ORIGINAL ARTICLE

Effectiveness of Kinesio Taping on Pain and Function after Total Knee Arthroplasty

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ABSRTACT

Objective: The objective of the study was to determine the effectiveness of Kinesio Taping on pain and function after total knee arthoplasty.

Methodology: The study design was quasi experimental trial. Non-probability purposive sampling technique was employed with a sample size of 30 including both male and female patients within age group of 50-85 who had undergone total knee arthoplasty. Patients were divided into two groups. Control group labeled as Group (A) received standard physical therapy treatment while experimental group labeled as Group (B) was treated with Kinesio Taping in addition to standard physical therapy treatment. Data collection tools used was Numeric Pain Rating Scale (NPRS) and Lysholm Knee Scoring Scale. The data was analyzed statistically through IBM SPSS version 25.

Results: The mean age of patients in Group (A) was 70.66 ±SD 3.33 while the patients in Group (B) had a mean age of 69.93±SD 5.37. Significant improvement was found in both groups. Mean value of Numeric Pain Rating Scale was significantly improved with pre-treatment (mean diff = 0.21) & post-treatment (mean diff = 0.14) whilst the p-value<0.05. Mean value of Lysholm Knee Scoring Scale was also found to be improved with pre-treatment (mean diff = 0.28) and post-treatment (mean diff = 0.00) whilst the p-value<0.05.

Conclusion: The study concludes positive effects of treatment in both groups but the Experimental group exhibited relatively greater improvements in terms of the mean difference of Numeric Pain Rating Scale and Lysholm Knee Scoring Scale.

Key words: knee arthoplasty, kinesiology taping, total knee replacement

INTRODUCTION

Knee joint is one of the prime weight-bearing hinge joint that significantly contributes to normal functionality of an individual in everyday life. Arthropathies devitalizing knee joint can considerably affect the quality of life of affected individual. In this direction, total knee replacement is one of the gold standard surgical procedures embraced to cope with the resultant disabilities. Total knee replacement is a complex surgical procedure adopted by orthopedic surgeons for patients with debilitating knee arthropathies. Although this surgical procedure does not reduce mortality rate but has produced appreciable improvements in field of rehabilitation to enhance health & quality of life in individuals with devitalizing knee conditions [(1)]. Total knee replacement involves resurfacing of diseased knee joint by cutting away the defaced bone and cartilage of femur, tibia and patella to implant prosthesis made of metal alloys, plastics and polymers[(2)].

Number of patients undergoing total knee replacement has been sloping upwards since past few years. Post-operatively, patients experience pain, edema, reduced lower limb muscle strength, muscular imbalance and compromised knee stability. Treatment regimens to cope with post-operative pain and edema include pharmacotherapy and other conservative methods. According to an American study, serious adverse effects are consequential to pharmacotherapy as compared to conservative methods of pain management [(1-3).]

Chronic autoimmune diseases, knee arthropathies and other conditions such as osteonecrosis are common causes for the recommendation of total knee replacement[(4)]. Osteoarthritis is a prime joint disease that results due to the breakage of cartilage between the knees. Total knee replacement is the foremost recommendation for patients with end stage osteoarthritis with the motive to regain normal function of joint and relieve pain[(5)].

Osteoporosis and Osteonecrosis are other conditions qualifying for total knee replacement[(6)]. After the removal of damaged bone and cartilage, three types of prostheses are used depending upon patient age, gender, activity level, weight, past medical history and overall health condition. These include semi-constrained, non-constrained and constrained[(7)].Semi-constrained prosthesis is used as a substitute for cruciate ligaments and is adopted when posterior cruciate ligament retention is not possible so the surgeon prefers to remove it. Non-constrained prosthesis relies on muscles and ligaments of patient for stability and the components are not dependent on each other. This type of prosthesis is popular in total knee replacement. Constrained prosthesis makes use of hinged mechanism to link tibial and femoral components and is adopted when knee is profoundly unstable[(8)].

Furthermore, three options are available to affix the prosthesis to bone. These include cemented, non-cemented & hybrid fixation. In cemented, fast drying bone cement is used to contain the prosthesis. Non-cemented

method encourages bone growth over the time to cause adherence. In hybrid fixation, a blend of cemented & non-cemented procedure is employed[9].

Kinesio Tape is an adhesive cotton tape widely used as a therapeutic tool to reduce pain and edema. It improves lymphatic and blood circulation, supports proper alignment to alleviate joint soreness and enhances function by re-educating muscles[10]. Kinesio Tape is commonly used as an adjunct to other standard physical therapy treatments to accomplish the treatment goal. This tape can be applied in F, Y, X, I or fan shape depending upon treatment goals. Research suggests that Kinesio Tape applied earlier after total knee replacement reduces post-operative pain, edema and serves to increase knee extension[11]. Kinesio Tape has found to be an effective rehabilitative tool to assist lymphatic drainage[12].

METHODOLOGY

The design adopted for this study was quasi experimental trial. The study was conducted from February to August 2019 in Physical Therapy Outpatient department of Sialkot Medical Complex and Syed Medical Complex after taking informed consent from patients and institutional review boards of the hospitals. The study was approved by research ethical committee of Riphah College of rehabilitation sciences (RCRS). Through non-probability purposive sampling technique, 30 patients within age group of 50-85 were included as sample that had undergone total knee replacement and were excluded if they exhibited post-operative complications, red flag signs or if they had received physical therapy treatment within the past month. Data was collected after informed consent and involved questionnaires & direct observation. The patients were divided in two groups with group A as control group given standard physical therapy treatment alone whilst group B as experimental group given Kinesio Taping adjunct to standard physical therapy treatment. Standard physical therapy treatment included ankle pumps, deep breathing exercises, hip and knee isometrics, sitting on bed edge, short-term walking with bearable weight on prosthetic side combined with cryotherapy session of twenty minutes. The frequency and repetition of the exercises was increased according to the patient condition. Patients also performed isotonic hip and knee circumference strengthening exercises. Patients were given ambulation training, stretching exercises and home plan was added at the end of the first week. Patients were kept aware of their progression. In addition to this program, the lymphatic correction technique was applied to the para-patellar region using a 0– 10% stretch to reduce edema and pain from the seconds day postoperative in the group receiving Kinesio Taping treatment. The tapes were changed every other day and new ones were applied. The patients were taped for the last time before discharge and were asked to visit outpatient department after 48 hours for replacement of Kinesio Tape.

Primary assessment session took place on the second post-operative day. The total treatment plan was completed in 4 weeks with 12 sessions on alternate days as 3 sessions per week. Afterwards, Numeric Pain Rating Scale (NPRS) and Lysholm Knee Scoring Scale were used as data collection tools. For statistical analysis, IBM SPSS version 25 was used. Shapiro-Wilk test analyzed normality of data. Parametric tests were employed for data analysis. Paired t-test and independent sample t-test were used to show change in subjective/objective measurements and difference across groups respectively.

RESULTS

Table No. 1 shows the descriptive statistics in both groups. The mean (±S.D.) age of the patients was 70.66±3.3 vs. 69.93±5.37 years in Group A vs. Group B respectively. Mean (±S.D.) BMI of the patients was 29.52±4.01 vs. 29.30±3.03 kg/m^2 in Group A vs. Group B respectively. There were 11 vs. 1o male in group A and group B respectively and 4 vs. 5 female patients in group A and group B respectively. As regards side of symptoms, 8 vs. 9 patients involved right side in group A and group B respectively while left side was involved in 7 vs. 6 patients in group A and group B respectively.

Table No. 2, shows the significance level for difference between the participants at different time points. A significant difference in pain between pre-treatment and post-treatment (mean diff = 2.74 and p< 0.05) in group A while group B pain difference between pre-treatment and post-treatment (mean diff =3.80 and *p*< 0.05). Numeric Pain Rating Scale mean difference reading shows that although in both groups' changes are significant (*p*< 0.05) but the differences are greater in group B.

Table 1: Descriptive Statistics of patients in both groups

Variable	Group A Conventional Physiotherapy	Group B Conventional Physiotherapy with Kinesio Taping
	Mean±S.D.	Mean±S.D.
Age	70.66± 3.33	69.93± 5.37
BMI	29.52± 4.01	29.30± 3.03
Gender		
Male	11	10
Female	04	05
Involved Side		
Right	8	9
Left	7	6

Table 2: Pair wise comparison of Numeric Pain Rating Scale within each group

Measurement	Group A mean difference		Group B mean difference	
Pre-treatment Numeric Pain Rating Scale	7.60		7.80	
Post-treatment Numeric Pain Rating Scale	4.86		4.00	
	Mean difference	p-value	Mean difference	p-value
Pre & Post treatment Numeric Pain Rating Scale	2.74	0.00	3.80	0.00

Table No. 3, explains the significance level for difference between the participants at different time points. A significant difference in pain between pre-treatment and post-treatment (mean diff =30.93 and *p*< 0.05) in group A while group B pain difference between pre-treatment and post-treatment (mean diff =46.60 and *p*< 0.05) Lysholm Knee Scoring Scale difference reading shows that although in both groups changes are significant (*p*< 0.05) but the differences are greater in group B.

Table 3: Pair wise Comparison of Lysholm Knee Scoring Scale within each group

Measurement	Group A mean difference		Group B mean difference	
Pre-treatment Lysholm Knee Scoring Scale	22.60		26.46	
Post-treatment Lysholm Knee Scoring Scale	53.53		73.06	
	Mean difference	p-value	Mean difference	p-value
Pre & Post treatment Lysholm Knee Scoring Scale	30.93	0.00	46.60	0.00

DISCUSSION

Total knee arthoplasty is a gold standard orthopedic surgical procedure employed for patients with end stage knee arthropathies. This complex and skillful surgical procedure involves the removal of defaced bone and cartilage of knee joint which is compensated with artificial joint implant composed of metal and plastic. Total knee replacement has shown promising results in enhancement of quality of life of individuals. Various complications such as infection, pain, edema, muscular imbalance and compromised knee stability have been reported after total knee arthoplasty[9(7)]. Conventional physical therapy treatments produce excellent results in alleviating the post-operative symptoms but kinesiology tape, a therapeutic cotton tape, used as an adjunct to conventional physical therapy treatments has exhibited noteworthy improvements in the overall quality of life of individuals[13].

Kinesio Taping applied together with conventional physiotherapy produces promising results in term of alleviation of pain and improvement of function after total knee arthoplasty as supported by few authors. In 2018 H. Guneys Deniz et al, study was conducted on 40 subjects with unilateral total knee arthoplasty. Subjects were randomized into three groups; Kinesio Taping group (12 patients), control group (15 patients), Manual Lymphatic drainage group (13 patients). Each patient received same postoperative rehabilitation sessions including early mobilization and physical therapy twice a day. On second day post-operatively, the lymphatic correction method was used on the Kinesio taping group patients and a standardized thirty minutes manual lymphatic drainage treatment was applied to the MLD group patients and physiotherapy treatment received only control patients group as a result of this study both Kinesio Taping and manual lymphatic drainage were beneficial in improving blood circulation and stimulating lymphatic circulation. Manual lymphatic drainage and Kinesio Taping groups both supported for improving and maintaining functional movements and also for pain reduction as compared to 3rd control group[12]. In current study, Kinesio-tapping was found to have helpful effects on pain, edema, and specific venous symptoms, but no indication was found for its effects on the muscle strength in the musculoskeletal problems[14].

A study was conducted in 2018 on 24 patients diagnosed with gonarthrosis within the age limit of 52-75 years and were recommended for the unilateral cemented total knee arthoplasty. The patients were divided into two groups A and B. After total knee arthoplasty, group A was treated with conservative post-operative physiotherapy treatment with Kinesio Taping and group B was treated with conservative post-operative physical therapy treatment alone. Both groups experienced reduction in both pain and swelling and improved functional activity after total knee arthoplasty but group A was comparatively dominant in positive results [17]. Current study corroborates the findings of this study.

CONCLUSION

The study concludes positive effects of treatment in both groups but the Experimental group exhibited relatively greater improvements in terms of the mean difference of Numeric Pain Rating Scale and Lysholm Knee Scoring Scale. Therefore, Kinesio Taping can be used as an additional means of rehabilitation for patients after total knee arthoplasty.

Limitations: The study contains few limitations including small sample size and short follow up duration which limits the generalizability of results.

Recommendations: Long term follow-up studies are encouraged to produce reliable conclusions. Gaps should be identified with further studies to create an in-depth understanding of the effect of Kinesio Taping on pain & function of patients with total knee arthoplasty.

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