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Original Article

A Minimally Invasive Approach for Managing Umbilical Hernia and Rectus Abdominis Diastasis: A Single-Center Case Series

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Abstract

Introduction

Umbilical hernias (UHs) and rectus abdominis diastasis (RAD) are distinct abdominal conditions that, though separate, frequently overlap in the context of surgical management. The debate over the most effective repair techniques continues, despite the proposal of numerous methods and guidelines. In this study, we reported a novel surgical technique involving a minimal incision for managing both UHs and RAD.

Methods

Following the de-identification of data, the necessary information was retrospectively collected from the clinical profiles of patients managed through our technique. The records included patient demographics, smoking, body mass index (BMI), family and patient history of hernias, parity, clinical symptoms, comorbidities, operation time, hospital admission, treatment outcomes, and follow-up. All the included cases had small-sized UHs (≤ 2 cm) and RAD.

Results

The patients' ages ranged from 23 to 44 years (34.3 ±5.65), with a mean BMI of 26.8±2.74 kg/m². All patients were multiparous women, with the majority having experienced three pregnancies. Clinical symptoms included pain and swelling in all cases. The surgical procedure duration varied from 30 to 45 minutes, with a mean of 33±4.9 minutes, and no complications were encountered intra or postoperatively. All the cases were discharged home the same day of the operation. There were no instances of hernia recurrence after a mean of 6.4 months of follow-up.

Conclusion

The technique discussed in this study may play a crucial role in effectively managing patients with UHs ≤ 2 cm and/or RAD, offering satisfactory outcomes with no complications and minimal operating times.

1. Introduction

Umbilical hernias (UHs) involve the abnormal displacement of peritoneal contents through the umbilical canal, which is bounded by the linea alba anteriorly, the umbilical fascia posteriorly, and the rectus sheath laterally. They can manifest centrally within the umbilicus or, at times, in a more lateral,

superior, or inferior position. They are categorized into three types: congenital, infantile, and adult. In 90% of cases, adult UHs are acquired [1]. Despite its aesthetic simplicity, the umbilicus represents one of the abdomen's weaker areas, thus predisposed to hernia formation [1]. Signs and symptoms of UHs may vary but commonly include a noticeable protrusion or lump in the umbilical region, often accompanied by discomfort, pain, or a sensation of pressure [2]. Chronic increases in abdominal pressure and weakened fascial tissue at the umbilicus constitute the primary etiology. UHs most commonly occur in obese individuals, women with multiple pregnancies, adults with large abdominal tumors, ascites, or those with cirrhosis. Women are notably affected at a higher rate than men, with a prevalence of three to five times greater [2]. UHs are not uncommon; they constitute 6 –10% of primary abdominal wall hernias, with a higher incidence during the fourth and sixth decades of life [1,2]. The debate regarding the best technique for their repair persists despite the passage of over a century since the first description by William J. Mayo in 1901 [3]. Adding to the complexity is the coexistence of UHs and rectus abdominis diastasis (RAD), especially in patients with weakened abdominal musculature [4]. UHs and RAD are distinct abdominal conditions that, though separate, frequently overlap in the context of surgical management [3,5]. Patients are more likely to experience recurrence after UH repair alone [4]. The ongoing debate on the best strategies for managing UHs stems from the challenges of the disease's diverse presentations and available treatment options [1,6]. Recurrence rates and complications of previous management methods have also limited the adoption of a specific technique [6]. Furthermore, for RAD, the surgical techniques often require substantial skin incisions running the length of the RAD or employing extensive Pfannenstiel incisions. These larger incisions can lead to suboptimal cosmetic outcomes and raise the chances of post-operative wound complications [4].

This study aims to report a novel surgical technique involving a minimal incision for managing UHs and RAD. All the referenced studies have been checked for reliability before being cited to avoid citing non-peer-reviewed data [7].

2. Methods

2.1. Study design

This single-centre case series focused on seven female patients with UHs and RAD who were diagnosed and treated in Smart Health Tower's abdominoplasty clinic between February 2023 and June 2023. Patients provided consent to participate in the study and to authorize the publication of any pertinent data. Smart Health Tower's scientific committee obtained the study's ethical approval.

2.2. Data collection

Following the de-identification of data, the necessary information was retrospectively collected from the patient's records stored in the clinic's database. The retrieved data encompassed patient demographics, smoking, body mass index (BMI), family and patient history of hernias, the number of pregnancies, clinical symptoms, comorbidities, operation time, hospital admission, treatment outcomes, and follow-up.

2.3. Eligibility criteria

All cases with small-sized UHs (≤ 2 cm) and RAD were included in the study (Figure 1). Patients with recurrent hernias, incisional hernias, individuals unfit for general anesthesia, and those with incomplete data were excluded.

Figure 1. The image shows a pre-operation para-umbilical hernia with divarication of the recti muscle, a typical indication for the REWA technique.

2.4. The procedure (REWA Technique)

The surgical procedure started with an inferior, half-circular umbilical incision. Subsequently, a parallel incision was made, transforming it into a half-circular, elliptical incision (Figure 2). The elliptical section of the skin was then excised, and dissection proceeded through the subcutaneous tissue until the external oblique sheath was reached. After this, dissection of the subcutaneous fatty tissue was meticulously performed, fully exposing the entire external sheath from the xiphisternum down to the pubic area. This dissection extended beyond the rectus abdominis muscles on both sides, revealing the entire recti divarication area. The procedure involved the detachment of the umbilicus from the abdominal wall and the subsequent dissection of the hernia sac. The hernia sacs were opened to reduce their contents. Non-absorbable monofilament sutures were then carefully performed, running from the upper to lower and lower to upper regions, spanning from the xiphisternum to the pubic region around the divarication area. Suturing was terminated at the defect site, and the defects were closed vertically using non-absorbable monofilament sutures. Following this closure, a non-absorbable narrow mesh was positioned behind the stitches previously placed for the divarication. Once the mesh was put in place, the stitches were

Figure 2. Intra-operative stage of the REWA technique, in which crescent infra-umbilical excision of skin and subcutaneous tissue is done before hernia and divarication repair.

Figure 3. REWA technique in the theater after putting Redivac drain and closing layers of the wound.

tightened, and suturing was performed in both directions, intersecting each other to create two knots at the superior and inferior parts of the operative area. Using non-absorbable sutures, the umbilicus was then reattached to its normal position on the abdominal wall. A closed drain was inserted into the subcutaneous space, and the wound was sealed with monofilament absorbable sutures, resulting in a discreet crescent-shaped scar at the lower edge of the umbilicus (Figure 3). Following the sterile coverage of the wound, a garment was applied to the patient's trunk, covering all areas that underwent dissection. After seven to ten days, the drain and stitches were figueremoved, leaving a small scar (Figure 4).

2.5. Statistical analysis

Data organization and coding were conducted using Microsoft Excel 2019. Qualitative data analysis involving descriptive statistics was carried out using the Statistical Package for the Social Sciences (SPSS) Version 25. The findings were presented as means, frequencies, and percentages.

3. Results

The patients were aged 23 to 44 years (34.3 ±5.65), with a mean BMI of 26.8±2.74 kg/m². A positive family history of hernia was found in two cases (28.6%); none of the patients were smokers, and none had a history of persistent cough. Comorbidity was

Figure 4. Ten days after the operation (stage of removing stitches), a very small wound with a highly cosmetic outcome.

observed in just one case, which was diabetes mellitus. All patients were multiparous women, with the majority having experienced three pregnancies. Clinical symptoms included pain

and swelling in all cases. The surgical procedure duration varied from 30 to 45 minutes, with a mean of 33±4.9 minutes, and no complications were encountered during and after the operations. All the cases were discharged home the same day of the operation. There were no instances of hernia recurrence after a mean of 6.4 months follow-up.

Table 1. The baseline characteristics of the patients.

Variables	N. (%) / Mean ± SD
Age range (mean ± SD)	23 - 44 yrs. (34.3 ±5.65)
BMI range (mean ± SD)	22.7 - 32.4 kg/m^2 (26.8 ±2.74)
Family history of hernia	
Yes	2 (28.6%)
No	5 (71.4%)
Smoking	
Yes	0 (0%)
No	7 (100%)
Comorbidity	
None	6 (85.7%)
Diabetes Mellitus	1 (14.3%)
Gravida	
Two	1 (14.3%)
Three	6 (85.7%)
History of persistent cough	
Yes	0 (0%)
No	7 (100%)
Pain and swelling	
Yes	7 (100%)
No	0 (0%)
Operation time range (mean ± SD)	30-45 minutes (33 ±4.9)
Complications	0 (0%)
Follow-up (mean± SD) by months	6.4 ±0.96
Recurrence	0 (0%)

SD; standard deviation, BMI; body mass index

4. Discussion

In routine general surgery, managing some situations is straightforward, allowing surgeons to proceed without hesitation. However, abdominal wall hernia surgery lacks clear and reliable clinical evidence, resulting in an ongoing debate [8]. UH repair techniques vary based on mesh use and whether they are performed through open or laparoscopic methods. Patient and surgeon preferences can influence the choice of technique. Still, the primary concern often revolves around the persistence of a visible scar and the possibility of fascial tension issues leading to recurrence [2, 9].

A significant decision confronting surgeons in planning open UH repairs pertains to the incorporation of mesh. Mesh-based or non-mesh repairs remain topics of ongoing debate, lacking a definitive consensus. Four prospective randomized trials have explored mesh application in UH repair, and three reported reduced recurrence rates associated with mesh deployment [10 - 13]. Furthermore, among 4,786 patients who underwent open repair for small (≤2 cm) umbilical or epigastric hernias, reoperation rates for recurrent hernias were lower in those who received mesh-based repairs compared to patients who underwent non-mesh repairs [14]. Smaller hernia defects can pose a greater challenge for sublay mesh placement, which has implications for resident education and surgeons' learning curves. Kaufmann et al. managed 150 cases with 1-4 cm UHs and found no surgeons needed to enlarge the hernia defects to place the mesh in the sublay position [15].

Schumacher et al. reported a notably higher recurrence rate of 31.8% in obese patients with a BMI exceeding 30 kg/m². Half of these patients had an abdominal wall defect larger than 3 cm. The increased recurrence appears to be linked to a combined effect of elevated intra-abdominal pressure and the size of the abdominal wall defect [16]. In light of these findings, some authors have recommended considering mesh repair for all UHs, especially for patients with obesity and abdominal wall defects of 3 cm or larger [17]. Multiparity is also considered a contributing factor to the development of UHs. A study revealed that among 49 female patients, approximately 87.8% had experienced multiple pregnancies [18]. In addition, the primary factor contributing to RAD is the increase in intra-abdominal pressure. RAD commonly affects two distinct groups of individuals. Firstly, middle-aged men with central obesity often experience a visible bulge between the rectus muscles when transitioning from a supine position to a sitting posture due to muscle contraction. Secondly, small post-pregnant women frequently exhibit a filiform dent along the thinned and stretched 'Linea alba' during rectus muscle contraction, which can be attributed to lower intra-abdominal pressure [19]. This study proposes a new mesh-based technique for managing cases with UHs (≤ 2) and RAD. This technique may be an alternative option to existing methods due to several significant points clarified in the following paragraphs. The cases in this study were all females with a mean age of 34.3 and a mean BMI of 26.8 kg/m². Consistent with the findings of Ismaeil et al. [18], all cases in our study were multiparous women, and the primary complaints among these patients were pain and swelling.

The Mayo repair, described in 1901, used stitches to fix UHs in a "vest over pants" fashion with two rows of horizontal mattress sutures. While it was popular for a while and is still used occasionally, it has limitations because of high long-term recurrence rates [20]. A study conducted on 279 employees with UHs assessed the approaches of surgery and watchful waiting. The surgical group incurred higher financial costs, but the no-surgery group had significantly higher healthcare utilization days and estimated workdays missed. As a result, the study recommended early surgical intervention as a potential means to reduce costs and resource utilization [21]. The evidence supporting the effectiveness of non-operative treatment for RAD is limited. A study indicates that physiotherapy can reduce the inter-rectus distance. However, it remains unclear whether a particular exercise program can enhance symptoms and quality of life [22]. Furthermore, there is no established standard

treatment approach for patients who have both RAD and umbilical or epigastric hernias [22].

Laparoscopic UH repair is gaining popularity as an alternative to open surgery. However, it is not yet standard due to cost, demanding surgical expertise, complications, and the need for synthetic mesh. Laparoscopy is preferred for larger hernia defects (>5 cm), but it may lead to complications like seroma, infection, and intestinal issues, even though it reduces the risk of recurrence [9]. Cassie et al. compared outcomes in 14,652 patients who underwent elective UH repair, either laparoscopic or open. They found that laparoscopic repair was linked to reduced wound complications but came with longer operating times, extended hospital stays, and an increased risk of respiratory and cardiac complications [23].

A fundamental consideration and challenge in all umbilicoplasty techniques is the prevention of making additional scars. Bawazir et al. introduced an umbilicoplasty technique for pediatric patients with proboscoid UHs, aiming to create a neo-umbilical scar that is hidden within and results in an inconspicuous appearance. However, their study lacks proper follow-up, making it challenging to assess the risk of infection and skin necrosis [24].

Ceccanti et al. also endeavoured to create a surgical procedure centred on preserving umbilical cord elements, capitalizing on the principle of inward scar retraction. This technique closed the fascial defect through the umbilical skin defect without separating the skin from the fascial edges and elements of the umbilical cord [25]. Another study introduced a technique for large, protruding UHs. They reduced the diameter of the neo-umbilicus by half by removing skin flaps and bringing the skin edges closer together. This approach ensured permanent umbilical depression without complications, but it did not result in a completely scarless outcome to some extent [26]. Kulhanek et al. described a treatment method for rectus muscle diastasis and/or UH in slim patients with excess skin around the belly button and some subcutaneous fat. Their technique overcomes the drawbacks of common abdominoplasty methods, like vertical and periumbilical scarring. However, it is not suitable for obese patients with a lot of excess skin and still involves scarring [27]. Mislowsky et al. and Yildiz et al. recommended a technique for managing UHs smaller than 2 cm and reported satisfactory outcomes. However, their methods were limited to addressing UHs alone [2, 9]. Moreover, there is a reported open technique for repairing small midline hernias (<4 cm) in conjunction with RAD using self-adhesive synthetic mesh, with only one documented case of recurrence [4]. Our proposed technique exhibits several advantages in comparison to the mentioned studies. Firstly, our method involves a minuscule elliptical incision that leaves no discernible scar, successfully addressing a concern prevalent in numerous prior techniques. Secondly, this singular incision allows us to manage both UHs (≤ 2 cm) and RAD, thereby reducing costs and minimizing the risk of complications and infections. Furthermore, it offers enhanced comfort for the surgeon and patients with short operative times, no hospital stays, and rapid recovery. Thirdly, up to the point of this publication, we have not recorded any recurrences among our cases. Nevertheless, our study has certain limitations, encompassing a small sample size, an incomplete study design, and a dearth of extended follow-up data since the case observation period did not exceed one year. Further research must assess this technique on a larger scale, with a proper sample size, an enhanced study design, and long-term follow-up periods.

5. Conclusion

The REWA technique may play a crucial role in effectively managing patients with UHs ≤ 2 cm and/or RAD, offering satisfactory outcomes with no complications and minimal operating times.

Declarations

Conflicts of interest: The author(s) have no conflicts of interest to disclose.

Ethical approval: The study's ethical approval was obtained from the scientific committee of Smart Health Tower.

Patient consent (participation and publication)**:** Written informed consent was obtained from the patients for publication.

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Use of AI: AI was not used in the drafting of the manuscript, the production of graphical elements, or the collection and analysis of data.

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