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의학석사 학위논문

복부 탈장의 확대 복막외 접근
탈장교정술의 초기 국내 결과

Initial Experience of Extended Extraperitoneal(eTEP)
for Ventral Hernia Repair in Korea

울산대학교 대학원

의학과

이은지

Initial Experience of Extended Extraperitoneal(eTEP) for Ventral Hernia Repair in Korea

지도교수 박동진

이 논문을 의학석사 학위논문으로 제출함

2022년 07월

울산대학교 대학원

의학과

이은지

이은지의 의학석사학위 논문을 인준함

심사위원 김규열 인

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국문요약

복막외 접근 탈장교정술을 2012년 복잡한 서혜부 탈장 교정을 목적으로 Daes 등이 2012년 최초로 보고한 바가 있다. 이후 Belyansky 등이 이 방법을 복부 탈장 교정에 적용하였다. 이후 연구에서 기존 술식과 수술 후 결과에 유의한 차이가 없음이 보고되어 여러 국가에서 시행중에 있다. 하지만 국내에서 아직 활발히 시행되고 있지 않아 본 연구에서 초기 결과를 발표하고자 한다.

2018년 10월부터 2022년 4월까지 복부 탈장으로 확대 복막외 접근법으로 수술을 시행받은 32명의 환자를 대상으로 하였다. EHS classification에 따라 컴퓨터단층 촬영결과로 탈장의 위치를 분석하였다. 19명(59.4%)의 환자들이 M3 위치의 탈장이었다. 평균 크기의 너비와 길이는 각각 6.00cm 과 7.47cm 이었다. 평균 수술 시간은 199분이었으며 평균 출혈량은 25.8ml 였다. 가장 흔한 수술 후 합병증은 상처 장액종(2명)과 배뇨곤란(2명)이었다. 재발은 2명의 환자에게서 보고되었다. 평균 재원기간은 8.25일이었다. 통증을 평가하기 위해 Visual Analogue Scale Score 측정을 수술 직후, 수술 후 1 일째, 3일째 평가하였으며 각각 5.81, 4.06, 2.94로 차츰 줄어드는 양상을 보였다.

기존 연구와 비교하였을 때 받아들일 만한 결과라고 생각되며 한국에서 본 방법을 통해 복부 탈장 교정을 조심스럽게 시행해 볼 수 있겠다. 향후 환자 군을 더 모아서 후속 연구를 통해 안정성과 효용성에 대해 조사해볼 필요가 있겠다.

차례

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Introduction

The extended or enhanced view totally extraperitoneal (eTEP) was introduced for complex inguinal hernia by Daes et al. in 2012.[1] Since then, Belyansky et al. applied this technique to retromuscular mesh placement for ventral hernia repair, named the extended totally extraperitoneal Rives Stoppa (eTEP RS).[2] There are several minimally invasive surgery techniques in ventral hernia such as laparoscopic transabdominal preperitoneal approach, laparoscopic intraperitoneal onlay mesh (IPOM), IPOM with the closure of the defect (IPOM plus), and extended view totally extraperitoneal Rives Stoppa(eTEP RS).[2,3]Recent study shows there are no differences in complications and recurrences between eTEP and IPOM plus, at the same time, it shows lower postoperative pain and better functional recovery and cosmesis.[4] Compared with IPOM, it shows similar outcomes in small to medium-sized defected ventral hernias.[5]

The European Hernia Society (EHS) categorizes ventral hernias into primary or congenital and incisional.[6] According to previous studies, in the USA, around 75% of hernia repairs are performed for primary ventral hernias (mainly epigastric and umbilical hernias) and around 25% are performed for incisional hernias.[7] As surgical technique advances and life expectancy increases, many patients have previous operation history. People who had abdominal surgery have a risk of developing incisional hernias. The overall incidence of postoperative incisional hernia was 3.7% and varied from 0.7% after laparoscopy to 9.9% after laparotomy.[8] There is no national data on incisional hernia incidence and no study of surgical intervention outcomes of incisional hernia in Korea.

In this study, we report the first Korean eTEP ventral hernia repair outcomes and its suitability and safety in Korea.

Methods

We performed a retrospective descriptive study with all patients undergoing extended TEP for ventral hernia either primary or incisional at Ulsan University Hospital in Korea by two surgeons between October 2018 and April 2022.

Data collection and Statistical analysis

Demographic data were collected for age, sex, BMI, and ASA classification. Preoperative variables were past medical history, operation history, smoking, and previous ventral hernia repair (recurrence). Hernia type was classified according to EHS classification and defect width and length were described.[6] We measured inter-rectal distance (IRD) at 3 centimeters (cm) above the umbilicus using Computed Tomography (CT) Scan and reported diastasis recti when IRD is wider than 2cm according to the definition of normal IRD[9] Intraoperative variables included operation time, hernia sac contents, incarceration and estimate blood loss. Postoperative variables were hospital stay length, complications, and recurrence. The diagnosis was obtained from Computed Tomography (CT) Scan. Statistical analysis was carried out using SPSS version 24 (IBM Corp, Armonk, NY).

Surgical techniques

Surgical technique was done according to the previously published article.[10] Incisions were made along to rectus lateral border. One 12mm balloon trocar was inserted into the retrorectus layer. A retrorectus space was created using blunt dissection. And one 5mm port was inserted in the middle of the abdomen. After making more space in the lower abdomen, a 12mm port was inserted. Then retrorectus space was completely dissected using laparoscopic devices. Depending on the defect location, the mid-line crossover point was decided and performed at 5 to 10 mm below from linea alba. Contralateral retrorectus space was dissected and the hernia sac was reduced. If needed, transversalis abdominis releasing (TAR) was considered when the defect was too large to close. Posterior rectus sheaths were closed using a barbed suture. Then the anterior defect was closed with a continuous suture of non-absorbable barbed suture. Polypropylene mesh was inserted and then properly placed to cover the retrorectus space. In this study, a surgical drain was inserted above the polypropylene mesh. Surgical approaches were classified as conventional laparoscopic, reduced port laparoscopic, single port laparoscopic, and robotic. The conventional laparoscopic approach means using 3 or more ports. Single port surgery was attempted with a suprapubic approach in cases of an umbilical hernia or a midline hernia above the umbilicus.[11] When an additional port was inserted during single port surgery, it was described as reduced port approach.

Robotic eTEP was performed only one case and it was performed with daVinci Xi. Each approach is described in Figure 1.

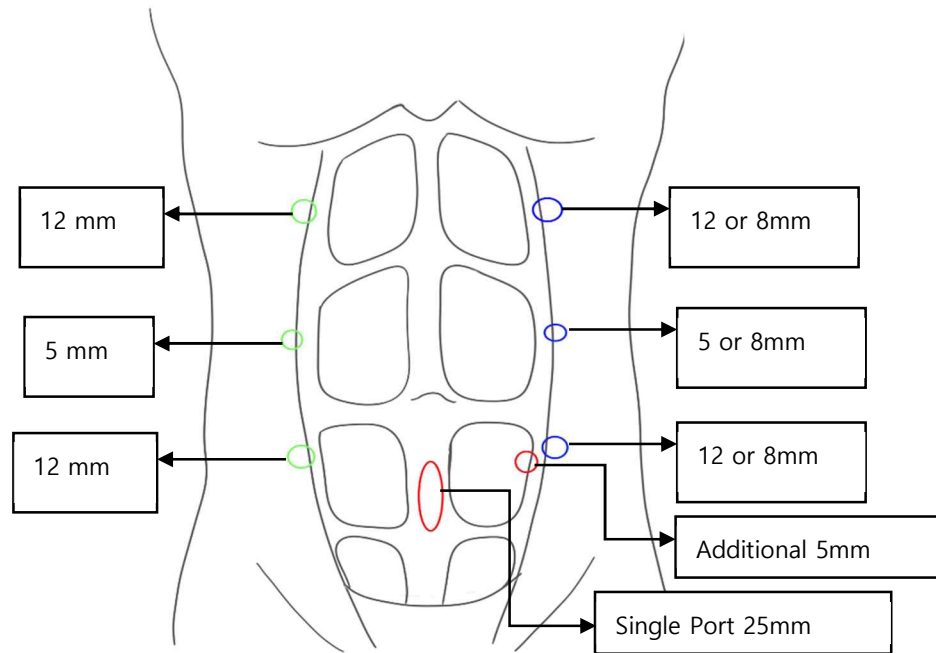


Figure 1 Blue : conventional or robotic, Red : single port or reduced port, Green : additional port

Results

Thirty-two patients underwent surgery for primary ventral abdominal hernia or incisional hernia between October 2018 and April 2022. Thirteen were male and nineteen were female. These patients had a mean age of 60.8 years old, mean BMI of 27.1 kg/m², and a median ASA score of 2. Four patients had a history of open hernia repair. Twelve patients (37.5%) had hypertension and seven patients (21.9%) had type II Diabetes Mellitus. Twelve patients(42.3%) were current or ex-smokers. Twenty-six patients had incisional hernias and the others had primary ventral hernias. The patient demographics are described in Table 1.

Age		60.8(±12.5)
Sex (female)		19(59.4%)
Body mass index		27.1(±0.39)
ASA classification		
1		1(3.1%)
2		27(84.4%)
3		4(12.5%)
Comorbidities	Hypertension	12(37.5%)
	Type 2 Diabetes mellitus	7(21.9%)
	Asthma	2(6.3%)
	COPD	2(6.3%)
	Coronary Heart Disease	5(15.6%)
	Smoking History	14(43.8%)
Abdomen OP history	MIS only	
	Open only	
	MIS and Open	
Incisional hernia Recurrence		4(12.5%)

The hernia location and size were measured according to the EHS classification using preoperative CT scans. Nineteen patients (59.4%) had a hernia in M3 location. The mean defect width and length sizes were 6.00 cm and 7.47 cm. Of total of thirty-two patients, sixteen(50%) had diastasis recti. There were eight incarcerated cases (25.0%) at the time of surgery. Eighteen patients had hernia sac contents during surgery, eleven had omentum, eight had small bowel, and only one patient had both. The hernia characteristics are described in Table 2.

Diastasis recti		16(50%)
Incarceration		8(25.0%)
Contents	omentum	11(34.4%)
	small bowel	8(25.0%)
Defect size (cm)	Width	6.00(±3.02)
	length	7.47(±4.69)
Midline hernia location	M1	1(3.1%)
	M2	8(25.0%)
	M3	19(59.4%)
	M4	2(6.3%)
Lateral hernia location	L1	0
	L2	1(3.1%)
	L3	1(3.1%)
Hernia width	W1	14(43.8%)
	W2	18(56.3%)
	W3	0

Of twenty-eight patients who were treated with eTEP RS, twenty-three were conventional laparoscopic assessment, two were reduced port, two were single port, and one was robotic assessment. All four patients who were treated with eTEP TAR were assessed by conventional laparoscopic. The mean operation time was 199minutes (min. 115, max. 340 minutes). The mean estimated blood loss volume was 25.8(±27.2)ml.

Table 3. Surgical data

Operation type	
Laparoscopic eTEP RS	23(71.9%)
Reduced Port eTEP RS	2(6.3%)
Single Port eTEP RS	2(6.3%)
Robotic eTEP RS	1(3.1%)
Laparoscopic eTEP TAR	4(12.5%)
Estimate blood loss (ml)	25.8(±27.2)
Operation time (min)	199(±48.5)

The most common complications were wound seroma (2 patients) and voiding difficulty (2 patients). Wound seroma complications were resolved after inserting a percutaneous drain. There were two cases of recurrence, one patient refused reoperation and we decided to follow up without surgical intervention because of old age and comorbidity. The other one needed reoperation. During the surgery, there was one iatrogenic small bowel injury case, repaired immediately. But the patient was also diagnosed with postoperative ileus, but this case did not require further surgical treatment. The mean hospital stay length was 8.25 days (min. 3, max. 24 days). The Visual Analogue Scale Score was checked at least 3 times daily and the highest score was analyzed. It showed a daily decrease of scale on operation day, postoperative day 1, and 3.

Table 4. Postoperative outcomes

Complications	Seroma	2(6.3%)
	Voiding Difficulty	2(6.3%)
	Surgical Site Infection	1(3.1%)
	Ileus	1(3.1%)
	Chronic pain	1(3.1%)
	FUO	1(3.1%)
	Recurrence	2(6.3%)
Visual Analogue Scale	POD 0	5.81(±1.26)
	POD 1	4.06(±1.19)
	POD 3	2.94(±1.37)
Length of Stay (day)		8.25(±4.45)

Discussion

There were many ways to repair the ventral hernia with minimally invasive techniques. In recent years, many surgeons tried diverse laparoscopic and robotic techniques. However, there is no definite optimal surgical technique up to date. The extended view totally extraperitoneal technique received a favorable evaluation since it was first introduced by Belyansky et al.[12] There are a few studies supporting this evaluation.[13-15]

This study is the first Korean report on eTEP technique outcomes. In Korea, many laparoscopic techniques and robotic techniques are introduced and actively used in many fields. However, the eTEP technique is not popularly performed yet. Traditionally, open suture repair for ventral hernia was familiar and favorable for many Korean surgeons. Few surgeons perform minimally invasive surgery for ventral hernia repair, but it is limited in IPOM or IPOM+. The reason for this might be that eTEP is relatively new and technically difficult, so it is not enough introduced in Korea yet. Ventral hernia repair has only one medical charge in Korea. It means, there are no differences in surgical fees between open hernia repair and eTEP. It hinders Korean surgeons from performing this novel technique.

In this study, one surgeon performed diverse laparoscopic techniques, and the other tried a multi-port laparoscopic technique. Incisional hernia surgery needs a tailored approach because of its characteristics. We need to consider not only abdominal wall conditions such as diastasis recti, rectus muscle, and fascia strength but also hernia characteristics such as location, defect size, etc.

Previous studies showed diverse operation time from 99.6 minutes to 203.5 minutes in eTEP RS and 240 minutes to 291.5 minutes in eTEP TAR in 2022.[5,12,15,16] The mean operation time of eTEP TAR was 184 minutes and eTEP RS was 201 minutes in this study. This result may be due to the proficiency difference of the surgeons. The latecomer tried only three cases of the eTEP approach in this period and two cases were included in this study because one case was converted TAPP approach. ETEP techniques need substantial cases to become proficient, in this aspect, we can accept these conflicting results of operation time. The mean operation time in this study was 199 minutes including both eTEP RS and eTEP TAR. This is an acceptable result considering previous studies outcomes.

The mean hospital stay length in this study was 8.25 days and it is a conflicting result comparing previous studies. Several studies have reported short hospital stay lengths from 1.0 to 2.7 days.[12] It can be explained by the differences in insurance systems. In Korea, almost all patients want to discharge after removing the drain and without pain. Because our insurance system makes patients feel free from financial burden. The cost does not increase proportionally with the length of stay. Therefore, we can explain the long length of stay with this difference.

There were several complications such as voiding difficulty and wound seroma. There were two patients with wound seroma complications. In both cases, operation site drains were malpositioned and malfunctioned. And there were two recurrence cases and one required further surgical intervention. The first recurrence case was detected during the hospital stay. In the case of the first operation, there was no 1-0 barbed suture, so a 3-0 barbed suture was used to close the hernia defect which could not withstand the force. It is considered a technical failure. Another patient visited the outpatient clinic a few months later after initial surgery and complained about re-bulging. Recurrence was confirmed with a CT scan and reoperation was recommended, but the patient refused the operation and we decided to follow up without surgical intervention because of old age and comorbidity.

The recurrence rate of this study is 6.3% and it is quite a higher recurrence rate when considering other studies, which reported 0% to 4.35%. [14,17,18] However, it is still less than the total incisional hernia recurrence rate after an elective incisional hernia repair operation. The recurrence rates were 18.1% at 1 year in one study.[19] The other study showed recurrence rates ranging from 24% to 43% are reported, even with the use of mesh.[17] In this study, the recurrence cases were early operation cases within the first year, the first case, and the eleventh case. After then there were no recurrence cases. There is no article about the optimal cases of the learning curve, but there is an agreement on the difficulty of this technique. Therefore, we can understand the higher rate of recurrence in this study with this aspect.

There was one case of ileus and the patient had higher VAS pain on postoperative day 3 than on operation day. It may be due to postoperative ileus, but this case did not require further surgical treatment. Conservative treatment was done and the pain was relieved postoperative day 5.

Postoperative pain was estimated on the Visual Analogue Scale (VAS) and recorded at least 3 times daily during hospitalization. Almost all patients had less pain scores after the operation. As mentioned previously, there was one patient who had a higher pain score because of postoperative ileus.

There are some limitations of this study. It is a retrospective and single-center study with a small sample size. We did not distinguish between incisional hernia and primary ventral hernia. We classified primary ventral hernia in EHS classification for incisional hernia. We also included recurred cases. We report initial experiences therefore long-term follow up were not included in this study. However, our patients were discharged on postoperative day 8 on average. Therefore, we can recognize early complications immediately. We need further large-scale studies for a ventral hernia to confirm our initial study outcomes.

Overall, these initial outcomes show that the eTEP technique for ventral hernia repair can be safely

applied in Korea. To make this technique popular, we need to consider a few disadvantages such as the same surgical fee for every ventral hernia repair. It makes psychological barriers to performing eTEP. To overcome this problem, we need to prove the validity of eTEP and show differences with open repair. Multi-center prospective studies will be needed.

Conclusion

In conclusion, we believe that the eTEP technique for ventral hernia repair can apply carefully in Korea. After more data is collected, we need further studies to confirm the safety and effectiveness.

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영문요약

The extended or enhanced view totally extraperitoneal (eTEP) was introduced for complex inguinal hernia by Daes et al. in 2012. Since then, Belyansky et al. applied this technique to retromuscular mesh placement for ventral hernia repair, named the extended totally extraperitoneal Rives Stoppa (eTEP RS). There is no data on this novel techniques in Korea.

Thirty-two patients underwent surgery for primary ventral abdominal hernia or incisional hernia between October 2018 and April 2022. The hernia location and size were measured according to the EHS classification using preoperative CT scans. Nineteen patients (59.4%) had a hernia in M3 location. The mean defect width and length sizes were 6.00 cm and 7.47 cm. The mean operation time was 199minutes (min. 115, max. 340 minutes). The mean estimated blood loss volume was 25.8(\pm 27.2)ml. The most common complications were wound seroma (2 patients) and voiding difficulty (2 patients). There were 2 cases of recurrences. The mean hospital stay length was 8.25 days (min. 3, max. 24 days). The Visual Analogue Scale Score was checked at least 3 times daily and the highest score was analyzed. It showed a daily decrease of scale on operation day, postoperative day 1, and 3.

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