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Research Article

Navigating Complexity: The Success of RIRS in a Morbidly Obese Patient with 6 O'clock Working Channel

Rahmita Putri[1], Laurentia Yamin[1], Daniel Amartya[1], Abdul Gofur[2], Kartika Dyah Cahayani[2], Moh Nur Husain Septiadi[2], Dyandra Parikesit[3*]

[1]Faculty of Medicine, Universitas Indonesia, Depok, Indonesia

[2]Nursing Department, Universitas Indonesia Hospital, Universitas Indonesia, Depok, Indonesia

[3]Urology Medical Staff Group, Universitas Indonesia Hospital, Universitas Indonesia, Depok, Indonesia

[*]**Corresponding Author:** Dyandra Parikesit, Universitas Indonesia Hospital, Pondok Cina, Beji, Depok City, West Java 16424, Indonesia

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Abstract

Obesity, defined as a BMI≥30 kg/m^2, affects 21.8% of the population in Indonesia, reported by the national health survey. Obesity and morbid obesity are often associated with various health problems, including urinary tract stones. Various procedures, including URS, SWL, PCNL, and RIRS, are used to treat this condition. However, managing morbidly obese patients with nephrolithiasis remains uncommon in Indonesia, necessitating awareness among urologists to optimize treatment outcomes. RIRS is known for its lower morbidity, fewer complications, and cost-effectiveness compared to other surgical procedures.

Here, we present a successful case of RIRS in a morbidly obese 43-year-old man with multiple nephrolithiasis with a size of 12.6 x 11.4 mm at middle posterior calix. RIRS is considered a safe and feasible treatment for managing nephrolithiasis in morbidly obese patients.

Keywords: Retrograde Intrarenal Surgery; Morbidly Obese; Multiple Renal Calculi; 6 O'clock Working Channel Disposable Flexible Ureteroscope

Introduction

Obesity is a complex, multifactorial chronic disease with a body mass index (BMI)≥30 kg/m^2, with morbid obesity defined as a BMI≥40 kg/m^2. In the United States, obesity rates are approaching 35%, with over 5% classified as morbidly obese [1]. The rate of obesity in Indonesia is reported by the national health survey at 21.8%; however, it doesn't specify the rate of morbidly obese patients [2]. Various procedures are used to treat urinary tract stones, including Ureteroscopy (URS), shock wave lithotripsy (SWL), percutaneous nephrolithotomy (PCNL), and, rarely, laparoscopy, robotic-assisted laparoscopy, and open surgery. Singh et al. reported obese patients typically have similar outcomes with various stone removal procedures except for SWL. In general, the complications rate is comparable to the non-obese group, except for the higher risk for trocar site hernias in individuals who undergo laparoscopic/robotic surgery and wound-related problems, including infection and hernia in those who need open surgery [1]. However, obese patients present several technical challenges, including anesthesia issues, patient positioning, imaging for access, longer skin-to-stone distances, and potential nephrostomy tube dislodgement [1]. They also have a higher risk of postoperative complications, longer length of hospital stay, and are associated with longer operative time [3]. Performing PCNL in obese patients can be incredibly challenging for surgeons due to these factors [4]. Retrograde Intrarenal Surgery (RIRS) is a preferable option for obese and morbidly obese patients as there are no contraindications regarding the procedure [4,5]. The management of morbidly obese patients with nephrolithiasis is rare in Indonesia. Physicians must know this patient group's unique anatomical and physiological challenges and make necessary

adjustments to optimize treatment outcomes. Here, we present a successful case of RIRS for multiple nephrolithiasis in a morbidly obese patient.

Case Presentation

A 43-year-old man (height, 171 cm; weight, 196 kg; BMI, 67.03 kg/m^2) visited the Urology clinic at Universitas Indonesia Hospital due to kidney stones diagnosed at the previous hospital. He had been experiencing recurrent bloody urine, stones in urine, dysuria, and urgency for the past six months. The patient exhibited uncontrolled gout after receiving self-medicated allopurinol medication. However, no significant medical or familial history was reported. The physical examination on admission was unremarkable except for his BMI. The blood examination findings were within normal limits. His creatinine level was 1.03 mg/dL and estimated glomerular filtration rate (eGFR) was 94.6 mL/min/1.73m^2. However, urinalysis showed microscopic hematuria. A Computed Tomography (CT) scan at the previous hospital showed multiple calyceal kidney stones (12.6x11.4 mm) and a parenchymal stone in the left kidney (Figure 1). He was diagnosed with multiple left kidney stones, gout, and morbid obesity and was scheduled for left RIRS after a DJ stent was placed two weeks before.

Figure 1: Initial CT scan shows multiple left kidney stones and a parenchymal stone.

The patient (Figure 2) underwent a left RIRS under general anesthesia in a lithotomy position using a steel-reinforced bed to support the buttocks. First, a DJ stent was removed from the left ureter. Then, two wires (guide and safety) were inserted retrogradely using a semi-rigid URS and confirmed its position through the c-arm. Next, a flexible and navigable suction ureteric access sheath (FANS) was inserted according to the previously published procedure [5]. Subsequently, RIRS with a 9.5 fr disposable flexible ureteroscope equipped with a 6 o'clock working channel by Dyne Medical Group was inserted through the FANS. Fluid irrigation was performed using a pressure bag set at 100 mmHg, positioned 1 meter above the patient. A Holmium laser with a 287 nm fiber with an energy output of 0.8-1 joule and a 10-15 Hz frequency was employed (Figure 3). The resulting fragments were removed using a suction sheath until no remnants were visible. Unfortunately, there was no access to the stone in the parenchyma, so the pursuit was abandoned to limit surgery time and reduce infection risk, as reported by Zhang H, et al. [6]. The total duration of the surgery was 50 minutes, and no DJ stent was inserted post-surgery. The vital signs during the surgery remained within normal range. The surgical team comprised a surgeon, nurses, and a surgical technician (Figure 4). The patient was discharged within 24 hours after the surgery without any recorded complications. A follow-up abdominal CT scan one month later showed no kidney stone in the calyceal system (Figure 5) with no recorded surgery-related symptoms. As anticipated, the nephrocalcinosis on the left kidney remains and will be assessed on a biannual basis.

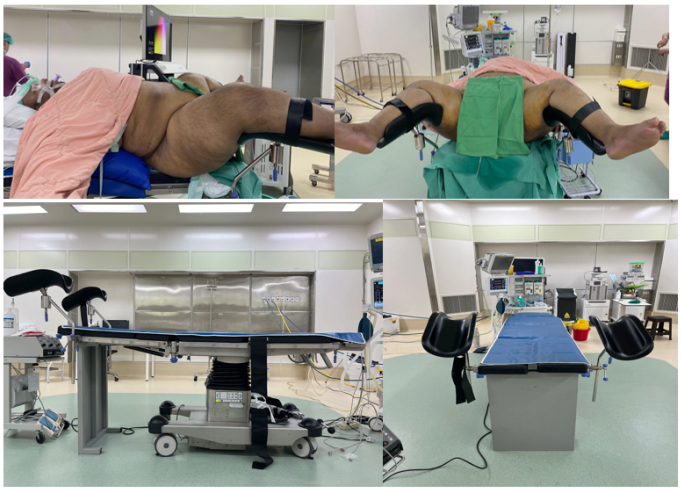

Figure 2: Pre-operative, 1A: lateral aspect, and 1B: inferior aspect. Steel reinforcement was put on the leg side of the bed to enhance patient security.

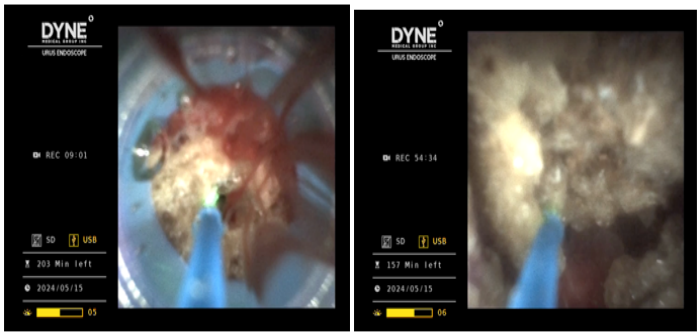

Figure 3: The stones (intra-operative). Note the capability to apply suction while dusting the stone within the FANS without causing harm to the access sheath while maintaining a clear and unobstructed vision.

Figure 4: The surgical team.

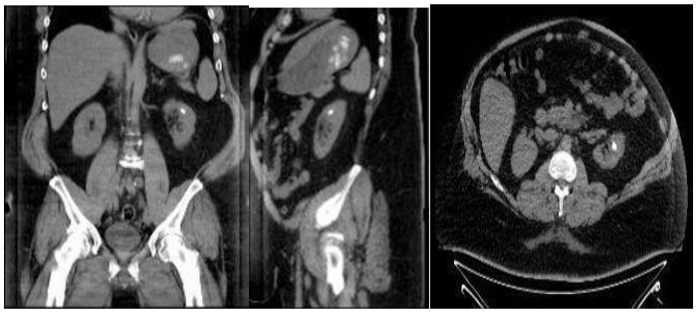

Figure 5: A follow-up CT scan one month after surgery reveals no kidney stone with the same parenchymal stone as the preoperative CT scan.

Discussion

Obesity presents a challenge to surgery as it is associated with a multitude of health problems that could complicate surgery [7]. The main perioperative challenges in managing obese patients are related to their respiratory system, including reduced lung volume with increased atelectasis, compromised respiratory system, lung and chest wall compliance, increased airway resistance, and moderate to severe hypoxemia. These physiological changes are especially pronounced in obese patients with hypercapnic syndrome or obstructive sleep apnea syndrome [7].

The degree of obesity also influences the incidence of intraoperative surgical complications [7]. Morbid obesity has been described as a challenge in numerous urological procedures, particularly for stone removal [1,5]. The European Association of Urology (EAU) recommends minimally invasive procedures for treating urolithiasis, such as ESWL, URS, RIRS, and PCNL [9]. ESWL is the least invasive procedure; however, its feasibility is low for obese and morbidly obese patients. Several studies have reported high failure rates in stone removal using the ESWL technique, particularly with increased Skin-to-Stone Distance (SSD), often leaving residual stone fragments behind [5]. Pareek et al. [10] reported an 85% failure rate in ESWL patients with an SSD >10 cm [10]. We ruled out ESWL as a treatment option because the CT scan showed an SSD>10 cm and multiple nephrolithiasis. The latest EAU guidelines also list severe obesity as a contraindication to ESWL [9].

PCNL is contraindicated in situations of untreated UTI, tumors in the access tract area, probable malignant kidney tumors, and pregnancy. In contrast, besides general issues like those with general anesthesia or untreated UTIs, URS and RIRS can be performed in all patients without specific contraindications [9]. Since none of the contraindications were observed in our patient, both PCNL and RIRS could still be considered for the patient.

Performing PCNL in obese patients poses significant challenges, including anesthesia, patient positioning, imaging for access, longer SSD, and potential nephrostomy tube dislodgement. The prone position is traditionally preferred for PCNL due to direct access to the posterior calyx and safer bowel positioning. However, a supine approach is recommended for obese patients to reduce ventilatory compromise despite increasing the distance and complicating access to the upper pole. Additionally, longer SSD require specialized equipment like a long nephroscope and amplatz sheath, adding complexity to intraoperative access and dilation. This approach also reduces collecting system filling, keeping it collapsed, which can make PCNL more challenging. As a result, the use of the supine position remains a topic of debate [5]. Keheila et al. [4] reported on PCNL in morbidly obese patients (BMI≥50 kg/m²), achieving 73% stone clearance after the first PCNL, increasing to 87% with auxiliary procedures. Preoperative planning and medical optimization are crucial. Experienced anesthesiologists are preferred as prone positioning can reduce lung capacity and decrease venous return due to inferior vena cava compression [4].

Despite being a high-volume PCNL center, we lack experience in supine PCNL, treating morbidly obese patients, and using

specialized equipment such as special nephroscopes and amplatz sheaths. Therefore, we chose RIRS for obese patients with kidney stones. RIRS provides superior visibility, convenient access to nearly all kidney calyces, and is more cost-effective, especially for stones outside the lower pole [11]. Despite having a lower Stone-Free Rate (SFR) than PCNL, RIRS exhibits reduced morbidity and complications [12].

Special consideration was taken to address challenges associated with the patient's position. The operating table was enhanced with steel brackets and supports were placed beneath the patient to ensure stability throughout the procedure. The flexible cystoscope's 6 o'clock working channel offered a natural orientation similar to a semi-rigid ureteroscope, providing an excellent visual field, especially in the tight corners of the calyx where ureteroscopes with 3 or 9 o'clock channels may be limited. The 6 o'clock channel facilitates the laser's ability to target and break down the stone within the FANS while also allowing for the safe removal of dust and debris without causing harm to the access sheath. The stone (Figure 5) was large and durable but was successfully broken into smaller pieces and evacuated through suction. However, the patient's large thighs posed a challenge during the initial assessment, particularly when inserting the semi-rigid ureteroscope. This issue was resolved by supporting the patient's buttocks and securing the thighs to the operating bed.

Multiple studies have compared the results of RIRS among different BMI groups. A retrospective study conducted a comparison of the success rates of ureteroscopy for proximal ureteral stones in obese and nonobese individuals. The success rates were 81% and 91%, respectively. Alkan E. reported overall SFR of RIRS among normal weight (BMI<25), overweight (25≤BMI<30), obese (30≤BMI<40), and morbidly obese patients (BMI≥40) as 81%, 87%, 87.4%, and 85%, respectively [13]. The studies mentioned above have demonstrated that the results of RIRS were comparable among patients with varying BMI scores. However, the above study only assessed patients with a BMI of up to 52 kg/m^2. To the best of our knowledge, our current study is the first to examine the outcomes of RIRS in morbidly obese patients.

Although complications can occur during or after RIRS, they are generally minimal and manageable. Common issues include bleeding, intrapelvic hematoma, mucosal damage, ureteral perforation and avulsion, urinary tract infection, and sepsis [14]. A study by Basatac C comparing patients with BMI≥35 and BMI<35 found higher post-operative and overall complication rates, higher mean operation time, and longer length of stay in patients with BMI≥35 [15]. Hence, a meticulous assessment and particular attention are required while managing individuals who are morbidly obese. Regrettably, there is a scarcity of research that assesses the treatment of patients with morbid obesity (BMI>60 kg/m^2) concerning kidney stone treatment.

Conducting new multicenter studies is essential to effectively evaluate and treat patients in this BMI category, as the number of morbidly obese patients is rising annually. Various types of flexible ureteroscopes, both disposable and reusable, are available, but they typically have working channel exits at 3 or 9 o'clock. This design can make accessing stones in tight, narrow-angle calyces challenging and may increase the risk of mucosal damage from lasing without proper visualization. A 6 o'clock working channel could offer better navigation and visualization, especially during lithotripsy, and shorten the learning curve by providing a more natural feel similar to a semi-rigid URS. However, further clinical research is needed to confirm these benefits [16]. This case report describes the first instance of a successful RIRS performed on a patient with morbid obesity (BMI>60 kg/m2) using a 6 o'clock working channel flexible ureteroscope.

Conclusion

The management of nephrolithiasis in morbidly obese patients requires careful consideration of anatomical challenges and technical factors. This case report demonstrates the successful application of RIRS in a morbidly obese patient with multiple kidney stones, highlighting RIRS as a safe and effective alternative to other minimally invasive therapies such as ESWL and PCNL. Despite the technical difficulties, the procedure achieved complete stone clearance without complications. Further research is essential to refine treatment strategies and enhance outcomes for morbidly obese patients with multiple nephrolithiasis.

Conflict of Interest: The authors declare that there is no conflict of interest to disclose pertaining to this research or its publication.

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