



## Primary total knee arthroplasty with posterior cruciate retaining prosthesis in Baqubah teaching hospital.

Ahmed .K. Jameel

Ministry of Health, Department of Orthopedic Surgery, College of Medicine, University of Mosul.

E-mail: [alazzawia57@yahoo.com](mailto:alazzawia57@yahoo.com)

### Abstract

**Aim:** To evaluate the efficacy of primary total knee arthroplasty (TKA) with P.S PROTHESIS in severely compromised knees.

**Methods:** 76 patients who underwent 85 primary TKA with P.S at our hospital from 2013 to 2017 were retrospectively reviewed. Indications for the use of a P.S prosthesis were extreme ligament imbalance or severe bone loss. Clinical evaluations were performed prior to surgery and at the final follow up which included visual analog scale (VAS), Hospital for Special Surgery (HSS) Knee Scores, range of motion (ROM) measurements, assessment of postoperative complications and radiographic data. There was no malalignment at the final follow-up. No signs of prosthesis subsidence or loosening were observed.

**Conclusion:** Primary TKA using P.S is effective at improving the pain and function of severely compromised knees.

**Keywords:** Knee, arthroplasty, p.s, surgical protocol

### Introduction

Total knee arthroplasty (TKA) in unstable knees is a challenge for the reconstructive surgeon. The use of condylar TKA designs is restricted because of serious bony and ligamentous defects [1]. Constrained prostheses are often needed to restore lower limb alignment and ensure initial stability [3, 4]. P.S with an improved design have been introduced to provide good initial stability while avoiding torsional stresses along the prosthesis/cement/bone interface [3, 4]. We performed a retrospective study to evaluate the outcomes of primary TKA with a P.S in severely compromised knees. Factors of particular interest included operative indications, surgical techniques and operative efficacy. Posterior stabilized (PS) knee prosthesis comes at the next level of constraint. It sacrifices the PCL and provides posterior stability by virtue of a tibial polyethylene post which engages in the intercondylar cam of femoral

component. However, it provides little varus-valgus and rotational stability. Therefore, good soft tissue envelope and well-functioning collaterals, and well balanced knee are important for optimal stability. Because, all the technical difficulties encountered during PCL balancing are eliminated, many surgeons consider PS prosthesis technically facile.

One important consideration in this kind of prosthesis is that, in presence of flexion laxity it might lead to cam dissociation and posterior subluxation. Therefore, PS implants can only be considered in presence of intact functioning ligaments and good quality bone. They have been used successfully in case of conversion of unicompartmental knee arthroplasty (UKA) to TKA.

## Materials and Methods

### Patient characteristics

From 2013 to 2017, 76 primary TKAs with P.S prostheses were performed at our HOSPITAL on 76 patients with severely deformed knees. Indications for the use of a P.S prosthesis were extreme-ligamentous-laxtyin-osteoarthric-patient-rheumatoid arthritis patient.

### Surgical procedure

Under general anesthesia and with a tourniquet, a senior surgeon performed all TKAs through a medial parapatellar approach. Osteo-phyte removal and soft tissue releases were performed for joint exposure. A V-Y quadriceps- plasty was performed if improved extensor mechanism exposure was required. Bone resection was guided by extramedul lary tibial and intra-medullary femoral alignment. Flexion and extension gap balance were obtained with measured bone resection and soft tissue releases. Bone defects were filled with cement or metal augments at depths of less than 5 mm or more than 5 mm, respectively. A cemented p.s. prosthesis with patellar flange, anti-luxation and rotational features was implanted after trialing. The lateral retinaculum was adequately relaxed for possible patellar subluxation, and no patellas were resurfaced. A thorough pulsatile lavage was performed, and suction drains were placed before closure.

Following surgery, antibiotic prophylaxis with cefazolin was given for 48 h and rivaroxaban was administered for 2 weeks for deep vein thrombosis prophylaxis. The suction drain was removed approximately 24-48 hours postoperatively, depending on drainage volume. Flexion-extension motion was permitted on the second post continuous passive motion device. Patients were permitted to walk with crutches 1 week after surgery, and advanced to full weight bearing 3 months post-arthroplasty. For patients with patella fractures, an adjustable long-leg brace was recommended to limit knee ROM for at least 3 months. A manual crease flexion-extension range of motion over that period.

### Data collection

Clinical and radiographic data were prospectively gathered pre-operatively, post-operative-ly and during follow-up (3, 6 and 12 months post-operatively, and every year thereafter). Clinical evaluation consisted of

visual analog scale (VAS) score, Hospital for Special Surgery (HSS) Knee Scores, ROM and postoperative complication assessment. Radiographic review included an assessment for prosthesis loosening, and measurements of mechanical axis, femorotibial angle, tibial varus/valgus alignment, and knee procurvatum/recurvatum. The criteria for postoperative malalignment included a femorotibial angle greater than 10° of valgus, any degree of varus and femoral flexion or extension [13]. Prosthesis loosening was diagnosed with a complete radiolucent line of 2 mm or more, a cement fracture around the implants or a change in component position [14].

### Statistical analysis

All statistical analyses were performed using SPSS 19.0 (IBM Corp., Armonk, NY, USA). Pre- and post-operative VAS scores, ROM measurements and HSS scores were analyzed with student's t-test. *P* values < 0.05 were considered statistically significant.

## Results

Extension deficits were also present in three other knees, and ranged from 5 to 10°. All were likely because of the intraoperative V-Y quadricepsplasty or quadriceps release. No neurovascular injuries or dislocations were detected. intra-operatively-postoperatively. Two deep infections were diagnosed postoperatively, and those patients required a two-stage revision. All patients were followed for 4-10 years. Mean VAS score decreased from 8.1 (range 6-10) preoperatively to 1.2 (range 0-3) at final follow-up (*P*=0.01). Mean HSS score improved from 38.5 (range 25-62) preoperatively to 86.3 (range 72-95) at final follow-up (*P*=0.02). The average knee ROM was 64° (range 20-90°) before surgery and 98° (range 90-110°) at final follow-up (*P*=0.04) (Table 2). There were no malalignments at the final follow-up. No signs of prosthesis subsidence or loosening were observed at final follow-up (Figures 1-4).

Table 1. General information and clinic feature of included patients

n=76		
Sex	Female	64
	Male	12
Age	68 years	Range: 55-81 years
Aetiology	Osteoarthritis	52
	Rheumatoid arthritis	4
	Posttraumatic arthritis	20
Deformity	Flexion deformity	10
	Valgus deformity	62
	Varus deformity	38

Table 2. Comparison of HSS score, VAS score, and ROM of knee between pre- and post-operation. (n=85, x ± s)

Time	VAS score	HSS score	ROM (°)
Preoperative	8.1±1.3	38.5±9.6	64±15
Last follow-up	1.2±0.8	86.3±8.9	98±11
Statistic	t=2.77, P=0.01	t=2.45, P=0.02	t=2.10, P=0.04

Table 3. Distribution of TKA with gender.

Type of operation	Gender	Right hip	Left hip	Bilateral	Total
TKA	Female	30	26	8	64
TKA	Male	7	4	1	12

Table 4. Postoperative complication

Superficial infection	4 knee
Deep infection	2 knee
Interior knee pain	3 knee
Extention lag	3



Figure 2. Pre-operative radiographs of this patients revealing limb malalignment.



Figure 4. Post-operative radiographs revealing favorable limb alignment.

## Discussion

Utilizing clinical exam findings and radiographic evaluations, we found acceptable mid-term benefits of TKA with p.s. implants on grossly unstable knees with serious bony and ligamentous defects. The efficacy of p.s. primary TKA has been evaluated in several studies, with results varying from poor to acceptable [3, 5, 15, 16]. Guenoun et al [16] had an unacceptably high complication rate of 30.8% after 52 P.S primary TKAs with a mean follow-up of 3 years. Pour et al [5] believed that knee salvage reconstruction with P.S devices was satisfactory in 44 knees after a mean follow-up of 4.2 years, despite a relatively high rate complication and failure rate (18.2%). Petrou et al [3] in a series of 100 knees with 7-15-year follow-up found P.S to be ideally suited for arthroplasty of deformed knees, with good or excellent results in 91% of cases. Barrack [15]

reported satisfactory results in a series of 23 knees after 2-9 year follow-up. The inconsistent findings of these papers suggest that TKAs using rotating-hinge devices have divergent results in different patient populations with diverse surgical protocols. Controversies persist concerning the indication, operative technique and efficacy of these devices.

P.S conform favorable initial stability through a link between the tibial and femoral components. Rotation of the tibial bearing around a yoke on the tibial platform reduces torsional stress at the prosthesis/cement/bone interface, leads to a lower risk of loosening and favorable outcomes [6-8]. Rotating-hinge devices are applied not only to revision knee surgery and oncologic reconstructions, but to primary TKA in specific situations. However, the indications for P.S primary TKA have remained controversial. Increased constraint produces torsional stress at the prosthesis/cement/bone interface, and therefore leads to a high risk of failure. The use of constrained prostheses was not advocated in cases where a condylar prosthesis could be implanted [1, 12, 17]. Grossly unstable knees with serious bony and ligamentous defects require the use of P.S prosthesis to ensure intrinsic implant stability [8]. Our study suggested that, for primary non-tumorous TKA, p.s. devices could be implanted in cases of lateral ligament compromise, and massive distal femur or proximal tibia bone loss. This finding is in agreement with several previous studies [2, 12, 15, 16].

A good surgical technique is one of the key elements that define the efficacy of p.s. devices. Detailed preoperative planning, including the evaluation of soft tissue balance and bone deficiency simplifies the surgical approach [18]. V-Y quadricepsplasty was not performed in our early study, and one knee with 0 to 30 ROM intra-operatively was found to have a patella avulsion fracture. Since then, a V-Y quadricepsplasty was proposed for knees with difficult exposures, especially stiff knees with serious osteoporosis. Quadriceps release was proposed for tight extensor mechanisms. Although V-Y quadricepsplasty and quadriceps release might lead to an extension deficit, our results suggest that a deficit of 5 to 10° is acceptable. P.S still could transmit high forces to the prosthesis/cement/bone surface, especially in cases of limb malalignment.

The most frequent complication of a p.s. prosthesis is periprosthetic infection, with rates higher than both primary and revision surgeries. Springer et al [19] reported an infection rate of 19% in a series of 26 knees over an average follow-up of 58.5 months. Yang et al [2] reported a 14% deep infection rate in 50 knees after a mean follow-up of 15 years. The relatively high infection rate of previously papers might be attributed to older patient age, serious joint disease on presentation and extensive operative exposure [2, 6, 19]. Only two cases (7.1%) of deep infections were reported in our study at final follow-up, probably because of our strict perioperative management. Anterior knee pain is usually reported after P.S TKA, with rates between 5 and 22% [3, 20, 21]. The incidence of anterior knee pain in our study was 10.7%. We propose that one of the main causes for this complication was that the patellas were not resurfaced. The lack of roll-back in the femoral and tibial components of P.S and the increased tension on the patellofemoral joint also accounted for increased pain complaints [21]. Several studies previously reported that patella misalignment and non-resurfacing are associated with anterior knee pain [22].

According to table 4, 2 patients had superficial wounds and one patients changes to deep infection .



**In conclusion**, our study showed primary TKA using P.S prosthesis can effectively relieve the pain and improve the function of severely compromised knees. There are several limitations in our study. It is retrospective and non-controlled. The length of follow-up may have been too short (range 3-5 years), although an average duration of 4 years is acceptable for studying the medium-term effects of P.S TKA for severely compromised knees. Our study is underpowered, so outcome differences on the basis of the underlying diagnosis was not possible. Our findings should be further validated with a well-powered prospective study.

**Disclosure of conflict of interest:** None.

## Abbreviations

TKA, total knee arthroplasty; VAS, visual analog scale; HSS Knee Scores, Hospital for Special Surgery Knee Scores; ROM, range of motion.

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