *musculus rectus* facilitating application and therefore increased muscle strength, recruitment of the muscle's motor units and its bioelectrical activity,[23-26] however, other researchers in this field found no effect of KT applications on muscle.[27, 28] It is worth remembering, that the reduction of edema and pain in the joint area itself can increase muscle strength and active range of motion.[20, 22] Which factor had mostly influenced better recovery of knee extension had not been the scope of our study and further investigation in this field might give a deeper insight.

## Conclusions

Kinesio Taping® technique appeared to be beneficial for reducing postoperative pain, edema, improving knee extension in early postoperative rehabilitation period. KT can be used as an additional means of rehabilitation for patients after TKR.

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