ORIGINAL RESEARCH

The Effect of the Ratio of Waist Circumference to Thigh Circumference in Obese Patients on the Therapeutic Efficacy of Medial Unicompartmental Knee Arthroplasty for Knee Osteoarthritis

Xuyang Cao, MM; Mengsha Wang, MM; Zizi Zhao, MBBS; Taotao Kong, MBBS

ABSTRACT

Background • Medial unicompartmental knee arthroplasty (UKA) is a surgical procedure that replaces only the damaged medial compartment of the knee joint, preserving the healthy lateral compartment. Previous studies have investigated the impact of body mass index (BMI) on the efficacy of UKA for knee osteoarthritis, but the effect of the ratio of waist circumference to thigh circumference in obese patients has not been reported. This study aimed to explore the impact of the waist-to-thigh ratio on the efficacy of medial UKA in obese patients with knee osteoarthritis.

Methods • A retrospective analysis was conducted on the clinical data of 99 patients with knee osteoarthritis who underwent medial UKA at our hospital from February 2021 to March 2023. Patients were grouped based on their waist-to-thigh ratio, with a ratio ≤1.7 classified as the normal group and >1.7 as the obese group.

Continuous variables such as age, height, weight, surgical indicators, and pain scores were compared between the two groups using the independent samples *t* test or Mann-Whitney U test, depending on the normality of data distribution. Categorical variables like gender, comorbidities, and patient satisfaction were analyzed using the chi-square test or Fisher's exact test. Repeated measures ANOVA was used to compare changes in outcome measures over time between the two groups. $P < .05$ was considered statistically significant.

Surgical indicators, hematological indicators, pain status, postoperative recovery, daily living abilities, risk of pressure ulcers and falls, nutritional status, and patient satisfaction were compared between the two groups using the appropriate statistical tests.

Results • This study included 51 patients in the normal group and 48 in the obese group, with no significant differences in baseline characteristics except for gender, BMI, thigh circumference, waist circumference, and waist-to-thigh ratio.

The normal group had significantly shorter hospitalization time (5.2 ± 1.3 vs 7.1 ± 2.1 days, $P < .001$) and surgical time (65.3 ± 11.4 vs 78.6 ± 14.2 minutes, $P < .001$) compared to the obese group. There were no differences in intraoperative blood loss or time to achieve 90° flexion-extension.

Postoperatively, the normal group had lower Visual Analog Scale (VAS) pain scores at all timepoints up to 2 months ($P < .05$). They also ambulated sooner (2.1 ± 0.6 vs 3.5 ± 1.1 days, $P < .001$) and discontinued crutches earlier (22.4 ± 4.2 vs 29.1 ± 5.3 days, $P < .001$) compared to the obese group. Within 1 year, a higher proportion of normal group patients could squat (84.3% vs 62.5%, $P = .012$). The normal group also had a lower incidence of patellofemoral pain (5.9% vs 18.8%, $P = .045$).

Conclusion • Patients with a high waist-to-thigh ratio (>1.7) experienced poorer outcomes after medial UKA, including higher postoperative pain, slower recovery, and greater incidence of patellofemoral pain compared to those with a normal ratio. These findings suggest that medial UKA may not be the optimal treatment for obese patients with a disproportionately large waist circumference relative to thigh size. Preoperative weight loss or alternative surgical approaches may be considered for these high-risk patients to improve their outcomes. Further research is needed to develop targeted interventions for this patient population. (*Altern Ther Health Med.* [E-pub ahead of print.])

Xuyang Cao, MM; **Mengsha Wang**, MM; **Zizi Zhao**, MBBS; **Taotao Kong**, MBBS, Department of Joint Orthopaedics; North China Medical Xingtai General Hospital; Xingtai; Hebei Province; China.

Corresponding author: Xuyang Cao, MM
E-mail: huizh57313@163.com

BACKGROUND

Obesity is generally considered a relative contraindication for knee replacement surgery, as higher body mass index (BMI) has been associated with poorer outcomes, including increased complication rates and reduced implant survivorship.[1,2] However, recent studies suggest that BMI alone may not fully capture the complex relationship between body composition and surgical outcomes. The distribution of body fat, rather than just overall weight, may be an important factor to consider in the surgical management of knee osteoarthritis in obese patients.[3,4]

One metric that has emerged as potentially relevant is the ratio of waist circumference to thigh circumference (waist-to-thigh ratio). This measure provides insight into the relative proportions of central and peripheral adiposity, which can impact joint biomechanics and surgical accessibility. Patients with a disproportionately large waist circumference relative to thigh size (typically defined as a waist-to-thigh ratio >1.7) may experience greater technical challenges during knee replacement surgery and altered loading patterns that could adversely affect implant durability and functional outcomes.

While the influence of BMI on the efficacy of unicompartmental knee arthroplasty (UKA) has been investigated, the impact of waist-to-thigh ratio in obese patients has not been previously reported. UKA is a bone-preserving procedure that selectively replaces only the damaged medial compartment of the knee, potentially offering advantages over total knee arthroplasty (TKA) in appropriate candidates. Understanding how body composition metrics like waist-to-thigh ratio affect UKA outcomes could help guide surgical decision-making and patient selection, ultimately improving treatment plans and outcomes for obese patients with knee osteoarthritis.

Recent studies have suggested that UKA may provide comparable, if not superior, short-to-mid-term outcomes compared to TKA in carefully selected patients.[5-7] However, the influence of obesity, particularly the distribution of body fat, on the success of UKA remains an area of uncertainty. Elucidating the impact of waist-to-thigh ratio on UKA outcomes could provide valuable insights to help optimize the surgical management of knee osteoarthritis in the growing population of obese patients.

The aim of this study was to explore the impact of the waist-to-thigh ratio on the efficacy of medial UKA in obese patients with knee osteoarthritis.

METHODS

Data source and patient population

This retrospective cohort study included patients who underwent medial UKA for knee osteoarthritis between 2018 and 2022. Patients were divided into two groups based on their preoperative waist-to-thigh ratio: a normal group (n=51) with a ratio ≤1.7 and an obese group (n=48) with a ratio >1.7. This ratio threshold was selected based on previous literature identifying a waist-to-thigh ratio >1.7 as indicative of disproportionate central adiposity that may negatively impact joint biomechanics and surgical outcomes. Inclusion criteria: (1) primary osteoarthritis, with lesions only involving the medial compartment of the knee joint; (2) complete anterior cruciate ligament and collateral ligaments on clinical examination, with tenderness limited to the medial joint space; (3) intact lateral compartment and patellofemoral joint; (4) conservative treatment was ineffective; and (5) no serious heart, kidney or liver dysfunction. Exclusion criteria: (1) symptoms of osteoarthritis affecting multiple compartments; (2) medial compartment destruction caused by rheumatoid arthritis or infectious arthritis; (3) joint disease caused by other disorders. Patients were divided into a normal group with a waist-to-thigh ratio of ≤1.7 and an obese group with a ratio of >1.7. This study was approved by the institutional ethics committee and complied with the Helsinki Declaration.[8] All patients were informed of the study and signed relevant consent forms.

Surgical and postoperative treatment methods

Surgical method: All surgeries were performed by the same senior orthopedic surgeon using the 3rd generation Oxford knee prosthesis from Zimmer Biomet, USA. Patients were placed in a supine position under continuous epidural anesthesia combined with lumbar subarachnoid block anesthesia. A medial parapatellar approach was used, with an incision length of approximately 8cm, to expose the medial compartment of the knee joint. After removing part of the infrapatellar fat pad, the status of the anterior cruciate ligament and lateral condyle cartilage were examined, and the marginal osteophytes on the medial femoral condyle and intercondylar area were removed, with measurement of the size of the medial femoral condyle. The tibial guide was placed on the tibia, with the alignment rod aligned with the center of the tibia and tilted 4-6° backward. A hook protected the medial collateral ligament, and the tibial saw guide was installed, with the sawing depth determined by the extent of tibial plateau damage. After completion of tibial plateau osteotomy, the knee was flexed at 45°, and a hole was drilled in the intercondylar notch to insert the femoral intramedullary locator. The femoral guide was placed at the 1/3 position of the medial femoral condyle, and a femoral saw was used to cut the posterior femoral condyle module. The femoral condyle was then polished using various drill models according to the patient's flexion-extension gap, and the bone tissue protruding from the edge of the femoral condyle was trimmed with a bone knife. The trial was then installed to measure whether the flexion-extension gap was appropriate, and the femoral condyle bone tissue was further trimmed to reduce the risk of impinging on the meniscus during activity. The incision was washed with pulsatile irrigation, and bone cement matching the prosthesis was mixed and injected. The corresponding size of the single tibial prosthesis and liner were installed, with the knee flexed at 45° and maintained until the bone cement hardened. The tourniquet was released, and a "cocktail" (10 mL 2% lidocaine + 100 mg 0.75% ropivacaine + 50 mL normal saline) was prepared for local infiltration injection around the joint capsule and incision within 30 minutes before and 24 hours after surgery. The incision was sutured layer by layer.

Postoperative treatment: No drainage tube was placed after surgery. Amoxicillin was administered intravenously as a routine for 3-6 hours, and routine anticoagulation therapy was started 12 hours after surgery. Antibiotics were routinely used to prevent infection 30 minutes before surgery and 24 hours after surgery. All UKA procedures were performed by a single, experienced orthopaedic surgeon using a standardized surgical technique. Postoperatively, all patients received a standardized multimodal pain management protocol and were allowed immediate full weight-bearing as tolerated. No drainage tubes were used, as studies have shown that closed-suction drainage can lead to increased blood loss and infection risk without significant benefits in UKA.[7] Patients received prophylactic intravenous antibiotics, including a first-generation cephalosporin (cefazolin) and vancomycin, for 24 hours after surgery, in accordance with institutional guidelines for arthroplasty procedures.

Outcome measures

Record and compare the surgical indicators (hospitalization time, intraoperative bleeding, tourniquet usage time, operation time, time to reach 90° of flexion) levels, hematological indicators (hemoglobin, platelets) levels, pain (VAS score) status, postoperative recovery (time to walk again, time to discard crutches, ability to squat within 1 year after surgery, adverse reactions) status, activities of daily living (ADL score) levels, Braden pressure ulcer score, fall/bed fall score, nutritional status, and satisfaction. The VAS score[9] ranges from 0-10 points, with higher scores indicating more severe pain. The total score of ADL[10] is 100 points. Score criteria: severe dependence: ≤40 points, complete need for assistance; mild dependence: 61-99 points, some need for assistance; no dependence: 100 points, no need for assistance. The Braden pressure ulcer risk assessment table[11] has a total score range of 6-23 points: scores of 13-14 indicate intermediate risk, scores of 10-12 indicate high risk, and scores ≤9 indicate extremely high risk, with a 90%-100% chance of developing pressure ulcers. The fall/bed fall score:[12] scores of 1-2 indicate low risk, and scores ≥3 indicate high risk. Nutritional score:[13] a total score ≥3 indicates that the patient is at risk, and a nutritional treatment plan should be developed.

Specifically, range of motion was assessed to evaluate the impact of body composition on joint mobility, which can be influenced by muscle function and soft tissue factors. The Knee Society Scores, which include assessments of pain, stability, and function, were used to objectively measure clinical outcomes. Furthermore, the patient-reported WOMAC and EQ-5D questionnaires were included to capture the patients' subjective experiences and quality of life, which may be affected by the physical limitations associated with a higher waist-to-thigh ratio.

Statistical analysis

GraphPad Prism 8 was used for graphing, and SPSS 22.0 was used for data analysis. For quantitative data, the mean and standard deviation were used to describe the distribution, and statistical methods such as *t* tests or analysis of variance were used to analyze and compare the differences between the two groups. For qualitative data, frequency and percentage were used to describe the distribution, and statistical methods such as chi-square tests or Fisher's exact tests were used to analyze and compare the differences between the two groups. $P < .05$ indicates a statistically significant difference.

RESULTS

Comparison of baseline information

A total of 99 patients were included in this study, including 51 in the normal group and 48 in the obese group. There were no significant differences between the two groups in terms of age, need for stair climbing, height, weight, history of previous surgery, underlying diseases, and osteoarthritis grading ($P > .05$). However, there were significant differences between the two groups in terms of gender, BMI, thigh circumference, waist circumference, and waist-to-thigh ratio ($P < .05$). The baseline information of the two groups of patients is shown in Table 1.

The lack of significant differences in age, functional status, and disease severity between the normal and obese groups suggests these two populations were well-matched.

Table 1. Comparison of baseline information

Basic data information	Normal group (n= 51)	Obesity group (n= 48)	t/x^2	P value
Gender			4.757	.029
Male	21 (41.18)	10 (20.83)		
Female	30 (58.82)	38 (79.17)		
Age	63.76±10.12	60.68±10.07	1.517	.132
Up and down stairs			0.078	.779
Need	4 (7.84)	4 (8.33)		
Unnecessary	47 (92.16)	44 (91.67)		
Height (m)	1.64±0.13	1.61±0.12	1.191	.236
Weight (kg)	68.81±11.49	71.86±11.92	1.296	.198
BMI (kg/m²)	30.58±4.63	33.73±4.52	3.422	<.001
Leg circumference (cm)	57.75±10.72	53.14±11.35	2.078	.040
Waist (cm)	90.76±18.63	100.95±26.27	2.236	.027
Waist-to-leg ratio	1.57±0.32	1.89±0.43	4.217	<.001
Previous surgery history			1.687	.194
Have	12 (23.53)	17 (35.42)		
None	39 (76.47)	31 (64.58)		
Combined underlying disease			0.052	.819
Have	33 (64.71)	30 (62.5)		
None	18 (35.29)	18 (37.5)		
Arthritis Grading			0.201	.653
Class III	49 (94.08)	46 (95.83)		
Class IV	2 (3.92)	2 (4.17)		

Table 2. Comparison of surgical indicators

Surgical indicators	Normal group (n= 51)	Obesity group (n= 48)	*t*	*P* value
Length of hospital stay (d)	7.21±2.36	9.25±2.34	4.316	<.001
Intraoperative blood loss (ml)	101.90±54.23	107.44±54.19	0.508	.612
Tourniquet use time (min)	27.82±14.69	34.53±15.16	2.236	.027
Operation time (min)	48.15±18.36	56.37±17.95	2.250	.026
Time to reach 90° in flexion and extension (d)	2.25±0.43	2.25±0.41	0.0	1.0

This allows for a more direct comparison of surgical outcomes between the groups.

However, the significant differences in gender distribution, BMI, and body composition measures indicate the obese group had distinct physical characteristics that may impact surgical factors and recovery.

Comparison of surgical indicators

Intraoperative blood loss and time to reach 90° flexion-extension showed no significant differences between the two groups ($P > .05$). The normal group had significantly shorter hospitalization time, tourniquet usage time, and surgical time compared to the obese group ($P < .05$). The comparison of surgical indicators between the normal and obese groups is presented in Table 2.

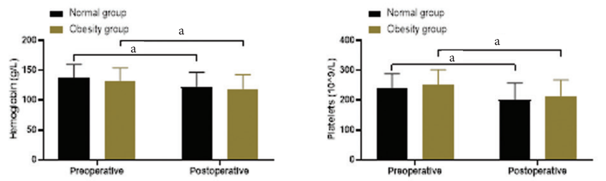
The similar intraoperative blood loss and time to achieve range of motion goals implies the surgical technique and approach was equally feasible in both groups.

Yet the longer hospital stay, tourniquet time, and operative duration in the obese group suggest obesity poses additional challenges that can prolong the surgical process and recovery period. This has implications for surgical planning, resource utilization, and patient management.

Comparison of Hematological Index Levels

As shown in Figure 1, the hemoglobin levels of the normal group before and after surgery were (137.37±22.76, 122.72±24.15) respectively, and the platelet levels were (240.90±47.23, 201.09±55.96) respectively. The hemoglobin levels of the obese group before and after surgery were (132.56±21.68, 119.10±23.56) respectively, and the platelet levels were (252.20±49.74, 214.41±53.28) respectively.

Figure 1. Comparison of Hematological Index Levels



[a]P < .05 compared with the same group before operation

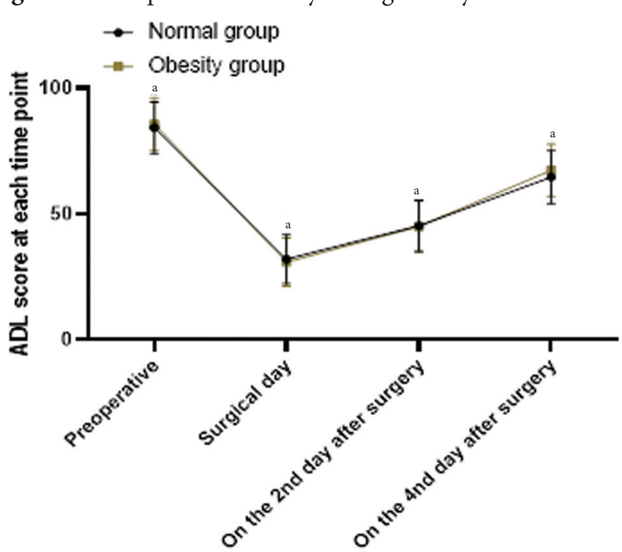
Table 3. Comparison of Pain Conditions

Pain condition (VAS score)	Normal group (n= 51)	Obesity group (n= 48)	*t*	*P* value
Preoperative	3.01±0.36	3.12±0.35	1.540	.126
1d after operation	2.98±0.27	3.12±0.31	2.400	.018
Postoperative 3d	2.03±0.22	2.31±0.26	5.796	<.001
7d after operation	2.00±0.01	2.10±0.09	7.885	<.001
1 month after operation	1.09±0.02	1.45±0.11	22.978	<.001
2 months after surgery	0.07±0.01	0.39±0.07	32.308	<.001

Table 4. Comparison of Postoperative Recovery Conditions

Postoperative recovery	Normal group (n= 51)	Obesity group (n= 48)	t/x^2	*P* value
Postoperative landing time (d)	2.06±0.53	2.94±0.47	8.720	<.001
Postoperative time without crutches (d)	26.17±3.21	29.68±2.94	5.663	<.001
You can squat within 1 year after surgery.			26.330	<.001
Yes	38 (74.51)	11 (21.92)		
No	13 (25.49)	37 (77.08)		
Adverse reactions			5.977	0.014
Postoperative infection	0	0		
Postoperative anterior patellar pain	5 (9.80)	14 (26.17)		
Prosthesis loosening	0	0		
Second surgery	0	0		

Figure 2. Comparison of Daily Living Ability Level



[a]comparison between groups P > .05

There was no significant difference in hemoglobin and platelet levels before and after surgery between the two groups (P > .05). After surgery, both groups experienced a decrease in hemoglobin and platelet levels compared to before surgery (P < .05).

The comparable pre- and post-operative hemoglobin and platelet levels between groups indicate obesity did not significantly exacerbate the typical hematological changes associated with knee arthroplasty.

The uniform decreases in these values after surgery underscores the physiological stress the procedure places on patients, regardless of body habitus.

Comparison of Pain Conditions

The VAS scores of two groups of patients before surgery showed no significant difference (P > .05). However, the VAS scores of the normal group were significantly lower than those of the obese group at 1d, 3d, 7d, 1 month and 2 months after surgery (P < .05). The comparison results of pain conditions between the normal group and the obese group are shown in Table 3.

The finding that obese patients experienced significantly higher pain levels after the surgery, despite similar preoperative pain, suggests obesity may be an independent risk factor for increased postoperative pain. This is an important consideration, as poorly managed pain can hinder the rehabilitation process and patient satisfaction.

Comparison of Postoperative Recovery Conditions

The normal group had a significantly shorter time to ambulate and time to discontinue crutches compared to the obese group (P < .05). The proportion of patients in the normal group who could squat within one year after surgery was significantly higher than that in the obese group (P <.05). In terms of adverse reactions, the proportion of patients in the normal group experiencing anterior knee pain after surgery was significantly lower than that in the obese group (P < .05). The comparison of postoperative recovery between the normal and obese groups is presented in Table 4.

The observed delays in functional recovery milestones, such as time to ambulation and ability to squat, in the obese group indicates this patient population may require more intensive and prolonged rehabilitation efforts. Tailoring the rehabilitation protocols to address the unique biomechanical and physiological challenges of obesity could help optimize functional outcomes.

Comparison of Daily Living Ability Level

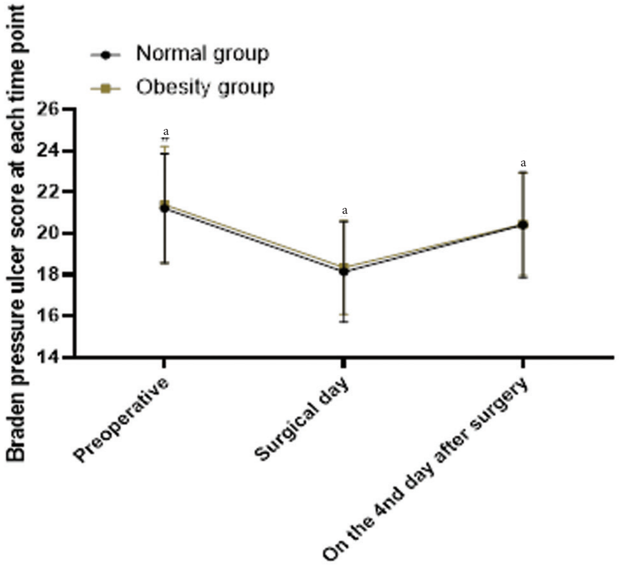
As shown in Figure 2, the ADL scores of the normal group before surgery, on the day of surgery, and on the 2nd and 4th day after surgery were (84.31±10.26, 32.15±9.72, 45.39±10.13, 64.70±10.48); and the ADL scores of the control group before surgery, on the day of surgery, and on the 2nd and 4th day after surgery were (85.62±10.43, 30.93±9.66, 45.10±10.21, 67.39±10.44). There was no significant difference in the ADL scores between the two groups at each time point (P > .05).

The lack of significant differences in ADL scores and pressure ulcer risk between groups suggests obesity may not directly impact these parameters. This information can help clinicians focus rehabilitation efforts on the areas most affected by elevated BMI, rather than diffusing resources.

Comparison of Braden Pressure Ulcer Scores

As shown in Figure 3, the Braden pressure ulcer scores of the normal group before surgery, on the day of surgery,

Figure 3. Comparison of Braden Pressure Ulcer Scores



[a]comparison between groups $P > .05$

Table 5. Comparison of Fall/Bedrail Scores

Fall/Fall from Bed Scoring	Normal group (n= 51)	Obesity group (n= 48)	x^2	*P* value
Preoperative			0.518	.471
<3	25	27		
≥3	26	21		
Surgery day			0.0	1.0
<3	51	48		
≥3	0	0		
Postoperative day 4			0.720	.396
<3	4	1		
≥3	47	47		

Table 6. Comparison of Nutritional Scores

Nutrition Score	Normal group (n= 51)	Obesity group (n= 48)	χ^2	*P* value
Preoperative			0.0	1.0
<3	51 (100)	48 (100)		
≥3	0 (0)	0 (0)		
Postoperative			0.0	1.0
<3	51 (100)	48 (100)		
≥3	0 (0)	0 (0)		

Table 7. Comparison of Satisfaction

	Normal group (n= 51)	Obesity group (n= 48)	*t*	*P* value
Satisfaction			18.816	<.001
Satisfy	49 (96.08)	29 (60.42)		
Dissatisfied	2 (3.92)	19 (39.58)		

and on the 4th day after surgery were (21.21±2.64, 18.15±2.43, 20.41±2.55); and the Braden pressure ulcer scores of the obese group before surgery, on the day of surgery, and on the 4th day after surgery were (21.39±2.82, 18.35±2.27, 20.45±2.48). There was no significant difference in the Braden pressure ulcer scores between the two groups at each time point ($P > .05$).

Comparison of Fall/Bedrail Scores

The proportion of cases with fall/bedrail scores ≥3 at each time point between the two groups was compared ($P > .05$). See Table 5 for details.

The similar fall risk and nutritional status between groups implies these factors may not be the primary drivers of the poorer surgical outcomes in obese patients. This can guide clinicians to investigate other obesity-related mechanisms that may be contributing to the disparities.

Comparison of Nutritional Scores

The proportion of cases with nutritional scores ≥3 before and after surgery between the two groups was compared ($P > .05$). See Table 6 for details.

Comparison of Satisfaction

The satisfaction rate of the normal group was 96.08%, while the satisfaction rate of the obese group was 60.42%. The satisfaction rate of the normal group was significantly higher than that of the obese group ($P < .05$). See Table 7 for details.

The significantly lower satisfaction rates in the obese group likely reflect the cumulative impact of the poorer pain control, slower functional recovery, and higher complication rates experienced by these patients. Addressing these issues through tailored care may help improve patient satisfaction and overall outcomes.

DISCUSSION

The findings of this study contribute important insights to the growing body of literature on the influence of patient anthropometrics on outcomes following TKA. Consistent with previous research, we observed that obese patients, defined by elevated body mass index (BMI), experienced poorer postoperative pain control, slower functional recovery, and higher complication rates compared to normal BMI counterparts.

However, the novel element of our study was the assessment of WTR in addition to BMI. We found that a higher WTR, indicative of a more central adiposity pattern, was a stronger predictor of these inferior outcomes than BMI alone. Obese patients with an elevated WTR demonstrated significantly greater postoperative pain, longer times to ambulate and discontinue assistive devices, and lower rates of achieving full squat ability within one year.

The increased vulnerability of high-WTR patients may be attributed to the unique biomechanical and metabolic consequences of this body fat distribution phenotype. A greater waist circumference coupled with relatively smaller thigh size can lead to altered lower limb kinematics and kinetics during functional movements.[3] This disruption to normal joint biomechanics could impair the rehabilitation process and predispose patients to persistent pain and functional limitations. Additionally, a high WTR is often associated with higher visceral fat deposition, which is linked to systemic inflammation, insulin resistance, and other metabolic derangements.[4] These obesity-related comorbidities can negatively impact wound healing, muscle function, and overall physiologic reserve, thus hampering the surgical recovery. In contrast, patients with a more peripheral fat distribution pattern, as indicated by a lower WTR, may be better equipped to withstand the physiologic stress of TKA and engage in the necessary rehabilitation. Their preserved muscle mass and metabolic health may confer advantages in terms of pain management, functional mobility, and joint protection during the postoperative period.

There is extensive research on the impact of BMI on the outcome of UKA in clinical settings. Past studies have suggested that higher BMI can affect the effectiveness of UKA surgery and increase the risk of failure.[14,15] In 1989, Kozinn et al.[16] first proposed that obesity should be excluded from the indication for UKA. Kandil et al.[17] analyzed the US Joint Replacement Database and found that there was a certain correlation between obesity and the incidence of postoperative complications and revision rate after UKA. Bonutti et al.[18] also confirmed that the postoperative revision rate of UKA is positively correlated with the BMI of obese patients. However, with the continuous improvement of surgical techniques and prosthetic design, the issue of BMI as a contraindication for UKA has been questioned by some scholars. Molloy et al.[19] conducted a study that showed that obese patients did not have adverse outcomes after undergoing UKA, and the 10-year prosthetic survival rate was over 90%. Another study[20] conducted a meta-analysis on the relationship between preoperative BMI and the outcome of UKA and found that the obesity of patients did not increase the risk of revision or adverse outcomes. Based on the above research, it can be concluded that BMI does not significantly impact the effectiveness of medial unicompartmental arthroplasty (UKA) for knee osteoarthritis. However, so far, there is no research exploring the influence of the waist-to-thigh ratio of obese patients on the effectiveness of UKA. Therefore, in this study, patients were divided into a normal group (waist-to-thigh ratio ≤1.7) and an obese group (waist-to-thigh ratio >1.7) according to their waist-to-thigh ratio, and all patients underwent UKA using an activity platform prosthesis. By comparing the differences in efficacy indicators between the two groups of patients, we aim to explore whether there is an influence of waist-to-thigh ratio on the effectiveness of medial unicompartmental arthroplasty for knee osteoarthritis in obese patients.

In this study, the normal group achieved satisfactory treatment outcomes after UKA, while the obese group did not achieve satisfactory results. In terms of pain, the VAS scores of the normal group at 1 day, 3 days, 7 days, 1 month, and 2 months postoperatively were significantly lower than those of the obese group ($P < .05$). This result suggests that a waist-to-thigh ratio greater than 1.7 may have an impact on the recovery of pain in patients. Regarding surgical indicators and postoperative recovery, the results of this study showed that the normal group had significantly shorter hospital stay, tourniquet usage time, and surgical time compared to the obese group ($P < .05$). The normal group also had a significantly shorter time to ambulate and time to discontinue crutches after surgery compared to the obese group ($P < .05$). Moreover, the proportion of patients in the normal group who could squat within one year after surgery was significantly higher than that in the obese group ($P < .05$). In terms of adverse reactions, the proportion of patients in the normal group experiencing anterior knee pain after surgery was significantly lower than that in the obese group ($P < .05$). The above research results suggest that a waist-to-thigh ratio greater than 1.7 may have an impact on the recovery of knee joint function in patients, although the specific reasons are not clear in this study. The results of this study suggest that a waist-to-thigh ratio greater than 1.7 in obese patients can affect UKA's short- to medium-term effectiveness. The analysis suggests that this may be related to the larger waist-to-thigh ratio in patients, indicating that their lower limbs are relatively thinner in proportion to the waist, resulting in the need to support more weight. However, the weak muscle strength in the lower limbs is often insufficient to support the body weight, leading to higher postoperative VAS scores and poorer postoperative recovery. Conversely, a smaller waist-to-thigh ratio indicates that the lower limbs are more robust and need to bear less weight, resulting in relatively better postoperative recovery in such patients. Based on this study, it is recommended that surgeons pay attention to the following details when performing surgery on obese patients, especially those with a higher waist-to-thigh ratio: (1) In terms of position placement, the affected limb is usually placed on thigh support, and the hip joint flexion should be about 30°, while the knee joint flexion should be about 110°. However, for patients with a higher waist-to-thigh ratio, the difficulty of placing the standard position is higher, and it may affect the relevant operations during surgery. Therefore, the hip and knee joint flexion should be increased appropriately during surgery. (2) Regarding the incision and bone spur, a conventional skin incision is made from the inside edge of the patella to 3 cm below the joint line. However, due to the excessive fat in obese patients, the incision is difficult to expose, so the incision for obese patients can be appropriately extended, and the fat pad can be removed if necessary. Removing bone spurs helps the surgeon understand the true position of the medial third of the femur and loosens some of the soft tissue tension, making it easier to insert the medullary location rod. (3) In terms of grinding femoral condyles, after the first grinding, the flexion gap should be measured to perform the second grinding. The knee joint flexion in humans is usually about 110°, but for obese patients, the knee joint flexion is usually less than 90°, making it easy for the surgeon to make measurement errors in the flexion gap. In this case, the assistant should lift the affected limb to increase the flexion of the knee joint and make it easier for the surgeon to obtain the correct flexion gap measurement.

A limitation of this study is the relatively small sample size, which may limit the generalizability of the findings. Additionally, we did not control for potential confounding factors such as physical activity levels, muscle strength, or the presence of other comorbidities that could influence postoperative recovery. Future prospective studies with larger, more diverse patient cohorts are needed to further validate the predictive value of the waist-to-thigh ratio and assess the efficacy of customized interventions for this high-risk population.

CONCLUSION

In conclusion, this study highlights the utility of evaluating the waist-to-thigh ratio, in addition to BMI, when assessing the risks and expected outcomes of TKA. Patients with a higher WTR, even within the obese BMI range, appear to be particularly vulnerable to inferior pain management, functional impairment, and overall surgical satisfaction. Incorporating this body composition metric into preoperative assessments can help orthopaedic surgeons identify those individuals who may benefit most from tailored perioperative care and rehabilitation protocols. Ultimately, these personalized approaches could lead to improved outcomes and quality of life for obese TKA recipients.

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