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Patella Retraction Versus Eversion in Total Knee Replacement

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Abstract: ***Purpose: Surgical exposure of the knee during total knee arthroplasty requires mobilization of the patella. In the current study an attempt has been made to compare two techniques of the patella mobilization used in knee arthroplasty. Mateial and methods: 40 patients were divided into two groups, Group 1 include patients underwent TKR using medial para-patellar approach with patellar eversion and Group 2 include patients underwent TKR using medial Para-patellar. The outcome were measured using Hospital stay, operative time, quadriceps strength (Quadriceps Muscle Strength Score, QMSS), pain, Knee society score (KSS), Knee function score (KFS) and Patella height using Insall-Salvati score. Results: both groups were compareable,we did not find any difference between two groups using above criteria's. Conclusion: Both techniques give good results in TKA. Its surgeon's personal choice but results may vary in obese patients***

Keywords: patella retraction, patella eversion, TKR

1. Introduction

Total knee arthroplasty (TKA) has excellent or good long-term outcomes ranging from 90% to 98% (1). Knee replacements are carried out through one of several different surgical approaches like median para patellar approach, mid-vastus or sub-vastus approaches. Surgical exposure of the knee during total knee arthroplasty requires mobilization of the patella. The two technique of patellar mobilization are eversion and lateral retraction (2-3). Potential advantage of eversion technique is augmented surgical exposure and has been a routine part of conventional TKA (4). Lateral retraction of the patella is an additional technique whereby the patella is subluxed laterally. However, exposure with this technique may be compromised. Benefits of avoiding patellar eversion as in subluxation technique are improved range of motion (ROM), earlier return of straight leg raising (SLR), better early knee flexion, avoidance of patella baja, and shorter hospital stay (5-11). In the current study an attempt has been made to compare two techniques of the patella mobilization used in knee arthroplasty.

2. Materials and Methods

A prospective study was done at our hospital which involves 40 patients treated by one surgical team, from October 1, 2014, to December 31, 2015, They were divided into two groups, Group 1 include patients underwent TKR using medial para-patellar approach with patellar eversion and Group 2 include patients underwent TKR using medial Para-patellar approach with patellar retraction. For randomization computer generated slips of two treatment options were sealed in 40 envelopes. Patients were treated surgically according to treatment option inside envelope chosen by patients.

Patients were followed up post operatively for a period of minimum 6 months for evaluation of clinical, functional and radiological outcomes at 2 weeks, 6 weeks, 3 months and 6 months. The outcome were measured using Hospital stay, operative time, quadriceps strength (Quadriceps Muscle Strength Score, QMSS), pain, Knee society score (KSS), Knee function score (KFS) and Patella height using Insall-Salvati score.

Inclusion criteria	Exclusion criteria
1. Patient from either sex	1. Age greater than 75 years.
2. Primary osteoarthritis of knee	2. Posttraumatic arthritis.
3. Age between 60 to 75 years	3. Previous high tibial osteotomy.
4. Written consent to participate in study.	4. Severe flexon deformity of more than 30 degree
	5. Neuromuscular involvement.
	6. Valgus deformity.
	7. Inflammatory arthritis.

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Sample Size Calculation

We hypothesized that patients with knees surgically exposed using patellar lateral retraction would have comparable outcomes with patients with knees surgically exposed using patellar eversion. For the sample size calculation, we defined a relevant difference of at least 20% in functional outcome between the two groups. Using a two tailed alpha value (0.05) and a beta value (0.2), 60 patients per group would be sufficient to detect a significant difference. Since the study was time bound, all consecutive patients meeting the eligibility criteria during the study period were enrolled. It was expected from the previous experience that about 20 patients per group will be sufficient.

Statistical Analysis

Statistical testing was conducted with the statistical package for the social science system version SPSS 17.0. Continuous variables are presented as mean ± SD, and categorical variables are presented as absolute numbers and percentage. The comparison of normally distributed continuous variables between the groups was performed using Student‟s t test. For within the group comparisons, paired t test was used to determine the change at different time points from Baseline. Nominal categorical data between the groups were compared using Chi-squared test or Fisher‟s exact test as appropriate. P<0.05 was considered statistically significant.

3. Results

The mean age of the patients in Group 1 was 60.20 years (SD ± 5.85) and in Group 2 was 60.5 years (SD ± 5.77) The difference was insignificant (p = 0.871). Group 1 had 5 (25%) male and 15 (75%) females, as compared to 12 (60%) males and 8 (40%) females in group 2, difference was not significant (p value 0.311).

All the patients included in the study had Grade III/IV osteoarthritis. Group 1 had 9 (45%) Grade III, 13 (55%) Grade IV, whereas group 2 had 8 (40%) Grade III, 12 (60%) Grade IV and there was no significant difference between the groups (p value =0.757).

The mean operative time in Group 1 was 71.79 minutes (SD ± 8.30) and mean operative time in Group 2 was 70.83 minutes (SD ± 5.20). The difference in operative time was also not significant ((p = 0.697).

The mean hospital stay in Group 1 was 8 (SD ± 2.03) and mean hospital stay in Group 2 was 6.75 (SD ± 1.86). The difference was not significant (p = 0.687).

The mean preoperative and 6 month postoperative quadriceps muscle strength score (QMSS) were 4.15 (SD ± .61) and 4.25 (SD ± 0.37) for group 1, whereas QMSS was 4.05 (SD ± 0.37) and 4.10 (SD ± 0.37) respectively for Group 2 (p = 1.000 for both the groups). Difference in QMMS score in both the groups were insignificant at 2 weeks, 6 weeks and 3 months follow-up (p values 0.744, 1.000 and 1.000 respectively).

QMSS	Group I	Group 2	P Value
	Mean ± SD	Mean ± SD	
Preop pain	4.05 ± 0.61	4.15 ± 0.59	0.599
Postoperative Two Week	4.05 ± 0.39	4.10 ± 0.55	0.744
Postoperative 6 Week	4.40 ± 0.50	4.40 ± 0.50	1
Postoperative 3Month	4.70 ± 0.47	4.70 ± 0.47	1
Postoperative 6 Month	4.05 ± 0.37	4.10 ± 0.37	1

The mean pre-operative and 6 months post-operative ROM score in Group I 15.1 (SD ± 1.37), and 19.1(SD ± 0.55); and in Group 2 17.85(SD ± 1.26), and 19.0 (SD ± .72); respectively. There was no significant difference at final follow up between the two groups (P = 0.627). At two weeks, 6 weeks and 3 months post-operative no significant difference was found in ROM score in both the groups with p values being 1.000, 0.318and 0.639 respectively.

ROM	Group I	Group 2	P Value
	Mean ± SD	Mean ± SD	
Preoperative	15.1 ± 1.37	17.85 ± 1.26	0.081
Postoperative Two Week	19.60 ± 1.39	19.73± 0.82	1
Postoperative 6 Week	20.05 ± 0.94	20.30 ± 0.57	0.318
Postoperative 3Month	20.3 ± 0.73	20.40 ± 0.59	0.639
Postoperative 6 Month	19.1 ± 0.55	19.0 ± 0.72	0.627

At the final follow up, mean pain score was 49 (SD ± 2.05) points in group1 and 49.25(SD ± 1.83) points in group2, according to the knee society knee score. This was a significant improvement from pre-operative pain scores (9.50 and 9.50 points in group1 and group2). The difference in symptoms score was not statistically significant (p > 0.05) between the two groups.

Pain	Group I	Group 2	P Value
	Mean ± SD	Mean ± SD	
Preoperative	9.50 ± 8.87	9.50 ± 7.59	1
Postoperative Two Week	23.50 ± 4.89	24 ± 5.98	0.774
Postoperative 6 Week	48.25 ± 2.93	48.25 ± 2.93	1
Postoperative 3Month	49.0 ± 2.05	49.25± 1.83	0.687
Postoperative 6 Month	49± 2.05	49.25 ± 1.83	0.687

The mean Knee Society Score (KSS) was 30.30 (SD ± 11.24) in group 1 and 90.30 (SD ± 3.58) in group 2. With p value 0.792 this difference was not significant. The difference in KSS post-operatively at 2 weeks, 6 weeks, 3 months and 6 months was also not significant with p values 0.544, 0.601, 0.714 and 0.919. The Knee Society Score in Group 1 increase preoperatively 34.30 (SD ± 11.24); to postoperative 6 months, 91.30(SD ± 3.58); (p value <.001). The Knee Society Score in Group 2 increased from preoperative 35.20 (SD ± 10.19); to 6 months postoperative, 91.40(SD ± 2.54); (p value <.001). This shows a significant gain in KSS with the surgical intervention irrespective of the approach.

Knee Function Score	Group I	Group 2	P Value
	Mean ± SD	Mean ± SD	
Preoperative	30.30± 11.24	35.20± 10.19	0.792
Postoperative Two Week	64.25 ± 4.99	65.30 ± 5.81	0.544
Postoperative 6 Week	89.60± 4.27	90.25 ± 3.47	0.601
Postoperative 3Month	91.25± 3.50	91.60 ± 2.37	0.714
Postoperative 6 Month	90.30 ± 3.58	91.40 ± 2.54	0.919

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The mean preoperative and 6 month postoperative KFS were 31 (SD ± 16.02) and 89.25(SD ± 6.13) for Group 1, whereas Group II patient's KFS were 30.75 (SD ± 13.11) and 88.75 (SD ± 7.41) respectively. It showed no significant difference (p = 0.817) between the two groups. The Knee Function Score in Group 1 increased from preoperative 31.00 (SD ± 16.02); to 6 months postoperative, 89.25 (SD ± 6.13); (p value <.001). The Knee Function Score in Group 2 increased from preoperative 31.75 (SD ± 13.11); to 6 months postoperative, 88.75 (SD ± 7.41); (p value <.001). Thus the KFS was significantly improved in both the groups post-operatively.

Knee Function Score	Group I	Group 2	P Value
	Mean ± SD	Mean ± SD	
Preoperative	31.00 ± 16.02	30.75 ± 13.11	0.957
Postoperative Two Week	31.75 ± 8.15	32.50 ± 9.10	0.785
Postoperative 6 Week	80 ± 8.43	79.75 ± 8.80	0.927
Postoperative 3Month	88 ± 7.32	88.25 ± 7.66	0.917
Postoperative 6 Month	89.25 ± 6.13	88.75 ± 7.41	0.817

No significant differences in extension lag were evident between the two groups, preoperatively as well as postoperatively (p value 0.154 and 1.000 respectively).

		Extension lag				P value
		None	5-10 degree	10-15 degree	15-20 degree	
Preop	Group 1	0	20	0	0	0.514
	Group 2	2	18	0	0	
2 wks	Group 1	6	14	0	0	0.752
	Group 2	3	17	0	0	
6wks	Group 1	7	13	0	0	1.000
	Group 2	5	15	0	0	
3 months	Group 1	9	11	0	0	1.000
	Group 2	9	11	0	0	
6 months	Group 1	10	10	0	0	1.000
	Group 2	10	10	0	0	

The mean preoperative and 6 month postoperative ISR (Insall-Salvati Ratio) were 1.11 (SD ± .89) and 1.12 (SD ± 0.07) for group 1, whereas ISR was 1.11 (SD ± .07) and 1.12 (SD ± 0.04) respectively for group 2 patients (p value 0.849).

ISR	Group 1	Group 2	P Value
	Mean ± SD	Mean ± SD	
Preoperative	1.11 ± 0.89	1.11 ± 0.07	0.936
Postoperative Two Week	1.14 ± 0.09	1.13 ± 0.06	0.770
Postoperative 6 Week	1.12 ± 0.07	1.13 ± 0.05	0.794
Postoperative 3 Month	1.12 ± 0.07	1.12 ± 0.05	0.959
Postoperative 6 Month	1.12 ± 0.07	1.12 ± 0.04	0.849

The overall complication rate in this study was 15 % in each group till 6 month of follow up. Three patients in each group had flexion contracture of 5-10 degrees. We did not come across any case of DVT, pulmonary embolism. There was no case of avulsion of patella tendon, deep infections, patella baja, instability, extensive osteolysis and subluxation or dislocation of mobile bearing, till the latest follow up. Mean alignment was same in both groups in range of 5-10 degree valgus.

4. Discussion

This was a prospective, randomized and blinded study and is a match paired study in term of age, sex distribution, side distribution, and preoperative axial alignment. Secondarily, all the patients were treated by a single surgical team at a single center which means there was consistency in surgical technique and implant use in the study.

No significant difference was found between patella eversion and lateral retraction approaches in terms of operative time, hospital stay, quadriceps strength and secondary outcomes (ROM, pain score, KSS, KFS and ISR) at immediate (2 weeks), short term (6 weeks to 3 months) and mid-term (6 months).

Jetkins et al (12) reported compared to the eversion group the retraction group had shorter stay at hospital (p=0.03). In our study stay in hospital was shorter (mean stay 6.75 days) for retraction group as compared to eversion group (mean stay 7.0 days) but the difference was not significant (p = 0.687).

Zan P et al (13) reported no significant difference in operative time between two groups. We had similar findings and had no significant difference between operative between two group (p= 0.697) although mean operation time is shorter in eversion group (74.79 minutes) than retraction group (75.83 minutes). Jetkins et al (12) measured tourniquet time and had no significant difference between the groups (p = 0.57).

Arnout et al (17) measured isokinetic leg extension strength using Biodex machine at six months and had no difference between two groups. Dalury et al (14) did not find significant difference between groups in terms of quadriceps strength tested with handheld dynamometer preoperatively and at six and twelve weeks postoperatively. Jenkins et al (12) measured quadriceps strength using Biodex dynamometer noted initial decline of strength at six weeks, followed by a steady increase in strength to one year, with no difference between groups. We assessed quadriceps strength using quadriceps muscle strength score (QMSS) (15) and found a significant improvement with in both the groups, but no significant difference between groups (P= 1.00).

The study by Reid et al (16) didn't show significant difference in knee flexion between patellar eversion and subluxation (1010 ± 5.370 versus 1020 ±4.140). Our study also failed to show significant difference between two groups at 2 weeks (p=1.000), 6 weeks (p=, 0.318), 3 months (p=0.639) and 6 months (P = 0.627) follow up in terms of range of motion (ROM) score. Arnout et al (7) done a randomized control trial using medial para-patellar approach with and without subluxation and found a significant increase in knee motion in subluxation group and attributed this to absence of excessive traction on extensor mechanism.

Ried et al (16) reported improvement in pain score from pre-operative score, but they didn't find significant difference between eversion and retraction groups. Jetkins et al (12) found significant improvement from preoperative pain score

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but no difference was found between the groups. Arnout et al (7) had similar results in their study. In this study all the patients in both the groups had significant improvement from preoperative pain score. However, the difference in symptoms score was not statistically significant ($p > 0.05$) between the two groups.

Zan P et al (13) noted knee function recovery is significantly ($p = 0.32$) improved with patellar retraction after TKR. Arnout et al (7) reported no significant difference in terms of knee society score (KSS) and knee function score (KFS) between two groups postoperatively. In our study KSS and KFS improved significantly from preoperative scores. However, this study didn't find significant difference between the groups (KSS; $P = 0.919$ and KFS; $P = 0.817$). Jetkins et al (12) also had similar findings using SF-36 knee score.

Arnout et al (7) and Jetkins et al (12) did not find any significant difference in ISR (Insall Salvati Ratio) in their studies. Current study had no significant difference in ISR between two groups ($p=0.849$) as measured on lateral radiograph (17).
Jenkins et al (12) found a higher rate for pulmonary embolism in eversion group. We did not come across any case of DVT, pulmonary embolism. However, in our study three patients in each group had flexion contracture. There was no case of avulsion of patella tendon, deep infections, patella baja, instability, extensive osteolysis and subluxation or dislocation of mobile bearing, till the latest follow up.

5. Conclusion

We couldn't find any significant difference between two groups in terms of knee society score (including pain score), Knee function score (KFS), range of motion, quadriceps strength, Knee functional score, patella height, complication rate ,hospital stay and operation time between two groups in our study namely Group 1 (Eversion group) and Group 2 (Retraction group).
The current study had limitations. First, the knee scoring systems are prone to inter-observer variability however we had one surgical team to minimize variability. Second, accuracy of measurement of ROM of the knee with a manual goniometer is less than using an electro-goniometer or fluoroscopic guided radiographic measurement (18) and there is an element of subjectivity in this method. Third, quadriceps muscle strength measurement was subjective. Finally, this study had small sample size and short duration of follow up.

We recommend a study with larger sample size and longer duration would be more appropriate to further prove the claim.

References

[1] Colizza WA, Insall JN, Scuderi GR. The posterior stabilized total knee prosthesis. Assessment of polyethylene damage and osteolysis after a ten-year-minimum follow- up. J Bone Joint Surg A. 1995; 7: 1713-1720.
[2] Bonutti PM, Mont MA, McMahon M. Minimally invasive total knee arthroplasty. J Bone Joint Surg Am 2004; 86: 26-32.
[3] Bonutti PM, Zyweil MG, McGrath MS, Mont MA. Surgical techniques for minimally invasive exposure of total knee arthroplasty. Instr Course Lect 2010; 59: 83-91.
[4] Meftah M, Jhurani A, Bhat JA. The effect of patellar replacement technique on patellofemoral complications and anterior knee pain. J Arthroplasty 2012; 27: 1075-1080.
[5] Flören M, Davis J, Peterson MG, Laskin RS. A mini-midvastus capsular approach with patellar displacement decreases the prevalence of patella baja. J Arthroplasty 2007; 22: 51-57.
[6] Sharma V, Tsailas PG, Maheshwari AV, Ranawat AS, Ranawat CS. Does patellar eversion in total knee arthroplasty cause patella baja? Clin Orthop Relat Res. 2008; 466: 2763-2768.
[7] Arnout N, Victor J, Cleppe H. Avoidance of patellar eversion improves range of motion after total knee replacement: a prospective randomized study. Knee Surg Sports Traumatol Arthrosc 2009; 17: 1206-1210.
[8] Boerger TO, Aglietti P, Mondanelli N, Sensi L. Mini-subvastus versus medial parapatellar approach in total knee arthroplasty. Clin Orthop Relat Res 2005; 440: 82-87.
[9] Haas SB1, Cook S, Beksac B.Minimally invasive total knee replacement through a mini midvastus approach: a comparative study. Clin Orthop Relat Res. 2004 Nov; (428):68-73.
[10] Laskin RS1, Beksac B, Phongjunakorn A, Pittors K, Davis J, Shim JC, Pavlov H, Petersen M.Minimally invasive total knee replacement through a mini-midvastus incision: an outcome study. Clin Orthop Relat Res. 2004 Nov; (428):74-81.
[11] Walter F, Haynes MB, Markel DC. A randomized prospective study evaluating the effect of patellar eversion on the early functional outcomes in primary total knee arthroplasty. J Arthroplasty 2007; 22: 509-514.
[12] Jenkins D, Rodriguez J, Ranawat A, Alexiades M, Deshmukh A, Fukunaga T, Greiz M, Rathod P, McHugh M. A Randomized, Controlled, Prospective Study Evaluating the Effect of Patellar Eversion on Functional Outcomes in Primary Total Knee Arthroplasty. J Bone Joint Surg 2014; 96: 851-858.
[13] Zan P, Wu Z, Yu X, Fan L, Xu T, Li G The Effect of Patella Eversion on Clinical Outcome Measures in Simultaneous Bilateral Total Knee Arthroplasty: A Prospective Randomized Controlled Trial. J Arthroplasty. 2016 Mar; 31(3):637-640.
[14] Dalury DF, Mulliken BD, Adams MJ, Lewis C, Sauder RR. Early recovery after total knee arthroplasty performed with and without patellar eversion and tibial translation. A prospective randomized study. J Bone Joint Surg Am 2009; 91: 1339-1343.
[15] Stanley Hoppenfeld, Orthopaedic Neurology-A Diagnostic Guide to Neurologic Levels, 3rd Edition, Philadelphia. Lippincott Williams & Wilkins 1977; 2.
[16] Reid MJ, Booth G, Khan RJ, Janes G.Patellar eversion during total knee replacement: a

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prospective, randomized trial.J Bone Joint Surg Am. 2014; 96 (3):207-213.
[17] Insall J, Salvati E. Patella position in normal knee joint. Radiology 1971 Oct; 101: 101-104.
[18] Nutton RW, Van der Linden ML, Rowe PJ. A prospective randomized double-blind study of functional outcome and range of flexion following total knee replacement with the NexGen standard and high flexion components. J Bone Joint Surg Br. 2008; 90:37–42.

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