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Knee Fusion In Awka, Nigeria, Indications, Prevalence And Treatment Methods.

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Abstract
Introduction *knee arthrodesis emerges as a viable salvage option when revision arthroplasty fails in treating total knee arthroplasty (tka) complications. With tka rates rising, subsequent revisions and arthrodesis procedures are expected to increase. Compared to above-the-knee amputations, arthrodesis offers superior pain relief, reduced need for future surgeries, better cosmetic outcomes, and enhanced ambulation. Various techniques like intramedullary nails, external fixation, and compression plates cater to different patient conditions. Decision-making depends on infection status, soft tissue condition, and bone loss. Recent studies favour external fixation and im nails for recurrent infections, but outcomes vary. This review aims to assess outcomes, indications, and complications of arthrodesis techniques for failed tkas.*
Methodology *the retrospective cohort study, conducted at an orthopedic hospital in awka, nigeria, analyzed patient records (2015-2022) focusing on severe knee osteoarthritis cases. 156 patients underwent total knee arthroplasty. Treatment included arthrodesis or fusion for specific cases. The outcome assessment involved clinical and radiological parameters, with ethical considerations upheld.*
Result *in a study analyzing knee fusion, six subjects with a mean age of 63.5 years underwent the procedure, predominantly females (66.7%). Common occupations were farming, civil service, and housewives. The prevalence of knee fusion among 156 knees was 3.85%. Primary reasons included severe arthritis (66.7%) and failed arthroplasty (33.3%). Most patients (83.3%) accepted surgery, with one expressing reluctance due to fear and concerns about knee rigidity. Compression plate fixation was the preferred technique (66.7%). Post-operatively, non-union occurred in two cases (33.3%), with healing taking 28 to 34 weeks. United cases reported satisfactory outcomes during a follow-up period averaging 1331.33 days.*
Conclusion: *knee arthrodesis is a promising salvage option post-revision arthroplasty failure, with varying techniques catering to diverse patient conditions and reported favourable outcomes. Prevalence in this environment is low, the rate of non-union with both compression plate and external fixators is 33,3%*
Keywords: *severe osteoarthritis, failed arthroplasty, knee fusion, prevalence, treatment*

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I. Introduction

In the circumstances that revision arthroplasty can no longer serve as a viable option to treat complications of total knee arthroplasty (TKA), knee arthrodesis serves as an acceptable option for salvage treatment.[1][5] The most common indications for knee arthrodesis are failed TKAs.[2] TKA will increased substantially and the need for revision will increase also leading to subsequent increase failed revision and arthrodesis procedures is likely to follow.[3] As a whole, when compared to above-the-knee amputations, which serve as the other major alternative salvage treatment option for a failed TKA, arthrodesis is the preferred procedure.[4][5][6] Knee arthrodesis is known to have its advantages, namely in regards to improved pain relief, decreased need for future surgery, preferred cosmetic appearance, and improved ambulation and energy efficiency, compared to above-the-knee amputation[5][6]]. When comparing the various arthrodesis techniques available, each presents its own set of advantages and disadvantages, as well as technique-specifics that cater to each patient's unique condition. The most common methods of arthrodesis today include use of intramedullary nails (IM nails), external fixation, and compression plates [7,8]. Intramedullary nails include two forms, long or short, while external fixation involves one of the following: a monoplanar fixation device, a biplanar fixation device, or the use of circular frames [1,3]. This article is aimed to review recent findings of the outcomes, indications, and complications of these different techniques of knee arthrodesis as a salvage procedure for failed TKA, as well as its technical aspects, advantages, and disadvantages.[7]

Deciding which specific arthrodesis technique to use, whether IM nail, external fixation, or compression plates, can be based on three main variables: infection state, condition of the soft tissue envelope, and preoperative bone loss. No definitive indications for treatment have been established, and much of the decision-making process as to which technique to treat a patient lies in the judgment of the surgeon.[7,8,9,10]However, a review of the

recent literature provides some direction in determining which specific technique should be considered given a patient's presentation in regard to the three variables mentioned above. Of the three main techniques, the majority of recent studies have looked into the use of external fixation devices and IM nails when recurrent infection was the main indication for the procedure. Results have generally showed favourable outcomes for these two main techniques, although, there has been a wide range of variance [9][10][11]

Compression plates have been shown to have comparable, if not better, fusion rates compared to external fixators, as well as increased structural comfort. However, data surrounding the efficacy of compression plates is sparse relative to external fixation devices and IM nails in the presence of infection.[11] In addition, typical to internal fixation devices in general, higher rates of deep infection have been reported.[12] For these reasons, external fixation and IM nails may be more reliable options in cases involving an infectious state[13][14] . The condition of the soft tissue envelope at the time of arthrodesis serves as another factor that can help determine which technique is indicated. In general, with increasing soft tissue compromise around the knee, the use of external fixation over IM nails seems to be a favourable option, which, in general, helps avoid hardware exposure and decreases the risk of deep infection. Severe soft tissue defects that may inhibit acute wound approximation and primary closure. The ability to gradually shorten the bone gap defect is an important advantage of external fixation over IM nails and compression plates[20]. In regard to patients who present with severe bony defects, IM nailing serves as a reliable treatment option. Different variations of treatment have been proposed to overcome extensive bone loss including the possibility of lengthening the bone using a circular frame, the use of bone grafts with IM nails, or newer modular IM nail techniques that do not require bone-to-bone contact[16,17,20] All of these stand as possible options when dealing with severe bony defects and are techniques that certainly should be further evaluated.

II. Methodology

The study, conducted in an Orthopedic hospital in Awka, Nigeria, involved a retrospective cohort study of patient records from 2015 to 2022. The focus was on patients with severe knee osteoarthritis who underwent total knee arthroplasty.

Study Setting: The study was conducted at an Orthopaedic hospital in Awka, Nigeria. This hospital likely specializes in orthopaedic surgeries and treatments.

Patient Selection:
Records of all patients presenting with severe knee osteoarthritis from 2015 to 2022 were reviewed.

Inclusion criteria involved patients undergoing total knee arthroplasty.
The study included 156 patients, including both primary and revision knee arthroplasty cases.

Treatment Modalities:

Patients with severe osteoarthritis, severe deformities, subluxation of the knees, and those who couldn't afford LCCK (lateral compartment knee arthroplasty) or hinged knee options underwent arthrodesis of the knee.

Patients with failed primary and revision knee arthroplasty underwent explantation (removal) and debridement (cleaning of the wound) followed by fusion.
Fusion was achieved using compression plates and external fixators.

Outcome Evaluation:
The outcome of the procedures was evaluated using both clinical and radiological parameters.
Clinical parameters included pain level, functional ability, and complications.

Radiological parameters involved assessing the fusion, alignment, and any signs of complications such as infection or implant failure.

Data Analysis:
Data from patient records were analyzed descriptively to assess the outcomes of the different treatment modalities. The result was presented in clear frequency tables.

Ethical Considerations:
Consent for procedures was fully obtained from the patients.
Patient confidentiality and privacy were ensured throughout the study process.

III. Knee Fusion Result

Table 1 presents the demographic characteristics of the six subjects who underwent knee fusion. The mean age of the participants was 63.5 years, with a standard deviation of 9.73 years, ranging from 47 to 75 years.

The study cohort consisted of a slightly higher proportion of females (66.7%) compared to males (33.3%). Regarding occupation, the distribution was relatively equal among farming, civil servants, and housewives, each comprising 33.3% of the sample. The majority of the participants were married (83.3%) as opposed to single (16.7%).

Table 1: Demographic Characteristics of Patients Undergoing Knee Fusion

	Frequency	**Percentage**
Mean Age (years)	63.5 ± 9.73	47-75
Gender		
Female	4	66.7
Male	2	33.3
Occupation		
Farming	2	33.3
Civil Servant	2	33.3
Housewife	2	33.3
Marital Status		
Married	5	83.3
Single	1	16.7

Prevalence of Knee Fusion

The study investigated the prevalence of knee fusion among a cohort of 156 knees. It was found that 3.85% of the knees underwent this procedure.

Reasons for Knee Fusion

Table 2 delineates the primary reasons leading to knee fusion. Notably, the most common indication for knee fusion was severe arthritis not amenable to arthroplasty, accounting for 66.7% of cases. Failed arthroplasty constituted 33.3% of the cases.

Patient Acceptance and Surgical Details

An overwhelming majority of patients readily accepted the surgery (83.3%). However, one patient (16.7%) expressed reluctance, citing fear of surgery and worry about a rigid knee subsequently as the primary reason (Table 2).

Regarding the type of implant used for fusion, compression plate fixation was the most frequently employed technique, utilized in 66.7% of cases and external fixators were utilized in 33.3% of cases each (Table 2).

Post-operative Details

Table 3 outlines post-operative details and patient satisfaction levels

Two of the cases failed to unite. One was fixed with a compression plate, while the other was performed with an external fixator. The non-union rate was 33,3%. The duration of healing ranged from 28 to 34 weeks (196-238) days. Those that united were followed up for an average of 1331.33 days ± 214.25 days, ranging from 940 to 1550 days without major complaints. Those who had non-union chose the option of a rigid full leg brace instead of repeat surgery.

Table 2: Surgical Details and Patient Outcomes Following Knee Fusion

	Frequency (n)	**Percentage (%)**
What Was the Reason for the Fusion?		
Severe Arthritis with severe deformity and bone defect	4	66.7
Failed Arthroplasty	2	33.3
Did the Patient Readily Accept the Surgery?		
Yes	5	83.3
No	1	16.7
If No, what were the Reason (s) (n = 1)		
The Fear of Surgery and post op function of a fused knee	1	100.0

Which Type of Implant was Used for The Fusion?		
Compression plate	4	66.7
External Fixators	2	33.3

Table 3: Post-operative Details in Days

	Mean (SD)	Range
Follow up since the Fusion (days)?	1331.33 ± 214.25	940-1550
Duration of healing	215.25	196-238

Table 4: Outcome of fusion

Outcome	Frequency	Percentage
Union	4	66.7
Non-union	2	33.3

IV. Discussion

The study's findings shed light on various aspects of knee fusion procedures, offering insights into demographic characteristics, prevalence rates, reasons for knee fusion, patient acceptance, surgical techniques, and post-operative outcomes.

Demographic Characteristics: The participants, averaging 63.5 years of age, comprised a slightly higher proportion of females (66.7%) than males (33.3%). Occupationally, the sample was evenly distributed among farming, civil servants, and housewives, while the majority were married (83.3%).

Among the 156 knees studied, the prevalence of knee fusion was recorded at 3.85%. The prevalence of knee fusion in this environment and in the United States has not been studied, therefore emphasizing its relevance in the context of orthopaedic interventions.[21] The primary indications for knee fusion were severe osteoarthritis with severe deformities and large bone defects (66.7%) and failed arthroplasty (33.3%), underscoring the need for alternative surgical approaches in challenging cases. [3,4,5]

A notable majority of patients (83.3%) accepted the surgery, albeit one expressing reluctance due to fear and concerns about post-operative knee rigidity. The study highlighted the use of compression plate fixation in 66.7% of cases and external fixators in 33.3% of cases, reflecting the diversity in surgical techniques employed for knee fusion. These are accepted and well known method of knee fusion, though intramedullary nails have been considered the best option especially in an infection free environment. [7,8,22] Two cases (33.3%) failed to achieve union post-surgery, indicating a significant non-union rate. However, despite the low prevalence and number of cases in this study the rate of non union is similar to other studies.[23][24]. However, there has been a report of 89% union rate with IM nail which further shows the superiority of IM nail over some other methods.[15] The healing duration ranged from 28 to 34 weeks, with patients who achieved union reporting satisfactory outcomes during the follow-up period averaging 1331.33 days ± 214.25 days. Interestingly, those experiencing non-union opted for conservative management with a rigid full leg brace rather than opting for repeat surgery, indicating varied patient preferences and management strategies.

These findings underscore the complexities associated with knee fusion procedures and highlight the importance of considering patient demographics, surgical techniques, and post-operative care in optimizing outcomes and patient satisfaction. Further research and advancements in surgical approaches may help address challenges such as non-union and enhance the efficacy of knee fusion procedures in addressing knee pathologies effectively. [7,15,22,23,24]

V. Conclusion:

Knee arthrodesis is a promising salvage option post-revision arthroplasty failure and an alternative to TKA in a resource-constrained environment with varying techniques catering to diverse patient conditions and reported favourable outcomes. Prevalence in this environment is low and the rate of non-union with both compression plate and external fixators is 33,3%

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