

# Short term results of primary total knee arthroplasty with tibial stem extension in morbidly obese patients

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## Abstract:

### Background:

Obesity is well known to be a leading factor to osteoarthritis, the increasing number of obese population worldwide and the successful outcome of total knee arthroplasty as a treatment of osteoarthritis causes an increasing number of obese patients undergoing total knee arthroplasty. Total knee arthroplasty in morbidly obese patients is associated with increased rate of aseptic loosening, the additional tibial stem is recommended to increase the longevity of the prosthesis.

In this study the authors assess the outcome of primary total knee arthroplasty with additional tibial stem in morbidly obese patients with knee osteoarthritis.

### Patients and Methods:

Twenty nine knees in twenty eight patients with knee osteoarthritis and body mass index (BMI)  $\geq 40$  kg/m<sup>2</sup> were managed with primary total knee arthroplasty with tibial stem extension. Standing weight bearing short AP films, lateral and merchant views of the knee were obtained for all patients preoperative, immediate post-operative and every 3 months till the last follow up. The Knee Society Score (KSS) with the knee score (objective) and function score components was used to evaluate the knee status before surgery, 3 months after surgery and by the last follow up. The visual analog scale (VAS) pain was used to assess pain preoperative and at 3 months post-operative and every 3 months thereafter till the last follow up. Short Form 12 Physical and Mental Component Summaries (SF12-PCS and SF12-MCS) were recorded pre-operatively along with three months postoperatively and by the last follow up. Zimmer NexGen Legacy posterior-stabilized knees were used for all patients; the tibial components were the NexGen stemmed modular tibial tray.

### Results:

The average age of the patients included in this study was 63years (range, 54 to 71). The average BMI was 43.1 kg/m<sup>2</sup> (range; 40-49.2 kg/m<sup>2</sup>) at the operation time and 45.7 kg/m<sup>2</sup> (range; 38.6-51.2 kg/m<sup>2</sup>) at the last follow up, the average duration of follow-up was 59 months (range, 38 to 72 months). The mean knee society objective score component was significantly improved 3 months post-operative and by the last follow up ( $p < 0.002$ ), the mean preoperative score was 30.7 (range; 16-61), the mean score at 3 months post-operative was 92.7 points (range; 70-100 points), the mean score at the last follow up was 93.3 points (range; 77-100), the mean improvement at 3 months was 62 points and by the last follow up it was 62.6 points. The mean function score component of the KSS was also significantly improved 3 months post-operative and by the last follow up ( $p < 0.003$ ), the mean preoperative score was 33.2 (range; 12-50), the mean score at 3 months post-operative was 88.1 points (range; 75-100 points), the mean score at the last follow up was 89.3 points (range; 75-100), the mean improvement at 3 months was 54.9 points and by the last follow up it was 56.1 points. The knee joint ROM, The visual analog pain scale (VAS) and Quality-of-life scores according to the SF-12 Health Survey were all significantly improved at 3 months post-operative and at the last follow up. No cases of implant failure or aseptic loosening were encountered in this study by the last follow up (mean about 5 years).

### Conclusion:

Total knee arthroplasty (TKA) with additional tibial stem is an excellent treatment option for morbidly obese patients with knee osteoarthritis with significantly improved clinical and functional knee scores, knee range of motion with a good impact on the Quality-of-life, additional tibial stem prevented implant failure or aseptic loosening for a mean of 5 years follow up.

### Key words:

Osteoarthritis; total knee arthroplasty; tibial stem; morbid obesity.

## Introduction:

Total knee arthroplasty (TKA) is one of the most commonly performed surgeries

worldwide (1). It is a very frequent and highly successful procedure. It relieves pain and improves knee function in people with advanced arthritis of the joint (2, 3). It has proven to be very

effective, with high success rates, in improving the quality of life and function in patients with moderate-to-severe osteoarthritis (OA) (1).

Obesity has reached epidemic proportions globally. Overweight is a body mass index (BMI) greater than or equal to 25 kg/m<sup>2</sup>, obesity is a BMI greater than or equal to 30 kg/m<sup>2</sup>, and morbid obesity is a BMI greater than or equal to 40 kg/m<sup>2</sup> (4).

The association between obesity and osteoarthritis (OA) explains the increasing number of obese patients undergoing total joint arthroplasty (5). Total knee arthroplasty (TKA) in obese patients is known to be associated with lower outcomes (5-9). Obesity has been shown to increase the risk for aseptic loosening which is a major cause for implant failure that requires revision TKA (10). While some studies have reported that obesity decreases the survival rate of the prosthesis, others have reported contrasting results (11,12).

Obese TKA patients have also an increased risk of infection and deep vein thrombosis, as well as increased load on the prosthesis–bone junction, leading to increased risk of bone or ligament insufficiency and migration and increased risk for revision (13).

A number of studies reported that obesity negatively impacts on outcomes following TKA, specifically significantly increasing the need for revision surgery, and reducing the survivorship of the prosthesis and focal osteolysis (14-16). Conversely, other studies reported that outcomes between obese and non-obese patients following TKA to be comparable (17).

Proximal tibial stress is affected by both body weight and tibial component design. Increased mechanical stresses in this area leads to implant failure. Consideration should be given to additional tibial fixation in patients with obesity (10, 18). It is important to modify implants to improve the likelihood that a patient with obesity will achieve high scores for function and quality of life after TKA (18). Ries *et al.* found a greater rate of loosening of the tibia with short keels when implanted in obese patients compared to standard keels. A greater contact area between bone and implant would lead to a better dissipation of stress (19). As many studies found a significant increase in the rates of aseptic tibial loosening in obese patient tibial stem extension has been described as a potential strategy to reduce mechanical failure in obese patients after TKA as they may limit the micro motion and improve the load distribution (6, 18, 20).

The use of tibial stems in obese patients to decrease the incidence of aseptic tibial loosening

(ATL) is increasing despite it is not evidence based. Abdel et al (2015) recommended additional fixation through tibial stem in obese patients to decrease the risk of aseptic tibial loosening (6). Gopalakrishnan et al (2017) found that the addition of a short tibial stem significantly decreases proximal tibial cement-bone compressive and shear stresses (21). However; Parratte et al (2017) concluded that tibial stems have no significant improving effect on the outcomes in obese patients undergoing TKA (18). In this study the authors assessed the outcome of primary total knee with tibial stem extension in morbidly obese patients with knee osteoarthritis.

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### Patients and Methods:

Twenty nine knees in twenty eight patients with knee osteoarthritis and body mass index (BMI)  $\geq 40$  kg/m<sup>2</sup> were managed in Mansoura university hospitals with primary total knee with tibial stem extension in the period between March 2013 and February 2016. Consents from all patients included in the study were taken and the study was approved by the university Institutional Review Board.

Patients in whom the stem extensions were used for any indication other than obesity, patients with revision surgery, rheumatoid arthritis or any causes other than degenerative osteoarthritis, patients with severe deformity with  $>15^\circ$  of varus, valgus, or fixed flexion deformity were excluded from the study. The mean age of the patients included in the study was 64 years (range; 54 to 71 years). All knees in this study had preoperative varus deformities with a mean of  $9.8^\circ$  (range;  $6^\circ - 12^\circ$ ), 13 patients in this study were diabetics.

Standing weight bearing short AP films, lateral and merchant views of the knee were obtained for all patients preoperative, immediate post-operative and every 3 months till the last follow up. Radiographic assessment was performed pre-operative and in each follow up visit.

The alignment of the knee was evaluated and a deviation of within  $\pm 3$  degrees from normal was accepted. The skyline film was used to assess patellar tilt/dislocation if any.

Aseptic loosening was radiologically considered by the presence of a progressive radiolucent line  $>2$  mm width, implant subsidence or the increase in the inclination of the implant on serial radiographs.

The Knee Society Score (KSS) with the knee score (objective) and function score components was used to assess the outcome (22), the knee score component rates the joint itself, with a maximum of 100 score ( 50 for pain, 25 for range

of motion and 25 for stability and considering extension lag, flexion contracture and malalignment as deductions) and the function score component addresses the walking distance (50 points) and the ability to climb stairs (50 points), with deductions for any walking aids used to evaluate the knee status before surgery, 3 months after surgery and by the last follow up.

The visual analog scale (VAS) pain was used to assess function and pain preoperative and at 3 months post-operative and by the last follow up (23).

Short Form 12 Physical and Mental Component Summaries (SF12-PCS and SF12-MCS) were recorded pre-operatively, three months postoperatively and by the last follow up (24).

All TKAs were done under spinal anesthesia with a tourniquet using a standard midline incision, a paramedian approach, and tibial resection with an extra medullary guide, distal femoral resection with an intramedullary guide. Intravenous cefazolin before surgery as an antibiotic prophylaxis, enoxaparin anticoagulant was used as a prophylaxis against DVT, Bupivacane 0.5% infiltration into the posterior capsule as a local anesthetic, antibiotics within the bone cement, and wound drains were used systematically for 48hours after surgery.

Zimmer NexGen Legacy posterior-stabilized knees were used for all patients; the tibial components were the NexGen stemmed modular tibial tray. The patella was not resurfaced in any patient and the posterior cruciate ligament was sacrificed in all patient[ Fig.1, 2].

Rehabilitation program starts the day of operation; the patients can move from the bed to chair, starts quadriceps strengthening exercises. Walking weight bearing as tolerated the day after surgery, and stair climbing on the second post-operative day.

Any post-operative complications were reported; rates of superficial wound infection, prosthetic joint infection, wound healing problems and revision rates.

### Statistical analysis:

The data was analyzed using SPSS statistical package version 23. The K independent sample test (Krusjal- wallis) is a non-parametric test used to analyze the data between two variables one is numerical and the other is nominal containing more than two categories and Correlation coefficient was used to compare two numerical data. *P*-values less than or equal to 0.05 were considered significant.

### Results:

The average age of the patients included in this study was 63years (range, 54 to 71). Twenty knees in nineteen female patients and eight knees in eight males were included in this study. The average BMI was 43.1 kg/m<sup>2</sup> (range; 40-49.2 kg/m<sup>2</sup>) at the operation time and 45.7 kg/m<sup>2</sup> (range; 38.6-51.2 kg/m<sup>2</sup>) at the last follow up, the average duration of follow-up was 59 months (range, 38 to 72 months). The mean duration of hospital stay was 7.9 days (range: 3-12days).

The mean knee society objective score component of the KSS was significantly improved 3 months post-operative and by the last follow up ( $p < 0.001$ ), the mean preoperative score was 30.7 (range; 16-61), the mean score at 3 months post-operative was 92.7 points (range; 70-100 points), the mean score at the last follow up was 93.3 points (range; 77-100), the mean improvement at 3 months was 62 points and by the last follow up it was 62.6 points. The mean knee society function score component of the KSS was also significantly improved 3 months post-operative and by the last follow up ( $p < 0.001$ ), the mean preoperative score was 33.2 (range; 12-50), the mean score at 3 months post-operative was 88.1 points (range; 75-100 points), the mean score at the last follow up was 89.3 points (range; 75-100), the mean improvement at 3 months was 54.9 points and by the last follow up it was 56.1 points. No correlations were encountered between the preoperative or the degree of improvement of KSS at 3 months post-operative and by the last follow up with either the age or sex.

A significant negative correlations was encountered between the preoperative score and the BMI ( $p < 0.03$ ), and a significant positive correlations was encountered between the degree of improvement of the objective and functional Knee scores and the BMI at 3 months post-operative and by the last follow up ( $p < 0.001$  and  $p=0.002$  respectively)

The Pre-operative knee joint ROM was significantly improved ( $p = 0.001$ ) from a mean of 86° (range: 70° -100°) to a mean of 102.1° (range: 95° - 120°) at 3 months post-operative ( $p = 0.001$ ) and a mean of 108° (range 100° -125°) at the last follow up ( $p < 0.001$ ). No significant correlation between BMI and ROM was encountered in this study  $p=0.74$

The visual analog pain scale (VAS) was significantly improved from a mean of 7.9 (range: 7-10) to a mean of 2.8 (range: 0- 4) at 3 months post-operative and a mean of 2.7 (range: 0- 4) at the last follow up ( $p < 0.001$ ). No significant

correlation between BMI and VAS was encountered in this study  $p=0.258$  (Table 1)

**Table 1:** Correlation between BMI and the degree of improvement in knee scores, VAS and ROM.

	Statistical test	p- value
BMI & improvement in objective score	Correlation coefficient	<0.001
BMI & improvement in Functional		0.002
BMI & improvement in VAS		0.258
BMI & improvement in ROM		0.74

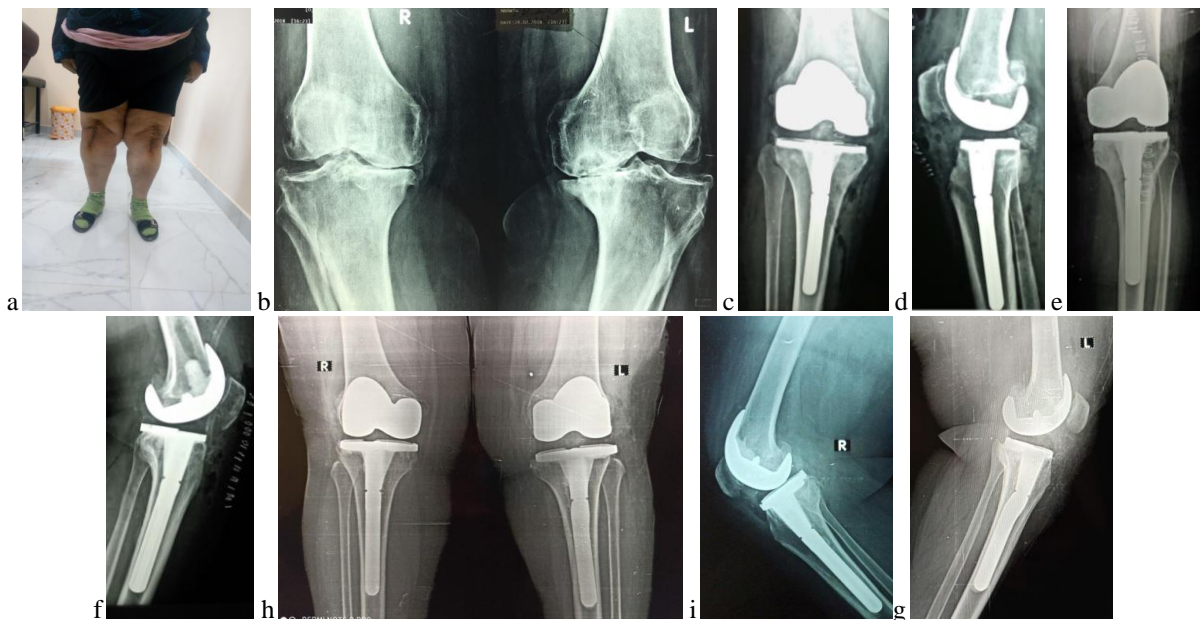
Quality-of-life scores according to the SF-12 Health Survey (physical and mental scores) was significantly improved ( $p < 0.001$ ), the physical component was significantly improved from a mean of 39 points (range: 27-46 points) to a mean of 68 points (range: 56 - 78 points) at 3 months post-operative and a mean of 70 points (range 60 - 79 points) at the last follow up ( $p < 0.001$ ), the mental component was significantly improved from a mean of 37 points (range: 27 -54 points) to a mean of 57 points (range: 46 - 68 points) at 3 months post-operative and a mean of 61 points (range 50 -72 points) at the last follow up ( $p < 0.001$ ). No significant correlation between BMI

and degree of improvement of physical and mental scores was encountered in this study  $p=0.06$  & 0.328 respectively (Table 2)

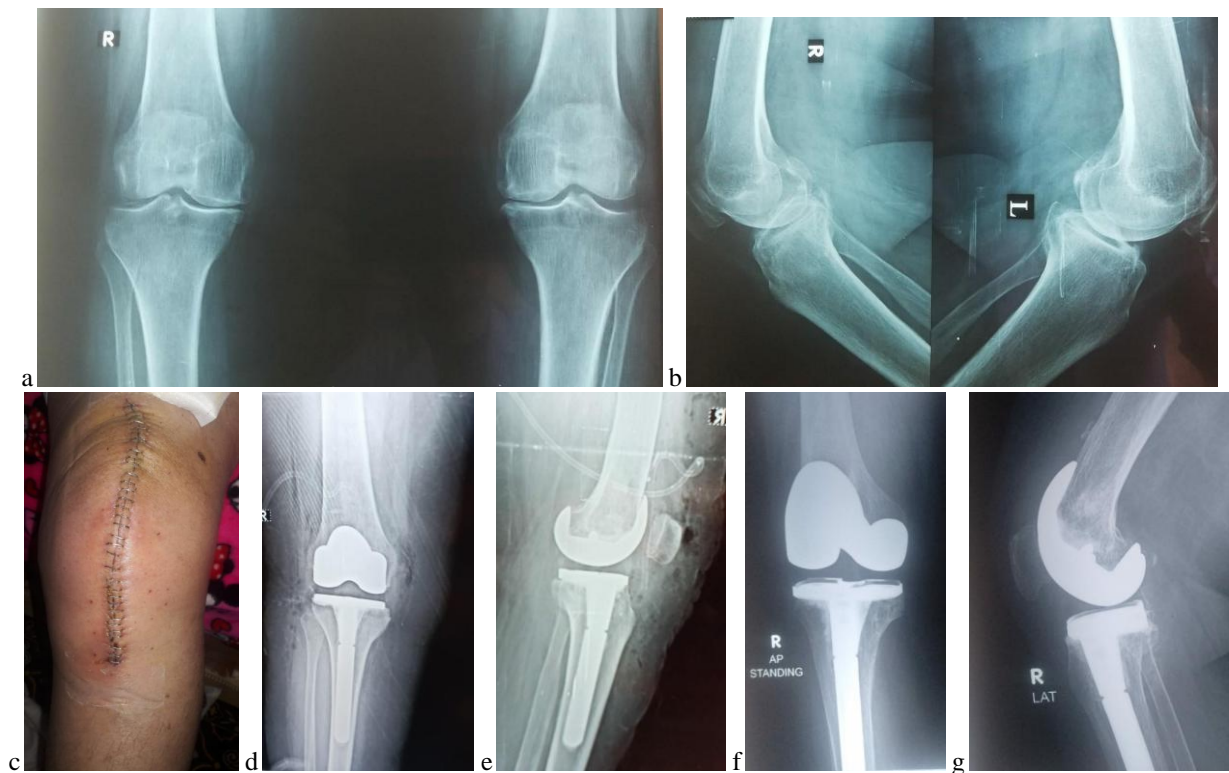
**Table 2:** Correlation between BMI & quality of life

	Statistical test	p- value
BMI & improvement in Physical score	Correlation coefficient	0.06
BMI & improvement in Mental score		0.328

Four knees had a mechanical axis deviation less than 3 degrees, six knees had minor wound healing problems such as superficial skin edge necrosis, and superficial cellulitis that improved after short periods of antibiotic therapy and two cases of DVT of the lower limb were reported and confirmed by duplex ultrasonography, no cases of deep infection were detected in this study, no cases of implant failure or aseptic loosening were encountered in this study by the last follow up, no patients complained of post-operative knee stiffness. There were no intra-operative avulsions of the medial collateral ligament that may be encountered in morbidly obese patients.



**Fig 1:** Bilateral OA knee in morbidly obese 61 years female patient that treated simultaneously by bilateral TKA with tibial stem. a: photo of the patient 3 months post-operative. b: AP view of both knees showing advanced OA. c-f: AP and lateral views of both knees post- operative. h-g: AP and lateral views of both knees 4 years post- operative without aseptic loosening..



**Fig 2:** OA right knee in a morbidly obese 62 years male patient that treated by TKA with a tibial stem. a&b: AP&lat views of both knees showing advanced OA. c: a photo of the patient 2 weeks post-operative showing good wound healing Fig 2d&e: immediate post-operative AP and lateral views. f&g: AP and lateral views 3 years post-operative.

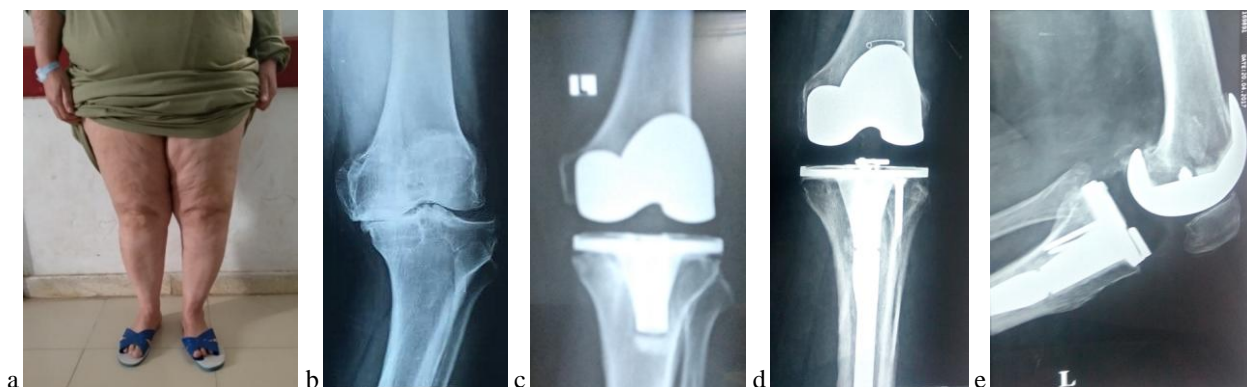
## Discussion:

Morbidly obese patients are more likely subjected to osteoarthritis of the knee (25). Their knees are overloaded; this load is transferred across the tibial component increasing the possibility of loosening requiring revision TKA (25-27). Failure requiring revision in TKR is mostly due to aseptic loosening of the tibial component (27). Prophylactic use of tibial stems may enhance tibial fixation in obese patients (10) [Fig.3]\*This figure for demonstration purpose only to show aseptic loosening and this patient was not included in the study.

No case in this study required revision. Boyce et al 2019 in their systematic review study found a significant increase in the rate of total knee revisions in the morbidly obese compared to non-obese patients, all functional scores showed significant improvement after total knee replacement but morbidly obese patients had higher overall complication rates (28). Amin et al (2006) found that the five-year revision rate was

25.8% for the morbidly obese and 0.0% in the non-obese. (25)

In this study The mean knee society objective score component of the KSS was significantly improved 3 months post-operative and by the last follow up ( $p < 0.001$ ), the mean preoperative score was 30.7 (range; 16-61), the mean score at 3 months post-operative was 92.7 points (range; 70-100 points), the mean score at the last follow up was 93.3 points (range; 77-100), the mean improvement at 3 months was 62 points and by the last follow up it was 62.6 points. The mean knee society function score component of the KSS was also significantly improved 3 months post-operative and by the last follow up ( $p < 0.001$ ), the mean preoperative score was 33.2 (range; 12-50), the mean score at 3 months post-operative was 88.1 points (range; 75-100 points), the mean score at the last follow up was 89.3 points (range; 75-100), the mean improvement at 3 months was 54.9 points and by the last follow up it was 56.1 points.



**Fig 3:** OA left knee in morbid obese 58 years male patient treated by TKA without tibial stem that was complicated with a septic loosening 9 months later and was revised using additional tibial stem. a: a pre-operative photo of the patient Fig 3b: AP view showing advanced OA c: AP view showing aseptic loosening d&e: AP and lateral views 3 years after revision using additional tibial stem. \*\*This figure for demonstration purpose only to show aseptic loosening and this patient was not included in the study

Some authors found no difference in the outcome for total knee arthroplasty in obese and non-obese patients whereas others reported inferior results in the obese patients (27).

Several Studies reported increased revision rates and lower functional scores in obese patients, others reported similar outcomes regardless of BMI (28). Gaillard et al. found that obesity did not affect mid-term implant survival, although they found lower functional outcomes and more complications in obese patients (29).

Morbidly obese and non-obese patients experience similar improvements in clinical scores after TKA and have the same extent of improvements in knee-related function and quality of life (28).

Amin et al (2006) found that total knee replacement had a significant influence on the knee and function score components of the KSS that were significantly improved post-operative ( $p < 0.001$ ), with comparable results when the BMI between  $30 \text{ kg/m}^2$  and  $40 \text{ kg/m}^2$ , while the morbidly obese ( $\text{BMI} \geq 40 \text{ kg/m}^2$ ) patients had an improved knee score component while the function score component of the KSS was significantly inferior. This suggests that while morbidly obese patients may achieve similar pain relief, range of movement and stability, they are likely to remain more functionally impaired following TKR, with limitation of walking distance, ability to climb stairs and greater dependence on walking aids. Krushell et al (2007) also had similar results to those of Amin et al (2006) (25, 30).

Baker et al. (2013) found that morbidly obese patients and those with a normal BMI had similar rates of functional improvement, greater

improvements in the morbidly obese was reported by Rajgopal et al. (2008) (31,32).

Preoperative function scores in morbidly obese patients are significantly lower than in those with a normal BMI as reported by Amin et al. (2006) and Krushell et al. (2007) (25, 30).

Winiarsky et al. (1998) and Feller et al. (1996), reported a significantly lower outcomes in morbidly obese patients. While the post-operative outcomes are similar as reported by Rajgopal et al. (2008) (32-34).

In this study Four knees had a mechanical axis deviation less than 3 degrees, six knees had minor wound healing problems such as superficial skin edge necrosis, and superficial cellulitis that improved after short periods of antibiotic therapy and two cases of DVT of the lower limb were reported and confirmed by duplex ultrasonography, no cases of deep infection were detected in this study, no cases of implant failure or aseptic loosening were encountered in this study by the last follow up, no patients complained of post-operative knee stiffness. There were no intra-operative avulsions of the medial collateral ligament that may be encountered in morbidly obese patients.

Steere et al (2018) in their study comparing the results of using tibial stems in obese patients to those with standard knee prosthesis they found no failures for aseptic loosening in both groups. Subgroup analysis of patients with  $\text{BMI} \geq 40 \text{ kg/m}^2$  did not show a difference in complications between groups. Serial knee radiographs was analyzed for radiolucent lines (RLLs) and no difference was reported between groups even in those with  $\text{BMI} \geq 40 \text{ kg/m}^2$  (10).

It is generally agreed that complication rates are higher in morbidly obese when compared to non-obese patients after TKA (35).

Boyce et al 2019 reported that Superficial wound infections and prosthetic joint infections are more likely to occur in morbidly obese patients that may be due to reduced immunity (28).

Amin et al (2006) found that in the morbidly obese TKA is associated with inferior clinical outcome scores, a higher rate of superficial and deep wound infections and inferior five-year survivorship compared to non-obese patients (25). Krushell et al (2007) found that TKA in morbidly obese patients with a minimum of a 2-year follow-up was associated with an increased rate of perioperative complications including wound problems, ligament injury, and infection. Functional scores were lower in the MO group; however, they did not find a significant difference in the range of motion or radiographic scores (30). AlTahan et al. (2018) found that deep tissue infection is the most common reason for revision in morbidly obese patients. Wagner et al (2016), Electricwala et al (2017) and Al Tahan et al. (2018) found a collinear relation between the BMI and the revision and deep prosthetic infection rates for knee prostheses (1,36,37).

Napier et al (2013) in their study although they found that MO group showed increased total complications compared to the NO group within the first three months of surgery, this difference was not statistically significantly (35).

In this study Pre-operative knee joint ROM was significantly improved ( $p = 0.001$ ) from a mean of  $86^\circ$  (range:  $70^\circ - 100^\circ$ ) to a mean of  $102.1^\circ$  (range:  $95^\circ - 120^\circ$ ) at 3 months post-operative ( $p = 0.001$ ) and a mean of  $108^\circ$  (range  $100^\circ - 125^\circ$ ) at the last follow up ( $p = 0.002$ ).

Napier et al (2013) in their study found that MO patients has pre-operative range of knee motion (mean=99 degrees), Three months post-operatively the mean ROM in MO was  $92.5^\circ$ , One year post-operatively it was  $99.2^\circ$ . the improvement in ROM one year post-operatively relative to pre-operative levels was greater for the MO group than for the NO group (35).

Winiarsky et al (1998) found no significant difference at five years post-operatively between ROM in MO and NO patients (mean  $106^\circ$  and  $109^\circ$ ) respectively (33).

The mean duration of hospital stay was 6.9 days (range: 3-12 days). Krushell et al. reported a statistically significant increased length of hospital stay for MO compared to NO patients (30).

Napier et al in their study found that the length of hospital stay for MO patients has a mean of 6.4

days while it is only 5.5 days in non-obese, which was not statistically significant (35).

In this study the visual analog pain scale (VAS) was significantly improved ( $p = 0.001$ ) from a mean of 7.9 (range: 7-10) to a mean of 2.8 (range: 0- 4) at 3 months post-operative ( $p = 0.001$ ) and a mean of 2.7 (range: 0- 4) at the last follow up ( $p < 0.001$ ).

Parrate et al (2017) found a significant improvement in the VAS score in patients with stemmed TKA from a mean of 6 cm to a mean of 2 cm on 10 cm scale with no difference between stemmed and non-stemmed TKA subgroups (18).

In this study Quality-of-life scores according to the SF-12 Health Survey (physical and mental scores) was significantly improved, the physical component was significantly improved from a mean of 39 points (range: 27 -46 points ) to a mean of 68 points (range: 56 - 78 points) at 3 months post-operative and a mean of 70 points (range 60 -79 points) at the last follow up ( $p < 0.001$ ), the mental component was significantly improved ( $p = 0.001$ ) from a mean of 37 points (range: 27 -54 points ) to a mean of 58 points (range: 45 - 68 points) at 3 months post-operative and a mean of 61 points (range 50 -72 points) at the last follow up ( $p < 0.001$ ), and these findings were not a gift of the tibial stem it is matching with the results of standard prosthesis.

Parrate et al (2017) found no differences in quality-of-life scores between stemmed and standard TKA they found SF-12 mean scores in the patients with stemmed TKA (mean physical score: 68 points/mental score 58 points) and in the patients with standard TKA (mean physical score: 67 points/mental score: 57 points) (18).

Steere et al (2018) reported that obesity is risk factors for aseptic loosening. They found that all cases of aseptic loosening had no additional tibial stem extensions, and they suggested additional tibial stem for obese patients (10). Abdel et al. (2015) and Lim et al. (2017) reported that obesity and weight gain after primary TKA increases the possibility of aseptic loosening and implant failure (6,7).

Many other studies reported aseptic loosening as the most important cause of failure after TKA mostly on the tibial side (38). Ritter et al [13] reported that severe preoperative varus deformity is associated with high implant failure rate, and those were excluded in our study to assess the effect of morbid obesity on the results (39).

In spite of the small number of studies that have demonstrated a significant reduction in aseptic loosening with a modular stemmed tibial component; many surgeons use tibial stems to decrease the rates of aseptic loosening (40).

In patients with obesity, the stem can spread the forces from the metaphysis to the diaphysis, limiting the load and the pain at the proximal aspect of the tibia (41).

Stems on tibial components may limit the micromotion and improve the load distribution (42).

Parratte et al (2017) hypothesized that a stemmed tibial component would improve outcomes for function and quality of life and reduce complications after TKA in patients with obesity. (18).

Fehring et al. (2017) and Berend et al. (2005) have measured proximal tibial stress in obese patients and found that Patients with greater proximal tibia stress had significantly higher rates of aseptic loosening. Fehring et al calculated the high tibial stress in cases of tibial component varus collapse with average BMI of 40.5 kg/m<sup>2</sup> and without additional tibial stems. The use of a tibial stems reduces micromotion and tibial implant subsidence compared to standard tibial components (10, 15,20).

Abdel et al.(2015) in their study used a short cemented stem. Parratte et al (2017) used a long stem with metaphyseal fixation to benefit both the alignment and load sharing potential. They found no advantage for the stems as regards alignment or loosening, but patients treated with stemmed TKAs had higher functional outcomes compared to those without stems however, the differences were small to be of clinical importance (6, 18).

Ries et(2013) alreported that the use tibial component with a short-keel is associated with a high failure rate (19). Park et al (2018) in their retrospective study found that using a tibial short extension stem would reduce the risk of loosening on the tibial side and increase implant survival rate even in the presence of preoperative varus deformity, they found no failure in 99 knees with a stem; the estimated 10-year implant survival rate was 100% in the stem group (38).

This study was limited by the small sample size and short duration of follow-up, another study with a larger number of patients and a longer duration of follow up is still required.

## Conclusion:

Total knee arthroplasty (TKA) with additional tibial stem is an excellent treatment option for morbidly obese patients with knee osteoarthritis with significantly improved clinical and functional knee scores, knee range of motion with a good impact on patient s Quality-of-life, additional tibial stem prevented implant failure or aseptic loosening for a mean of 5 years follow up.

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