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Early Patellar Related Complications after Total Knee Arthroplasty

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ABSTRACT

Background and Aim: Total knee arthroplasty (TKA) surgeries are growing annually. Reporting the early patellar related complications in patients undergoing TKA was the aim of this study.

Patients and Methods: In this prospective study, medical history, clinical and radiological evaluation, and planning and simulation were performed preoperatively. The Knee Society Score was used to assess the clinical outcomes. Early patellar related complications were assessed.

Results: This study included thirty patients with a mean age of 60.73±6.84 years and most of them were ladies (76.7%) with male to female ratio was 1: 3.29. A significant improvement in the mean Functional Score section of Knee Society Score, from 62.6±2.35 preoperatively to 90.0±0 postoperatively, with a mean follow-up period of six months. Additionally, a significant improvement in flexion deformity was detected. (10%) of cases showed anterior knee pain due to patella-femoral origin, patellar clunk was seen in (3.33%), patella alta in (10%), and none of them reported rotational malalignment, infection, venous thromboembolism (VTE), or stiffness.

Conclusions: TKA with medial parapatellar approach achieves excellent clinical and radiological outcomes with a low incidence of early patellar related complications such as persistent pain and patella alta or clunk

Keywords: Total Knee Arthroplasty, Early patellar related complications, KSS Function.

INTRODUCTION

Total knee arthroplasty (TKA) surgeries are increasing every year. Orthopedic surgeons should be aware of the early patellar related complications. The surgery aims to relieve pain and improve mobility while maintaining stability. Despite good reported clinical results after TKA, 10% of patients may suffer from one or more of its complications. Early complications occur either intraoperatively or within six months postoperatively ranging from minor incidents to major ones [(1)].

Patellofemoral complications including patellofemoral instability, anterior knee pain, and rupture of the extensor mechanism have been identified as severe [(2)]. Patellar related complications include fracture of the patella, patella dislocation, and subluxation, patella clunk syndrome, as well as rupture of the patellar tendon [(3)]. Plain radiographs assess patellar complications following surgery, subtle abnormalities may be present in patellar complications [(4)]. Significant complication like patellar instability during TKA due to component location, an imbalance in the extensor mechanism, and/or other factors reduces the likelihood of a successful functional outcome and might necessitate additional surgical intervention [(3)].

The prevalence of anterior knee pain, particularly when engaging in stressful activities, suggests patellar instability. Radiological examination of the kneecap's location, alignment, as well as component fixation, can yield a diagnosis of the condition. Revision of the total knee arthroplasty if mal-positioned components and lateral retinacular release, with or without proximal or distal realignment if soft tissue imbalance are the primary therapy options [(4)]. This study aimed to report and evaluate early patellar related complications in patients undergoing TKA to study the etiologies, diagnosis, and methods of prevention and treatment.

PATIENTS AND METHODS

Study design

A prospective study included thirty individuals who had surgical intervention for TKA at Orthopedic Surgery Department at Menoufia University Hospital from September 2021 till June 2023.

Patients' criteria

We included in this study any patients who had full medical records, regular physical examinations, and radiographies for less than six months after TKA. Patients with uni-compartment TKA were not included in the study.

Data were collected according to the following:

Personal data as name, age, sex, weight, body mass index, height, and type of prosthesis**.**

Clinical examination as quadriceps strength was evaluated, coronal alignment was calculated, the stability of the cruciate and collateral ligaments was determined, as well as instability was rated on a scale from mild to severe. At zero and thirty degrees of knee flexion, valgus and varus stress were applied to assess the collateral ligaments.

Preoperative assessment

All patients were examined both clinically and radiologically on admission to the hospital as follows: general assessment of the patient, local assessment of the knee based on the New Knee Society Clinical Rating System score, knee radiographs, comprising standing anteroposterior (AP) and lateral (Lat.) views, document status of preoperative neurovascular examination. Planning and simulation were made

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preoperatively to assess the type of prosthesis and how to deal with LLD, laboratory investigations (CBC, random blood sugar, ESR, CRP, renal and hepatic function, and pro thrombin activity), and preoperative neurovascular examination were documented.

Surgical technique

Under spinal or epidural anesthesia, patients were placed in a supine position. A single dose of third generation cephalosporin was administered intravenously at the induction of anesthesia. Sterilization of the limb was done according to institutional protocol. The medial parapatellar approach was utilized and a straight midline incision in the skin on the front of the knee of the patient was made. Dissection was done down to the extensor mechanism to minimize skin flaps. Medial arthrotomy; a medial parapatellar incision was made, and sub periosteal exposure of the proximal medial tibia was done using a periosteal elevator. Flexion of the knee as well as eversion of the patella was done. Marginal osteophytes were removed. Then release of the lateral synovial fold and lateral patellofemoral ligament. The ACL and PCL are then sacrificed, and the proximal tibia is displaced anteriorly. The tibia and the femur were cut using their special jigs.

The proximal tibia was prepared for the tibial base plate as well as the distal femur was finished. A reduction was tried using trial components. Patellar tracking was examined. The trochlea groove in the femoral component should allow the patella to glide in and out without requiring excessive force. The trial components were removed. Bone cement was prepared by combining the necessary ingredients and then cementing both tibial and femoral components. Patellar denervation was performed by diathermy, and the wound was closed in layers.

Postoperative care and follow-up

On the first day postoperatively, AP and Lat. Knee X-rays were obtained. One gram vancomycin intravenous infusion was given as a postoperative antibiotic regimen every twelve hours for forty-eight hours. Enoxaparin 40 IU once daily started twelve hours after the surgery and maintained for one month. Partial weight bearing started the second day after surgery with a walker for two weeks. Then, two elbow crutches were used for another four weeks, and full weight bearing was permitted at six weeks postoperatively. Patients were followed up in the outpatient clinic; clinically and radiologically at six weeks, three months, and six months postoperatively. Standing AP views of both knees and lateral view of the operated knee were performed.

Outcome measures

Patient reported outcome measures (PROMs) including the Knee Society Score (KSS) as well as Global Range of Motion (ROM) were employed at six weeks, three and six months after surgery.

Ethical consideration

All procedures followed the ethical norms established by the institutional committee. The study was approved by the Faculty of Medicine, Menoufia University's Ethics Committee (IRB approval ID: 7/2020 ORTH26) and followed the Declaration of Helsinki. After explaining the nature and scope of the study, all participants provided signed informed consent.

Statistical analysis

Data were analyzed using the IBM Statistical Package for the Social Sciences software (SPSS) version 26.0 (Armonk, NY: IBM Corp.) and MedCalC (Medical Calculation Calculator) version 19.1 was used to tabulate as well as statistically analyze the acquired data. Quantitative data were presented as mean± standard deviation (SD), median, and range. Qualitative data were presented as frequency and percentage. P value below 0.05 was considered significant.

RESULTS

The current study included thirty patients, twenty-three were females (76.7%), the mean age was 60.73±6.84 years. The mean body mass index (BMI) was 37.03±1.73 kg/m^2. Also, nineteen (63.3%) of patients were operated for the right side and eleven (36.7%) for the left side (Table1).

Table (1): Distribution of the examined cases regarding age and sex (n=30).

Parameters		Studied patients (n= 30)	
		N	%
Age (years)	≤ 60 years	15	50.0%
	> 60 years	15	50.0%
	Mean± SD	60.73± 6.84	
	Median	60.5	
	Range	47.0 – 76.0	
Sex	Male	7	23.3%
	Female	23	76.7%

In our study, all cases underwent arthroplasty with medial parapatellar approach. The mean operative time was 102±9.791 min. The mean blood loss was 373.33± 28.57 ml. Regarding distal femoral cut rotation, all of them underwent three degrees external rotation and all of them had six degrees femoral cut valgus angle (Table 2).

Table (2): Distribution of studied cases as regards operative data.

Parameters		Studied patients (n= 30)	
		N	%
Approach	Medial Parapatellar	30	100.0%
Tracking	Tracking	30	100.0%
Operative time (minutes)	Mean± SD	102± 9.791	
	Median	100	
	Range	90 – 120	
Blood loss (ml)	Mean± SD	373.33± 28.57	
	Median	350.0	
	Range	350.0 – 450.0	
Distal femoral cut rotation	Three-degree external rotation	30	100.0%
Femoral cut valgus angle	Six-degree valgus angle	30	100.0%

Regarding the flexion deformity improvement, 60% of patients had preoperative deformity at 5°-10. Meanwhile، most cases (90%) had postoperative deformity at 0°-5°. There was significant improvement in flexion deformity (Table 3).

Table (3): Distribution of studied cases as regards preoperative and postoperative flexion deformity.

Flexion Deformity		Studied patients (n= 30)	
		N	%
Preoperative	0°-5°	9	30%
	5°-10°	18	60%
	10°-15°	3	10%
Postoperative	0°-5°	27	90%
	5°-10°	3	10%

There was significant improvement in KSS Function postoperatively compared to preoperative value (Table 4).

Table (4): Comparison between preoperative as well as postoperative KSS Function.

		Range	Mean ± SD	Median	Wilcoxon Signed Ranks Test	
					Z	p- value
KSS Function	Preoperative	49 – 69	62.6 ± 2.35	63	5.477	**<0.001****
	Postoperative	90 – 90	90.0 ± 0.0	90		

*Significant

There was significant improvement in anatomical axis postoperatively compared to preoperative value (Table 5).

Table (5): Comparison between preoperative and postoperative anatomical axis.

		Range		Mean ± SD		Median		p- value
		aLDFA	MPTA	aLDFA	MPTA	aLDFA	MPTA	
Anatomical Axis	Preoperative	77-80	82-85	78.6±1.08	83.967±0.94	79	84	<0.001*
	Postoperative	84	90	84±0	90±0	84	90	

*Significant

As for the presence of complications among the studied cases, anterior knee pain due to patellofemoral origin was found in 3 patients (10%) with significant improvement during follow up, while the most studied patients (90%) were satisfied with no pain. Patellar clunk was seen in one patient (3.33%) who was not satisfied but pain and clunk had been improved with physiotherapy. Patella alta was seen in 3 patients (10%), but they improved significantly with physiotherapy. Also, most patients were satisfied with further follow up, and none of cases reported periprosthetic fracture, patellofemoral instability or failure of extensor mechanism, rotational malalignment, infection, VTE or stiffness (Table 6, 7)**.**

Table (6): Distribution of studied cases as regards patellar-related complications.

Parameters		Studied patients (n= 30)	
		N	%
Patellar-related complications	Anterior patellar pain	3	10%
	Patellar clunk	1	3.33%
	Patella Alta	3	10%
	Fracture	0	0.0%
	Patellofemoral instability	0	0.0%
	Failure of Extensor Mechanism	0	0.0%

n: number, %: percentage.

Table (7): Distribution of studied cases as regards general complications.

Parameters		Studied patients (n= 30)	
		N	%
Patellar-related complications	Rotational Malalignment	0	0.0%
	Infection	0	0.0%
	VTE	0	0.0%
	Stiffness	0	0.0%

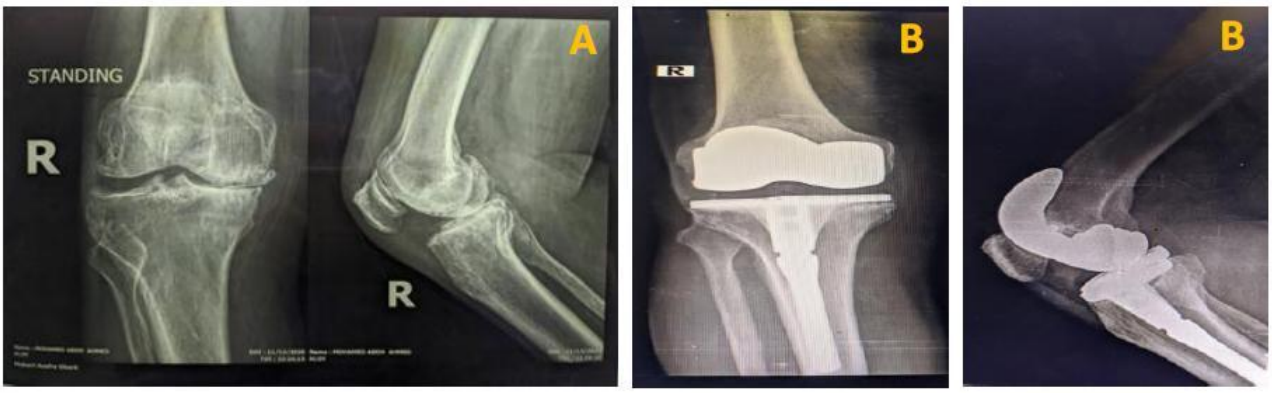

Figure (1): 62 years old male, BMI=35. He was diagnosed as bilateral primary osteoarthritis and followed 6 months after having a successful TKR. He had a KSS= 90 and excellent knee function with no complications. A) pre- and B) postoperative X-ray standing of RT knee.

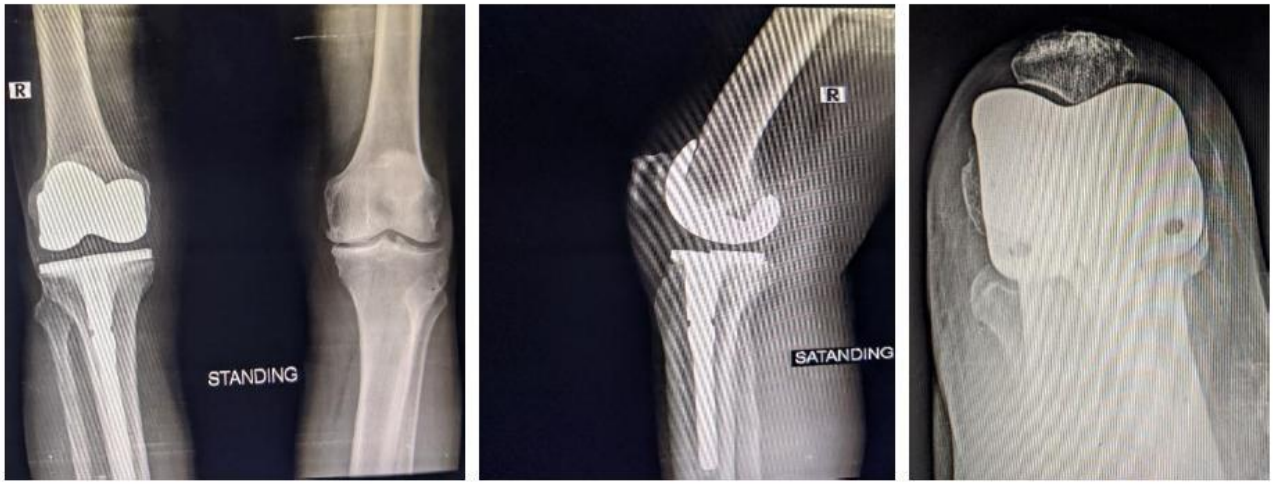

Figure (2): Follow up X-ray standing both knee AP, Rt lateral view, and skyline view.

DISCUSSION

TKA is one of the most successful surgical interventions. Orthopedic surgeons should be aware of the early patellar related complications [(1)]. In this study, the clinical and radiological outcomes of TKA were assessed for incidence of the early patellar related complications either intraoperatively or within six months postoperatively. In our study thirty patients were enrolled with mean age of 60.73±6.84 years and most of them were females (76.7%) with male to female ratio was 1: 3.29.

Our results agree with the findings of **Hawker *et al.*** [(5)] where the prevalence rates of TKA were higher for females than males across most age group as they had worse symptoms, a higher frequency of arthritis, and greater disability. Also, in concordance with our study, **Patel *et al.*** [(6)] enrolled 418,885 patients and revealed that most patients underwent TKA were females (59.1%).

In our study, mean BMI was 37.03± 1.73 Kg/m^2 and ranged from 33 Kg/m^2 to 42 Kg/m^2. Most cases (86.7%) were obese class I. The systematic review by **Griffin *et al.*** [(7)] revealed that obesity had a negative influence on findings after TKA .

Also, in the current study, the mean operative time was 102±9.791 minutes. The mean blood loss was 373.33± 28.57 ml. All our patients underwent three degrees external rotation and all of them had six degrees femoral cut valgus angle.

However, **Lin *et al.*** [(8)] treated 330 persons submitted to arthroplasty via a medial parapatellar (MPP) approach and showed that the mean operative time was 81.8±7.2 minutes. As well, **Pongcharoen *et al.*** [(9)] enrolled 30 patients who underwent arthroplasty via a medial parapatellar approach and revealed that the mean operative time was 97 ± 6 (90–115) minutes and the mean blood loss was 368±58 ml, this was comparable with our results.

Additionally, 30% of our patients had preoperative flexion deformity at 0°-5°, 60% of them at 5°-10° and 10% at 10°-15°. Meanwhile، most cases had postoperative flexion deformity at 0°-5° and 10% of patients at 5°-10°, with significant improvement in flexion deformity. Consistent with our study, **Sinha *et al.*** [(10)] found that patients who underwent arthroplasty via a medial parapatellar approach saw considerable reduction in flexion deformity at 1- and 6-week monitoring.

Regarding Knee Society Score (KSS) significantly improved postoperatively (92.87±0.73) compared to preoperative value (60.33±3.20). In this concern, mean KSS function was significantly improved postoperatively (90.0± 0) compared to preoperative value (62.6 ±2.35). Also, **Kholeif *et al.*** [(11)] revealed significant improvement in clinical KSS score from 38 (31.5–44) preoperatively to 88 (87.5–89.75) at 1 year postoperatively among patients treated with medial parapatellar approach. As well, **Dileep *et al.*** [(12)] showed significant enhancement in Knee Society Objective Score from 31.70±12.36 preoperatively to 99.11±0.97 at 1 year postoperatively. Also, Knee Society Functional Score significantly improved from 10.19±7.53 preoperatively to 99.07±2.42 at 1 year postoperatively among patients treated with medial parapatellar approach.

Regarding anatomical axis, our study showed that both lateral distal femoral angle and medial proximal tibial angle were significantly improved postoperatively (84 and 90) compared to preoperative. (78.6±1.083 and 83.967±0.948) respectively.

Regarding the presence of complications among the studied cases, there were 3 cases who had anterior knee pain due to patellofemoral origin, one case had patellar clunk who was not satisfied, 3 cases had patella alta, which was probably because of the large size of polyethylene insert. Also, most of our patients were satisfied with further follow up, and none of cases reported periprosthetic fracture, patellofemoral instability or failure of extensor mechanism, rotational malalignment, infection, VTE or stiffness. In line with the findings, **Yuan *et al.*** [(13)] indicated that the quadriceps-sparing technique and the standard medial parapatellar approach to total knee arthroplasty both resulted in a considerable improvement in mechanical axis, with the quadriceps-sparing strategy being slightly superior.

Finally, there were many limitations of the current study as our study was conducted at a single center and included small sample size of patients. Thus, further multicenter studies with large sample size of patients should be conducted using well-designed randomized controlled trials or large, comparative observational studies to validate our findings.

CONCLUSIONS

In conclusion, TKA with medial parapatellar approach can achieve satisfactory results with excellent clinical and radiological outcomes with low incidence of early patellar related complications (anterior knee pain, patellar clunk, patella Alta). Proper patient selection, appropriate implant design, insert size, correct surgical technique، and effective postoperative care are mandatory to ensure good outcome.

DECLARATIONS

- **Consent for publication:** Consent to publish individual data was obtained from patients.
- **Competing interests:** The authors declare that they have no competing interests.
- **Funding:** No financial support was received for this study.

- **Author contributions:** Mohamed E. Habib and Ahmed A. Dewidar designed the study, performed the surgeries, and revised the final manuscript. Ashraf S. M. El Dsh wrote the preliminary manuscript, performed analysis and interpretation of data and manuscript preparation.

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