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COMPARISON OF MINIMALLY INVASIVE TOTAL KNEE ARTHROPLASTY WITH STANDARD APPROACH TOTAL KNEE ARTHROPLASTY IN TERMS OF LENGTH OF POST-OPERATIVE HOSPITAL STAY.

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ABSTRACT… To compare the minimally invasive total knee arthroplasty with standard approach total knee arthroplasty in terms of mean length of post-operative hospital stay. **Study Design:** Randomized Controlled Trial. **Setting:** Department of Orthopaedics, Benazir Bhutto Hospital, Rawalpindi. **Period:** 06 months i.e. from 21st March 2018 to 20th September 2018. **Materials and Methods:** A total of one hundred (n=100) patients between age 30-80 years who were planned to undergo total knee arthroplasty (TKA) were enrolled and randomly allocated to two groups. The patients in group A were operated through minimally invasive technique and in group B, were operated through standard approach. Outcome was measured in terms of mean length of hospital stay in both groups. **Results:** Baseline characteristics were comparable in both the groups. In group A, mean length of hospital stay was 4.4±0.64 days while in group B it was 5.6±0.63 days (p=0.001). Similar trend was noted when data was stratified with respect to age, gender, anatomical side and BMI. **Conclusion:** Minimally invasive TKA resulted in shorter length of hospital stay following when compared with standard approach TKA.

Key words: Length of Hospital Stay, Minimally Invasive, Osteoarthritis, Total Knee Arthroplasty.

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INTRODUCTION

Total knee arthroplasty (TKA) is a surgical technique in which the weight-bearing part of knee joint is replaced to provide pain relief and improved functional outcome to the patient.[1] It is a gold standard procedure for patients with advanced osteoarthritis of the knee joint and should be taken into consideration when the conservative treatment modalities have failed.[2] Other important indications of this procedure may include knee pathologies like in rheumatoid arthritis, psoriatic arthritis and other inflammatory arthritis, correction of varus/valgus deformities, etc.

TKA is not only a bony procedure, but also involves excessive soft-tissue dissection as well. Like any other surgery, TKA is not free of complications. The complications can be categorized into procedure-related and general peri-operative complications. Possible complications of the procedure include hemorrhage, wound infection, intra-operative fracture, post-operative deep vein thrombosis etc.[3] The technique of surgery is one of the main determinant of the possibility of complications. There are two major approaches in TKA; the minimally invasive approach (sub-vastus approach) and standard medial parapatellar approach.[4] The medial parapatellar approach offers good exposure, however, this approach requires division of the quadriceps tendon that may result in increased post-operative pain and hence prolong the recovery.[5] Minimally invasive TKA results in improved postoperative function and reduced pain.[6]

The rationale of this study was to compare the mean length of post-operative hospital stay after total knee arthroplasty done by two different techniques as described above, as there is no pre-existing study done in our local population comparing these two procedures. The results of this study will enable the orthopaedic surgeons to adapt more suitable technique for TKA.

MATERIALS AND METHODS

This Randomized Controlled Trial (RCT) was conducted for a duration of 06 months, i.e. from 21st March 2018 to 20th September 2018 at the Department of Orthopaedics, Benazir Bhutto Hospital, Rawalpindi, Pakistan. Inclusion criteria were patients of age 30-80 years of either gender, presenting with advanced osteoarthritis knee for primary unilateral TKA and are fit for surgery. Exclusion criteria were sepsis of the knee joint, active infection, bilateral TKA, revision TKA, disruption of extensor mechanism, history of chronic illness like uncontrolled Diabetes Mellitus (HbA1c > 7.5), Ischaemic heart disease, chronic renal failure, chronic liver disease, etc, Immunocompromised patients, past history of any chemo- or radiotherapy, history of repeated infection and marked obesity (BMI ≥40 kg/m^2).

Sample size of 100 cases; 50 cases in each group was calculated using the following parameters. Level of significance = 5%; Power of study = 80%. Mean length of post-operative hospital stay in minimally invasive group i.e. 4.5±1.5 and in standard approach group 5.9±2.7.[7]

After taking the required approval from hospital ethical board, 100 patients fulfilling the selection criteria were included in this study from outpatient Department of Orthopedic Surgery and Traumatology, Benazir Bhutto Hospital, Rawalpindi. An informed consent was obtained. Demographic profile (name, age, gender, anatomical side and contact number of the patient) was also obtained. Then patients were randomly divided in two groups by using lottery method.

The patients included in group A were operated through minimally invasive technique, while the patients included in group B, were operated through standard approach technique. All arthroplasties were performed by the same consultant orthopaedic surgeon under tourniquet applied to upper thigh set at 150 mm Hg above the systolic blood pressure and zimmer cemented implants were used. After completion of surgery, when the patient was shifted to ward, the time was noted. All the patients were given standard post-operative care and analgesia. The time at which decision of discharge of the patient was made by the operating surgeon was noted. The length of hospital stay was calculated from the two times noted. All patients who underwent TKA followed a pre-set rehabilitation protocol. This consisted of three phases; phase-1 (early function phase) from 1st post operative day till the 2nd week, phase-2 (progressive function phase) from 3rd post operative week till the 6th week and phase-3 (advanced function phase) from 7th post-operative week till 12th week post-op. Information was noted on designed proformas.

Data entered and analyzed through SPSS version 21. The quantitative variables like age, weight, height, body mass index and length of post-operative hospital stay presented as means and standard deviations. Categorical variables like gender and anatomical side were presented as frequency and percentage. Student's t-test was used to compare mean post-operative length of hospital stay in both the groups. Data were stratified for age, gender, body mass index and anatomical side to see the impact of these on outcome in both groups. Stratified groups were compared. P-value ≤ 0.05 was taken as significant.

RESULTS

A total of 100 patients between age 30-80 years were included (details shown in Table-I).

Mean BMI between the two groups was not statistically significant (P>0.05) as shown in Table-II.

Difference in side of involvement and BMI between the two groups shown in Table-III.

In group A (Minimally invasive TKA), average length of hospital stay was 4.4±0.64 days and in group B (Standard TKA) it was 5.6±0.63 days (p=0.001) (shown in Table-IV).

Similar trend was noted when data was stratified with respect to age, gender, anatomical side and BMI. Mean length of hospital stay was significantly shorter in patients who underwent

minimally invasive TKA as compared to patients who underwent standard TKA ($p<0.05$).

DISCUSSION

Although TKA is a very successful procedure in terms of functional outcome and pain relief but there has always been a disagreement on the optimal technique of TKA.[7] The quadriceps sparing technique was introduced in order to minimize the soft-tissue damage, and is considered as one of the least invasive TKA technique.[8] Our results showed that baseline characteristics were similar in both groups. In our study, 67% patients undergoing TKA were females while 33% males.[9] These statistics were in accordance to a study undertaken by Khan et al. in Rawalpindi, Pakistan in which 56.36% patients who had their knee joints replaced comprised of females.[10] Mean age of patients in group A was 56.8±6.9 years and in group B it was 57.9±8.9 years. These parameters were similar to a study done by Memon et al. in which average age was 55.5±8.3 years.[11] In our study, 63% had right knee joints replaced which were in accordance to a research done by Khan et al., in which the same side was operated in 53.8% cases.[12]

Gender	Group		Total
	Minimally Invasive TKA	Standard TKA	
Males	16	17	33
	(32.0%)	(34.0%)	33.0%
Females	34	33	67
	(68.0%)	(66.0%)	67.0%
Total	50	50	100
	(100.0%)	(100.0%)	(100.0%)

Table-I. Gender distribution in both groups

Group		Age (in years)	Height (in meters)	Weight (in Kg)	Body Mass Index (Kg/m²)
Minimally Invasive TKA	Mean	56.8	1.61	84.2	32.4
	SD	6.9	0.06	9.2	4.1
Standard TKA	Mean	57.9	1.64	86.1	32.2
	SD	8.9	0.06	9.4	3.9

Table-II. Details of mean Body mass index of both groups

		Group		Total
		Minimally Invasive TKA % (n)	Standard TKA % (n)	
BMI	≤30 Kg/m²	13	12	25
		(26.0%)	(24.0%)	(25.0%)
BMI	31-40 Kg/m²	37	38	75
		(74.0%)	(76.0%)	(75.0%)
Side	Right	33	30	63
		(66.0%)	(60.0%)	(63.0%)
Side	Left	17	20	37
		(34.0%)	(40.0%)	(37.0%)

Table-III. BMI and Side of Involvement between the groups

Group	Mean Length of Hospital Stay (Days)	Std. Deviation	P-Value
Minimally Invasive TKA	4.4	0.64	0.001
Standard TKA	5.6	0.63	

Table-IV. Mean length of hospital stay in both groups

Some studies have shown that minimally invasive (MIS) TKA has both short and long term benefits for the patients in terms of lesser requirement of analgesics, rapid recovery, short post operative hospital stay and minimal blood loss.[13,14,15]

The results of our study conducted in our local population are quite similar with the internationally published data on the subject. In group A, mean length of hospital stay was 4.4±0.64 days while in group B it was 5.6±0.63 days (p=0.001). The results were similar to a study done by Dabboussi et al., in which average hospital stay in minimally invasive group was 5.2±1.5 days while in standard approach cases was 7.0±1.8 days (p<0.0001). In a study undertaken by Tasker et al. in which he did a prospective, randomized, multi-surgeon, controlled trial comparing MIS and standard approach TKA. Their results showed that average surgery time between MIS and control group was 95.5 (range = 90.0 to 101.0) and 94.8 (range = 88.2 to 101.4) minutes, respectively. Surgery to discharge time was shorter in the MIS group 4.5±1.5 (range = 4.1 to 4.9) days versus 5.9±2.7 (range = 5.1 to 6.7) days among controls (p = 0.004).[7]

In a study conducted by Shen et al. in which he evaluated the short-term clinical outcome of MIS compared to a standard TKA. They concluded that the visual analog pain scores (VAS) were significantly lower at the 1st, 3rd and 7th post-operative days in the MIS compared to the standard TKA group, resulting in early discharge of the patient post-operatively.[16] Song YC, et al conducted a systematic review in which he compared the early efficacy of MIS with standard TKA. A total of 18 RCTs were included. Their analysis revealed that compared with the standard TKA procedure, the MIS group had reduced blood loss (WMD 8.31, 95%CI (6.16, 10.46)); lower VAS score at days 3-5 post-operation (WMD 4.99, 95%CI (4.19, 5.78)). Authors concluded that MIS leads to a faster recovery than conventional surgery with a shorter operative duration, a reduced blood loss, a lower VAS score and a faster recovery.[17] These results were in accordance with our study.

In summary, based on our study results and internationally published literature, evidence is in favor of MIS in terms of earlier recovery and shorter duration of hospital stay.

CONCLUSIONS

MIS TKA resulted in shorter length of hospital stay following TKA when compared with standard approach knee replacement.

RECOMMENDATIONS

We recommend further large scale randomized controlled trials to establish the superiority of MIS TKA in terms of recovery time and length of hospital stay.

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AUTHORSHIP AND CONTRIBUTION DECLARATION

Sr. #	Author-s Full Name	Contribution to the paper	Author=s Signature
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2	Raja Umar Liaqat	Data collection and final approval of the version to be published.	
3	Junaid Khan	Literature search and data interpretation.	
4	Islam ud Din	Data collection.	
5	Muhammad Imran Aftab	Critical revision of the article.	