Repair of Complex and Large Incisional Hernias: Comparison of Anterior Component Separation Technique and Modified Rives-Stoppa Technique

Karmaşık ve Büyük Kesi Fıtıklarının Onarımı: Ön Bileşen Ayırma Tekniği ile Modifiye Rives-Stoppa Tekniğinin Karşılaştırılması

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Abstract

Background	Incisional hernias are one of the common complications after abdominal surgeries. In this article, we compared the anterior component separation technique (ACST) and the modified rives-stoppa technique (MRST).
Materials and Methdos	The records of 78 patients who underwent surgery for large incisional hernia between January 2017 and December 2022 were reviewed. Patients who were followed for at least 1 year, had an abdominal defect larger than 10 cm and area loss ≥20% were included in the study. Immunosuppressive patients, patients with severe cardiac, respiratory and hepatic insufficiency were not included in the study. The patients were divided into two parts: mesh-supported ACST (group 1) and MRST (group 2). The groups were compared in terms of recurrence, complications, and other clinical features.
Results	33 patients in group 1 and 29 patients in group 2 were included in the study. The difference was seen between the two groups in terms of surgery time, postoperative hospital stay, number of drains, drain removal time, and return to normal life. In Group 2, the duration of surgery, postoperative hospital stay and return to normal life were shorter, the number of drains used was less, and the drains were removed earlier. The difference was seen between the two groups in terms of postoperative pain score (VAS). In Group 2, the pain score was lower on the 1st and 3rd days.
Conclusion	In conclusion, although there was no difference between the two groups in terms of recurrence and postoperative morbidities but a difference was found in terms of duration of surgery, postoperative pain, length of hospital stay and return to normal life in terms of cost-effective results.
Keywords	large incisional hernia, recurrent hernia, rives-stoppa, component separation technique

Özet

Arka plan	İnsizyonel herniler, abdominal cerrahilerden sonra sık görülen komplikasyonlardan biridir. Bu makalede, anterior komponent ayırma tekniği (ACST) ile modifiye rives-stoppa tekniğini (MRST) karşılaştırdık.
Gereç ve Yöntemler	Ocak 2017 ile Aralık 2022 arasında büyük insizyonel herni nedeniyle ameliyat edilen 78 hastanın kayıtları incelendi. En az 1 yıl takip edilen, 10 cm'den büyük abdominal defekti olan ve alan kaybı ≥%20 olan hastalar çalışmaya dahil edildi. Bağışıklık sistemini baskılayan hastalar, ciddi kardiyak, solunum ve karaciğer yetmezliği olan hastalar çalışmaya dahil edilmedi. Hastalar iki bölüme ayrıldı: mesh destekli ACST (grup 1) ve MRST (grup 2). Gruplar, tekrarlama, komplikasyonlar ve diğer klinik özellikler açısından karşılaştırıldı.
Bulgular	Grup 1'de 33 hasta ve grup 2'de 29 hasta çalışmaya dahil edildi. İki grup arasında ameliyat süresi, ameliyat sonrası hastanede kalış süresi, dren sayısı, dren çıkarma süresi ve normal hayata dönüş açısından fark görüldü. Grup 2'de ameliyat süresi, ameliyat sonrası hastanede kalış süresi ve normal hayata dönüş daha kısaydı, kullanılan dren sayısı daha azdı ve drenler daha erken çıkarıldı. İki grup arasında ameliyat sonrası ağrı skoru (VAS) açısından fark görüldü. Grup 2'de ağrı skoru 1. ve 3. günlerde daha düşüktü.
Sonuç	Sonuç olarak, iki grup arasında tekrarlama ve ameliyat sonrası morbidite açısından fark olmasa da, maliyet-etkin sonuçlar açısından ameliyat süresi, ameliyat sonrası ağrı, hastanede kalış süresi ve normal hayata dönüş açısından fark bulundu.
Anahtar Kelimeler	büyük kesi fıtığı, tekrarlayan fıtık, rives-stoppa, bileşen ayırma tekniği

INTRODUCTION

Incisional hernias occur in approximately 10 to 20 percent of patients who have abdominal surgery(1). It accounts for nearly 80% of all ventral hernias. Large incisional hernias are defined as hernias larger than 10 cm in diameter and with impact area loss >20%(2-4]). Incisional hernia occurs due to both patient and technical factors (5-7). Non-compliance with correct closure techniques, use of inappropriate suture material, wound infection are technical factors that increase the risk of incisional hernia; Comorbid diseases such as obesity, smoking, malnutrition, immunosuppressive therapy and connective tissue disorders are patient-related factors that prevent normal wound healing and increase the risk of incisional hernia(8-11). Continuous mass closure with slowly absorbable stitches and a 4:1 ratio of stitch length to wound length has been accepted as the best abdominal closure method(12-14).

The high recurrence rate in incisional hernia surgery has forced general surgeons to try new techniques. The complexity of hernia increases complications(15). Tension-free repair is considered the most appropriate method by many authors, and repair with only sutures is not recommended. High recurrence rates (63%) have been reported in patients repaired with sutures alone(15). Placing a prosthesis in the preperitoneal area is the most commonly used method today(16). In cases where primary closure of large hernias is not possible, separation technique, composite or biological mesh are the most preferred methods. However, composite and biological meshes are expensive and may not always be available. Non-absorbable synthetic patches are both cheap and easily available. For this reason, it is more preferred.

Many techniques have been described to reduce relapse and complications. These techniques are described as onlay, inlay, sublay, underlay or intra-abdominal mesh placement technique, according to the anatomical placement of the prosthesis relative to the rectus muscle(17). Both recurrence and complication rates have been shown to be higher in onlay or inlay meshes than in sublay or underlay meshes(18-20).

The separation technique described by Ramirez is used for the repair of giant abdominal hernias and restores the integrity of the abdominal wall(21). Component separation allows fascial closure by advancing the rectus abdominis muscle up to 10 cm from both sides(22). The Rives stoppa technique is defined as a sublay repair that allows a wide placement of the prosthesis in the extraperitoneal space behind the rectus muscles and provides a tension-free closure. With this technique, a large area is created behind the rectus muscle and a tension-free closure is provided(23,24).

In this study, our aim is to compare the open anterior component separation technique and the modified rives-stoppa technique in terms of hernia recurrence and complications in the repair of complex and large incisional hernias.

MATERIALS AND METHODS

Collection of data

The files of 78 patients who were operated for large incisional hernia in Tekirdağ Namık Kemal University, Faculty of Medicine, Department of General Surgery between January 2017 and December 2022 were retrospectively analyzed. Patients with at least 1 year follow-up were included in the study. In the current study, Large incisional hernia was defined as a fascial defect (hernial orifice) measuring 10 cm or more in any or area loss ≥ 20% direction according to the definition of the European Hernia Society (EHS) (25). According to the classification of the EHS, hernias developing in the M1-M5 regions above the midline of the abdomen were included in the study. Hernias arising from the lateral region L1-L4 were not included in the study(25). Primary hernia was not included in our study. All hernias were secondary (incisional) hernias that developed after abdominal operations.

Immunosuppressive patients, patients with severe heart, respiratory and liver failure were excluded from the study. Surgical reports of 62 eligible patients were analyzed using hospital records. The preoperative computed tomography(CT)images of the patients were examined and the hernia width and length were measured. Examination findings at 1, 3, 6 and 12 months were recorded after surgery in patients. CT and ultrasonography (USG)were used to diagnose recurrence and complications. The patients were divided into two groups as repair with component separation technique (ACST) and modified rives-stoppa technique (MRST). Evaluated parameters: Patient-related parameters included age, gender, body mass index (BMI), American Society of Anesthesiology (ASA) score, any associated comorbidities. Hernia-related parameters were duration of symptoms, presence of primary or recurrent hernia, localization of the hernia, and size of the defect.

Parameters related to the operation are the duration of the operation, the number of drains. Outcome parameters included recurrence rate after 1 year of follow-up, pain score, length of hospital stay, time to remove drains, time to study entry, and postoperative morbidity. Since the study was retrospective, the distribution of patients in the two groups was not homogeneous in terms of some parameters (hernia length, body mass index, number of drains, etc.).

Operation techniques

Antibiotics (ampisid 1g iv) and thrombosis prophylaxis (4000 IE low molecular weight Heparin sc) were administered before the surgery. Since the study is retrospective, the reason for choosing the technique is not clear. However, both techniques are preferred in complex and large incisional hernias(26,27). Monofilament propylene mesh was used in both techniques. Dual mesh was used to close fascial defects in MRST. Depending on the size of the hernia, mesh measuring 15x15 cm to 30x30 cm was used.

Anterior component separation technique

The anterior component separation technique was performed as described in detail by Ramirez(21).

Modified rives-stoppa technique

The layers were crossed with a wide midline laparotomy that included the patient's previous scar. Intra-abdominal adhesions were completely dissolved, the hernia sac was preserved as much as possible, and another layer of autogenous tissue was placed between the intraperitoneal content and the back surface of the prosthesis. The internal organs were released from the abdominal wall and a large towel was laid over the intestine. After the towel was placed, the edges of the defect on the face were determined and length/width measurements were made. Careful examination of the fascia to identify multiple or other discrete defects was routinely performed.

Five Kocher clamps were then placed on the medial edge of the rectus. Using a serrated forceps, the posterior rectus sheath was retracted and incised just lateral to the rectus border to expose the underlying muscle center. The entire medial edge of the posterior rectus sheath was separated and the medial edge of the rectus muscle was exposed. Dissection continued until the retrorectus area was completely exposed. After the posterior rectus sheath was adequately medialized to the midline and adequate isolation of the internal organs was achieved, the posterior sheath was reapproximated. The mesh was fixed with a u-shaped suture passing through the lateral rectus muscle by placing a prolene mesh on both sides extending to the lateral rectus muscle. Additionally, the mesh was fixed to both caudal ends. However, in cases where the prosthesis was exposed to direct intraperitoneal exposure, the expanded polytetrafluoroethylene (PTFE) side was used facing the abdominal cavity and the polypropylene side was facing the abdominal wall (DualMesh), or a hernia sac was placed between the prosthesis and intraperitoneal tissues. After approximating the anterior rectus sheath, a drain was placed and the skin was closed.

Anterior to the anterior rectus fascia, no attempt was made to examine the subcutaneous space laterally to the extent of the mesh; The autogenous tissues on the front of the prosthesis were brought as close to the midline as possible, covering the front surface of the prosthesis after appropriate fixation. Sometimes lateral fascial release incisions or a component separation technique were used to reapproximate the midline fascia to cover the prosthesis with another layer of vascularized tissue to protect it from potential infection(28,35).

Post-operative care

In the early postoperative period, patients were mobilized and oral intake was allowed. Those with thromboembolic risk were given low molecular weight heparin (LMWH) using the Modified Caprini deep vein thrombosis (DVT) Risk Determination Scale. Clinical information was recorded at six-hour intervals. Wounds were examined daily for seroma, hematoma, and infection. The amount and color of the drain were monitored. When the fluid entering the drain was <25 ml/day, the drain was withdrawn. Patients whose pain was controlled with oral analgesics and who tolerated adequate oral nutrition were discharged without complications. Patients were told not to lift anything heavy.

Patient monitoring

Patients were followed for 12 months after discharge. It was performed on the 1st, 3rd, 7th and 15th days after surgery and at 1, 3, 6 and 12 months after discharge.

A comprehensive clinical examination was performed at each visit, and patients with suspected recurrence were evaluated with imaging devices. Patients whose follow-up process was interrupted were contacted by phone. Patients with suspected recurrence were called for control.

RESULTS

The primary endpoint was the rate of recurrence 1 year after the procedure. Secondary outcomes included postoperative morbidities, including operative time, number of drains and removal time, pain score, length of hospital stay, wound and mesh-related complications such as seroma, hematoma, infection, and wound grade. Pain was measured using the Visual Analogue Scale (VAS) at 1,3 and 7 days postoperatively, with no pain as "0" and most severe pain as "10". We accepted patients who required aspiration or drainage for seroma and hematoma. We divided the wound into 4 groups as normal wound, erythema and swelling, purulent discharge and open wound. Postoperative morbidity was performed according to the Clavien-Dindo classification(29).

Statistical analysis

Data were analyzed by saving to SPSS (Statistical Package for Social Sciences) for Windows 22 program. In order to decide the normality of the data, the Shapiro-Wilk test was evaluated by examining the other assumptions of the normal distribution, kurtosis and skewness. The Man Whitney-U test was used to compare two independent groups. Friedman test was used in the comparison of more than two dependent groups and Bonferroni multiple comparison test was used to determine the source of the difference. The relationship between categorical variables was examined with Chi-square and Fishersexcat tests. The significance level of 0.05 was used as a criterion in interpreting whether the obtained values were significant or not. After excluding patients who did not meet the inclusion criteria and whose data were not available, the remaining 62 patients were included in the analysis (Fig. 1).

Characteristics of the patients

When the general distribution of the patients was examined, 35 (56.4%) were female and 27 (43.5%) were male. Thirty-nine patients (62.9%) had ASA score(1), 18 (29%) had ASA score(2), and 5 (8%) had ASA score(3). Thirty-eight patients (61.2%) were non-smokers, mean age of the patients was 57.94±10.92, mean BMI was 28.13±6.34. Thirty-two patients had comorbid disease. Age, gender, ASA, smoking status, presence of comorbid disease and BMI did not show a statistically significant relationship between the groups (p>0.05) (Table1).

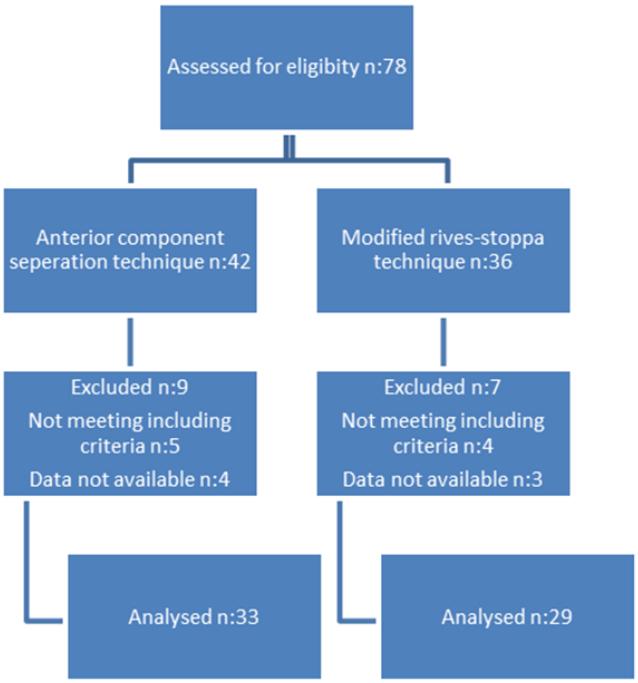

Figure 1. Consort flow chart shows patients' recruitment process

Hernia features and surgery details

In both groups, all hernias were located over the median incision. Symptom duration was 7.85±9.08 in group 1 and 4.71±4.69 year in group 2.

Table 1. Patients' characteristics

		Total	Group 1%	Group 2%	P value
Gender	F M	35(%43,55) 27(%56,45)	20 (%60,61) 13 (%39,39)	15 (%51,72) 14 (%48,28)	p:0,609
Age(Mean ±SD)		57,94±10,92	57,33±11,81	58,62±9,98	P:0,65
BMI(Kg/m²)		28,13±6,34	27,42±5,77	28,93±6,94	p:0,47
Smoking	Yes No	24(%38,71) 38(%61,29)	11 (%33,33) 22 (%66,67)	13 (%44,83) 16 (%55,17)	p:0,354
ASA score	1 2 3	39(%62,90) 18(%29,03) 5(%8,06)	20 (%60,61) 9 (%27,27) 4 (%12,12)	19 (%65,52) 9 (%31,03) 1(%3,45)	p:0,524
Co-morbidity	Yes No	32(%51,6) 30(%48,4)	16 (%48,48) 17 (%51,52)	16 (%55,17) 13 (%44,83)	p:0,596
Total		62			

Hernia length and width in group 1 were 17.27±2.63 cm and 10.73±1.21 cm, respectively, while in group 2 they were 16.14±2.33 cm and 10.38±1.24 cm. In Group 1, 21 (63.64%) patients had primary hernia, while 12 (36.36%) patients had recurrent hernia. In Group 2, 25 (86.21%) patients had primary hernia and 4 (13.79%) patients had recurrent hernia. Thirty-eight patients had a single defect, and 24 patients had 2 or more hernia defects. A statistically significant relationship was found between the groups in terms of recurrent incisional hernia and symptom duration (time spent with hernia). Previous incisional hernia surgery and duration of symptoms were found to be lower in Group 2 (p:0.041 and p:0.03). There was no significant difference between the groups in terms of defects and hernia size (p>0.05). The mean operative time was 2.56±0.92 hours in group 1 and 1.90±0.40 hours in group 2. The median number of drains used was 2 (range 1-3). In Group 1, two drains were used in 25 (75.76%) patients and three drains were used in 8 (24.24%) patients. In group 2, two drains were used in 26 (89.66%) patients and one drain was used in 3 (10.3%) patients. A statistically significant relationship was found between the number of drains, the duration of the operation and the groups (p:0.00,p:0.00). While the use of one drain was 10.34%, the use of two drains was 89.66%, and the use of three drains was 0% in group 2, these rates the use of one drain were 0%, the use of two drains and 75.76%, and the use of three drains %24.24 in group 1. The operation time was shorter in group 2 (p:0.00). In Table 2, hernia characteristics and surgical details are summarized.

Table 2. Hernia characteristics and operative detail

		Total	Group 1%	Group 2%	P value
Hernia nature	Primer Recurren t	46(%74,19) 16(%25,81)	21(%63,64) 12(%36,36)	25(%86,21) 4 (%13,79)	**p:0,041**
Symptoms duration (year)		6,38±7,47	7,85±9,08	4,71±4,69	**P:0,03**
Hernia lenght		16,74±2,53	17,27±2,63	16,14±2,33	p:0,12
Hernia width		10,55±1,23	10,73±1,21	10,38±1,24	p:0,22
Number of. Defects	Single Multıple	38(%61,2) 24(%38,7)	20(%60,61) 13(%36,36)	18(%62,07) 11(%37,93)	p:0,892
Operative time(Hour)		2,25±0,79	2,56±0,92	1,90±0,40	**P:0,00**
Number of drains	1 2 3	3(%4,84) 51(%82,26) 8(%12,90)	0 (%0,00) 25(%75,76) 8 (%24,24)	3 (%10,34) 26 %89,66) 0 (%0,00)	**P:0,00 1**

Post-operative follow-up; pain score, length of hospital stay, duration of drain removal, morbidities

A statistically significant difference was found between the groups in terms of drain removal time, length of hospital stay (days), time to start the study (in weeks) (p<0.05). In Group 2, shorter hospital stay and earlier return to normal life were observed. It was observed that the drains were removed later in Group 1. According to the Bonferroni multiple comparison test, the end-of-day 7 pain values were significantly lower than the 1st and 3rd day pain values, and the 3rd day pain values were significantly lower in the 1st day pain values. Pain scores on the 1st and 3rd days show a statistically significant difference between the groups (p<0.05). When the median values were examined, the patients in group 2 were 1.and 3rd day pain scores were found to be lower than the patients in group 1. The surgical wound was stage I in 26 patients in Group 1 and 23 patients in Group 2. Stage II wounds were detected in 5 patients in group 1 and in 5 patients in group 2. 2 patients in group 1 and 1 patient in group 2 had Stage III wounds. Only one (3.6%) patient in group 1 had a small hematoma requiring bedside drainage, while none of the patients in group 2 developed a postoperative hematoma. Seroma developed at the surgical site in 4 patients in group 2. Seroma developed in 7 patients in group 1. Seromas were drained by puncture in the outpatient clinic. According to the Clavien-Dindo classification, 23 patients in group 1 and 23 patients in group 2 were grade I, meaning that no pharmaceutical or surgical treatment was required for any deviation from the normal postoperative course. 4 patients from Group 1 and 5 patients from Group 2 had Grade II, that is, long-term pharmaceutical treatment with systemic antibiotics was required. 5 (28.6%) patients in Group 1 and 1 patient from Group 2 were classified as grade IIIa. There was no significant difference between the groups in terms of morbidities.

Table 3 summarizes the postoperative findings.

Recurrence

The mean follow-up time was 36 months (13–62) in group 1 and 41 months (14–68) in group 2. Recurrence was observed in 4 (12.1%) patients in group 1 and in 2 (6.8%) patients in group 2. There was no difference between the groups in terms of recurrence (p:0.880).

DISCUSSION

In this study, it was shown that there was no statistically significant difference in terms of recurrence and postoperative morbidity between the mesh reinforced anterior component separation technique and the modified rives-stoppa technique in the repair of large incisional

hernias. However, in the modified rives-stoppa technique, it was determined that the postoperative pain score (VAS) was lower and the return to normal life was earlier. In addition, it has been shown that the operative time and hospital stay are shorter in the modified rives-stoppa technique. The results are statistically significant.

Table 3. Postoperative pain score, hospital stay, drain removal time, morbidities, recurrence

		Total	Group 1%	Group 2%	P value
Pain score(VAS)	1.day 3.day 7.day	5,44±1,21 3,15±0,90 1,35±0,55	5,73±1,40 3,48±0,76 1,45±0,51	5,10±0,86 2,76±0,91 1,24±0,58	**p:0,04** **p:0,02** p:0,15
Postoperative stay(days)		3,075±1,46	4,18±1,88	1,97±1,05	**P:0,00**
Drain period (days)		7,41±3,2	9,00±5,34	5,83±1,07	**p:0,00**
Return to normal life (week)		2,55	2,97±1,36	2,14±1,25	**p:0,01**
Wound grade	1 2 3	49(%79,03) 10(%16,13) 3(%4,84)	26(%78,79) 5 (%15,15) 2 (%6,06)	23(%79,31) 5(%17,24) 1(%3,45)	p:0,881
Postoperative morbidities (Seroma, hematoma, infection)	No Yes	47(%75,8) 15(%24,1)	23(%69,70) 10(%30,30)	24(%82,76) 5 (%17,24)	P:0,231
Clavien-Dindo classification	1 2 3	46(%75,41) 9(%14,75) 6(%9,84)	23(%71,88) 4 (%12,50) 5 (%15,63)	23(%79,31) 5 (%17,24) 1 (%3,45)	p:0,268
Recurrence	No Yes	56(%90,3) 6(%9,6)	29(%87,8) 4(%12,1)	27(%93,1) 2(%6,8)	P:0,880

In this patient group, who also has a history of previous surgery, several comorbid diseases are often accompanied. They also have large hernias with multiple defects or have had previous failed hernia repairs.

In the method of separation into its components, which was published by Ramirez in 1990 and performed without using a patch, the rectus muscle is moved approximately 7-10 cm to widen the abdominal Wall(21). Although many variations have been described in addition to the original ramirez technique, it has been commented that it should only be applied in contaminated cases where the use of mesh is not safe due to high recurrence and complications(30,31). Due to the high recurrence rates, the technique of separating mesh-reinforced components was then described. The recurrence rate, which reaches 40% in the separation technique without mesh reinforcement, has become one of the methods that can be preferred in ventral hernia repair with the decrease below 10% after mesh reinforcement(32). It has been proven that mesh repair is superior to suture-only repair in terms of recurrence in incisional hernia repair, regardless of hernia size(15,16). However, the incidence of postoperative morbidities such as seroma, hematoma, surgical site infection and skin necrosis was found to be higher due to wide dissection, use of large patches, and damage to the perforating vessels feeding the skin(33,34).

The rives-stoopa technique, first described by the French surgeons Jean Rives and René Stoppa in the 1980s, is a retrorectus dissection(35). The advantage of this method is that since the surface area of the patch is larger than the defect, intra-abdominal forces push the prosthesis towards the muscles. Modified Rives-Stoppa repair was described in the 1990s. The advantage of this method over the conventional method is that it can be performed more quickly, requires less dissection, and is more cosmetic because there are no skin holes. In the modified Rives-Stoppa repair, a prosthesis larger than the hernia defect is placed and fixed behind the recrus muscle and in front of the posterior rectus sheath-peritoneum. In this way, tissue integration of the prosthesis is optimized and the mesh becomes more resistant, reducing infection and seroma formation. This provides mechanical strength to the anterior abdominal wall. The rectus sheath-peritoneum prevents direct contact of the prosthesis with the intestine(23). Tansawet et al. used sublay-mesh placement for mesh repair, which showed better results compared to onlay, inlay, and underlay repairs(20). In a meta-analysis, sublay mesh placement was associated with a lower risk of recurrence and surgical site infection compared with onlay, inlay, and underlay(19). In our study, a recurrence rate of 12% in the ACST group and 6.8% in the MRST group was observed in accordance with the literature. Although there was no statistically significant difference, numerically fewer recurrences were observed in the MRST group. Likewise, The postoperative complication rate was found to be numerically higher in the ACST group. However, it was not statistically significant. We think this is due to extensive dissection. The fact that less dissection is required in the modified rives-stoppa technique stands out as an advantage. As a continuation of this, the withdrawal time of the drains was shorter in the 2nd group and it was statistically significant. We attribute this situation to the fact that less dissection is required in the technique used in the second group.

Many different studies have shown that increasing obesity is a risk factor for many diseases and an important factor that increases hernia recurrence. In a study conducted in the United States, patients were examined in terms of hernia repair types, age, gender, and BMI, and recurrences were found to be high in patients with a BMI of 30 and above(9,36,37). In this study, the increase in BMI was not

found statistically significant in terms of recurrence in both groups. We attribute this to our low BMI average.

In the same study, comorbid diseases and BMI were classified according to repair types and their effects on recurrence were evaluated. It has been reported that the incidence of recurrence in patients with diabetes mellitus, COPD and cardiac disease history is similar to those without the disease(34). However, there are also studies showing that such comorbidities increase hernia recurrence. Such diseases impair wound healing by disrupting tissue nutrition(38,39).

In the current study, although there was no statistical significance on the basis of group, it was found that comorbidities increased recurrence studies have shown that there is a relationship between the size of the hernia and its recurrence. However, this Hernia sizes vary widely in studies. In a study conducted in 2001 involving 246 cases, in which large hernias (over 10 cm) were in the majority and repair with prosthesis was applied, it was found that the recurrence rate increased as the defect grew(40). In this study, it was observed that hernia size did not increase the recurrence rate.

Among the factors that increase the recurrence; smoking, malnutrition, hypoproteinemia, malignant diseases, ascites and cough. These factors are thought to be effective in the etiology of hernia and recurrence by increasing intra-abdominal pressure(41). Fischer et al proved that smoking is an important factor that increases the rate of incisional hernia after laparotomy(42). In our study, there was no significant difference in smoking between the two groups [p=0.354].

Milad et al. reported that since the retromuscular plane is highly vascular, it helps to prevent seroma and infection, and when any infection occurs in the subcutaneous plane, the patch is not affected because the patch is in a deeper plane(43). Many studies have reported that the highest postoperative complication rates can be observed in onlay hernia repair(44,45). In this study, the Clavien-Dindo classification was used to evaluate postoperative complications, as it was based on therapeutic results. No statistically significant difference was found between the two groups in the Clavien-Dindo classification(29). The length of hospital stay, pain and return to normal life are very important in comparing different surgical techniques for hernia repair. Although laparoscopic hernia repair has been developed for this purpose, it is difficult to apply, especially in large ventral hernias, and the presence of intra-abdominal adhesions makes dissection difficult and causes undesirable conditions such as intestinal injury(33). In our study, both the mean of VAS on days 1, 3 and 7 in the modified rives-stoppa group, as well as the length of hospital stay and return to normal life were lower than the ACST group, and there was a statistically significant difference. In our study, the duration of surgery was longer in the ACST group. Further dissection and separation of layers were seen as the reason for this. Retrorectus dissection in the MRST group is faster due to its anatomical structure.

Limitations

Because this study was retrospective, data regarding technique selection were not available. It is clear that prospective studies with larger populations are needed. Although not statistically significant, hernia size was higher in the ACST group than in the mrst group.

CONCLUSION

As a result, although there was no significant difference in terms of recurrence and postoperative morbidities in the repair performed using the MRST compared to the ACST technique, a significant difference was found especially in cost-effective results, operation time, postoperative pain, hospital stay and return to normal life. Therefore, we recommend repair with MRST in cases with ventral hernia.

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Conflicts of interest
There are no conflicts of interest.

Availability of data and materials
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Author's contributions
Conceptualization and data curation: All authors; Investigation: Suat BENEK; Methodology: İlhan BALİ

Ethical confirmation
This study was approved by the Tekirdağ Namık Kemal University Non-Interventional Clinical Research Ethics Committee (Protocol no. 2023.184.06.14 dated 29 June 2023). All practices during our study complied with the ethical standards of the 1964 Declaration of Helsinki and national/institutional scientific research committees.

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