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ORIGINAL ARTICLE**Case Control Study**

- 14 Alternative to mesh repair for ventral hernias: Modified rectus muscle repair
Naraynsingh V, Cawich SO, Hassranah S

CASE REPORT

- 22 Endoscopic intermuscular dissection for locally advanced rectal cancer: A case report
Sekra A, Tan T

ABOUT COVER

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Case Control Study

Alternative to mesh repair for ventral hernias: Modified rectus muscle repair

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Abstract

BACKGROUND

Mesh utilization for ventral hernia repair is associated with potential complications such as mesh infections, adhesions, seromas, fistula formation and significant postoperative pain. The modified rectus muscle repair (RMR) is as an option to repair midline ventral hernias without mesh.

AIM

To evaluate the short term outcomes when the modified RMR was used to repair ventral hernias.

METHODS

This was a 5-year prospective study that examined the outcome of all consecutive patients with ventral abdominal wall hernias > 5 cm in maximal diameter who underwent repair using the modified RMR technique in a single surgeon unit. Patients were reviewed in an outpatient clinic at 3, 6 and 12 mo and evaluated for hernia recurrence on clinical examination. Each patient's abdominal wall was also assessed with using ultrasonography at 24 mo to detect recurrences. All data were examined with SPSS ver 18.0.

RESULTS

Over the 5-year study period, there were 52 patients treated for ventral hernias at this institution. Four patients were excluded and there were 48 in the final study sample, at a mean age of 56 years (range 28-80). The mean maximal diameter of the hernia defect was 7 cm (range 5-12 cm). There were 5 (10.4%) seromas and 1

recurrence (2.1%) at a mean of 36 mo follow-up.

CONCLUSION

The authors recommend the modified RMR as an acceptable alternative to mesh repair of ventral hernias. The seroma rate can be further reduced with routine use of drains. The modified RMR also has the benefit of eliminating all mesh-specific complications.

Key Words: Ventral; Hernia; Mesh; Complication; Recurrence

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Core Tip: Mesh utilization for ventral hernia repair is associated with potential complications such as mesh infections, adhesions, seromas, fistula formation and significant postoperative pain. Using the modified Rectus Muscle Repair results in 10.4% seromas, which can be further reduced with routine use of drains. Using the modified Rectus Muscle Repair results in 2.1% recurrences at a mean of 36 mo follow up. The modified Rectus Muscle Repair is as an option to repair midline ventral hernias without mesh.

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INTRODUCTION

In the 21st Century, most surgeons use mesh to repair midline ventral hernias in an attempt to lower recurrence rates[1]. However, mesh utilization is associated with potential complications such as mesh infections, adhesions, seromas, fistula formation and significant postoperative pain[2-7]. These have resulted in numerous lawsuits[8]. Moreover, in low and middle-income countries, both the cost of mesh and its inconstant availability are additional factors that limit its utilization.

The rectus muscle repair (RMR) was described in 1993 as an option to repair midline ventral hernias without mesh[9]. However, we noticed that this technique could not be applied to hernias > 6 cm in maximal diameter, and this prompted our development of a modified RMR, described in detail in a previous report[10].

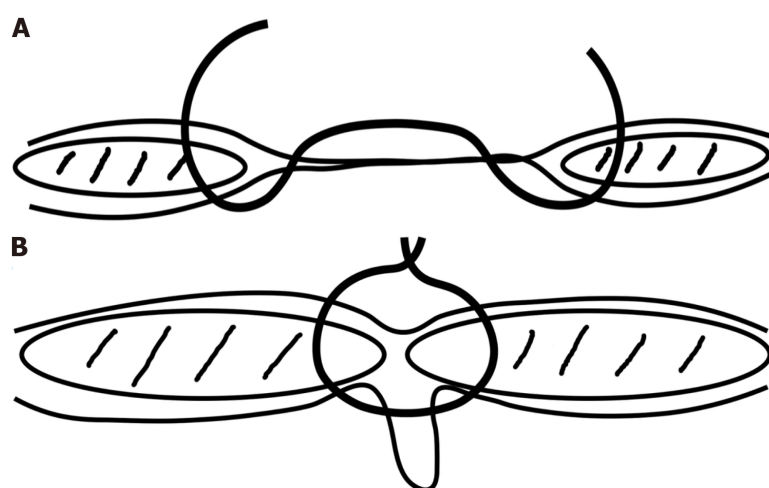
The short-term recurrence and complication rates of the modified RMR are largely unknown, and this paper will make them clear. We carried out this study to evaluate the short-term outcomes when the modified RMR was used to repair ventral hernias.

MATERIALS AND METHODS

This study was approved by the local institutional review board and performed at a tertiary referral hospital in Trinidad & Tobago, an island state in the Eastern Caribbean. This was a prospective study that spanned a period of 5 years, from January 1, 2015 to December 30, 2019. All consecutive patients who were referred to the surgical department with diagnoses of a ventral abdominal wall hernia were potential candidates for the study. We included all those who were above the age of 18 years, had hernia defects > 5 cm in maximal diameter, and consented to participate. Exclusion criteria included patients who were less than 18 years of age, did not consent to participate, had hernia defects larger than 15 cm in maximal diameter that did not allow primary closure, and those who desired mesh repairs. We collected the following data from all patients who underwent repair using the modified RMR technique in a single surgeon unit: patient demographics, complications, mortality and recurrences. Patients were reviewed in an outpatient clinic at 3, 6 and 12 mo and evaluated for hernia recurrence on clinical examination. Each patient's abdominal wall was also assessed with using ultrasonography at 24 mo to detect recurrences. All data were examined with SPSS ver 18.0.

Technique

The RMR technique has already been described in detail in a previous publication[9]. The technique focused on bringing the recti together in the midline by full thickness nylon sutures through the anterior sheath, rectus muscle and posterior sheath on one side and continued through the posterior sheath, muscle and anterior sheath of the opposite side (Figure 1A). Thus, when brought together, the hernia sac and attenuated linea alba are inverted ventrally towards the peritoneal cavity (Figure 1B); the sac is not opened unless multiloculated. The inversion resembles the Keel operation but the major difference is that the suture must engage more than 1cm of rectus muscle and its sheaths whereas the Keel engages the 'fibroaponeurotic' tissue around the hernia.



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Figure 1 Rectus muscle repair technique. A: The suture engages full thickness of rectus abdominis muscle and its anterior and posterior sheaths; B: When pulled together, the recti assume a midline position, inverting the attenuated linea alba and hernia sac.

The suture bites engage 1.5-2 cm of rectus sheath and muscle on each side and successive bites are 1.5cm apart. The anterior sheath is dissected to expose 3-4 cm lateral to the medial margin of the rectus muscle; this allows enough space for suturing the muscle as well as incising the anterior sheath, not the muscle (Figure 2). In this center, we used the modified RMR technique previously described[10], where relaxing incisions were made in the anterior rectus sheath (Figure 3) in an attempt to reduce tension on the suture line. The anterior sheath relaxing incision did not extend > 1 cm below the umbilicus because the posterior rectus sheath was deficient below this point. This differs from the Ramirez procedure in that (1) the dissection is not carried far laterally to the lateral border of the rectus muscle; and (2) the relaxing incision is in the anterior rectus sheath, not the external oblique aponeurosis. Haemostasis was achieved and a subcuticular suture was placed to close skin. For large defects, a subcutaneous drain was used. This was strictly an observational study and the attending surgeon was solely responsible for clinical decisions.

RESULTS

Over the 5-year study period, there were 52 patients treated for ventral hernias at this institution. Four patients were excluded due to a desire to have mesh repair (2) and large hernias defects (15 cm and 17 cm) that did not allow primary suture closure (2). The final study sample, therefore, was 48 patients with ventral hernias. These included umbilical hernias (15), para-umbilical hernias (12), supra-umbilical (9) and incisional (12).

There were 48 patients in the final study sample, at a mean age of 56 years (range 28-80). Of this 46 patients had elective repairs and 2 patients with paraumbilical hernias had emergency repairs after presenting with strangulation. The mean maximal diameter of the hernia defect was 7 cm (range 5-12 cm); see distribution in Table 1.

Abdominal drains were used in 30 patients. Eighteen patients had no drains placed, at the decision of the attending surgeon, and 5 of these patients developed clinically significant seromas, requiring aspiration between post-operative days 7-14. There were no seromas in the sub-group in which drains were used. There were no haematomas detected and no other complications were recorded in any patients.

The mean follow up time was 36 mo (range 12-60 mo). There was 1 (2.1%) recurrence diagnosed on clinical examination at the eight post-operative month in a patient who underwent incisional hernia repair. On reoperation, the nylon suture line was intact; the defect had recurred lateral to it, near the umbilicus. The suture had not engaged the muscle and its two sheaths - an error in technique.

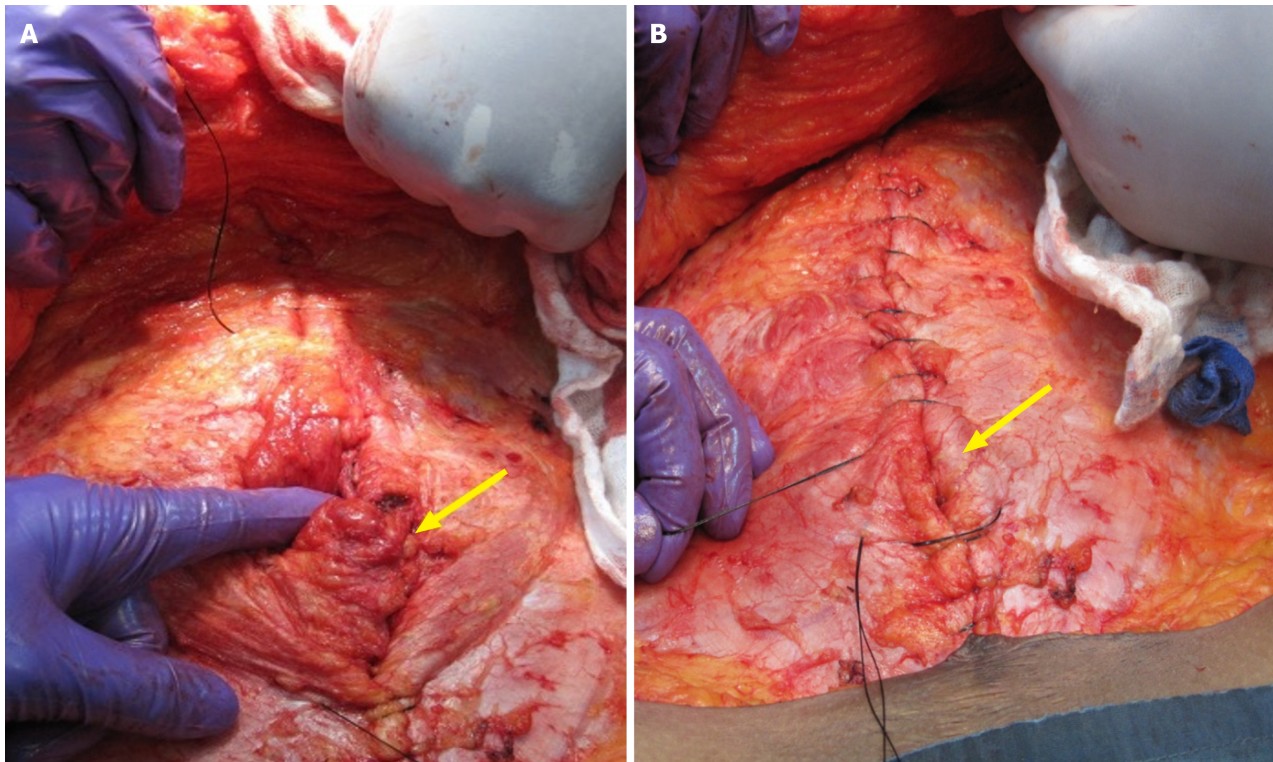
DISCUSSION

Hernia repairs were initially done using sutures to close the defect primarily, but the problem of recurrence eluded surgeons. Theodore Billroth[11] in 1890 first postulated that a prosthesis could be used to close the defect but, at that time, mesh repair was met with high complication rates[11,12]. At that time the quality of material used, the absence of haemostatic devices and paucity of antibiotics would have contributed to the high complication rate. In 1958, Francis Usher published his research on the more inert polypropylene mesh and it was adopted as the gold standard of hernia repair compared to primary suture repair[12,13]. Mesh has become so widely accepted that Pawlak *et al*[1] reported that it was used in 75% of all hernias repaired in the United Kingdom in the year 2020.

While we agree that the use of mesh in ventral hernia repair generally reduces the rate of recurrence when compared to non-mesh repair [14], we also note that many of the existing non-mesh techniques focus on accurately placing non-

Table 1 Type, size and number of hernias

Hernia type	No.	Mean diameter
Umbilical	15	6 cm
Paraumbilical	12	7 cm
Supraumbilical	9	9 cm
Incisional	12	8 cm



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Figure 2 The hernia sac and attenuated linea alba are inverted by placing full-thickness sutures to approximate the rectus abdominis muscles (arrows). A: The sutures incorporate the anterior and posterior sheaths en masse including the medial 1-1.5 cm of the muscle; B: All attenuated midline tissues are therefore eliminated (by inverting them).

absorbable sutures in the linea alba 1cm from the midline[15]. In our opinion, this is not ideal because the linea alba in patients with hernias is often already attenuated and quite wide. We agree with Naraynsingh *et al*[16] who wrote “it seems logical that a repair which eliminates the linea alba should minimise the risk of recurrence.”

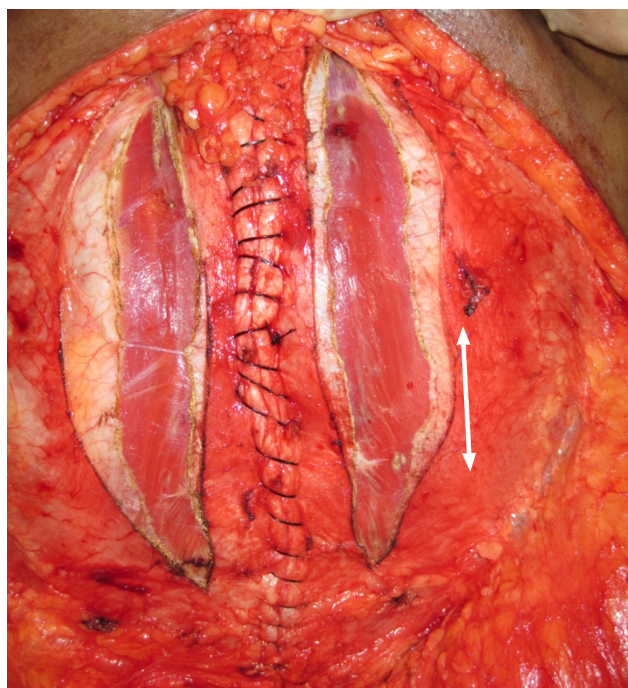
The Rives-Stoppa repair is the main technique when mesh is utilized, but it is a challenging operation[17] and may not always be accurately reproduced. Additionally, there are two issues that deserve further consideration before mesh is used for ventral hernia repair: Mesh complications and mechanism of recurrence.

Mesh complications

Mesh infection remains a concern despite aseptic technique and perioperative antibiotic prophylaxis[4,5,18,19]. Perioperative antibiotics reduce, but do not eliminate, mesh infections. Rios *et al*[18] reported that mesh infections reduced from 26.3% to 13.6% when peri-operative antibiotics were administered to patients who underwent mesh repairs of incisional hernias. Apart from the fact that many patients who develop hernias already harbour conditions that predispose to infections, such as obesity, increased age, diabetes and/or a history of smoking[4,20,21], the mere presence of a foreign body reduces the number of bacteria needed to cause an infection by 100000[22,23].

Adhesion formation with bowel involvement can lead to obstruction[24] and abdominal pain[25] in these patients. Aubé *et al*[26] reported that significant adhesions form after 14% of mesh hernia repairs.

The mesh can also lead to irritation and post-operative pain. Chronic post-operative pain, persisting for > 3 mo, occurs in 11%[7] to 17%[27] of patients after ventral hernia repairs. This results in poor function and reduced quality of life in 10%[28] to 26%[28] of patients after undergoing mesh hernia repair, and up to 13% of patients need occasional analgesics up to 4 years after the procedure[28].



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Figure 3 Relaxing incisions are made in the anterior rectus sheath in order to reduce tension on the suture line.

The incidence of seromas was reported by Bauer *et al*[29] to be 5% with polytetrafluoroethylene mesh and Molloy *et al* [30] reported 4% incidence of seromas and 2% incidence of haematomas with Marlex® mesh. In our study, we did not encounter any haematomas. The incidence of seromas was greater than expected (10.4%), although we noted that these occurred only when drains were omitted. A reasonable further modification could be the routine use of drains as there is no risk of prosthesis infections.

Fistula formation is a relatively rare complication of mesh use, but when it occurs it is a devastating complication[5,6].

In addition to these known complications, the cost of the mesh and the price of treating these complications are yet to be addressed and quantified[2-7]. Given the number of complications associated with mesh repairs, a dedicated legal industry dedicated has developed. In 2011, C.R. Bard was made to pay USD\$184 million to settle approximately 3000 cases of mesh failure[8]. This was the largest case of this type but in November 2019, there were over 7000 similar lawsuits pending against Ethicon, Atrium and Bard[31]. There is no established method to quantify the burden of stress to the patients and surgeons dealing with these legalities, but we firmly believe that the money and time spent to settle these lawsuits should be taken into account before a decision is made to use mesh in ventral hernia repairs.

We also suggest that this decision should also include the cost of care to treat mesh complications. Plymale *et al*[32] identified 34 patients who had ventral hernia repair and subsequent mesh removal. The median cost was approximately double for the removal than for the ventral hernia repair, and the majority of patients developed recurrences.

Mechanisms of hernia recurrence

Midline ventral hernias recur through the linea alba, almost never through the rectus muscles with their anterior and posterior sheaths. It seems logical that the modified RMR which eliminates the linea alba should minimise the risk of recurrence. This study documented that there was a 2.1% recurrence rate after the modified RMR. Additionally, we consider the single recurrence in this series to be due to a technical failure since the recurrence occurred at an area where the sutures did not engage the anterior sheath, rectus muscle and posterior sheath en masse.

Mesh repairs, on the other hand, do not focus on elimination of the defective linea alba. It was not surprising, therefore, that the surgical literature reported greater recurrence rates after mesh repairs, ranging from 2.7%-20%[3,4,7,33,34]. In our opinion this was predictable, considering that recurrence following mesh repair does not occur through the rectus abdominis muscle nor through the mesh itself. Recurrences occur through the linea alba, above, below or beside the mesh.

Modified RMR repair

Although the European Hernia Society and American Hernia Society recommend use of mesh in the umbilical and epigastric hernias more than 1 cm in size[35], many authors have demonstrated the feasibility of successful non-mesh repair in much larger hernias. Ramirez showed that component separation may allow closure of large defects (up to 35 cm) without using prostheses[36]. Using this technique as a modification, Girotto *et al*[37] were able to achieve a recurrence rate of 6% in 30 patients and Shestak *et al*[38] reported 5% recurrence rate in 22 patients with 6-14 cm defects after 52 mo follow up. Thus, in spite of the general recommendations, it is possible to achieve acceptable results without using mesh, but none of these emphasize muscular approximation with elimination of the linea alba as we are

advocating.

This study has demonstrated that the modified RMR technique carries a lower morbidity risk than the surgical literature reports for mesh ventral hernia repairs[4,7,19,24,27] and avoids the financial and medico-legal ramifications associated with mesh complications[8,31]. With a low morbidity profile and 2.1% recurrence after 36 mo mean follow-up, we suggest that the modified RMR technique should be seriously considered as a viable option for ventral hernia repair.

CONCLUSION

The modified RMR is an acceptable alternative to mesh repair of ventral hernias. The technique carries a 10.4% seroma rate, but this can be further reduced with routine use of drains. The modified RMR also has the benefit of eliminating all mesh-specific complications.

ARTICLE HIGHLIGHTS

Research background

This study examined the use of a novel procedure to repair ventral hernias without the use of prosthetic mesh. This is a newly described technique.

Research motivation

Mesh utilization for ventral hernia repair may potentially lead to mesh infections, adhesions, seromas, fistula formation and postoperative pain. If the modified Rectus Muscle Repair technique is shown to be effective and safe, then it may lead to the omission of mesh in patients with ventral hernias.

Research objectives

The objective of this study was to examine the short term outcomes of all consecutive patients with ventral abdominal wall hernias > 5 cm in maximal diameter who underwent repair using the modified rectus muscle repair (RMR) technique in a single surgeon unit.

Research methods

A 5-year prospective study was undertaken to examine the outcome of all consecutive hernia repairs using the modified RMR technique. Patients were reviewed in an outpatient clinic at 3, 6 and 12 mo and evaluated for hernia recurrence on clinical examination. Each patient's abdominal wall was also assessed with using ultrasonography at 24 mo to detect recurrences. All data were examined with SPSS ver 18.0.

Research results

There were 52 patients treated for ventral hernias, and 4 were excluded, leaving 48 in the final study sample, at a mean age of 56 years (range 28-80). The mean maximal diameter of the hernia defect was 7 cm (range 5-12 cm). There were 5 (10.4%) seromas and 1 recurrence (2.1%) at a mean of 36 mo follow-up.

Research conclusions

This study proposes that the modified RMR can be used as an acceptable alternative to mesh repair of ventral hernias. The new method that this study suggests is the routine use of drains to reduce seroma rates

Research perspectives

Further study of larger case series is warranted since this early research shows encouraging results.

FOOTNOTES

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Endoscopic intermuscular dissection for locally advanced rectal cancer: A case report

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Abstract

BACKGROUND

Endoscopic submucosal dissection is considered curative for patients with early rectal cancer when level of submucosal invasion is < 1000 microns with favourable histopathological features. Recent data suggests even deeper submucosal invasion can potentially be curative if R0 resection can be achieved and when no high-risk histopathological features are seen in the resected specimen. To achieve R0 resection, deeper dissection is required.

CASE SUMMARY

A 66 year old New Zealand European male presented with 3 mo history of per rectal bleeding. He was referred for a colonoscopy test to investigate this further. This revealed a malignant appearing lesion in the rectum. Biopsies however showed high grade dysplasia only. Given endoscopic appearances suspicious for deep submucosal invasion, patient was consented for endoscopic intermuscular dissection (EID). The case was successfully performed, and the presence of muscularis propria was confirmed in the resected specimen. There were no complications and total procedure time was 124 min. Lesion was clear of radial margins however deep margins were positive confirming it was at least a pT2 cancer. Patient was recommended to have further treatment but could not have radical surgery due to comorbidities and instead was referred for long course chemoradiotherapy.

CONCLUSION

EID is a safe and feasible option for management of rectal cancer in highly selected patients.

Key Words: Endoscopic intermuscular dissection; Endoscopic submucosal dissection;

Rectal cancer; Interventional endoscopy; Case report

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Core Tip: Endoscopic intermuscular dissection is a novel technique for management of locally advanced rectal cancer especially for patients who are not fit for oncological surgery or chemoradiotherapy. This technique ensures local resection of the tumour which is safe and feasible with minimal recovery times.

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INTRODUCTION

Endoscopic submucosal dissection (ESD), for early rectal cancer, is considered a curative option for patients. It is an organ preserving surgery with higher rates of en bloc resection and lower risk of local recurrence compared with endoscopic mucosal resection[1]. It is significantly cheaper than radical surgery, with significantly fewer days in hospital and has lower morbidity and mortality[2-4].

Early rectal cancer is defined as T1 cancer with invasion < 1000 microns into the submucosa (SM) or SM1 Kikuchi levels, as the risk of nodal metastasis is close to 0%. ESD is considered curative for these lesions[5].

Recent European Society of Gastrointestinal Endoscopy guidelines also recommend that an en bloc R0 resection of a superficial lesion with histology no more advanced than well-differentiated adenocarcinoma (G1/G2), sm1 (< 1 mm SM invasion) with no lymphovascular invasion (LVI), would be considered curative. Surgery, on the other hand, is recommended when LVI (deeper infiltration than SM1), positive/ non evaluable vertical margins, or poorly differentiated tumour with SM invasion is diagnosed[6]. However, more recent data suggests that the depth of SM invasion is not an independent risk factor for lymph node metastasis (LNM) in T1 colorectal cancer (CRC)[7]. Several studies have shown that in the absence of adverse histopathological risk factors, such as; poor differentiation, high tumour budding, LVI, and perineural invasion, the risk of LNM (regardless of depth of SM invasion) is extremely low[8-11].

With ESD the dissection plane is limited to SM. As a result, the vertical margins are more likely to be positive if the lesions invade deeper into the SM[12]. More recently, endoscopic intermuscular dissection (EID) technique has been described to achieve R0 resection for the management of lesions with deeper submucosal invasion[13,14].

EID technique has evolved from ESD. The principle of ESD is based on the dissection of the submucosal plane. EID, on the other hand, focuses on the dissection of the superficial circular muscle layer of the rectum, allowing the longitudinal layer to remain intact. This essentially means that the EID can achieve a deeper dissection compared to ESD.

CASE PRESENTATION

Chief complaints

A 66 year old New Zealand European male presented with per rectal bleeding.

History of present illness

Patient presented with 3 mo history of intermittent per rectal bleeding. He reported that the blood was often mixed in the stools. He did not report any history of changes in bowel habits or weight loss.

History of past illness

Patient has known history of ischaemic heart disease and he underwent a previous angioplasty. He has known congestive heart failure from ischaemic cardiomyopathy. He also had poorly controlled type 2 diabetes mellitus and is on insulin.

Personal and family history

There was no known personal or family history of bowel cancer.

Physical examination

A physical exam including a digital rectal exam was completely normal.

Laboratory examinations

Patient's full blood count, iron studies, and carcinoembryonic antigen were all normal.

Imaging examinations

The colonoscopy revealed a 30 mm rectal tumour, located 10 cm from anal verge, at the posterior wall of the rectum. The lesion was IIc/IIa lesion as per Paris classification (Figure 1A). There was a type Vn Kudo pit pattern in the area of the depression. Magnification virtual chromoendoscopy revealed a Narrow Band Imaging International Colorectal Endoscopic classification 3, Japan Narrow Band Imaging Expert Team classification 3 lesion (Figure 1B). Biopsies taken from the lesion showed high grade dysplasia only. The patient underwent a staging computed tomography scan which did not show any evidence of metastatic disease. Magnetic resonance imaging showed a T2N0M0 rectal lesion at the posterior wall.

An invasive cancer was suspected based on the endoscopic features. Consequently, the patient was referred to the colorectal surgeons for further management. Since initial biopsies had shown high grade dysplasia only, the patient underwent a second biopsy, which again showed high grade dysplasia. Due to the clinical suspicion of invasive cancer, the patient was then considered for radical surgery. Unfortunately, he had significant comorbidities and was therefore deemed an unsuitable candidate for radical surgery. He was further evaluated for a transanal minimally invasive surgery for accurate staging and diagnosis, but was deemed extremely high risk to even receive a general anaesthesia.

MULTIDISCIPLINARY EXPERT CONSULTATION

The case was discussed in the multidisciplinary team meeting and the consensus was to perform an endoscopic resection with a view to; confirm the diagnosis, accurately stage the disease, and to attempt a curative resection. Because a deep invasion was suspected, the patient was consented for an EID under conscious sedation.

FINAL DIAGNOSIS

Invasive rectal cancer.

TREATMENT

Patient underwent EID procedure. The procedure was performed under conscious sedation with midazolam and fentanyl. A standard gastroscope (Olympus GIF-HQ190, Olympus, Tokyo, Japan) with a transparent hood (Olympus, Tokyo, Japan) was used. Submucosal lifting was performed with a mixture of adrenaline, methylene blue, and hydroethyl starch (Voluven® 6%). A 1.5 mm dual knife J (Olympus, America) was used, with an endocut mode of the ERBE VIO 300D (ERBE Elektromedizin, Tübingen, Germany).

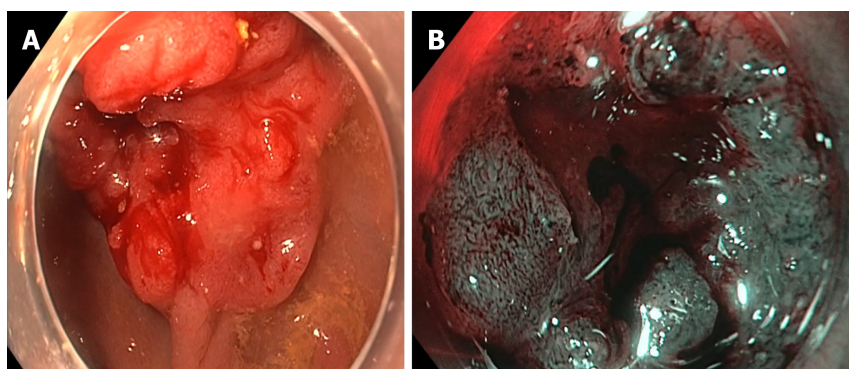
Firstly, a mucosal incision was created at the anal side of the lesion. Submucosal dissection was then performed in the same area. This was, however, stopped due to poor access and visualisation of the submucosal space. An incision was then made at the oral side and the circumferential incision was completed. The scope was entered into the submucosal space using the transparent hood. Significant fibrosis was encountered at this point. The fibrotic area was dissected (Figure 2A). The inner circular layer was visible at this point. An attempt was made to inject just above the muscle layer; however, this could not be achieved due to fibrosis. The inner circular layer was then dissected from the oral side to the anal side of the lesion, managing to keep the outer longitudinal layer intact (Figure 2B). The tumour was finally released from the muscle layer and was resected en bloc. The lesion was pinned on the cork and then submitted for histology (Figure 2C). The total procedure time was 124 min. The patient was given IV antibiotics intraoperatively and was discharged home after 2 h of observation. He received a one-week course of oral antibiotics. There were no immediate or delayed complications noted.

Figure 2A shows the significance of the fibrosis encountered during Endoscopic Intermuscular Dissection. After dissecting the fibrotic area, the inner muscle layer was dissected, keeping the outer longitudinal layer intact, as shown in Figure 2B. The tumour was released from the muscle layer and pinned on the cork board and submitted for histological analysis (Figure 2C).

The histology confirmed the presence of muscularis propria in the specimen. This is a low-grade adenocarcinoma, with absent LVI, absent perineural invasion and low tumour budding. The lesion was clear of peripheral margins by 7 mm. Vertical margins, however, confirmed infiltration of the tumour into the muscularis propria and were positive. This confirmed it as at least a pT2 lesion (Figure 3).

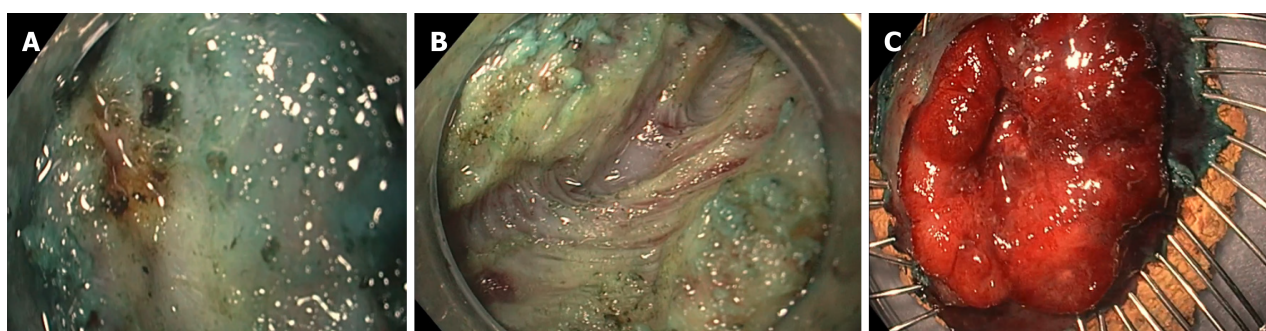
OUTCOME AND FOLLOW-UP

This histology was again discussed in a multidisciplinary meeting, and it was concluded that the patient will require additional treatment. He was referred for long course chemoradiotherapy, which he successfully completed without any side effects. A follow up colonoscopy, 6 mo after the resection, showed no residual disease. An MRI scan of the rectum was performed 9 mo after the resection and showed no recurrence of disease. After 9 mo of follow up, the patient had remained well, with no symptoms and no delayed complications from the EID procedure.



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Figure 1 Endoscopic image of the lesion. A: Lesion in white light. There is a central depression with Paris classification IIc/IIa; B: Vn type pit pattern corresponds to Narrow Band Imaging International Colorectal Endoscopic classification 3, Japan Narrow Band Imaging Expert Team classification 3 lesion.



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Figure 2 Lesion during dissection and after removal. A: Significant fibrosis encountered during endoscopic intermuscular dissection; B: After dissecting the fibrotic area, the inner muscle layer was dissected, keeping the outer longitudinal layer intact; C: The tumour was released from the muscle layer and pinned on the cork board and submitted for histological analysis.

DISCUSSION

EID was first described by Rahni *et al*[13] for resection of rectal lesions with significant fibrosis. It is a new technique where a dissection is carried out of the inner circular muscle layer in the intermuscular plane, while keeping the outer longitudinal layer in the rectum intact. A recent case series of 67 patients described this technique for resection of rectal cancers with suspected invasion beyond the SM1 layer. This series concluded that EID is a feasible technique, with a technical success of 96% and a safe procedure requiring no surgery in EID related complications. 12% of patients had minor adverse events[14].

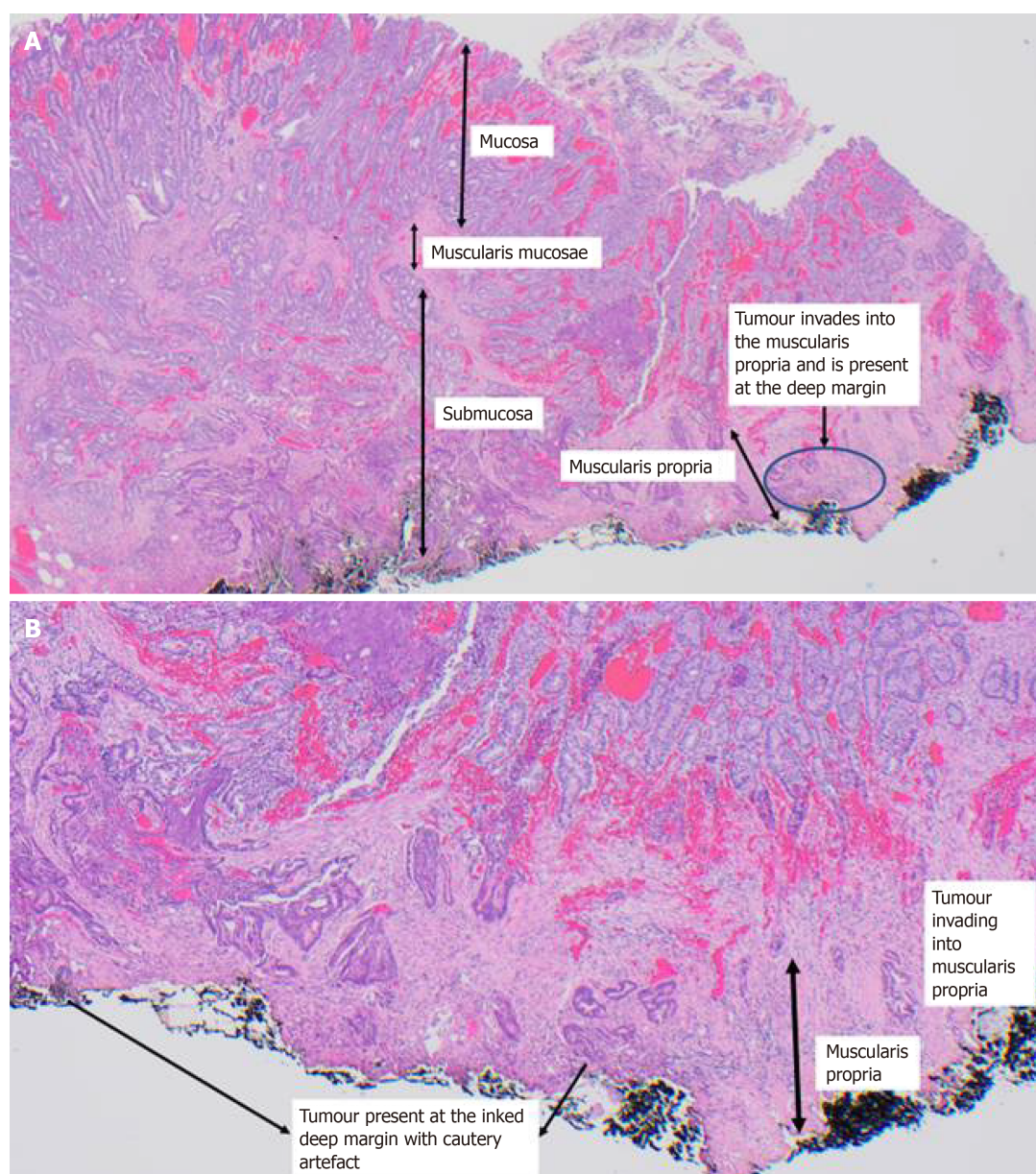
The case discussed above, was the first such procedure to be performed in New Zealand. Although the patient did not have R0 resection and ideally should have had radical surgery, his comorbidities meant that such surgery was prohibitive. Radical surgery can still be safely performed in low risk patients who have non curative ESD[15]. Our patient underwent long course chemoradiotherapy instead, with no disease recurrence after 9 mo of follow up.

There is preliminary data to suggest that patients who undergo local resection, followed by adjuvant chemoradiotherapy, can preserve their rectum and have better QoL[16]. A large, randomized trial (TESAR trial) is underway and results are awaited with interest[17]. This trial will consider this issue and, if positive, radical surgery might be avoidable for high risk patients in future.

A recent study evaluated the clinical outcome of non-curative ESD for early CRC. This study included 207 non-curative ESD cases and showed the tumour recurrence and disease specific survival rates were similar in patients who had radical surgery *vs* those who were followed up by endoscopy (after a median follow-up of 30 mo)[18]. Additional treatment decisions are often based on patient comorbidities and risks of additional treatment should be carefully weighed against the benefits. The patient discussed above was considered fit enough for long course chemoradiotherapy, with the aim to treat both the local residual disease and LNM if present.

CONCLUSION

This groundbreaking EID case, the first to be performed in New Zealand, highlights that this technique is an option worth considering for some patients. It is feasible and can be performed successfully, without any major complications, in



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Figure 3 Pathological analysis of the lesion. A: Endoscopic intermuscular dissection specimen, including muscularis propria. A low-grade adenocarcinoma invading into the muscularis propria as shown at the inked deep margin (at least pT2); B: Enlarged image of tumour invasion into muscularis propria.

highly selected lesions and patient groups. It can potentially offer curative local resection of rectal cancer despite deep submucosal invasion, showing favourable histopathological features in carefully selected patients.

FOOTNOTES

Author contributions: Sekra A performed the procedure and wrote the manuscript, Tan T reported the pathology and described the pathology figure in the manuscript.

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