

The Prevalence And Predictive Factors For Constrained Condylar Tka

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Abstract

Background: The essential factors for a successful total knee arthroplasty (TKA) include achieving optimal alignment, ensuring proper balance, and correcting deformities. Certain cases including severe deformities, substantial bone defects, stiffness, and instability are exceedingly challenging to rectify only through soft tissue release and necessitate the use of restricted prostheses, even in initial total knee arthroplasty (TKA). Under these conditions, the restricted condylar knee (CCK) method is the optimal selection.

Aim of the This study sought to determine the prevalence and predicted characteristics related to the necessity of limited insert utilization in primary total knee arthroplasty (TKA).

Patients and method: Retrospective study for 286 patients from January 2020 to January 2023 enrolling all patients underwent total knee arthroplasty arthroplasty in hospital of surgical specialties in medical city and two private hospitals in Baghdad. All patients underwent total knee arthroplasties (TKA) conducted by the same surgical team. We conducted a retrospective analysis of the preoperative and intraoperative factors related to the utilization of restricted inserts. A total of 42 knees needed constrained condylar stemmed total knee arthroplasty were found.

Study population: 286 patients (76 males and 210 female) age from 27 to 79 years old. The inclusion criteria required that all patients underwent complete knee arthroplasty. Patients with revision knee arthroplasty and valgus knees were excluded from the study.

Data collection and analysis: factors related to preoperative and intraoperative steps. The evaluated patient's age, BMI, range of motion, Knee Society Score (KSS), sex, (KL grade), alignment determined through anteroposterior (AP) standing radiographs.

Results: The restricted implant was utilized in 42 out of 286 knees (14.6%).

Preoperative and intraoperative clinical variables linked to an elevated modified probability of limited insert utilization encompassed significant varus deformity. A surgeon operating the curvature was developed to ascertain the appropriate threshold value of 17.6° for the tibiofemoral angle, indicating the requirement for a restricted implant.

Conclusion: The preoperative factors examined comprised the patient's age, body mass index, range of motion, Knee Society Score (KSS), sex, Kallgren and Lawrence grading, alignment assessed via anteroposterior (AP) standing radiographs, and the gravity of the anatomical varus angle as indicated by the tibiofemoral angle

Keywords: Total knee arthroplasty with a confined condylar design.

1. INTRODUCTION

1.1. Overview

Knee osteoarthritis (OA) is a primary cause of impairment in persons over 65 years of age. Individuals with osteoarthritis endure markedly increased pain and functional impairments during routine everyday tasks, resulting in diminished productivity and a decline in quality of life. Numerous conservative therapeutic options exist for the management of mild-to-moderate osteoarthritis. Significant emphasis must be placed on

post-operative knee mobility or range of motion (ROM) to facilitate adaptation to daily living activities.

The restricted knee range of motion postoperatively may increase the risk of falls, but knee flexion exceeding 120 degrees is suitable for most daily activities.

The quantity of TKA treatments is anticipated to increase significantly, reaching an estimated 3.48 million annually. As value-based care programs increasingly emphasize hospital readmission rates and patient satisfaction, it is imperative for healthcare providers to devise and execute a multidisciplinary strategy to improve TKA results while reducing superfluous costs.

2. PATIENTS AND METHODS

2.1. Research Methodology

This retrospective investigation indicates that between January 2020 and January 2023, a total of 302 patients underwent total knee arthroplasties (TKAs) using a PS-TKA technique. The TKA techniques permitted the choice between a typical PS insert or a restricted insert, contingent upon the equilibrium evaluated effort to equilibrate the soft tissue. Figure 2.1.

Inclusion criteria:

All patient needs tkr with varus knees.

Exclusion criteria:

Patient had previous tkr need revision and primary valgus knees.

All patients with knee osteoarthritis whose symptoms were unresponsive to conventional treatment were admitted under the care of a single surgical team for TKA. Patients were disqualified trial if met specific criteria. need revision surgery and valgus knee. A total of 286 patients (76 males and 210 female) satisfied the inclusion criteria, eliminating 11 knees requiring revision and five knees with valgus knees (**Fig. 2.2**).

Fig. (2.1): Discrimination between (PS) insert (A) and a constrained insert (B). A restricted prosthesis features a more robust and broader column compared to a posterior-stabilized implant.

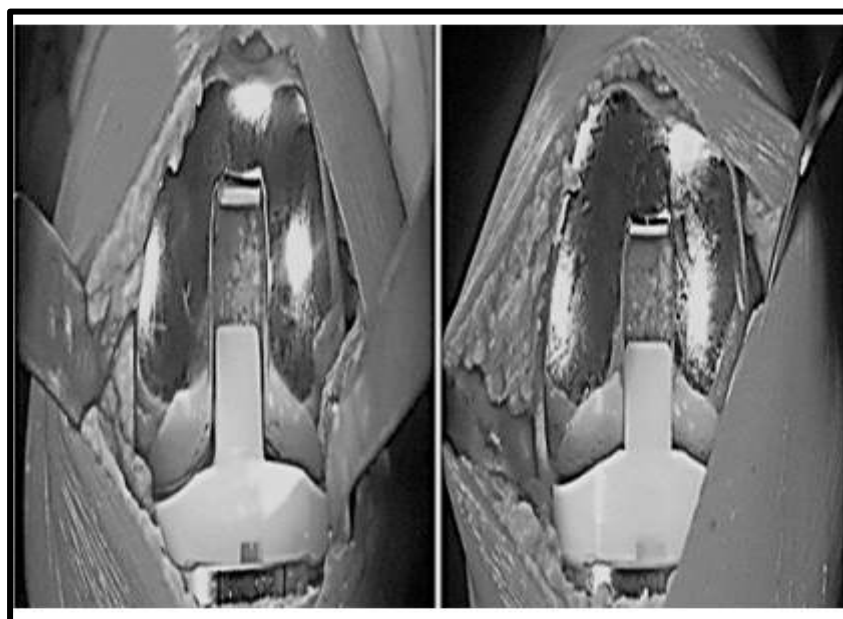
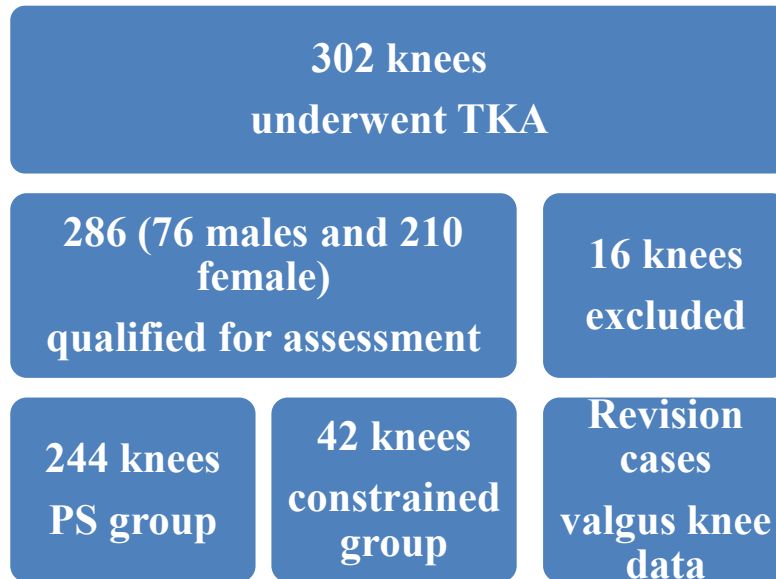


Fig. (2.2): Examine the flowchart TKA: complete knee arthroplasty. Posterior-stabilized.

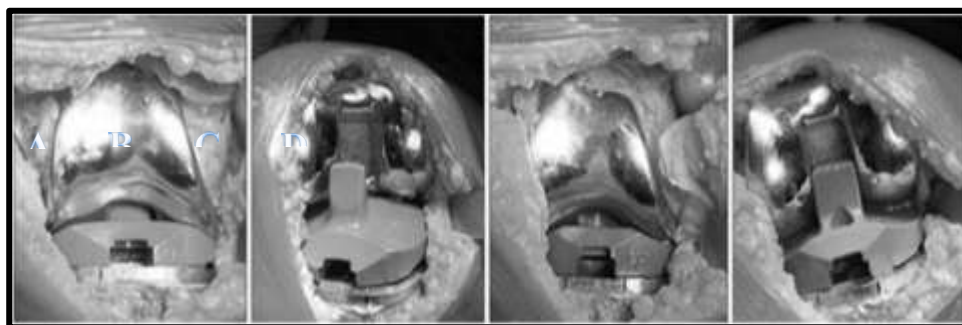


2.2. Surgical Procedure

A conventional approach for patellar resurfacing was executed. Spinal or general anesthesia was utilized. The incision was generally no more than 10 cm. The femoral excision at an angle of 6° or 7° of valgus in a varus knee. The dimensions of the femoral component were established using the anterior citing instrumentation method. The proximal tibial excision was executed via the intramedullary method. Upon positioning the PS insert was utilized in the equilibrated knees, provided that symmetrical apertures were attained and that the medial/lateral opening did not surpass 3 mm throughout varus and valgus stress tests at 0°, 45°, and 90°.

The transition a confined liner was implemented if the ligament were unable to be equilibrated, if gaps in flexion-extension were incongruent, or if the varus-valgus aperture measured 3 mm or greater during varus and valgus stress testing at 0° (Fig. 2.3). All cases involved cemented femoral and tibial implants. Both groups utilized identical postoperative pain management and rehabilitation techniques. which provided early postoperative mobilization.⁽¹⁷⁾

Fig (2.3): A posterior-stabilized component was utilized; The knee exhibited optimal equilibrium in complete extension. (A) but exhibited instability in full flexion (B). We are substituting with a restricted insert of identical thickness; the knee exhibited optimal balance in both full extension (C) and full flexion (D).



2.3. Patients Data Analysis:

To elucidate the prognostic characteristics linked to the necessity for a restricted implant in (TKA), the subsequent pre and intra surgical variables were incorporated into the research. The examined preoperative variables comprised Quantitative variables.

The surgeon (ST) evaluated the rigidity Laxities in the coronal and sagittal planes were observed. (12, 20, 21)

3. FINDINGS

3.1 Demographic Information

A total of 302 knees were discovered; however, 16 were eliminated due to valgus knee data and revision cases. This study involved 286 knees. The limited implant was utilized in 42 out of 286 knees (14.6%). Table 3.1

Table (3.1): Demographic comparison between the PS and Constrained Groups

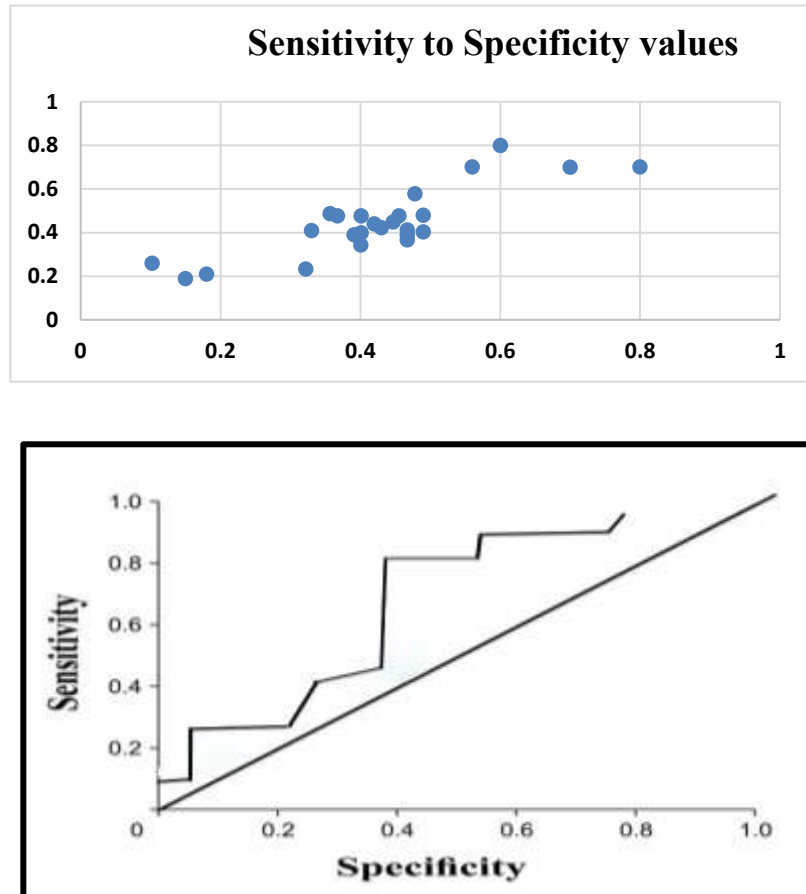
Variable	PS group (244)	Constrained group (42)	p-value
Preoperative variable			
Age (yrs.)	62.2 ± 5	64.4 ± 3	0.50
Sex (male: female)	63: 181	13: 29	0.20
Body mass index (kg/m ²)	28.5 ± 5	29 ± 7	0.48
Range of motion (°)	111.3 ± 17	103 ± 23	0.80
Knee Society score	36 ± 16	27 ± 11	< 0.05
Severity of varus angle			
1	88		
2	85	26	< 0.05
3	71	16	< 0.05
Severity of coronal plane laxity			
1	89		
2	108	25	< 0.05
3	47	17	< 0.05
KL grade 4	244	42	< 0.05
Intraoperative variable			
Extent of soft-tissue release			
1st step	60		
2nd step	101	13	< 0.05
3rd step	83	29	< 0.05

Table (3.2): Multivariable Logistic Regression Examination shows Predictive Factors to implant of Constrained Insert in TKA

Characteristic	Odds ratio	95% CI	p-value
Preoperative variable			
Age (yrs.)			
≤ 65	0.6	0.56-2.1	0.201
> 65	0.8	0.5–1.03	0.182
Sex			
Male	1.98	0.34-3	0.78
Female	1.34	0.7–2.4	0.23
Body mass index (kg/m²)			
Underweight to normal (≤22.9)			
Overweight to obese (≥23.0)	1.9	0.4–1.4	0.89
Range of motion (°)			
≤ 100	1.2	0.2-1.8	0.9
> 100	0.75	0.8–1.8	0.45
Knee Society score			
≤ 50	0.7	0.46-2.0	0.57
> 50	0.5	0.2–1.2	0.21
Severity of varus angle			
1			
2	1.2	0.9–2.8	0.2
3	4.8	2.5–12.6	< 0.05
Severity of coronal plane laxity			
1			
2	0.85	0.62–1.0	0.60
3	0.9	0.46–1.2	0.42
KL grading			
4	0.9	0.1–1.77	0.5
Intraoperative soft-tissue release			
1st step			
2nd step	2.01	0.9–3.9	0.32
3rd step	6.01	3.4–15.5	< 0.05

Predictive Factors for the confined insert usage is demonstrated in Table 3.2 by multivariate regression analysis. Preoperative and intraoperative clinical factors associated with an increased modified risk of restricted insert utilization included significant varus deformity and extensive soft tissue release. A surgeon operating the curvature was established to determine the optimal termination value of 17.6° for the tibiofemoral angle, necessitating the use a constrained implant. Figure 3.1.

Figure (3.1): The curve's point is associated with the preoperative tibiofemoral varus. An angle of 17.6° , indicating the value with maximal sensitivity and specificity.



4. DISCUSSION

Our study revealed that the prevalence of constrained implant (TKA) with deformity was 14.6%. Additionally, preoperative severe varus deformity and significant soft tissue release via step 3 release of the medial collateral ligament during surgery were identified as key factors prompting the use of the constrained insert in primary TKA. An anatomical tibiofemoral varus angle above 17.6° preoperatively was correlated with the selection of a restricted implant and may serve as a prospective predictor for implant choice.^(17,24)

Augmenting the limitation to intricate main knee implant necessitates the utilization of the CCK system to accommodate broader polyethylene columns and more substantial femoral component containers with stems to restrict varus-valgus and torsional movements. while stem extension may elevate the difficulty and expense of the surgical procedure. The selective application of the stemmed restricted insert is advised. Therefore, it would be advantageous for surgeons to identify knees suitable for the use of the stemmed restricted insert prior to the operation.⁽²⁴⁻²⁶⁾

A prior retrospective investigation indicates few factors to contemplate concerning the severity risk of varus or intraoperative procedures when deciding to utilize a limited stemmed implant in total knee arthroplasty (TKA). Although the pronounced varus deformity and significant soft tissue release may be perceived as contributing factors to

the heightened risk associated with restricted inserts, no explicit evidence supports this notion.^(27,28)

This study aims to determine predictive criteria for the utilization of the stemmed restricted insert in primary total knee arthroplasty to assist surgeons in preoperative implant preparation. Severe varus deformity or significant soft tissue release was associated with a heightened likelihood of utilizing restricted inserts in primary total knee arthroplasty with stem extensions.

This investigation revealed that knees exhibiting severe varus deformity, as assessed by tibio-femoral angle from historical x-ray evaluations, had a 5.78-fold increased likelihood of requiring limited insert utilization compared to individuals Exhibiting a minor varus deformity (OR: 4.8, 95% CI: 2.5-12.6, $P < 0.05$).

determined ideal tibiofemoral varus angle of 17.6° for prospective implant selection prediction.

This study, utilizing the conventional medial release technique on patients with varus deformity, demonstrated that individuals undergoing extensive soft tissue or superficial MCL release experienced an increased likelihood of requiring constrained inserts (OR: 6.01; 95% CI, 3.4–15.5; $p < 0.05$) compared to those with minimal soft-tissue release. Insufficient medial soft-tissue release resulted in suboptimal deformity repair, while excessive superficial MCL release expanded the flexion-extension gap on the medial aspect, potentially causing knee instability. Surgeons have two management options when faced with this condition. The primary approach is to utilize lateral soft-tissue release for gap balancing, requiring the placement of a larger polyethylene component, which may result in limited range of motion due to an increased joint line, patellofemoral maltracking, and constraints in extension. This study utilizes an alternative method that transitions to a constrained insert, ensuring stability while maintaining the joint line and patellofemoral kinematics.^(13,24,27,29)

Our analysis indicated a 14.6% prevalence of limited insert utilization in initial total knee arthroplasty with varus deformity. Morales Moreno B et al.

This study possesses multiple strengths. The patient series was sequential, and all procedures were conducted by a single surgical team

This study has significant drawbacks. The reflective examination design for the showing of linking rather than establishing a definitive connection. Secondly, the number of patients in some groups was relatively constrained.

5. CONCLUSIONS:

- Our analysis indicated a prevalence of 14.6% for the use of restricted inserts.
- Anatomic preoperative tibiofemoral varus angle above 17.6° and significant soft tissue release via the superficial medial collateral ligament were correlated utilization to restricted implants after surgical procedure.

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