folia medica

Folia Medica 63(2):183-8
DOI: 10.3897/folmed.63.e54133

Original Article

Total Extra-Peritoneal Inguinal Hernia Repair: a Single-Surgeon Preliminary Findings Report

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Received: 10 May 2020 ♦ **Accepted:** 11 Sep 2020 ♦ **Published:** 30 Apr 2021

Citation: Kostov GG, Dimov RS. Total extra peritoneal inguinal hernia repair: a single-surgeon preliminary findings report. Folia Med (Plovdiv) 2021;63(2):183-8. doi: 10.3897/folmed.63.e54133.

Abstract

Introduction: Inguinal hernia repair is one of the most frequent operations in general surgery. Various techniques have been used to repair inguinal hernias since the first reconstructive technique described by Bassini in 1887. In 1989 Lichtenstein reported a new technique: tension free inguinal hernia repair. Laparoscopic inguinal hernia repair was introduced in the early 1990s, and soon also became popular. Literature has shown the benefits of laparoscopy (in comparison with open repair) to be mostly related to the more minimally invasive nature of the surgery, having lower wound infection rates, faster recovery, and less postoperative pain.

Aim: To evaluate our totally extraperitoneal (TEP) inguinal hernia repair initial results and compare them to literature data.

Materials and methods: In a prospective review and analysis, we examined 61 cases of hernia repair via laparoscopy (specifically TEP), performed by a single surgeon, between April 2019 and December 2019 at the Kaspela University Hospital in Plovdiv. The centre's Institutional Review Board approved the study with no specific consents required due to the retrospective, minimal risk nature of the study. The routine informed consent required by the National Insurance Fund has been considered sufficient for the study objectives.

The surgical outcome measures included operating time (hours/minutes), conversion, peritoneal injury, surgical emphysema; and the clinical outcome measures included postoperative seroma, post-operative infection, and post-operative chronic groin pain.

Results: Inguinal pain on discharge was characterized as mild by 56 (96.55%) patients and moderate by 2 (3.44%), there were no patients describing the pain as severe. The most frequently reported postoperative complications were annoyance and discomfort (10.34%), swelling (6.9%), seroma (3.44), hematoma (1.72%), paresthesia 1.72% (1); however, only those with seromas required special treatment.

Conclusions: Limitations of the present study include the relatively small number of patients, all cases were operated on by a single surgeon and short postoperative follow-up period, but we are sharing our initial six months results. These results demonstrate that laparoscopic TEP inguinal hernia repair without mesh fixation is a reliable technique, which can reduce postoperative morbidity when applied by experienced surgeons.

Keywords

inguinal hernia, pre-peritoneal hernia repair, TEP

INTRODUCTION

Inguinal hernia repair is one of the most frequent operations in general surgery. There are two main categories – the direct and indirect hernias, which differ in the direction at which the protrusion is apparent. In case of direct inguinal hernia, a protrusion of an organ or tissue through the inguinal canal runs medially, whereas in indirect hernia it runs laterally to the inferior epigastric vessels.

Various techniques have been used to repair inguinal hernias since the first reconstructive technique described by Bassini in 1887. In 1989 Lichtenstein reported a new technique: tension free inguinal hernia repair, and soon this approach became a gold standard.[1] Laparoscopic inguinal hernia repair was introduced in the early 1990s, and has also become popular.[2] Literature has shown the benefits of laparoscopy in comparison with open repair to be mostly related to the more minimally invasive nature of the surgery, with lower wound infection rates, faster recovery, and less postoperative pain. The two most common variations of laparoscopic technique for inguinal hernia repair are the trans-abdominal pre-peritoneal (TAPP) repair and the total extra peritoneal (TEP) repair.[3] In recent years, the robotic approach to hernia repair has evolved as a promising operative technique. The selection of a mesh for every patient must take into account individual characteristics, and especially mesh properties (durability, pliability, resistance to infection, and minimal mesh-induced foreign body responses). Currently available meshes differ with respect to their composition, structural, and mechanical parameters.[4]

Treatment of inguinal hernia can lead to a various complications. The most common problems following this surgery are recurrence and chronic pain. Recent large volume systematic reviews, comparing laparoscopic with open repair, do not report difference in these treatment options, but they point out the advantages of the laparoscopic techniques, which are reduced chronic pain and an earlier return to daily activities.[5]

Common complications from the laparoscopic inguinal hernia repair are urinary retention, bowel obstruction, visceral injury (small and large bowel, bladder), vascular injury, gas embolus, and port site hernia. A comparison of TEP with TAPP shows a higher postoperative complication rate for TAPP which did not, however, result in any difference in the re-operation rate.[6]

AIM

The aim of the study was to evaluate our TEP inguinal hernia repair initial results and compare them to literature data.

MATERIALS AND METHODS

In a prospective review and analysis we examined 61 cases with hernia repair via laparoscopy (specifically TEP), performed by a single surgeon, between April 2019 and December 2019 at the Kaspela University Hospital in Plovdiv. The centre's Institutional Review Board approved the study with no specific consents required due to the retrospective, minimal risk nature of the study. The routine informed consent required by the National Insurance Fund was considered sufficient for the study objectives.

Inclusion criteria were: (1) age 18 years or more, (2) ASA score Grade I, II, III (American Society of Anesthesiologists), (3) patients with uncomplicated inguinal hernia.

Exclusion criteria were: (1) patient's age less than 18 years, (2) ASA Grade IV-V, (3) complicated inguinal hernia, (4) recurrent inguinal hernia, (5) femoral hernia, (6) extreme BMI, (7) patient's reluctance for laparoscopic repair.

All TEPs were performed by a single experienced consultant surgeon. The surgical outcome measures included operating time (hours/minutes), conversion, peritoneal injury, surgical emphysema; and the clinical outcome measures included postoperative seroma, infection and chronic groin pain. The observational period was too short to evaluate the recurrence rate.

Three of the patients were excluded from the research because of conversion to open surgery, due to missing of sufficient working space. In two of them the reasons were extreme BMI>32, and in another case the reason was the tearing of peritoneum initially during insertion of a blind trocar, this was our fourth patient for TEP, and we do not have too much experience during this period.

After excluding 3 patients because of conversion to open surgery, all of the rest participants were hernia patients of one surgeon; they were surgically treated electively with a TEP repair for a unilateral or bilateral hernia defect. A total of 58 patients were included. There were 54 males (93.1%) and 4 females (6.9%) during this time interval **(Table 1)**. The mean age of the patients was 41.4 years (range, 18–82 years).

Table 1. Demographics

Variable	Data
Patients	n=58
Age, yrs (SD)	41.4 (14.1)
Sex, n (%)	
Male	54 (93.1%)
Female	4 (6.9%)
Hernia laterality	n (%)
Bilateral	48 (82.8%)
Unilateral	10 (17.2%)

Methods

The procedures were performed under general anesthesia. The patients were placed in the supine Trendelenburg 30-degree position. Infra umbilical 12 mm skin incisions were done. Anterior rectus fascia was incised on the same side with hernia (if the hernia is bilateral we usually choose the side of the smallest hernia) and rectus muscle was abducted and a trocar was inserted bluntly through symphysis pubis direction gently in preperitoneal space. We temporary closed the opening in the fascia by mattress suture. After that we started CO_2 insufflation of the chamber of 12 mm Hg pressure. Then 30 degree-angle optic was inserted and gentle blunt dissection of preperitoneal space

starts using "angles hair" method. We reached symphysis with camera, and after visualization of rectus muscles, a median 5-mm trocar was inserted four finger breaths bellow the camera trocar. Another median 5-mm trocar was also inserted at midpoint close to the symphysis. We continued with dissection of the chamber to visualize inferior epigastric vessels, inferior parts of rectus muscle and symphysis pubis. The pre-peritoneal space was created underneath the transversalis fascia containing the deep inferior epigastric vessels by a combination of blunt and/or sharp dissection from the midline to the ASIS (anterior superior iliac spine). The Cooper ligament was dissected to the point where it met the femoral vein and the iliopubic tract was exposed. The spermatic cord was found and the hernia sac was separated off the cord and reduced. Then a 10×15-cm mesh was located to cover the myopectineal orifice, the Hasselbach area and the femoral canal orifice. We did not fix the mesh to symphysis pubis. The anterior rectus fascia was closed with No 0 Vicryl suture and the skin incision with No 4/0 Vicryl intra cutaneous stitches. In bilateral hernias we preferred to use two separate meshes.

The majority of surgical mesh devices used to strengthen the hernia repair were lightweight monofilament, ultra-thin, non-absorbable polyester. The mesh fixation technique was not used.

The standard approach to postoperative pain consisted of paracetamol and non-steroidal anti-inflammatory drugs (NSAIDs). Additionally, single dose antibiotic prophylaxis, mainly 2nd generation cephalosporins, was given to patients (n=42/72.4%), before induction of anesthesia to prevent the occurrence of postoperative infectious complications.

The operation time was determined as the time from beginning of skin incision to the end of its closure. Duration was 48.88±8.16 min (range: 34–91 min) in unilateral and 96.14±21.44 in bilateral hernias.

Intra-operative complications were observed in 6 (10.34%) patients. They included bleeding from epigastric vessels in 1 (1.72%) and tearing of sac during dissection because of dense adhesions in 5 (8.62%) patients.

RESULTS

The time from postoperative day 1 to day 10 was defined as "short term interval." At day 10, the first follow-up in the clinic was scheduled. The median duration of hospital stay was 36 hours **(Table 2)**. One of the most important short-term postoperative symptoms was pain on the first day. Patients were asked to rate their pain on a visual analog scale (VAS) from 1 to 9 (1–3 - mild, 4–6 - moderate, 7–9 - severe). For the purposes of this study, postoperative pain was alternatively categorized into groups 1, 2, 3 corresponding to no, moderate, and severe pain, respectively. Inguinal pain on discharge was characterized as mild by 56 (96.55%) of the patients and moderate by 2 (3.44 %), while there was no severe pain described by the patients **(Fig. 1)**.

The most frequently reported postoperative complications were annoyance and discomfort (6 patients, 10.34%), swelling of scrotum (4 patients, 6.9%), seroma (2 patients, 3.44%), hematoma (1, 1.72%), paresthesia (1, 1.72%). Only seromas required special treatment.

The majority of patients (44, 75.86%) did not have complaints.

Table 2. Duration of hospital stay in hours and postoperative complication types

Duration of hospital stay	n (%)
24 h	4 (6.89%)
36-48 h	50 (86.20%)
72 h	4 (6.89%)
Complications	
Discomfort	6 (10.34%)
Swelling	4 (6.9%)
Seroma	2 (3.44%)
Hematoma	1 (1.72%)
Paresthesia	1 (1.72%)

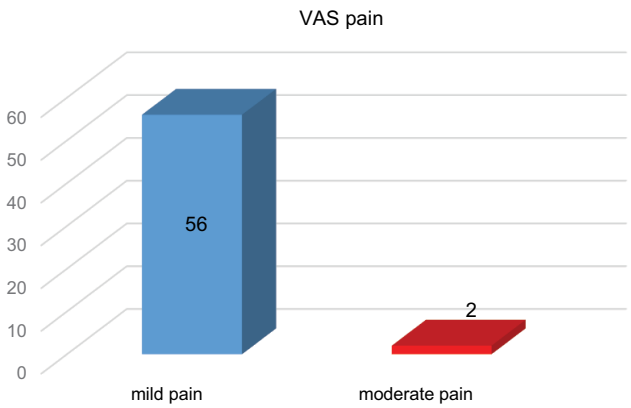

Figure 1. Postoperative pain: visual analog scale score.

DISCUSSION

Similarly to previous publications our study found out that inguinal hernias occurred more frequently in males, median age was 41.4 years, and types were right sided and oblique (indirect) in 42 (72.41%) of cases in contrast to Zendejas et al. who reported a higher frequency of direct hernias.[7]

The operation time in our series was 48.88±8.16 min (range: 34–91 min) for unilateral and 96.14±21.44 for bilateral hernias. Hisham reported operation time of 99±25 min (range 70-170 min), which coincides with our results.[8] However, as expected, simultaneous bilateral TEP took more time compared to the unilateral TEP.

Laparoscopic TEP inguinal hernia repair is, however, a challenge for surgeons, especially at the beginning of the learning curve, because of the unfamiliar posterior anatomical view of the inguinal wall anatomy and orientation

technical difficulties of laparoscopy. These challenges may cause conversion and serious complications. A problem unique to the TEP procedure is that technical difficulties can happen any time. We believe that conversion is a difficult and serious situation for both surgeon and patient, because patients have great expectations for maximal cosmetic results with minimally invasive surgery, and the surgeon may be concerned that conversion to conventional open surgery may result in a disaster for patients, because of the need for a new incision.[9]

In the present study, three out of 61 TEP were converted to open repair, with an overall conversion rate of 4.91%. The reason for conversion to open surgery was lack of sufficient working space. In two of them it was because of extreme BMI>32, and in another case because of the tearing of peritoneum. In these early cases we do not have too much experience. A similar conversion rate of 4% was reported by Cohen et al.[10], but there are conversion rates of up to 10% reported by some other researchers.[11] The causes for conversion include irreducible and complicated hernia, peritoneal injury/pneumoperitoneum, inability to unroll mesh, difficulties in creating space, high BMI, adhesion, epigastric vessel injury, iliac vessel injury, bowel injury, CO_2 retention, preformed anatomy, early phase of study and inexperience.

Tearing of the sac and pneumoperitoneum is common especially in old hernias. It results in migration of insufflated gas to the intraperitoneal cavity. This not only affects the respiratory dynamics but also results in loss of working space, making dissection difficult and dangerous. Pneumoperitoneum can also precipitate postoperative ileus. All such tears should be closed, usually with an absorbable endo loop. Larger tears may need multiple absorbable loops or intra corporeal sutures. At times, the pneumoperitoneum may warrant the placement of a Veress needle in the left subcostal position (Palmer's point) to deflate the gas and restore the domain. We observed this complication in 5 (8.62%) of our patients. We placed a Veress needle and closed the peritoneal openings by clip placement. A missed tear can result in future omental or intestinal herniation.[12]

The incidence of inferior epigastric artery and vein injury in laparoscopic extra peritoneal inguinal hernia repair ranges from 0.1 to 0.4%. These vessels are important landmark in inguinal hernia surgery, differentiating direct from indirect hernia and serving as a guide for hernia dissection. These are the most commonly injured abdominal wall vessels during surgery. These injuries can happen during creation of space especially in TEP, during separation of the hernia sac from the cord structure and tacking of mesh. Separation of the sac from the cord structures should be done in the middle part or in the lower part of sac, far from the deep ring.[13] The bleeding in our patients was caused by a lesion of the epigastric vein during mesh insertion in the preperitoneal space and it was controlled by bipolar coagulation with subsequent aspiration of blood and mesh placement without further obstacles. In contrast with our intraoperative complication rate, Köckerling et al.[6] reported intraoperative complications to be 1.19%.

In the present study, the overall incidence of the post-operative seroma was 3.44% (n=2) of all cases. The mean size of the seromas was 4.2 cm and within eight weeks, the seromas resolved spontaneously. Zanella et al.[14] and Dulucq et al.[15] have reported <5% incidence of seroma, while Hisham et al.[8] have reported a very high incidence of 21%. Significant clinical factors associated with seroma formation included old age, large defects, an extension of the hernia into the scrotum, and presence of a residual distal indirect sac. By logistic regression, a large hernia defect and an extension of the hernia into the scrotum were found to be independent risk factors for seroma formation.[15]

Minor short-term postoperative complications included annoyance and discomfort, swelling, and numbness, which is completely in accordance with the literature evidence.[16]

There were no patients' reports of complaints like post-operative chronic pain in our study, while the registered literature incidence varies from of 1-16%. Chronic (postoperative) pain has been defined as pain lasting at least 2–3 months (after surgery), but modifications are proposed to this time frame. A group of experts in hernia surgery and chronic pain has suggested modifying the definition for chronic pain after hernia repair as pain lasting at least 6 months after operation. The reason for this extended period of time is because the inflammation around the mesh is still ongoing after 3 months, and there is a chance that some patients will improve substantially from 3 to 6 months postoperatively.[17]

In our patients, we used two meshes in bilateral preperitoneal inguinal hernia repair. The laparoscopic insertion and manipulation of two smaller meshes in the preperitoneal space is easier than that using a larger mesh. And there are no differences in the early and late outcomes when one or two meshes were used for the laparoscopic repair of bilateral inguinal hernias; however, the cost was lower when a single mesh was used. The intensity of the inflammatory response is directly proportional to the mesh size. Utiyama EM et al. reports that the inflammatory responses to the mesh during the acute phase are similar in the two groups.[18]

For this short study period (six months) no hernia recurrence was recorded in the present study. Dulucq et al. reported 2.5% while Hisham et al. reported 4% incidence of hernia recurrence.[8,15] Several other randomized studies showed that non-fixation of the mesh is not associated with increased hernia recurrence rate and actually reduces the cost and the postoperative complications compared with mesh fixation techniques. The slit in the preformed mesh used in this study is placed around and behind the spermatic cord, providing some form of fixation and thus preventing mesh migration after preperitoneal desufflation. Recently two large case series[19] of TEP repairs with no mesh fixation reported recurrences rates of less than 0.3%.

CONCLUSIONS

Limitations of present study include its relatively small number of patients, all cases have been operated upon by a single surgeon and short postoperative follow-up period, but we are sharing our initial six-month results. These results demonstrate that laparoscopic TEP inguinal hernia repair without mesh fixation is a reliable technique that can reduce postoperative morbidity when applied by experienced surgeons.

Conflict of Interest

The author has no conflicts of interest to declare.

Ethical Statement

The author is accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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Тотальная экстраперитонеальная пластика паховой грыжи, проведённая одним и тем же хирургом: отчёт о предварительных результатах

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Дата получения: 10 мая 2020 ♦ **Дата приемки:** 11 сентября 2020 ♦ **Дата публикации:** 30 апреля 2021

Образец цитирования: Kostov GG, Dimov RS. Total extra peritoneal inguinal hernia repair: a single-surgeon preliminary findings report. Folia Med (Plovdiv) 2021;63(2):183-8. doi: 10.3897/folmed.63.e54133.

Резюме

Введение: Восстановление паховой грыжи – одна из самых распространённых операций в общей хирургии. Для восстановления паховых грыж использовались различные методы, начиная с первой методики реконструкции, описанной Бассини (Bassini) в 1887 году. В 1989 году Лихтенштейн (Lichtenstein) сообщил о новой технике: пластике паховой грыжи без натяжения. Лапароскопическое восстановление паховой грыжи было внедрено в начале 1990-х годов и быстро стало популярным. Литература подтверждает, что преимущества лапароскопии (по сравнению с открытой реконструкцией) чаще всего связаны с минимально инвазивным характером хирургического вмешательства с более низкой частотой раневых инфекций, более быстрым выздоровлением и меньшими послеоперационными болями.

Цель: Оценить наши первоначальные результаты ТЭП и сравнить с данными из литературы.

Материалы и методы: В рамках проспективного обзора и анализа мы изучили 61 случай герниопластики с помощью лапароскопии (особенно ТЭП), выполненные одним и тем же хирургом в период с апреля по декабрь 2019 года в университетской клинике «Каспела» в Пловдиве. Институциональный совет центра одобрил исследование без специального согласия ввиду ретроспективного характера с минимальным риском исследования. Обычное информированное согласие, требуемое НЗОК, было сочтено достаточным для целей исследования.

Критерии хирургического исхода включали время операции (часы / минуты), конверсию, травму брюшины, хирургическую эмфизему, а критерии клинического исхода включали послеоперационную серому, послеоперационную инфекцию и послеоперационную хроническую боль в паху.

Результаты: Паховая боль при выписке была описана как лёгкая у 56 (96.55%) пациентов и умеренная у 2 (3.44%), ни один из пациентов не описал боль как сильную. Наиболее частыми послеоперационными осложнениями были раздражительность и дискомфорт (10.34%), отёк (6.9%), серома (3.44%), гематома (1.72%), парестезия 1.72% (1); но только те, у кого была серома, требовали специального лечения.

Заключение: Ограничения настоящего исследования включали относительно небольшое количество пациентов, все случаи были прооперированы одним и тем же хирургом с последующим коротким послеоперационным периодом наблюдения, но тем не менее мы представляем наши предварительные шестимесячные результаты. Эти результаты показывают, что лапароскопическое ТЭП-восстановление паховой грыжи без использования паховой сетки является надёжным методом, который может снизить послеоперационную смертность при выполнении опытными хирургами.

Ключевые слова

паховая грыжа, преперитонеальная пластика паховой грыжи, ТЭП