Modified Altemeier procedure for incarcerated rectal prolapse–A Case Series

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Abstract

**Background:** Intrusive rectal prolapse is a rare emergency condition. Despite the numerous surgical options available, the clinical outcome is not promising.

**Objective:** To explore the efficacy of modified Altemeier procedure in the treatment of incarcerated rectal prolapse.

**Design:** We conducted a follow-up study of 12 patients with impaction rectal prolapse.

**Settings:** This study was conducted at a tertiary referral center.

**Patients:** A total of 12 patients with impaction rectal prolapse were included in this study. All cases were treated with emergency surgery because of failed conservative treatment. A total of 12 patients, 11 males, and 1 female, were included in this study. Age was 24-82 (Med42.08±MD15.95) years, previous medical history was 3-40 (Med19.92±MD13.43) years, and time from onset to admission was 0.5-26 (Med7.96±MD8.03) h.

**Interventions:** Modified Altemeier procedure was performed in all cases.

**Main outcome measures:** The primary outcomes included Mortality, complication rates, time and severity of postoperative recurrence, changes in pre- and postoperative Wexner anal incontinence scores and ED-5Q-5L quality-of-life autonomy scores. Secondary outcomes included operative time, intraoperative bleeding, and length of hospital stay.

**Results:** During the 24-month follow-up period, no death or recurrence was observed in any of the patients. There was only one case of hemorrhage from the anastomosis on the fourth postoperative day, and the patient was discharged after receiving emergency suturing to control the bleeding. At the same time, all patients' quality of life scores dramatically increased and the postoperative Wexner anal incontinence scores were significantly lower. Finally, the intraoperative bleeding volume was 15-20 (Med20.83±SD7.71) ml; the operative time was 140-260 (Med172.50±SD57.70) min; and the hospital stay was 6-44 (Med16.75±SD9.61) d.

**Limitation:** First, embedded rectal prolapse has an acute onset and requires emergency surgery, so there is a lack of objective indicators such as preoperative and postoperative anal manometry; second, this disease is extremely rare and few cases were included in this study; finally, this study is a retrospective clinical study and may be biased.

**Conclusions:** The mortality, recurrence rate, complication rates after the modified Altemeier procedure were better than the results of previous studies, which showed that this modified procedure was effective in reducing the mortality and complication rates of impaction rectal prolapse. At the same time, patients showed significant improvement in preoperative and postoperative anal function and quality of life, but the length of hospital stay was longer than previously reported in the literature.
Introduction

Pelvic organ prolapse (POP) is a type of pelvic floor dysfunctional disorder caused by a variety of factors that result in weak pelvic floor support tissues, causing the pelvic organs to descend and shift, resulting in an abnormal position and function of the organs. Clinically, POP can be broadly classified into anterior pelvic prolapse, middle pelvic prolapse, and posterior pelvic prolapse according to the location of the prolapse. Among them, posterior pelvic prolapse mainly includes rectal prolapse (RP), etc. Although RP is not life-threatening, symptoms such as prolapsed masses, anal prolapse, and perianal dampness and itching seriously affect patients' normal work and social activities. In addition, although the course of RP is progressive, patients at any stage of the disease are at risk for prolapse of the intestinal segment impaction or even necrosis \[1\]. Rectal incarceration severely impedes blood circulation and eventually leads to intestinal necrosis (Fig. 1). Therefore, once rectal intussusception is detected, urgent interventional surgery must be performed.

Incarcerated RP is a rare type of RP with the same pathologic and anatomic features as RP. Therefore, the surgical approach to incarcerated RP has evolved along with the surgical approach to RP. Currently, the two main categories of common clinical procedures are transperineal and transabdominal. However, the optimal surgical approach has always been controversial due to the incomplete clarity of the pathogenesis of incarcerated RP, low morbidity, and patient heterogeneity \[2\]. The mainstream view is that the Altemeier procedure with a transperineal approach is the most appropriate option for the treatment of incarcerated RP \[3\]. Unlike complete rectal prolapse, patients with incarcerated rectal prolapse have higher anal sphincter tone. In addition, local obstruction of venous reflux and vasodilatation of the intestinal segment cause a large amount of tissue fluid to accumulate in the incarcerated bowel, resulting in edema and thrombosis of the mucosal tissue and nerve plexus of the bowel. As a result, patients with incarcerated RP are more likely to have fatal complications such as anastomosis or even death after surgery \[4\]. Not only that, an epidemiological survey found \[5\] that the postoperative recurrence rate in patients with incarcerated rectal prolapse who underwent Altemeier's procedure in an emergency could reach 12%. Therefore, there is an urgent clinical need to optimize and improve the traditional Altemeier procedure to improve the safety and cure rate of incarcerated RP.

In our long-term clinical practice, we found that incarcerated RP is not only associated with edema of the rectal mucosa, but also of the mesentery (mesenteric edema can be seen when the incarcerated prolapsed bowel segment is dragged out after opening the Douglas sulcus during surgery, Fig. 2). Altemeier procedure involves operations such as anastomosis of the severed ends of bowel segments, however, intestinal mucosa and mesenteric edema increase the risk of intraoperative complications such as anastomosis. Meanwhile, we point out that the traditional Altemeier procedure only involves the resection of the redundant bowel segment, the elevation of the Douglas fossa, and the repair of the anal levator muscle. However, patients with rectal prolapse may have a dramatic change in the diameter of the distal and proximal bowel lumen at the site of intussusception. The traditional Altemeier procedure with only a single-layer manual anastomosis of the severed end is difficult to correct these abnormal anatomic changes. This may be another important reason for the occurrence and recurrence of complications after
Altemeier. To completely correct the anatomical defect of rectal prolapse, improve the success rate of incarcerated rectal prolapse treatment, and maximize the restoration of normal bowel function in patients with prolapse, this study modified the traditional Altemeier procedure. By summarizing the clinical recurrence rate, complication rate, postoperative anal function, quality of life, and other indicators of patients with incarcerated rectal prolapse who underwent Altemeier, this study investigated the clinical efficacy of the modified Altemeier procedure to provide new ideas and references for the clinical treatment of incarcerated rectal prolapse.

Methods and Results

1 Subjects

A total of 12 patients, 11 males, and 1 female, were included in this study. Age was 24–82 (Med42.08 ± MD15.95) years, previous medical history was 3–40 (Med19.92 ± MD13.43) years, and time from onset to admission was 0.5–26 (Med7.96 ± MD8.03) h. All patients in this group were combined with varying degrees of anal incontinence, with preoperative Wexner anal incontinence scores of 2–12 (Med7.50 ± MD8.03) and gastrointestinal quality of life scores of 2–30 (Med7.33 ± MD7.45).

2 Surgery procedure

2.1 Preparation

Complete ancillary tests such as blood biochemistry, infection, and cardiopulmonary tests in the emergency room to understand the patient's systemic condition. Exclude contraindications to surgery such as cardiovascular disease and coagulation disorders. If necessary, anti-infection, analgesia, and maintenance of water-electrolyte balance should be provided.

2.2 Modified Altemeier procedure

The Altemeier procedure was chosen for this study to treat incarcerated rectal prolapse. 12 patients were treated without additional prophylactic fecal diversion. The surgery was performed by the same physician. The procedure is as follows: after anesthesia, 6 stitches are placed in the perianal area to fully expose the area and the prolapsed intestinal segment; the rectum is fixed by clamping the tip of the rectum with Alls forceps, and the pre-excision line is marked with an electric knife in the rectal mucosa 2–3 cm above the incarcerated prolapsed intestinal tube; To reduce bleeding, an ultrasonic knife was used to separate the rectal mucosa layer by layer along the marker line to the muscular layer and preserve the 3 cm rectal muscle sheath(Fig. 3). The outer layer of the rectum is thick and the inner layer of the intestine is thin and the tissue boundary is not clear. During the operation, the surgeon needs to separate carefully to avoid damaging the inner intestinal canal; at the same time, the rectal mesenteric thrombus should be cleared in time to prevent the occurrence of postoperative anastomotic bleeding. The descending pelvic floor peritoneum is opened completely in front of the surgical view. 7-gauge suture traction is applied to prevent retraction. Use an ultrasound knife to expand to both sides. After opening
the peritoneum and posterior rectal mesentery, the outer layer of the bowel is opened along the marked line to both sides and the outer layer of the prolapsed rectum is turned downward. The prolapsed inner rectum and part of the sigmoid colon are freed and revealed. The rectosigmoid colon is pulled outward toward the anus to its maximum extent. The pelvic floor is reconstructed and elevated using a 3 − 0 absorbable wire to adequately elevate and close the rectal bladder trap (or recto-uterine trap). Anal levator plication repair is performed posteriorly to the rectum using 2 − 0 absorbable threads. A point approximately 3–5 cm from the closed pelvic floor is selected in a tension-free state as the proximal medial bowel pre-excision line, and the proximal bowel is dissected along the pre-excision line. Finally, a double-layer manual anastomosis was performed between the proximal and distal segments. The double "sleeve" anastomosis was performed as follows: after interrupted suturing of the proximal intestinal plasma muscle layer and the internal sphincter muscle layer of the rectal stump, a second layer of anastomosis was performed between the proximal intestinal mucosa layer and the mucosa layer of the rectal stump.(fig. 4)

2.3 New anomalous anatomy detection method

After intraoperative resection of the specimen, the distal and proximal diameters were measured using a specimen measuring tape.(Fig. 5)

3. Results

3.1 Basic information about the perioperative period

All 12 patients underwent a modified Altemeier procedure, and none of them had a combined colostomy or ileostomy during the operation. The intraoperative bleeding volume was 15–20 (Med20.83 ± SD7.71) ml; the operative time was 140–260 (Med172.50 ± SD57.70) min; and the hospital stay was 6–44 (Med16.75 ± SD9.61) d.

<table>
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<tr>
<th>Wexner anal incontinence score</th>
<th>mean ± SD</th>
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<th>P value</th>
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<td>preoperative</td>
<td>7.5 ± 4.01</td>
<td>2.649</td>
<td>0.023**</td>
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<tr>
<td>The last postoperative follow-up</td>
<td>4.75 ± 3.42</td>
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Table 2

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<th>Life quality score for anal incontinence before and after surgery</th>
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<tr>
<td><strong>ED5Q5L</strong></td>
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<td>Quality of life score</td>
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<td>preoperative</td>
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<td>The last postoperative follow-up</td>
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3.2 Postoperative Complications and Recurrence

All patients were treated successfully. There were no fatalities during the perioperative period, and one patient had a major anastomotic hemorrhage on the fourth postoperative day. The patient recovered and was discharged after emergency suturing to stop the bleeding. The average follow-up time was 24 months, and no recurrence was observed in all cases.

3.3 Comparison of preoperative and postoperative anal function and quality of life of patients

The results of the final follow-up showed a significant reduction in Wexner anal incontinence scores and a significant improvement in quality-of-life scores in all patients (Table 1,2).

Discussion

RP has a long course and is often associated with clinical symptoms such as anal incontinence, perianal dampness, and constipation, which severely affect patients' quality of life [6]. RP is rare in colorectal surgery [7], leading to slow progress in research on its etiology and treatment. The pathogenesis of RP is unclear. Parks et al. suggested that electrophysiological and histological abnormalities or injuries such as weak pelvic floor support levels, and denervation of the anal levator and anal sphincter may be the main cause of its development [8]. It has also been suggested that prolonged and repeated rectal prolapse stretching may also result in muscle or connective tissue damage, and reverse sphincter spasm with incarcerated RP [9–10]. In mild cases of incarcerated RP, blood circulation is affected and intestinal necrosis occurs. Severe cases can endanger the life of patients. Therefore, once incarcerated RP occurs, it is urgent to perform the manual correction. At the same time, the patient was given conservative medical treatment such as improving circulation, eliminating edema, and intravenous nutritional support, and elective surgery was performed. However, the success rate of manual reduction of incarcerated RP is not high, and it is easy to relapse after successful reduction. Therefore, the main treatment for incarcerated RP is surgical release of the incarcerated propped bowel segment, repair of muscle injury, and strengthening of pelvic floor support.

There are hundreds of surgical approaches for incarcerated RP, but each of them has certain drawbacks. Altemeier's procedure is one of the representative procedures of the trans-perineal approach. Based on the theory of "sliding hernia", the Altemeier procedure requires resection of the long prolapsed rectosigmoid
colon, reconstruction and elevation of the pelvic floor peritoneum due to prolapse, and repair of the anal levator muscle without affecting the normal physiological function of the body. The Altemeier procedure is commonly used to treat patients with rectal prolapse >5 cm in length, incarcerated, necrotic, or anal incontinence. The 12 patients included in this study were all patients with incarcerated rectal prolapse with varying degrees of edema or necrosis. The average length of prolapse was 13.42 cm and no small bowel hemia was seen on preoperative examination, so the Altemeier procedure was more appropriate.

The traditional view is that the Altemeier procedure via perineal approach can reduce the risks and complications of transabdominal surgery such as abdominal infection and intestinal adhesions, and the complication rate is significantly lower than that of the transabdominal approach. However, according to the survey, the incidence of complications of the Altemeier procedure is about 10%-20%. We believe that neglecting the Altemeier procedure anastomotic approach and site may be the main reason for the high incidence of complications. In particular, the prolapsed rectum in patients with incarcerated RP is severely necrotic and more ill-defined, resulting in residual necrotic bowel even after Altemeier. This would further increase the incidence of postoperative anastomosis and other complications. In addition, we found that patients with incarcerated RP have more brittle intestinal mucosa and are often associated with extensive mucosal edema, thrombosis, and varying degrees of rectal mesenteric edema. Rectal mesenteric edema may further increase the probability of complications such as anastomotic tears and anastomotic leaks. Most importantly, by looking at specimens resected after Altemeier, we found that all patients with rectal prolapse may have another abnormal anatomical defect - pathological distal rectal dilatation, i.e., a drastic change in the diameter of the intestinal lumen at the site of prolapse overlap, with excessive distal and proximal differences. Prolonged passive dilatation of the distal segment of the prolapsed bowel can lead to damage and thinning of the muscle fibers of the bowel wall. At this point, surgical management of incarcerated RP may increase the theoretical risk of anastomotic failure. Based on the above research basis, this study proposes to improve the traditional Altemeier procedure in terms of repairing the existing anatomical defects of incarcerated RP and reducing the rate of complications.

First, the modified Altemeier procedure was chosen to circumferentially dissect the rectal mucosa 1.5 cm from the dentate line. The length of the peeled mucosa was greater than the length of the anal canal, and the plane of peeling was located above the dentate line, aiming to avoid the hemorrhoidal area to reduce the risk of bleeding during anastomosis; At the same time, a muscle sheath of about 3 cm is preserved to improve postoperative anal function and to provide a basis for subsequent anastomosis. It is important to note that the intestinal canal of patients with prolonged incarcerated rectal prolapse is often edematous, congested, and dilated. The surgeon should determine the pre-excision line according to the demarcation line between the incarcerated necrotic bowel and the normal bowel to ensure that there is no residual necrotic bowel to avoid complications. Second, we innovated the "sleeve" tension-free anastomosis method. On the one hand, the anastomosis site is usually surrounded by the anal sphincter, anal levator, and pelvic floor muscles. The muscle layer of the intestinal wall increases the adhesion width of the anastomosis site and strengthens the protection of the anastomosis. The tubular scar
formed by the double "sleeve" anastomosis further thickens the weak distal muscular layer of the intestinal wall and improves its ability to resist intra-abdominal pressure. On the other hand, this sleeve-type thickening anastomosis is located just below the elevated pelvic floor peritoneal reflex. Thus, it allows circumferential reduction of the distal pathologically dilated bowel and also further reduces the terminal bowel lumen, thus solving the problem of difficult circumferential reduction of the dilated lower rectum and reducing the occurrence of complications such as anastomotic tears in the traditional procedure. The results of the present study also showed that the complication rate in patients undergoing the modified Altemeier procedure (8.33%) was significantly lower than the results of the previous studies mentioned above. Only one patient experienced anastomotic hemorrhage due to premature diet 4 d after surgery. No other sequelae were caused after the emergency suture ligation procedure to stop bleeding. The anastomotic hemorrhage was mainly associated with premature bowel movements, poor quality of the anastomosed bowel (inflammation, edema, etc.), and local dehiscence due to high anastomotic tension. Finally, we advocate that patients routinely have postoperative indwelling anal drainage, antibiotics against infection, and a slowly advancing diet to provide sufficient time for anastomotic scar formation. The above postoperative management measures may have contributed to the higher mean number of days of hospitalization in patients in this study compared with previous studies.

The present study also found that the modified Altemeier procedure was effective in reducing the postoperative recurrence rate. Sean C. Glasgow et al. reported a median time to recurrence of prolapse after traditional Altemeier surgery of 13 months and a recurrence rate of 8.5% [16]. Ram E suggested that recurrence was associated with pelvic floor insufficiency and failure to perform anorectoplasty [17]. Scott R et al. suggested that recurrence may be related to inadequate resection of the prolapsed bowel segment or low anastomotic tension [18]. We believe that the modified Altemeier procedure provides better resistance to abdominal pressure and therefore has a significantly lower recurrence rate. However, the present study is a single-center, small sample with short-term follow-up, and there is a lack of long-term follow-up results of more than 10 years, which makes it difficult to accurately confirm whether the modified Altemeier procedure can completely avoid postoperative recurrence and reduce the complication rate of incarcerated rectal prolapse. To clarify the true recurrence and complication rates, multi-center, large sample, and long-term follow-up studies are needed for further validation.

This study also showed that the modified Altemeier procedures significantly improved the anal function of patients. Studies have shown that patients with rectal prolapse tend to have varying degrees of anal incontinence [19–20], and the etiology of fecal incontinence in these patients is unknown. It has been suggested that this may be related to impaired pelvic autonomic nerves in patients with rectal prolapse, but opposing views suggest that the inhibition of the internal anal sphincter by the prolapse itself may only be a contributing factor to fecal incontinence [21]. The results of the current study showed that although the modified Altemeier procedure promoted the recovery of anal incontinence and improved the quality of life in patients with incarcerated rectal prolapse, it was difficult to fully restore the patients' self-control of stool. However, this treatment effect was significantly better than previous research results [22]. We believe that this may be due to the modified Altemeier procedure, which focuses more on the
protection of the muscular sheath. In addition, the "sleeve" double-layer anastomosis allows for suspension and "disconnection" of the rectum, preserving the normal elasticity and compliance of the rectal wall. In addition, the modified Altemeier procedure is performed on the dentate line to protect the defecation receptors. Finally, the modified Altemeier procedure combined with the anal levator maximally helped to improve postoperative anal function [23]. However, patients with incarcerated RP were treated with emergency surgery, so objective indices such as anal manometry have not been included in this study. Future studies should include more objective tests to further investigate the effect of traditional versus modified Altemeier procedure on the restoration of anal function.

In conclusion, this study indicates that the modified Altemeier procedure is effective in preventing postoperative complications and recurrence of incarcerated rectal prolapse and may be the procedure of choice for incarcerated rectal prolapse. In addition, the modified Altemeier procedure is more effective than the traditional Altemeier procedure in improving the patient's bowel control and quality of life, but the average length of stay in the hospital is longer.

Declarations

Disclaimers: There is no conflict of interest among the authors.

Funding/Support: None reported.

Authors' contributions: Benjun Wang and Weiwei Han contributed the central idea, analysed most of the data, and wrote the initial draft of the paper. Yuze Zhai conceived of the study, designed the study and collected the data. All authors analysed the data and were involved in writing the manuscript.

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Authors' Contributions: All authors were involved in this study. Yuzhe Zhai wrote the manuscript; Benjun Wang and Weiwei Han provided technical support; Bianfang Yu and Congcong Liu analyzed the data; Qianfu Gao and Shanchao Wang reviewed the manuscript, and Yuting Fang edited the surgical photos and videos.

Conflict of interest statement: All studies conducted in this study involving participants were conducted following the ethical standards of the Medical Ethics Committee of the Affiliated Hospital of Shandong University of Traditional Chinese Medicine and the 1964 Declaration of Helsinki and its subsequent amendments or similar ethical standards. In this study, we obtained written informed consent from the participants themselves.

Funding: No applicable. I have had full access to all the data in the study (if applicable) and thereby accept full responsibility for the integrity of the data and the accuracy of the data analysis.
Ethics approval and consent to participate: All studies involving participants in this study were conducted in accordance with the ethical standards of the Medical Ethics Committee of the Affiliated Hospital of Shandong University of Traditional Chinese Medicine and the 1964 Declaration of Helsinki and its subsequent revisions or similar ethical standards. This study was approved by the Medical Ethics Committee of the Affiliated Hospital of Shandong University of Traditional Chinese Medicine. Also, all patients in this study were older than 16 years of age, and all patients included in the study had consent from their families or guardians. Patients and their families were informed of the study content and signed an informed consent form.

References


**Figures**
Figure 1

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Figure 2

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Figure 3

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Figure 4

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