



## Case Report

## A Multidisciplinary Approach to the Nonambulatory Bariatric Patient With Bilateral Knee Osteoarthritis

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## ABSTRACT

Obesity and lower-extremity arthritis are challenging problems to address as they are often mutually exacerbating. Due to the known perioperative risk of morbid obesity, the modality and timing of weight loss prior to arthroplasty is debated. We present a case of a 55-year-old nonambulatory female patient with an initial body mass index of 80.3 kg/m<sup>2</sup>. This individual underwent a staged bariatric and joint replacement surgical pathway employing personnel of differing treatment disciplines. Our patient successfully lost a substantial amount of weight and has been able to ambulate, exercise, and engage in new, strenuous physical activities. In the care of the nonambulatory bariatric patient, employing a multidisciplinary treatment plan can produce successful results.

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## Introduction

Obesity is an increasingly prevalent issue in the United States. By 2030, nearly half of the United States population, 48.9%, will have obesity [1]. Obesity is a serious medical condition that has systemic adverse effects on multiple organ systems. Specifically, in regards to orthopedic practice, obesity has been identified as an independent risk factor for the development of osteoarthritis (OA) because the excess body weight increases the mechanical stress load on the hip and knee joints, accelerating cartilage destruction [2]. Additionally, excess adipose tissue releases proinflammatory mediators such as interleukin-6 and C-reactive protein, which appear to be pro-catabolic for chondrocytes and the articular surface [3]. This is meaningful to orthopedic surgeons because these patients often come into the clinic in need of joint replacement.

Patients with morbid obesity present specific challenges to surgeons, as they are at increased risk of perioperative complications and hospital readmissions [4]. Therefore, it is ideal if these patients lose weight prior to total joint arthroplasty (TJA). However, many people cannot achieve sufficient weight loss with lifestyle

changes and medical management. Medical professionals have come to view bariatric surgery as the optimal long-term treatment for patients with obesity who have been unable to lose weight through lifestyle changes and medical treatment [5]. The unique connection of obesity, bariatric surgery, OA, and TJA produces a need for a sophisticated and well-developed multidisciplinary approach to best assist these patients.

Herein we report a case of a nonambulatory 55-year-old female patient with a body mass index (BMI) of 80.3 kg/m<sup>2</sup> who underwent sleeve gastrectomy and massive panniculectomy, followed by bilateral total knee arthroplasties (TKA). She then ultimately underwent conversion of the sleeve gastrectomy to a single anastomosis duodenoileostomy (SADI) for additional weight loss after her ambulatory capacity had been re-established.

## Case history

A 55-year-old woman presented to a bariatric surgery specialist due to her morbid obesity with a BMI of 80.3 kg/m<sup>2</sup> at presentation (Fig. 1). The patient reported a medical history of hypertension, obstructive sleep apnea, type 2 diabetes mellitus, and significant bilateral knee OA (Fig. 2). This patient was nonambulatory and unable to fully perform activities of daily living at home and in the community. She reported being unsatisfied with the inability to perform the activities she previously enjoyed. This patient has a

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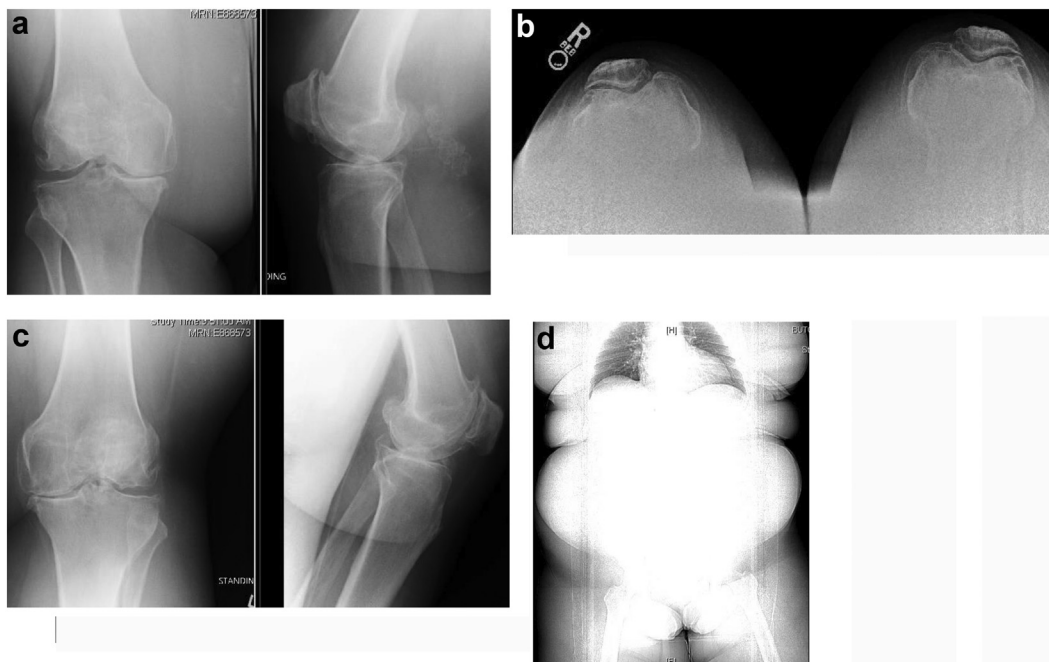


**Figure 1.** Preoperative photographs of the patient at 466 lbs and BMI 80.3 kg/m<sup>2</sup>.

history of multiple failures at nonoperative weight loss and lifestyle management. She was enrolled in a bariatric-joint replacement pathway involving multiple disciplines of care.

She began extensive lifestyle changes with the involvement of a dietitian and a physical therapist in preparation for the initial laparoscopic vertical sleeve gastrectomy by our minimally invasive bariatric surgeon. One year following the successful sleeve gastrectomy, the patient's BMI had decreased to 53 kg/m<sup>2</sup> (Fig. 3). The patient continued with extensive physical therapy, exercising 3-5 times per week, nutritional goals of 60-80 g of protein daily, less than 30 g of carbohydrates daily, and appropriate vitamin supplementation. About 1.5 years after her initial bariatric procedure, she

was evaluated by our plastic and reconstructive surgeons and was noted to have a large pannus hanging down to the lower third of her thighs, significantly impeding ambulation. She underwent a massive panniculectomy to remove 21.5 lbs of skin and adipose tissue to improve her mobility and ability to exercise (Fig. 4). After the panniculectomy, her activities and independence increased; however, her bilateral knee OA remained painful with exercise. The following year, after she lost more weight down to a BMI of 48.2 kg/m<sup>2</sup>, she underwent left TKA by our orthopedic surgeons, with approximately 4 months of interval for the contralateral knee (cemented posterior stabilized; Triathlon; Stryker Corp, Kalamazoo, MI) (Fig. 5). Our patient began to walk without pain and reported



**Figure 2.** Preoperative radiographs. (a) Anteroposterior and lateral radiographs of right knee OA. (b) Sunrise radiographs of bilateral knee OA. (c) Anteroposterior and lateral radiographs of left knee OA. (d) Radiograph of patient's body habitus of 80 kg/m<sup>2</sup>.



**Figure 3.** One year after the sleeve gastrectomy procedure, BMI 53 kg/m<sup>2</sup>.

significant satisfaction with her improved quality of life (Fig. 6). She slowly gained a small amount of weight back to a BMI of 54.2 kg/m<sup>2</sup> despite consistently following a bariatric diet, exercising 3–4 times per week, and using weight loss medications. She was re-evaluated in the bariatric clinic, and approximately 3.5 years after her index bariatric operation, she underwent a revision of the sleeve gastrectomy to a SADI, a bariatric procedure that combines a sleeve gastrectomy with an intestinal bypass.

At 4 years of follow-up, our patient reported she is extremely satisfied with her results and improvement in functional mobility. Six months after the revision to a SADI, her most recent BMI is 47.5 kg/m<sup>2</sup>, with estimated weight loss of 59% (Fig. 7). Although this is not her ideal bodyweight, she has become more functionally mobile and reports a significant increase in her quality of life. She is currently exercising 5 times per week and has moved from primarily water aerobics to participating in an intensive weightlifting program and walking several miles per day on a treadmill. This case

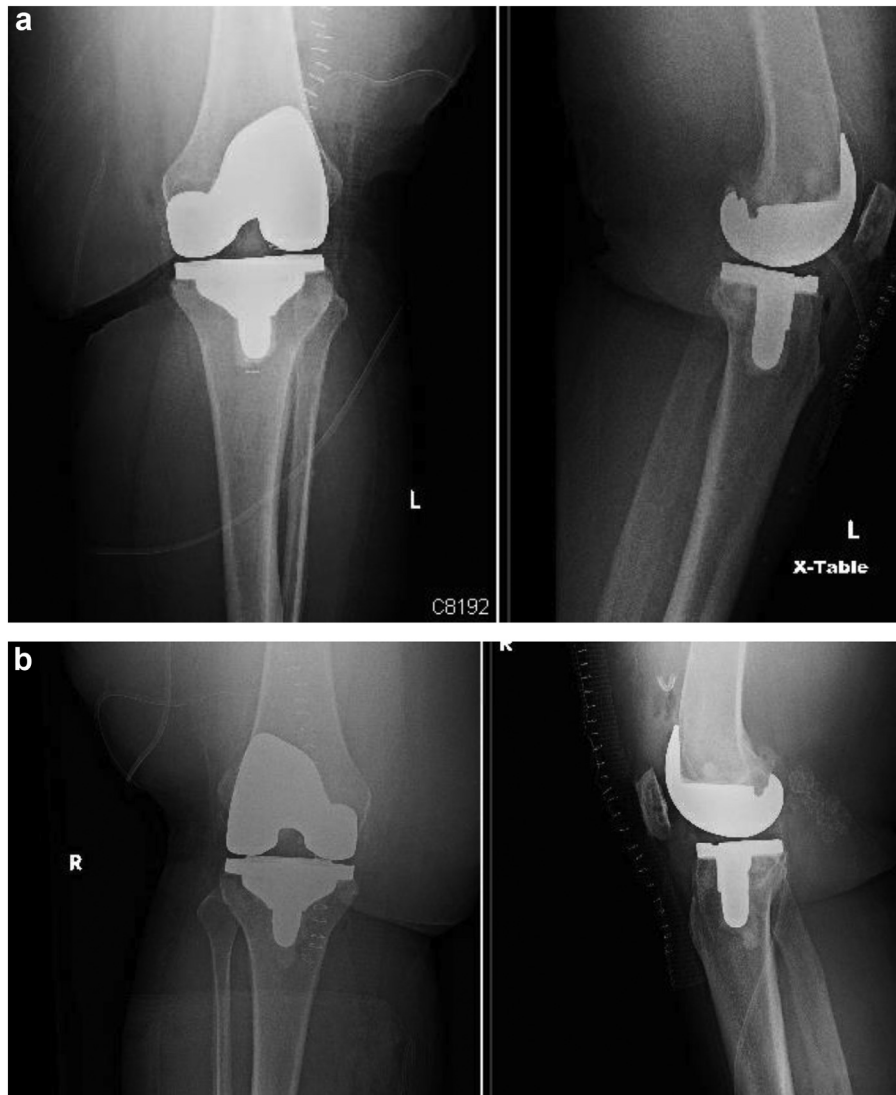
required effective communication between 7 different disciplines of care (orthopedic surgery, bariatric surgery, plastic and reconstructive surgery, primary care provider, dietetics, physical therapy, and nursing) with a planned treatment algorithm spanning multiple years. Although daunting, we believe institutional treatment pathways can yield similar results with this patient population reintegrating back into society. Consent was obtained from the patient to publish this deidentified case report.

### Discussion

Obesity and TJA are both becoming more prevalent in the United States. It is predicted that 24% of Americans in 2030 will have a BMI >35 kg/m<sup>2</sup> [1]. This procedure continues to increase with prediction that 3.48 million primary TKAs will be performed in the year 2030 [6]. The most common indication for TJA is OA, and a diagnosis of OA is more likely to occur in a person with obesity due to



**Figure 4.** Panniculectomy with removal of 21.5 lbs of excess skin/pannus.



**Figure 5.** (a) Left TKA: November 09, 2020, uncomplicated, noted to ambulate >75' postoperatively. (b) Right TKA: March 29, 2021, uncomplicated, noted to ambulate >100' postoperatively.

the increased load of daily stress on their joints, highlighting the connection between BMI and lifetime potential need for arthroplasty. This creates a substantial need for a multidisciplinary approach for patients with obesity, both with weight modification from bariatric surgery and TJA. Combining procedures can help to increase these patients' ability to have sustainable weight loss by improving pain control and allowing an increase in exercise tolerance. As obesity continues to increase into the future, improving patients' weight status is going to become increasingly important for safe and effective TJA.

Many studies have highlighted the benefit of undergoing bariatric surgery prior to TJA in order to enhance mobility and weight loss. In 1 large database study, Werner et al. compared 11,294 morbidly obese patients who underwent TKA with 219 morbidly obese patients who underwent bariatric surgery prior to TKA [7]. Their study showed patients who had bariatric surgery first had half the rate of major complications (odds ratio 0.45,  $P = .001$ ) and 40% fewer minor complications (odds ratio 0.61,  $P = .01$ ) [7]. In a similar study carried out by Kulkarni et al., 143 obese patients were identified who underwent both bariatric surgery and TJA at varying time points [8]. Fifty-three patients underwent bariatric surgery prior to TJA, and they had a 3.5 times lower wound infection rate and 7 times lower readmission

rate than patients who had TJA first [8]. Another promising meta-analysis including 38,728 patients by Li et al. found that bariatric surgery prior to TJA was associated with reduced short-term medical complications, hospital length of stay, and operative times [5].

Despite the promising findings, it is important to mention other studies have not demonstrated this same reduction in complications. Inacio et al. demonstrated that bariatric surgery prior to TJA did not reduce the frequency of complications, deep surgical site infections, or revision following the arthroplasty procedure [9]. Another recent study showed that the timing of bariatric surgery (6 months and 1 year) prior to TJA had similar incidences of medical/surgical complications and revisions ( $P < .001$ ) [10]. Additionally, Severson et al. found patients who underwent TJA more than 2 years after bariatric surgery had no significant difference in length of hospital stay or 90-day complication rates compared to patients who had TJA within 2 years of their bariatric surgery procedure [11]. These studies lead to hesitancy to fully accept the benefit of the timing of bariatric surgery in association with TJA, but they do not show substantial downside to proceeding with bariatric surgery first. The promising data should be examined concurrently with this information when care providers are deciding on the surgical procedure order and timing.



**Figure 6.** Radiographs at 6-month follow-up for the right TKA and 10-month follow-up for left TKA.

Another critical topic of discussion is the demonstrated ability of bariatric surgery alone to improve arthritis symptoms in patients who have morbid obesity. One prospective review conducted by Abu-Abeid et al. discovered that within 3 months of laparoscopic adjustable gastric banding, patients with a mean BMI of 43 kg/m<sup>2</sup> showed radiographic improvement of knee OA along with clinically relevant improvement in pain and function [12]. Another study reported on 145 obese patients with a mean BMI of 49 kg/m<sup>2</sup> who had knee OA and underwent laparoscopic adjustable gastric banding. At a follow-up duration of 3–8 years, there was a statistically significant decrease in the percentage of patients complaining of knee pain (47% to 38%;  $P < .001$ ). Trofa et al. conducted a retrospective report on 15 obese patients (mean BMI, 52 kg/m<sup>2</sup>) with OA, and they found the patients who underwent bariatric surgery prior to TJA lost 27.9% or more of their BMI ( $P = .49$ ) compared to patients who never went on to undergo TJA [13]. These studies all provide evidence that it is worthy to consider conducting bariatric surgery prior to arthroplasty because there is a chance their symptoms improve from the weight loss surgery alone, and if more benefits are desired by the patient, they could proceed with TJA.



**Figure 7.** Image taken 3.5 years from the index procedure and 6 months following single anastomosis duodenoileostomy; patient weight: 277 lbs (BMI 47.5 kg/m<sup>2</sup>).

Furthermore, patients can undergo drastic weight loss resulting in sarcopenia and malnutrition. While this is less likely to occur when weight loss is intentional and medically monitored, this has been shown to increase complication rates for TJA [14,15]. We recommend strict emphasis on postoperative nutrition with a protein-rich diet and regular monitoring of nutritional serum markers, such as albumin.

In this case, the orthopedic surgeon was the first care provider to contact the bariatric surgery program on behalf of the patient. We recommend that the physician performing the initial encounter should contact relevant care providers with expertise in medical and surgical obesity treatment. Once contact was initiated, this patient underwent an extensive, multidisciplinary bariatric program. We had regular meetings and discussions periodically following the patient's appointments, primarily via email with all care providers. After closely assessing the patient's general health and other comorbidities, the plan was finalized as a cohesive team. First, she began with behavioral modification, followed by bariatric surgery, and panniculectomy for hygiene and mobility reasons. Finally, her TKA and subsequent bariatric revision for maximal weight loss were completed in a staged fashion. This produced an exceptional outcome for the patient and fostered collegiality among departments.

Our case is a demonstration of the importance of effective interdisciplinary communication and collaboration to provide the best result for the bariatric patient. While it is common in many clinics to counsel to lose weight and return when desired BMI is achieved, having an option for referral into an alternative treatment pathway can be beneficial to these patients. While many, including the authors, would argue that prevention of obesity is key, every patient deserves a chance with presentation of both nonoperative and operative options.

## Summary

Utilization of a multidisciplinary approach to relieve extremity arthritis in patients with obesity has been shown to increase functional mobility and decrease perioperative complications with satisfactory outcomes. Our case presentation shows the successful story of a patient undergoing bariatric surgery followed by TKA while regaining ambulatory status and a life-changing improvement in quality life. This report highlights the active role orthopedic surgeons can play in planning TJA after the bariatric surgery to encourage weight loss maintenance and increased mobility. This article also highlights the need for more prospective studies to evaluate the intertwined relationship of weight, OA, bariatric surgery, and TJA and how to serve this patient population better.

## Conflicts of interest

The authors declare there are no conflicts of interest.

For full disclosure statements refer to <https://doi.org/10.1016/j.artd.2023.101108>.

## Informed patient consent

The author(s) confirm that written informed consent has been obtained from the involved patient(s) or if appropriate from the parent, guardian, power of attorney of the involved patient(s); and, they have given approval for this information to be published in this case report (series).

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