Original Article

Outcomes of infrapatellar fat pad excision versus preservation following total knee arthroplasty

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Objective: To determine the effect of infrapatellar fat pad (IPFP) excision or preservation on outcomes following primary total knee arthroplasty (TKA).

Methodology: This randomized controlled trial was conducted at The Department of Orthopedic Surgery, Lahore General Hospital, Lahore, Pakistan from September 2020 to June 2021. A total of 60 cases (30 in each group) aged between 20 to 75 years who underwent primary TKA were enrolled. There were 30 patients who were placed in IPFP removed (IPFPR) groups and 30 others were to be in IPFP not removed (IPFPNR) group. Knee range of motion (ROM), anterior knee pain and total "Knee Society Score" were measured as outcomes in both groups.

Results: Out of 60 patients, 44 (73.3%) were female. Mean age was 65.7 ± 6.5 years. Majority, 31 (51.7%) belonged to urban areas. There were 55 (91.7%) patients who had osteoarthritis. Comparison of knee flexion and knee society scores at different intervals during the study period showed no significant differences ($p > 0.05$). At 6-months follow up, there were 4 (14.3%) patients who had anterior knee pain in IPFPR group in comparison to 0 in IPFPNR group and the difference in terms of anterior knee pain was statistically significant ($p = 0.041$). None of the patients had avascular necrosis or patellar fractures during follow-ups.

Conclusion: Increased rates of anterior knee pain were observed among patients who had removal of infrapatellar fat pad. No significant differences in knee flexion and knee society scores were observed among patient who had removal or preservation of infrapatellar fat pad.

Keywords: Infrapatellar fat pad, total knee arthroplasty, knee flexion, anterior knee pain.

INTRODUCTION

Infrapatellar fat pad (IPFP) lies below the patellar ligament that has transverse infrapatellar arteries supplying the patella and the anterior portion of the knee joint.[1] Resecting the IPFP is a routine procedure doing primary total knee arthroplasty (TKA), assisting surgical exposure and preventing interposition during prosthesis implantation.[2] Some researchers have propagated TKA to be linked with less severity of post-surgery pain and faster rates of recovery following surgery but difficulty in exposure might contribute to misalignment as well as early failure following TKA.[3] Removal of IPFPs fully or partially was done in 86-88% cases undergoing TKA in several studies.[4,5]

Outcomes following IPFP resection have shown conflicting results where risk of avascular necrosis after resection have been noted.[6] Some other researchers have pointed out compromise in blood supply related to patella that can lead to shortening of the patella tendon, which ultimately results in patella fracture.[7] On the contrary, some studies have shown no unwanted effects on blood supply following IPFP resection.[8] Evidence has also suggested that removing IPFP can contribute to increased post-operative stiffness while some other studies have come out showing no difference in functional outcomes comparing preservation or removal of IPFP.[9,10] No research has been done in Pakistan comparing outcomes following these two approaches, so this study aimed to determine the effect of IPFP excision or preservation on outcomes following TKA.

METHODOLOGY

This randomized controlled trial was conducted at The Department of Orthopedic Surgery, Lahore General Hospital, Lahore, Pakistan from September 2020 to June 2021. Approval from Institutional Ethics Committee was taken (Ref#620/8/21). Informed written consent was acquired from all study participants. Considering 80% power to detect 5% difference in patellar tendon length among both study groups according to a previous study that found 7% patellar tendon length reduction following TKA,[11] a sample size of 54 (27 in each group) was calculated.

Considering 10% loss of follow up among patients in

the present study, a total of 60 cases (30 in each group) aged between 55 to 75 years who underwent primary TKA were enrolled. All cases having unsuitability for TKA, rheumatoid arthritis, past history of open knee surgery or severe stiffness (flexion less than 90° or flexion contracture above 10°) were excluded. Patients were randomized by computer generated numbers and a random number table was generated in Microsoft Excel to allocate patients to both study groups. Thirty patients who were placed in full IPFP excision group while other 30 were to undergo without IPFP removal.

All primary TKA surgeries were done as per standard resection technique adopting same surgical techniques. A cemented prosthesis was utilized in all patients. Knee range of motion (ROM), anterior knee pain and total "Knee Society Score (KSS)" were measured as outcomes in both study groups. The anterior knee pain was labeled as disturbing pain affecting daily life routine activity of the patients. All demographic, clinical, radiological and outcome variables were measured at pre-surgery, immediately after surgery, at 6-weeks, 3-months and 6-months. Complications like patellar fracture and avascular necrosis were also noted at follow up intervals. Post-surgery, all patients were prescribed analgesics as per need.

Statistical Analysis: This was performed through SPSS 26. Qualitative variables were compared using chi-square test whereas quantitative data was compared employing student t-

Table 1: Baseline characteristics of study groups (n = 60).

Characteristic		IPFPR Group (n = 30)	IPFPNR Group (n = 30)	P-Value
Gender	Male	9 (30.0%)	7 (23.3%)	0.5593
	Female	21 (70.0%)	23 (76.7%)	
Age in years (Mean ± SD)		64.2 ± 6.1	66.8 ± 6.3	0.1098
Area of Residence	Urban	14 (46.7%)	17 (56.7%)	0.4383
	Rural	16 (53.3%)	13 (43.3%)	
Diagnosis	Osteoarthritis	27 (90.0%)	28 (93.3%)	0.6404
	Rheumatoid Arthritis	3 (10.0%)	2 (6.7%)	

Table 2: Comparison of anterior knee pain at baseline, 6-Weeks, 3-Months and at 6-Months.

Interval	IPFPR Group (n = 30)	IPFPNR Group (n = 30)	P-Value
Pre-Surgery	16 (53.3%)	14 (46.7%)	0.6056
6-Weeks	4 (13.3%)	3 (10.0%)	0.6876
Interval	**IPFPR Group (n = 29)**	**IPFPNR Group (n = 28)**	**P-Value**
3-Months	3 (10.3%)	0	0.080
Interval	**IPFPR Group (n = 28)**	**IPFPNR Group (n = 27)**	**P-Value**
6-Months	4 (14.3%)	0	0.041

IPFPR = Infrapatellar fat pad removed; IPFPNP= Infrapatellar fat pad not removed

Table 3: Comparison of mean knee flexion (degree) at baseline, 6-Weeks, 3-Months and at 6-Months.

Interval	IPFPR Group (n = 30)	IPFPNR Group (n = 30)	P-Value
Pre-Surgery	119 ± 8	116 ± 6	0.1058
6-Weeks	114 ± 6	112 ± 7	0.2396
Interval	**IPFPR Group (n = 29)**	**IPFPNR Group (n = 28)**	**P-Value**
3-Months	116 ± 6	115 ± 8	0.5947
Interval	**IPFPR Group (n = 28)**	**IPFPNR Group (n = 27)**	**P-Value**
6-Months	120 ± 8	118 ± 7	0.3290

test. $p < 0.05$ was considered significant.

RESULTS

Out of 60 patients, 44 (73.3%) were female. Mean age was 65.7 ± 6.5 years. Majority, 31 (51.7%) belonged to urban areas. There were 55 (91.7%) patients who had osteoarthritis (Table 1). At 3 months interval, 57 patients completed the follow ups so those were included in the analysis whereas at 6-months interval 55 patients came for follow up so they were included in the final analysis.

Table 4: Comparison of Knee Society Score at baseline, 6-Weeks, 3-Months and at 6-Months.

Interval	**IPFPR Group (n = 30)**	**IPFPNR Group (n = 30)**	**P-Value**
Pre-Surgery	59 ± 6	62 ± 7	0.0799
6-Weeks	86 ± 8	84 ± 9	0.3667
Interval	**IPFPR Group (n = 29)**	**IPFPNR Group (n = 28)**	**P-Value**
3-Months	88 ± 9	86 ± 8	0.3797
Interval	**IPFPR Group (n = 28)**	**IPFPNR Group (n = 27)**	**P-Value**
6-Months	69 ± 9	73 ± 8	0.0877

There was no significant difference among patients of both study groups at pre-surgery ($p = 0.6056$), at 6-weeks ($p = 0.6876$) and 3-months ($p = 0.080$). At 6-months follow up interval, there were 4/28 (14.3%) patients who reported anterior knee pain in infrapatellar fat pad removed (IPFPR) group in comparison to 0 in infrapatellar fat pad not removed (IPFPNR) group and the difference in terms of anterior knee pain was noted to be statistically significant ($p = 0.041$) (Table 2).

Table 3 and 4 are showing comparison of mean knee flexion and knee society score at baseline, at 6-weeks, 3-months and at 6-months intervals while no statistically significant difference was noted in between both study groups. None of the patients were reported with avascular necrosis or patellar fractures during follow-ups.

DISCUSSION

The IPFP is present to serve as a cushion between patellar tendon and anterior tibial plateau and known to hinder exposure to the surgical field during TKA. Removing IPFP improves exposure during. In present study, we found that mean Insall-Salvati Ratio, mean Knee Flexion and KSS were not significantly difference at various follow up intervals among patients of both study groups but anterior knee pain was noted to be among 4 patients of IFPFR group in comparison to none in IFPFNR group and this difference was statistically significant ($p = 0.041$). Some studies have found that removal of IFPF may result in increased rates of anterior knee pain, avascular necrosis or fracture of patella and limited knee ROM.[12,13]

A systemic review conducted by Ye et al concluded that preservation of IPFP might be better when compared to IPFP excision among patients undergoing TKA as preserving IPFP might result in lower rates of anterior knee pain during short-term follow ups.[14] Their findings correlates well with the findings of the present study, as we also found that at 6-months follow up interval, none of the patients who had IPFP preserved experience anterior knee pain and when compared with those patients who had IPFP removed, the difference in terms of rates of anterior knee pain turned out to be significant at 6-months interval followup.

As we know that IPFP are have peptidergic C- and substance P+ nerve fibers that play important roles in inflammatory process so removal of IPFP in itself could be a cause of anterior knee pain.[15] Sun et al in a meta-analysis of 9 selected randomized controlled trials comparing IPFP resection or preservation among patients undergoing TKA concluded that none of the approaches were superior to each other in terms of clinical outcomes.[16]

In the present study, none of the patients had avascular necrosis or patellar fractures during follow ups. Kayler et al reported that IPFP removal did not result in injury to inferior part of the anastomosis ring while disruption of infrapatellar blood supply might not influence vascularity of the patellar bone.[7] Our findings in terms of post-surgery complications were very similar to Pinsornask et al from Thailand.[17]

Small sample size, being a single center study and a relatively short-term outcome were some of the limitations of this study. Further randomized controlled trials involving multiple centers with large sets of population need to be conducted to form consensus whether IPFP should be removed or preserved among patients undergoing primary TKA keeping in mind short and long term outcomes.

CONCLUSION

Increased rates of anterior knee pain were observed among patients who had removal of infrapatellar fat pad. No significant difference in knee flexion and knee society scores were observed among patient who had removal or preservation of infrapatellar fat pad.

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