Research Square

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A Modified Lateral Skin Incision Reduces Wound Complications and hospital stay in Obese patients undergoing Total Knee Arthroplasty: A Propensity-Matched Cohort

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Abstract

Background

This prospective study investigates if a modified curved lateral skin incision in total knee arthroplasty (TKA) for morbidly obese patients reduces complications. we hypothesized that preserving the medial angiosomal blood supply would decrease wound issues, and lateralized skin incision would decrease hypesthesia, and kneeling difficulties without impacting operative time or function.

Methods

The study evaluated 124 morbidly obese patients undergoing primary TKA, comparing a modified curved lateral skin incision (n=62) to a standard midline incision (n=62). Following 1:1 propensity score matching for demographics and preoperative status. a single surgeon performed all procedures using curved lateral skin incision and then medial parapatellar arthrotomies. Primary endpoints were wound complication rates and hospital stay length; secondary outcomes included hypesthesia, kneeling ability (VAS), Knee Society Scores (KSS), and operative metrics.

Results

Both groups were well-balanced at baseline (SMD < 0.20). The Lateral group showed a significantly lower overall wound complication rate (3.2% vs. 19.4%, p = 0.016), exclusively minor, with no major complications. Additionally, this cohort had shorter hospital stays (3.02 vs. 3.48 days, p = 0.021) and a markedly smaller area of hypesthesia. On multivariable logistic regression, the lateral incision was an independent protective factor against wound complications (OR 0.094; 95% CI 0.014–0.643; p= 0.016), while smoking was the strongest independent risk factor (OR 48.95; 95% CI 4.958–483.4; p < 0.001).

Conclusion

In morbidly obese patients undergoing TKA, a modified curved lateral skin incision significantly reduces wound complications, hospital stay, and anterior knee hypesthesia compared to the standard midline approach. While the lateral technique improves early kneeling ability, long-term functional outcomes remain equivalent. The researchers conclude the lateral incision is a superior strategy for this high-risk population.

Introduction

Obesity affects one-third of the global population, with Class III (morbid obesity) defined as a Body Mass Index(BMI) > = 40 kg/m².[1] Every five-unit increase in BMI raises knee osteoarthritis risk by 35% due to mechanical stress and inflammation. [2]

TKA is the primary treatment for end-stage osteoarthritis, yet 40–50% of candidates are obese, presenting significant clinical challenges. Morbid obesity increases risks for wound complications, such

as infections and dehiscence. These patients often require longer surgeries and larger incisions, which can cause soft-tissue ischemia and impair wound healing.[2,3]

Historically, a lateral skin incision in TKA has been reserved for specific anatomical indications, principally severe fixed valgus deformity and the presence of a pre-existing lateral scar.[4] The established neurological rationale for this approach centers on avoidance of the infrapatellar branch of the saphenous nerve, which traverses the medial aspect of the operative field; injury to this structure produces the characteristic zone of anterior knee hypesthesia and dysesthesia that many patients find profoundly distressing following standard TKA.[5] The same argument applies to vascular supply that positioning the incision lateral to the midline preserves the dominant medial cutaneous vasculature and the medial-to-lateral transverse anastomoses, thereby protecting the angiosomal integrity of the anterior knee skin, yet has not been systematically evaluated, particularly in the context of morbid obesity.[6]

Despite the anatomical and physiological rationale for preferring a lateral skin incision in morbidly obese patients, no previous study has rigorously evaluated this modified technique in this specific high-risk population. The existing literature on lateral incisions in TKA is largely confined to descriptive series or retrospective analyses in non-obese or mixed-BMI cohorts, and none have employed propensity-matched comparative methodology to control for the confounding variables inherent to observational designs.

Against this background, the present study was designed to rigorously evaluate the safety, efficacy, and comparative clinical outcomes of a modified curved lateral skin incision versus the standard longitudinal midline incision for primary TKA in patients with morbid obesity (BMI ≥ 40 kg/m²). Using a prospective cohort design with 1:1 propensity score matching(PSM), we aimed to determine whether the lateral approach independently reduces wound complication rates and hospital stay, limits anterior knee hypesthesia, and facilitates earlier kneeling recovery, without imposing any functional deficit or additional operative burden. We further sought to characterize the independent predictors of these outcomes using multivariable regression analyses.

Methods

Study Design and Ethical Considerations

This study was a prospective comparative cohort analysis, enhanced by retrospective PSM, conducted at [Insert Institution/University Name]. The study protocol was reviewed and approved by the Institutional Review Board. All patients provided written informed consent prior to enrollment and surgical intervention.

Patient Selection

Patients presenting with primary advanced knee osteoarthritis scheduled for primary TKA were prospectively evaluated for enrollment. The study specifically targeted a high-risk demographic, establishing strict inclusion criteria: (1) Body Mass Index (BMI) ≥ 40 kg/m² (Class III obesity), and (2)

indication for primary, unilateral TKA. Exclusion criteria included a history of prior open knee surgery, post-traumatic arthritis, inflammatory arthropathies (e.g., rheumatoid arthritis), severe fixed valgus or varus deformities (> 15 degrees) requiring constrained implants, and pre-existing severe peripheral vascular disease.

Eligible patients were categorized into two cohorts based on the surgical approach utilized: a study group receiving a modified curved lateral skin incision and a control group receiving a standard longitudinal midline skin incision.

Propensity Score Matching Protocol

To strictly control for selection bias and baseline confounding variables inherent in observational designs, a 1:1 PSM algorithm was executed prior to the final outcome analysis. A multivariable logistic regression model was utilized to calculate a propensity score (PS) for each patient, representing the conditional probability of receiving the modified lateral incision.

The covariates included in the matching model were age, BMI, sex, preoperative smoking status, and the direction of preoperative deformity (varus/valgus). Matching was performed using a nearest-neighbor algorithm, enforcing a caliper width of 0.2 standard deviations of the logit of the PS. Match quality and baseline covariate balance were rigorously assessed using the Standardized Mean Difference (SMD), with an SMD < 0.20 considered indicative of excellent balance. This algorithmic matching yielded a finalized, perfectly balanced study cohort of 124 patients (62 patients per group).

Surgical Technique

All procedures were performed by a single senior arthroplasty surgeon using a standard medial parapatellar arthrotomy for joint entry and identical instrumented bony resections, regardless of the superficial skin incision utilized.

- Lateral Curved Incision Group (Study Cohort): A modified curved lateral skin incision was placed laterally to circumvent the thin anterior soft tissue envelope directly over the patella (Fig. 1). This theoretically preserves the dominant medially based cutaneous vascular supply and respects the regional angiosomes of the anterior knee. This approach allowed medial retraction of the whole medial compartment fat on the anterior part of the knee (Fig. 2).
- Standard Midline Incision Group (Control Cohort): A traditional longitudinal straight midline skin incision was made directly over the anterior aspect of the knee.

Postoperative Protocol and Clinical Pathways

As this was a single institution practice, standardized institutional enhanced recovery after surgery (ERAS) protocol was uniformly applied to all patients. This included standardized multimodal analgesia, deep vein thrombosis (DVT) prophylaxis, and physical therapy regimens initiating early mobilization on

postoperative day one. Standardized hospital discharge criteria were applied to all patients, requiring adequate pain control on oral medications, independent transfers, and the ability to safely ambulate with an assistive device.

Study Outcomes

Clinical, functional, and operative parameters were prospectively recorded. The primary endpoints were the incidence of wound complications and the length of hospital stay. Secondary endpoints included functional recovery and patient-reported subjective outcomes.

- Wound Complications: Prospectively monitored and stratified by severity. *Minor wound complications* were defined as superficial erythema, delayed wound healing, or superficial surgical site infections successfully managed non-operatively with local wound care and/or oral antibiotics. *Major wound complications* were defined as deep periprosthetic joint infections (PJI), full-thickness skin flap necrosis, or deep wound dehiscence requiring a formal return to the operating room for surgical debridement.
- Length of Hospital Stay (LOS): Calculated in days from the date of surgery to the date the patient successfully met the standardized discharge criteria.
- Length of Surgical Scar: Measured in centimeters immediately following skin closure.
- Hypesthesia Area: Measured at the final follow-up by mapping the area of diminished sensation or numbness on the anterior knee using a light touch and pinprick test, quantified in square centimeters (cm^2).
- Kneeling Ability: Assessed at 3 months postoperatively using a specific Visual Analog Scale (VAS) ranging from 0 to 10 (where 0 indicates "not difficult at all" and 10 indicates "extremely difficult") when the patient attempted to bear weight directly on the flexed operated knee.
- Functional Scores and Range of Motion (ROM): The Knee Society Score (KSS) was evaluated preoperatively and sequentially postoperatively. Knee flexion was measured in degrees using a standard clinical goniometer.

Statistical Analysis

Statistical analysis was performed on the finalized propensity-matched cohort (N = 124). Continuous variables were assessed for normality and are presented as means with standard deviations (SD). Differences between the continuous variables of the two matched groups were analyzed using the independent Student's t-test or the Mann-Whitney U test, as appropriate. Categorical variables are presented as frequencies and percentages. Categorical complication rates were strictly analyzed using Fisher’s Exact Test or Chi-square tests.

To further validate the independent effect of the surgical approach on postoperative wound healing, a multivariable logistic regression model was constructed. Minor wound complication (Yes/No) was set

as the dependent variable, with surgical incision type, smoking status, BMI, age, and operative time inputted as independent predictors to calculate adjusted Odds Ratios (OR) and 95% Confidence Intervals (CI). A p-value of < 0.05 was considered statistically significant.

Results

1. Patient Enrollment and Propensity Score Matching

A total of 124 patients with primary advanced knee osteoarthritis and a Body Mass Index (BMI) ≥ 40 kg/m² (Class III obesity) met eligibility criteria and were enrolled. Following 1:1 PSM the finalized analytic cohort comprised 62 patients in the Lateral Curved Incision group and 62 patients in the Standard Midline Incision group. All patients had complete follow-up and were included in the final analysis.

2. Baseline Patient Characteristics and Group Balance

The PSM produced excellent covariate balance between the two cohorts across all baseline demographic and clinical variables (Table 1). Mean age was comparable between the Lateral Curved and Standard Midline groups (56.47 ± 5.30 vs. 55.90 ± 4.90 years; SMD = 0.111; $p = 0.539$). The cohorts were similarly composed regarding sex distribution, with 82.3% and 85.5% female patients in the Lateral and Midline groups, respectively ($p = 0.807$). Mean BMI was nearly identical between groups (43.59 ± 1.98 vs. 43.30 ± 1.85 kg/m²; $p = 0.404$). Smoking prevalence was low and well-matched in both cohorts (4.8% vs. 8.1%; $p = 0.717$). The predominant preoperative deformity was varus in both groups (71.0% vs. 69.4%; $p = 1.000$). Preoperative knee flexion, extension lag, KSS, and KSS Functional scores were all statistically equivalent between groups, with all Standardized Mean Differences (SMD) remaining well below the 0.20 threshold (Table 1).

Table 1
Baseline Patient Characteristics Following PSM(N = 124)

Variable	Lateral Curved (N = 62)	Standard Midline (N = 62)	SMD	P-value
Age (years)	56.47 ± 5.30	55.90 ± 4.90	0.111	0.539
Sex (Female)	51 (82.3%)	53 (85.5%)	-0.090	0.807
BMI (kg/m²)	43.59 ± 1.98	43.30 ± 1.85	0.150	0.404
Smoking (Smoker)	3 (4.8%)	5 (8.1%)	-0.134	0.717
Deformity (varus)	44 (71.0%)	43 (69.4%)	0.035	1.000
Preoperative Flexion (°)	75.18 ± 5.89	75.74 ± 5.62	-0.098	0.586
Extension Lag (°)	2.87 ± 2.25	2.48 ± 1.85	0.188	0.298
Preoperative KSS	58.23 ± 6.26	58.89 ± 5.41	-0.113	0.530
Preoperative KSS Functional	64.05 ± 5.42	64.90 ± 4.58	-0.170	0.345

SMD = Standardized Mean Difference. Values presented as Mean ± SD or N (%). All SMD < 0.20 confirm excellent covariate balance. P-values derived from independent t-test, chi-square, or Fisher's Exact Test as appropriate.

3. Surgical Parameters and Length of Hospital Stay

Operative time was comparable between the two groups (Lateral: 74.97 ± 8.19 min vs. Midline: 73.26 ± 7.20 min; $p = 0.219$), indicating that the modified lateral approach did not impose any additional operative burden. Similarly, incision length did not significantly differ between groups (14.57 ± 0.74 cm vs. 14.78 ± 0.42 cm; $p = 0.059$) (Fig. 3).

The length of hospital stay was statistically shorter in the Lateral Curved Incision group (3.02 ± 0.86 days vs. 3.48 ± 1.32 days; SMD = − 0.421; $p = 0.021$). This represents a reduction of approximately half a day, achieved in the context of a standardized institutional ERAS protocol applied uniformly to both cohorts (Table 2).

Table 2
Surgical and Clinical Outcome Variables: Between-Group Comparison

Variable	Lateral Curved (Mean ± SD)	Standard Midline (Mean ± SD)	SMD	P-value	Sig.
Operative Time (min)	74.97 ± 8.19	73.26 ± 7.20	0.222	0.219	
Incision Length (cm)	14.57 ± 0.74	14.78 ± 0.42	-0.343	0.059	
Hospital Stay (days)	**3.02 ± 0.86**	**3.48 ± 1.32**	**-0.421**	**0.021**	*
Final Flexion (°)	93.48 ± 3.88	93.98 ± 3.60	-0.136	0.455	
Final KSS	92.15 ± 3.52	92.67 ± 3.23	-0.155	0.393	
Final KSS Functional	93.57 ± 3.07	94.00 ± 2.85	-0.144	0.429	
Kneeling VAS at 3 Months	**3.00 ± 0.75**	**6.95 ± 0.80**	**-5.071**	**< 0.001**	***
Kneeling VAS at 1 Year	2.00 ± 0.75	1.95 ± 0.80	0.063	0.728	
Hypesthesia Area (cm^2)	**3.25 ± 0.77**	**12.48 ± 1.03**	**-10.135**	**< 0.001**	***

*Values presented as Mean ± SD. SMD = Standardized Mean Difference. * $p < 0.05$; *** $p < 0.001$. Statistical test: independent t-test for all variables. Kneeling VAS: 0 = no difficulty, 10 = extreme difficulty. Bold rows denote statistically significant between-group differences.*

4. Functional and Clinical Outcomes

Both groups demonstrated profound and statistically equivalent improvements in all objective clinical parameters from baseline to final follow-up (Table 3). Within the Lateral Curved group, mean knee flexion improved from 75.21° preoperatively to 93.48° at final follow-up ($p < 0.001$), the KSS improved from 58.26 to 92.15 ($p < 0.001$), and the KSS Functional score rose from 64.07 to 93.57 ($p < 0.001$). Comparable gains were observed within the Standard Midline group, with mean flexion improving from 75.79° to 93.98° ($p < 0.001$), KSS from 58.93 to 92.67 ($p < 0.001$), and KSS Functional from 64.93 to 94.00 ($p < 0.001$).

Table 3
Wound Complication Rates: Between-Group Comparison

Outcome	Lateral Curved (N, %)	Standard Midline (N, %)	P-value	Sig.
Overall Wound Complications	**2 (3.2%)**	**12 (19.4%)**	**0.016**	*
None	60 (96.8%)	50 (80.6%)	—	
Minor	2 (3.2%)	10 (16.1%)	0.030*	
Major	0 (0.0%)	2 (3.2%)	0.496	
Wound Debridement Required	0 (0.0%)	2 (3.2%)	0.496	
Deep Periprosthetic Infection	0 (0.0%)	0 (0.0%)	1.000	

*Statistical test: Chi-square (overall complications) and Fisher's Exact Test (individual categories). * p < 0.05. Values presented as N (%).*

Between-group comparison at final follow-up confirmed no statistically significant difference in final KSS (92.15 vs. 92.67; $p = 0.393$) or final flexion arc (93.48° vs. 93.98°; $p = 0.455$), establishing that the modified lateral approach achieves clinical efficacy equivalent to the standard midline technique (Table 2).

5. Patient-Reported Outcomes: Skin Hypesthesia and Kneeling Ability

The Lateral Curved Incision conferred highly significant advantages in both anterior knee skin sensibility and early kneeling comfort. The area of anterior knee hypesthesia was smaller in the Lateral group (3.25 ± 0.77 cm² vs. 12.48 ± 1.03 cm²; SMD = − 10.135; $p < 0.001$), representing a 74% reduction in the area of diminished skin sensation.

At 3 months postoperatively, kneeling difficulty assessed using VAS was significantly lower in the lateral curved group compared with the standard midline group (3.00 ± 0.75 vs. 6.95 ± 0.80, p < 0.001). However, by 1-year follow-up, no significant difference remained between groups (2.00 ± 0.75 vs. 1.95 ± 0.80, p = 0.728).

6. Wound Complication Rates

The overall rate of wound complications was significantly lower in the Lateral Curved Incision group compared to the Standard Midline group (3.2% vs. 19.4%; $p = 0.016$) (Table 3). Specifically, minor wound complications — comprising superficial erythema, delayed wound healing, and superficial surgical site infections managed non-operatively — occurred in 2 patients (3.2%) in the Lateral group versus 10

patients (16.1%) in the Midline group ($p = 0.030$). Major wound complications, defined as deep wound dehiscence or full-thickness necrosis requiring formal operative debridement, occurred in 0 patients (0.0%) in the Lateral group versus 2 patients (3.2%) in the Midline group ($p = 0.496$). No cases of deep periprosthetic joint infection (PJI) were recorded in either group.

7. Multivariable Regression Analyses

The Lateral Curved Incision emerged as a significant independent protective factor against wound complications (OR = 0.094; 95% CI: 0.014–0.643; $p = 0.016$), conferring approximately 90% lower odds of any wound complication compared to the Midline approach, even after controlling for all other predictors. Smoking status was the strongest independent risk factor identified in this model (OR = 48.95; 95% CI: 4.958–483.4; $p < 0.001$), with smokers having nearly 49 times greater odds of developing a wound complication (Table 4).. Age, BMI, and operative time were not independent predictors of wound complications in this cohort.

Table 4
Multivariable Logistic Regression: Independent Predictors of Overall Wound Complications

Predictor	Coefficient	OR	95% CI	P-value	
Group (Lateral Curved)	**-2.366**	**0.094**	**0.014–0.643**	**0.016**	*
Smoking Status (Smoker)	**3.891**	**48.95**	**4.958–483.4**	**< 0.001**	***
Age	0.147	1.158	0.605–2.219	0.658	
BMI	-1.180	0.307	0.056–1.688	0.175	
Operative Time	0.057	1.059	0.896–1.251	0.501	

*Dependent variable: presence of any wound complication (Yes/No). OR = Odds Ratio; CI = Confidence Interval. * p < 0.05; *** p < 0.001. Reference category for Group: Standard Midline Incision*

When the model was restricted exclusively to minor wound complications (N = 12 vs. N = 110 without complications), the protective effect of the lateral incision remained statistically significant (OR = 0.124; 95% CI: 0.018–0.871; $p = 0.036$), confirming an approximately 87.6% lower odds of minor wound complications. Smoking remained a powerful independent risk factor in this sub-analysis as well (OR = 58.97; 95% CI: 5.855–593.89; $p = 0.001$).

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A multiple linear regression model was constructed to identify independent predictors of the hypesthesia area (Table 5a). The Lateral Curved Incision was the dominant predictor, independently associated with a 9.218 cm² reduction in hypesthesia area ($p < 0.001$). Higher BMI was also a significant independent predictor of greater hypesthesia area ($\beta = 0.154$; $p = 0.001$), while incision length demonstrated a non-significant positive association ($\beta = 0.276$; $p = 0.068$).

Table 5
a. Multiple Linear Regression: Independent Predictors of Hypesthesia Area (cm²)

Predictor	Coefficient (β)	Standard Error	P-value	Sig.
Group (Lateral Curved)	**-9.218**	**0.153**	**< 0.001**	***
BMI	**0.154**	**0.047**	**0.001**	**
Incision Length (cm)	0.276	0.150	0.068	
*Dependent variable: hypesthesia area (cm²). ** p < 0.01; *** p < 0.001.*				

Table 5
b. Multiple Linear Regression: Independent Predictors of 3-Month Kneeling VAS

Predictor	Coefficient (β)	Standard Error	P-value	Sig.
Group (Lateral Curved)	**-3.904**	**0.147**	**< 0.001**	***
Incision Length (cm)	0.185	0.143	0.199	
BMI	-0.029	0.045	0.521	
*Dependent variable: kneeling VAS at 3 months (0–10). *** p < 0.001. BMI and incision length were not significant predictors in this model.*				

In the regression model for 3-month kneeling VAS (Table 5b), the Lateral Curved Incision was the only significant independent predictor, independently reducing the kneeling VAS score by 3.904 points ($p < 0.001$). Neither incision length (β = 0.185; $p = 0.199$) nor BMI (β = −0.029; $p = 0.521$) were significant predictors of early kneeling difficulty, confirming that the choice of surgical approach was the primary determinant of this outcome.

Discussion

Obesity significantly drives advanced knee derangement through mechanical loading and systemic inflammation, and acts as a potent driver for both immediate and delayed morbidity following TKA. [7,8]This propensity score–matched study found that a modified lateral curved skin incision provides significant soft tissue and patient-centered benefits over conventional midline incisions for morbidly obese patients undergoing TKA patients. While functional recovery and KSS were comparable between groups, the lateral approach significantly reduced wound complication rates, shortened hospital stays, minimized postoperative hypesthesia, and improved early kneeling comfort. Regression analysis identified the lateral curved incision as an independent protective factor, reducing wound morbidity odds by approximately 90%.

The primary clinical finding of this study is that The lateral curved incision's significantly lower wound complication rate (3.2% vs. 19.4% in the midline group). Notably, all major complications requiring debridement occurred in midline patients. These results reflect the known vulnerability of obese soft

tissue, where factors like hypovascularity and mechanical stress increase infection and dehiscence risks. Existing literature confirms that obesity independently elevates surgical site risks, with complication rates scaling alongside BMI.[7,8]

The reduced hypesthesia area in the lateral cohort aligns with findings by Laffosse et al. and Tsukada et al., suggesting anterolateral incisions avoid the infrapatellar branch of the saphenous nerve. [9,10]Slattery et al. similarly reported fewer sensory deficits with lateral approaches. Improved early functional recovery, evidenced by lower 3-month kneeling pain, matches Suetomi et al.'s observation of fewer perceptual deficits in kneeling zones. [11]Although kneeling ability equalized at one year, long-term performance remains influenced by mechanical factors, patellar resurfacing, kinesiophobia, and BMI. While standard practice often favors midline incisions for obese patients, this study found fewer wound complications with the lateral approach. This supports the angiosome theory, which suggests that preserving medial transverse anastomotic networks enhances skin flap perfusion.[12]

In this cohort, both the lateral and midline groups exhibited comparable incision lengths and operative durations. This observation is consistent with the meta-analysis by Slattery et al., which examined five studies and found mean incision lengths of 20.8 cm for anterolateral approaches versus 19.4 cm for midline approaches—a difference that was not statistically significant.another Randomized controlled trial by Chanalithichai et al demonstrated comparable operative time and incision length between study groups along with lower final area of numbness. [4,13]

Multivariable regression analysis identified the surgical approach and smoking status as the predominant determinants of minor wound morbidity in this cohort. This finding is consistent with the work of Kee et al., who emphasized in their retrospective review of 128 revision arthroplasties the necessity of preoperative patient optimization after observing that a high proportion of early revision cases possessed at least one modifiable risk factor, such as tobacco use, poor dental health, or extreme obesity (BMI > 40). [14]

Furthermore, Iorio and Osmani reported that tobacco use serves as a potent risk factor for deep surgical site infections, with an odds ratio of 3.1 in primary TKA cases. Such findings have catalyzed the implementation of comprehensive risk-modification programs at major institutions. [15]

Other finding in our study is the shorter hospital stay observed in the lateral curved incision group. While this was statistically significant the absolute difference was modest and its clinical and economic significance is not assessed. however , Reduced wound complications may also indirectly lower readmission rates, postoperative dressing changes, and secondary procedures, all of which contribute to healthcare costs after TKA**.**

The modified curved lateral incision is a soft-tissue management option for morbidly obese patients undergoing primary TKA. Using a lateral incision in patients with high BMI lowers the rates of superficial wound dehiscence and minor surgical site infections. The shorter hospital length of stay and lower

wound complication can potentially lower healthcare costs and support enhanced recovery after surgery (ERAS) pathways. The lateral incision reduces early neuropathic pain and hypersensitivity, which may improve early patient compliance with postoperative rehabilitation protocols. Long-term high-flexion kneeling capabilities remain limited by the mechanical constraints of obesity.

The present study possesses several strengths. First, the use of prospective data collection combined with PSM minimized baseline confounding and selection bias. The matched cohorts demonstrated excellent balance across all major demographic and preoperative variables, strengthening the internal validity of the comparisons. Second, the study focused specifically on a morbidly obese population (BMI ≥ 40 kg/m²), which represents one of the most challenging and clinically relevant subgroups in arthroplasty practice. Third, the inclusion of both objective clinical outcomes, hospital stay and patient-reported sensory and kneeling assessments allowed for a more comprehensive evaluation of incision-related morbidity beyond traditional functional scoring systems.

This study has several limitations. The single-center, single-surgeon design restricts the generalizability of the findings and introduces possible procedural proficiency bias. Despite PSM, the study remains non-randomized, and residual confounding cannot be entirely excluded. The sample size, although adequately powered to detect differences in wound complications and sensory outcomes, may still be insufficient to evaluate rare events such as deep periprosthetic joint infection. The one-year follow-up is sufficient for evaluating wound healing and early functional recovery. It does not provide data on long-term implant survivorship or the incidence of late-onset periprosthetic joint infection (PJI).

The study used systemic BMI as the primary anthropometric metric for obesity risk stratification. Watts noted that direct radiographic measurements of localized anterior subcutaneous fat in lateral xray is accurate predictor of wound complications in obese patients. [16]

Future research should prioritize large-scale, multicenter randomized controlled trials to validate the reproducibility of these results across diverse surgical settings. Additionally, research should explore the synergistic effects of combining lateral skin incisions with specialized closure methods such as barbed sutures or tension-offloading retention stitches to further minimize wound complications. There is also a distinct need for subsequent studies to evaluate the economic implications, hospital stay and cost-effectiveness of adopting a lateralized approach over the standard midline incision.

Declarations

Author Contribution

Ahmed Saeed Younis: Conceptualization, main surgeon, draft writing, data collection, revisionsSherif Mostafa Abdeldayem: supervision, final revision and editingIbrahim Mahmoud Abdelmonem: Conceptualization, assistant surgeon, draft writing, data collection, revisions

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Figures



Figure 1

Preoperative skin marking demonstrating the modified lateral curvilinear skin incision used for total knee arthroplasty in obese patients. The incision is positioned laterally to avoid the medial skin fold and reduce tension across the wound edges.

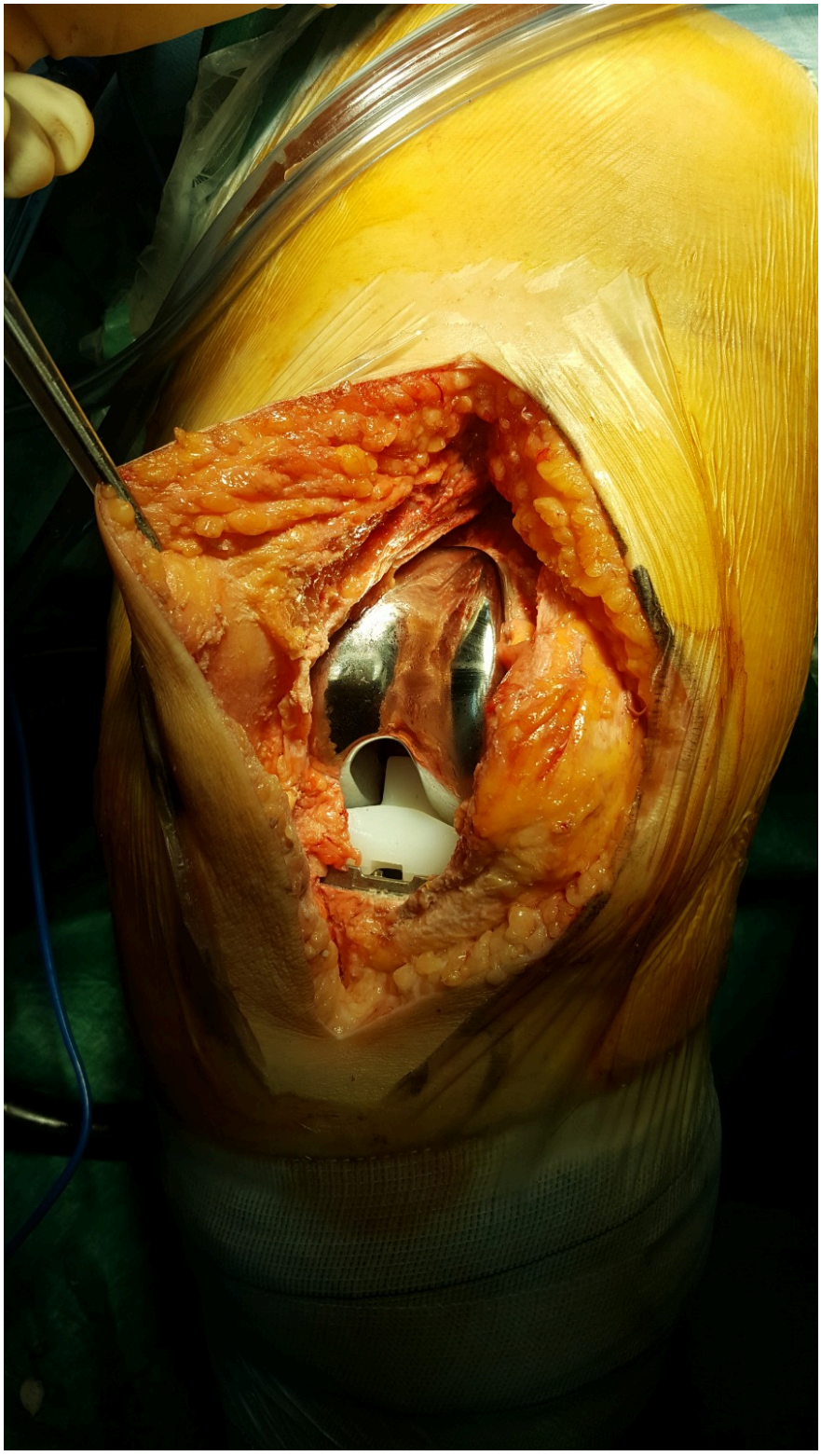


Figure 2

Intraoperative photograph showing exposure of the knee joint and implantation of the total knee arthroplasty components through the modified lateral skin incision approach.

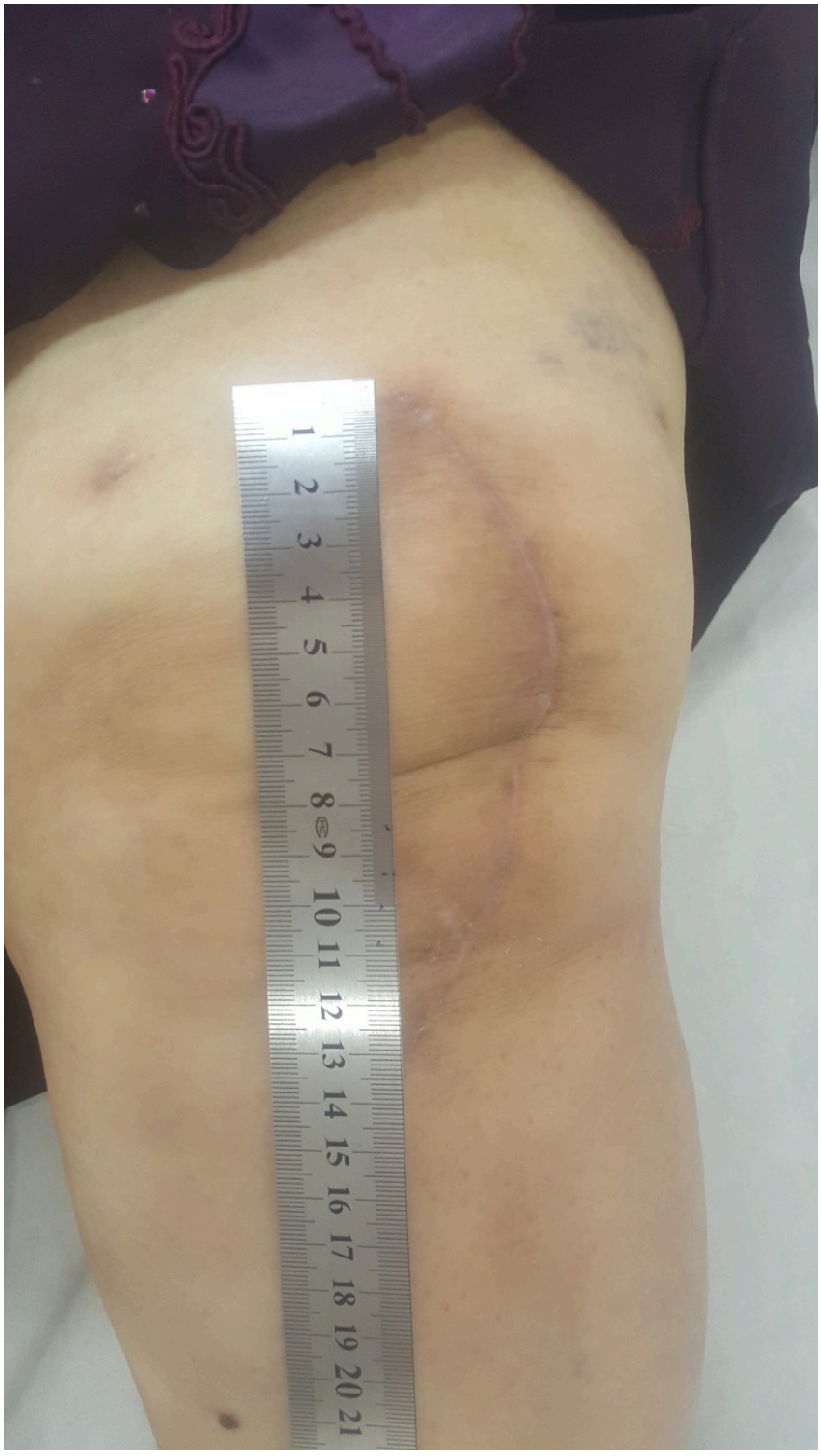


Figure 3

Postoperative clinical photograph demonstrating satisfactory wound healing and scar appearance following total knee arthroplasty using the modified lateral skin incision, with reduced wound tension and acceptable cosmetic outcome.