Original Research Article

Attitudes and Decision-Making of Nigerian Orthopaedic Surgeons on the Proximal Tibial Cut in Total Knee Replacement

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Abstract: Total knee replacement (TKR) is an established procedure for advanced knee osteoarthritis, primarily indicated when pain and functional limitation significantly impair quality of life and activities of daily living. Surgical outcomes depend greatly on intraoperative technical decisions, particularly tibial cut and polyethylene thickness selection. This study explored the surgical preferences, intraoperative methods, and decision-making factors guiding proximal tibial resection and polyethylene selection among Nigerian orthopedic surgeons performing TKR. A descriptive cross-sectional survey of orthopedic surgeons with TKR experience was conducted using a structured questionnaire across four domains. Data were analyzed with descriptive statistics in SPSS v26. A total of 52 male surgeons participated, with 48.1% aged 41–50 years and 38.5% aged 51–60 years. Most had <10 years of arthroplasty experience (77%) and performed <50 TKRs annually (71%). Tibial resection was commonly guided by a combination of stylus and angel wing (69.2%), while polyethylene thickness was mainly determined by intraoperative gap assessment (69.3%). Key decision factors included flexion–extension gap balance (37.9% for tibial cut; 45.2% for polyethylene thickness) and joint line preservation (26.7% and 30.8%). The majority preferred polyethylene thickness of 10–12 mm (88.5%), with overstuffing indicated by polyethylene popping out on flexion (34.6%) or difficulty with insertion (31.5%). Nigerian orthopedic surgeons predominantly rely on conventional gap-balancing techniques and mid-range polyethylene thickness during TKR. The limited adoption of advanced technologies highlights the need for region-specific guidelines, enhanced training, and access to modern instrumentation to optimize surgical decision-making and long-term outcomes.

Keywords: Total Knee Replacement, Tibial Cut, Polyethylene Thickness, Surgical Decision-Making, Nigeria.

INTRODUCTION

Total knee replacement has become an established surgical intervention for advanced knee osteoarthritis and other degenerative joint conditions worldwide [1]. It is one of the most successful orthopedic procedures in restoring joint function, alleviating pain, and improving quality of life [2]. Global data show a steady rise in the number of total knee replacements performed annually, especially in high income countries where patient expectations and surgical expertise have advanced considerably [3, 4]. Despite this progress, the technical demands of the procedure remain high, and decisions made during surgery have a direct bearing on postoperative outcomes [5].

Among the critical technical steps, the proximal tibial cut is regarded as one of the most influential in determining alignment, stability, and long term survival of the artificial joint implant that replaces the damaged surfaces of the knee [6]. The tibial resection can be performed using different alignment systems, most commonly intramedullary or extramedullary guides, each with specific advantages and limitations [7]. Intramedullary guides are associated with improved control of the tibial slope but may be less suitable in cases of canal deformity or previous fracture, while extramedullary guides are more versatile but heavily reliant on accurate anatomical landmark identification [8,9]. More recent options include computer assisted navigation, patient specific instrumentation, and robotic assisted systems, which have been shown to improve precision of the tibial cut, although their clinical superiority and cost effectiveness remain subjects of debate [10].

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In sub-Saharan Africa, the uptake of total knee replacement has grown steadily over the last two decades, though the volume remains low compared to global figures [11]. Cost barriers, limited implant availability, and variations in training continue to shape practice patterns. Reports from South Africa and Nigeria have documented encouraging outcomes following total knee replacement, yet they also highlight challenges with instrumentation and implant selection [12, 13]. In particular, Nigerian surgeons often face constraints in accessing advanced technologies such as computer navigation or robotic assistance, making decisions around conventional intramedullary or extramedullary guides especially critical [14]. While international studies have examined the accuracy and outcomes of different tibial resection methods [16, 17], there is limited evidence on how Nigerian orthopaedic surgeons approach these intraoperative decisions, and what factors guide their attitudes and preferences.

This study therefore aims to explore the attitudes and decision making of Nigerian orthopaedic surgeons regarding the proximal tibial cut during total knee replacement. By examining their perspectives, the study seeks to clarify how global best practices are adapted within the Nigerian context, where training backgrounds, resource availability, and patient needs converge to influence surgical choices.

METHODOLOGY
Study Design
This study employed a descriptive cross sectional design to explore the attitudes and decision making patterns of Nigerian orthopaedic surgeons regarding the proximal tibial cut in total knee replacement. The target population comprised orthopaedic surgeons practicing in Nigeria who had experience with total knee replacement surgery. Participants were identified through the Nigerian Orthopaedic Association and affiliated professional networks. A purposive sampling approach was used to ensure inclusion of surgeons actively involved in arthroplasty practice.

Instrument Development and Data Collection
Data were collected using a structured, self-designed questionnaire developed by the research team after an extensive review of the literature on tibial resection techniques and surgical decision making in total knee replacement (Karade *et al*., 2012; van der Sluis *et al*., 2021; Walgrave and Oussedik, 2023). The questionnaire contained both closed and semi open ended items organized into four domains: (i) socio demographic and professional characteristics, (ii) surgical techniques and intraoperative methods, (iii) decision making factors guiding tibial resection and polyethylene choice, and (iv) surgical experience and practice patterns. The draft instrument was pretested among a small group of surgeons not included in the final study sample to ensure clarity, relevance, and content validity. The final questionnaire was administered electronically using Google Forms. An invitation link was distributed via professional mailing lists, WhatsApp groups, and direct emails to maximize reach across the country. Participation was voluntary, and responses were anonymous.

Data Analysis
Responses were exported from Google Forms into Microsoft Excel and subsequently analyzed using the Statistical Package for the Social Sciences (SPSS) version 26. Descriptive statistics such as frequencies, percentages, means, and standard deviations were used to summarize participant characteristics and response patterns.

Ethical Considerations
Ethical approval for the study was obtained from the appropriate institutional review board. Participation was voluntary, informed consent was obtained electronically before commencement of the questionnaire, and data confidentiality was maintained throughout the study.

RESULTS
According to table 1, nearly half of the respondents (48.1%) were aged 41–50, followed by 38.5% aged 51–60 and 13.5% aged 31–40. All were male. About 38.5% each had 1–5 years and 6–10 years of joint replacement experience, while 11.5% had 11–15 years or 16–20 years. Most practiced in West Africa (94.2%) with 5.8% in Europe. Overall, 34.6% had performed fewer than 50 total knee replacements, 36.5% performed 50–100, and 34.6% performed 101–500. Each year, 46.2% of practitioners performed between 10 and 20 procedures, 42.3% conducted 21 to 50 procedures, 7.7% performed fewer than 10, and 3.8% carried out between 51 and 100.

Table 2 shows that the majority of respondents (69.2%) determined the proximal tibia cut using a combination of the stylus and angel wing, while 28.8% relied on the stylus pointing to the higher side and only 1.9% used the angel wing on the deeper side. Most surgeons rarely revisited or redid the proximal tibia cut, with 65.4% reporting this occurred in less than 10% of cases, whereas 34.6% did so occasionally. For polyethylene thickness, intraoperative assessment such as trial components and soft tissue balancing was the most common method (69.3%), followed by angel wing placement with visual estimation (20.0%), preoperative planning (6.7%), and stylus measurement (4.0%).

As shown in Table 3, decision making for tibial cuts was mainly guided by flexion and extension gap balance (37.9%) and joint line preservation (26.7%), with fewer respondents considering polyethylene thickness (22.4%), anatomical landmarks (8.6%), or bone defects (4.3%). Polyethylene thickness decisions were most influenced by flexion and extension gap

balance (45.2%) and joint line preservation (30.8%), with fewer citing component design and material (19.2%) or mediolateral joint stability (4.8%).

Table 4 indicates that the preferred polyethylene thickness range was predominantly 10–12 mm (88.5%), while only 11.5% chose 8–10 mm. The most common intraoperative indicators of an overstuffed joint were polyethylene popping out with flexion (34.6%) and difficulty inserting polyethylene (31.5%). Limited knee flexion (18.9%) and knee extension lag (15.0%) were less frequently reported.

Table 1: Socio-demographic and professional characteristics of respondents

Variables	Frequency	Percentage
Age		
31-40	7	13.5
41-50	25	48.1
51-60	20	38.5
Sex		
Male	52	100.0
Years spent in joint replacement (years)		
1-5	20	38.5
6-10	20	38.5
11-15	6	11.5
16-20	6	11.5
Place of practice		
Europe	3	5.8
West Africa	49	94.2
Total number of TKR performed		
Less than 50	18	34.6
50-100	19	36.5
101-500	18	34.6
Total number of TKR performed annually		
Less than 10	4	7.7
10-20	24	46.2
21-50	22	42.3
51-100	2	3.8

Table 2: Surgical techniques and intraoperative methods

Variables	Frequency	Percentage
Methods used to determine the proximal tibia cut		
Angel-wing on the deeper	1	1.9
Combination of the stylus and angel-wing	36	69.2
Stylus pointing to the higher side	15	28.8
How often do you revisit or redo the proximal tibia cut		
Occasionally (10-50%)	18	34.6
Rarely (<10%)	34	65.4
Methods do you use to determine polyethylene thickness[m]		
Angel-wing placement and visual estimation	15	20.0
Intraoperative assessment (e.g., trial components and soft tissue balancing)	52	69.3
Preoperative planning (e.g., templating)	5	6.7
Stylus measurement	3	4.0

Table 3: Decision-making factors guiding tibia cut and polyethylene choice

Variables	Frequency	Percentage
Factors that influence decision on proximal tibia cut		
Flexion and extension gap balance	44	37.9
Joint line preservation	31	26.7
Polyethylene thickness	26	22.4
Anatomical landmarks	10	8.6
Bone defect	5	4.3
Factors influence your decision on polyethylene thickness		
Flexion and extension gap balance	47	45.2

Variables	Frequency	Percentage
Joint stability especially in the mediolateral axis	5	4.8
Component design and material	20	19.2
Joint line preservation	32	30.8

Table 4: Surgical experience and practice patterns

Variables	Frequency	Percentage
Preferred polyethylene thickness range (mm)		
8-10	6	11.5
10-12	46	88.5
Indications that joint is overstuffed [m]		
Difficulty with polyethylene insertion	40	31.5
Polyethylene pops out with flexion	44	34.6
Limited knee flexion	24	18.9
Knee extension lag	19	15.0

DISCUSSION

This study provides insights into the surgical preferences and intraoperative decision-making patterns of orthopedic surgeons performing total knee replacement (TKR) in a West African context. The age and experience profile of the respondents indicates a predominance of mid-career surgeons aged 41–50 years, with most having fewer than 20 years of arthroplasty experience. The majority of respondents in this survey were between 41 and 50 years (48.1%), followed by those aged 51 to 60 years (38.5%). This distribution aligns with reports from other surveys where arthroplasty surgeons were typically within their mid-career stage [18]. For instance, Singh *et al*., found that most knee arthroplasty surgeons in their multicenter registry were between 40 and 55 years [19]. These findings suggest that the technical demands and experience required for arthroplasty are most often acquired and consolidated during this career stage, which corresponds with the present study.

Procedure volumes were also comparatively lower, with most surgeons performing fewer than 50 cases annually. This contrasts with high-income countries where annual case volumes per surgeon typically exceed 100, a factor associated with better outcomes and reduced revision rates [20-21]. In terms of tibia cut methods, the majority of respondents (69.2%) used a combination of stylus and angel-wing referencing, while 28.8% relied on stylus alignment. This finding is consistent with reports from Asia and Europe where the stylus remains the most widely used method [22]. However, the limited use of preoperative imaging or advanced navigation in this cohort hilights the continued reliance on conventional methods, in contrast with increasing adoption of navigation and robotics in higher-income settings [23, 24].

Decision-making was strongly guided by flexion and extension gap balance (37.9%) and joint line preservation (26.7%). This is consistent with existing literature which emphasizes the importance of balanced flexion-extension gaps in optimizing postoperative function and implant survival [25]. Polyethylene thickness selection was similarly guided by gap balance (45.2%) and joint line restoration (30.8%), aligning with findings that malalignment and imbalance increase the risk of implant failure and instability [26]. However, fewer respondents considered component design or mediolateral stability, which contrasts with Western literature where these are critical considerations [27].

The preference for polyethylene thickness of 10–12 mm (88.5%) mirrors findings from European series where inserts of 9–12 mm are most frequently used (Hitt *et al*., 2003). Indicators of overstuffing such as polyethylene popping out with flexion (34.6%) and difficulty with insertion (31.5%) were frequently reported, similar to previous reports linking overstuffing to reduced flexion and functional limitations [28].

Limitations

This study was limited by its cross-sectional design and reliance on self-reported data, which may be subject to recall or reporting bias. The sample was drawn from orthopedic surgeons attending a single professional conference, which may not be fully representative of all arthroplasty surgeons in the region. Finally, the relatively small sample size may limit the statistical power to detect meaningful variations in practice patterns.

CONCLUSION

This study highlights that among orthopedic surgeons in this cohort, tibial cut practices are largely guided by intraoperative gap balancing techniques, with strong preference for polyethylene inserts within the 10–12 mm range. These findings emphaisze the predominance of conventional methods and surgeon experience in guiding intraoperative decisions, while adoption of advanced technologies such as navigation or robotics remains limited. The results point to the need for continued skills training, mentorship, and region-specific guidelines to optimize surgical decision-making and outcomes in total knee arthroplasty.

Authors' Contributions: This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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