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· 专题研究 ·

## 腹腔镜下腹壁疝腹膜外补片修补术与腹腔内补片修补术比较的多中心回顾性研究

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### 摘要

**背景与目的:** 腹壁疝修补术是最常见的外科手术之一, 全球每年有200万例左右的腹壁疝患者接受手术治疗。与开放手术相比, 腹腔镜下腹壁疝修补术优势明显。然而腹腔镜下腹腔内补片修补术(IPOM)与腹腔镜下腹膜外补片修补术(ESR)这两种腔镜术式的优缺点及疗效如何, 尚无大样本的临床研究证实。因此, 本研究通过比较ESR与IPOM两种手术方式治疗腹壁疝的近远期疗效, 为临床提供循证参考。

**方法:** 回顾性分析2017年1月1日—2022年12月31日湖南省11家医疗机构收治的157例行腹腔镜腹壁疝修补术患者的临床资料, 其中124例行ESR(ESR组), 33例行IPOM(IPOM组), 对比分析两组病例的临床特点、手术方式和术后近远期效果。

**结果:** 全组无中转开腹病例或围术期死亡病例。两组病例的年龄、性别、BMI、类型差异均无统计学意义(均 $P>0.05$ )。两组病例疝环横径、手术时间、术中出血量、疝环闭合概率差异均无统计学意义(均 $P>0.05$ )。网片固定方式ESR组以自固定和缝线固定为主(91.1%), 而IPOM组以钉枪固定为主(69.7%), 差异有统计学意义( $P<0.05$ )。ESR组的术后疼痛评分明显低于IPOM组( $2.4\pm 0.8$  vs.  $2.8\pm 1.0$ ,  $P<0.05$ ), 住院费用明显低于IPOM组(21 001元 vs. 38 437元,  $P<0.05$ )。两组的术后住院时间和近期并发症发生率差异无统计学意义(均 $P>0.05$ )。中位随访10.3个月, ESR组无复发病例, IPOM组2例复发(6.1%), 差异有统计学意义( $P<0.05$ )。

**结论:** ESR是湖南地区腹腔镜下腹壁疝修补的主流术式之一。由于固定方式和网片选择的不同, ESR较之IPOM而言, 术后疼痛更轻微、费用更低、复发率更低, 且并不明显增加手术时间和术后近期并发症。

### 关键词

疝, 腹; 疝修补术; 腹腔镜; 外科网

中图分类号: R656.2

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# A multicenter retrospective study comparing laparoscopic extraperitoneal sublay mesh repair and intraperitoneal onlay mesh repair for ventral hernias

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## Abstract

**Background and Aims:** The ventral hernia repair surgery is one of the most common surgical procedures, with approximately two million cases of ventral hernia patients undergoing surgical treatment worldwide each year. Compared to open surgery, laparoscopic ventral hernia repair offers significant advantages. However, there is currently no large-scale clinical research confirming the advantages, disadvantages, and therapeutic effects of two laparoscopic techniques: intraperitoneal onlay mesh (IPOM) and extraperitoneal sublay repair (ESR) for repairing ventral hernias. Therefore, this study was conducted to compare the short- and long-term efficacy of ESR and IPOM in the treatment of ventral hernias, so as to provide evidence-based references for clinical practice.

**Methods:** The clinical data of 157 patients who underwent laparoscopic ventral hernia repair in 11 medical institutions in Hunan Province from January 1, 2017 to December 31, 2022 were retrospectively analyzed. Among them, 124 cases underwent ESR (ESR group) and 33 cases underwent IPOM (IPOM group). A comparative analysis was performed on the clinical characteristics, surgical methods, and short- and long-term postoperative outcomes of the two groups of patients.

**Results:** There were no cases of conversion to open surgery or perioperative deaths in the entire cohort. There were no statistically significant differences in age, gender, BMI, or hernia type between the two groups (all  $P > 0.05$ ). There were no statistically significant differences in hernia defect diameter, operative time, intraoperative blood loss, or hernia ring closure rate between the two groups (all  $P > 0.05$ ). In terms of mesh fixation methods, self-fixation and suture fixation were mainly used in the ESR group (91.1%), while helical tack fixation was mainly used in the IPOM group (69.7%), and the difference was statistically significant ( $P < 0.05$ ). The postoperative pain score in the ESR group was significantly lower than that in the IPOM group ( $2.37 \pm 0.82$  vs.  $2.76 \pm 1.00$ ,  $P < 0.05$ ), and the hospitalization cost was significantly lower in the ESR group compared to the IPOM group (21 001 yuan vs. 38 437 yuan,  $P < 0.05$ ). There were no statistically significant differences in postoperative hospital stay and short-term complication rates between the two groups (all  $P > 0.05$ ). With a median follow-up of 10.3 months, there were no cases of recurrence in the ESR group, while the IPOM group had 2 cases of recurrence (6.1%), and the difference was statistically significant ( $P < 0.05$ ).

**Conclusion:** ESR is one of the main techniques for laparoscopic abdominal ventral repair in the Hunan region. Due to differences in fixation methods and mesh selection, ESR has advantages over IPOM, including milder postoperative pain, lower costs, and lower recurrence rates. Furthermore, it does not significantly increase operative time or the incidence of short-term postoperative complications.

**Key words:** Hernia, Ventral; Herniorrhaphy; Laparoscopes; Surgical Mesh

**CLC number:** R656.2

腹壁疝修补术是最常见的外科手术之一,全球每年约有200万例的腹壁疝患者接受手术治疗<sup>[1]</sup>。虽然目前尚无腹壁疝修补的金标准术式,但学界公认,相较于开放修补手术,腹腔镜下腹壁疝修补术的伤口感染发生率较低,住院时间更短,术后疼痛相对轻微,患者恢复更迅速<sup>[2-3]</sup>。腹腔镜下腹腔内补片修补术(intraperitoneal onlay mesh, IPOM)作为最经典的腹腔镜下腹壁疝修补术式之一,已经成为疝和腹壁外科专业医生所必须掌握的基本术式<sup>[4-6]</sup>。近年来,随着技术的不断进步,腹腔镜下腹膜外补片修补术(endoscopic sublay repair, ESR)逐渐成为部分中心常用的术式<sup>[7-8]</sup>。然而,IPOM和ESR治疗腹壁疝的优缺点及疗效如何,尚无大样本的临床研究证实。鉴于此,湖南省医学会外科学分会疝和腹壁外科学组对湖南省内同时开展这两种术式的中心进行了一项多中心回顾性临床研究,旨在评估这两种术式治疗腹壁疝的近远期疗效。

## 1 资料与方法

### 1.1 一般资料

本研究由中南大学湘雅医院疝和腹壁外科中心在湖南省医学会外科学分会疝和腹壁外科学组委员和青年委员所在单位发起,共30家医疗机构参与调查,其中11家同时开展了IPOM和ESR的医疗机构提供了病例。病例数>25例的单位包括中南大学湘雅医院、中南大学湘雅三医院、湖南省湘潭市中心医院和湖南医药学院第一附属医院;病例数10~25例的单位包括湖南省浏阳市人民医院、湖南省株洲市三三一医院、湖南省长沙市第一医院;病例数<10例的单位包括湖南省中医药大学第二附属医院、湖南省中医药大学第一附属医院、湖南省益阳市人民医院、湖南省长沙市第四医院。2017年1月1日—2022年12月31日,参与提供病

例的11家医疗机构共收治157例行腹腔镜腹壁疝修补术的患者,其中男61例,女96例,中位年龄61(52~79)岁;原发腹壁疝31例(脐疝19例,白线疝12例),切口疝126例;ESR组124例,IPOM组33例;ESR组中经腹膜前修补术(transabdominal preperitoneal, TAPP)103例,完全腹膜外修补术(totally extraperitoneal, TEP)21例。

纳入标准为:(1)患者术前影像学检查及体格检查支持腹壁疝诊断;(2)身体一般情况得到有效调整,可以耐受麻醉和手术。排除标准为:(1)年龄<18岁者;(2)术前诊断不明确者;(3)疝嵌顿需急诊手术者;(4)身体重要器官情况差,不满足麻醉条件者;(5)腹部存在感染或者创伤者;(6)伴有腹腔恶性肿瘤或者已有转移者。本研究为回顾性观察性队列研究,已经获得所在医疗机构伦理委员会批准,并获得知情同意豁免。

### 1.2 方法

**1.2.1 术前准备** 完善术前常规血化验检查和心电图、胸片、心肺功能等辅助检查,CT明确疝缺损大小。若为复发性,则详细了解前次手术补片放置及固定方式并调阅手术记录。若为吸烟患者,术前2周应严格戒烟。若患有高血压、糖尿病等基础疾病,则将血压、血糖调整稳定后行手术治疗。体质量指数(BMI)>30 kg/m<sup>2</sup>的患者,尽量减重至BMI<25 kg/m<sup>2</sup>后再行手术治疗<sup>[9]</sup>。所有患者均予以术前预防性抗生素。

**1.2.2 手术方法** 全身麻醉气管插管,仰卧位,气腹压12~14 mmHg(1 mmHg=0.133 kPa),一般采用3孔法或4孔法操作。IPOM手术:进入腹腔,全面探查,松解粘连,回纳疝内容物。测量疝环缺损并尽可能予以关闭,方法包括腹腔镜下连续缝合和钩针体外闭合。置入防粘连补片(柯惠公司15例,型号:PCO补片,规格:15 cm×10 cm;强生公司10例,型号:proceed补片,规格:20 cm×15 cm;天助公司8例,型号:复合补片,规格:15 cm×10 cm)

并固定,固定方法包括钉枪固定、缝线固定等<sup>[10]</sup>。ESR手术:根据是否进腹操作,分为TAPP和TEP两种方式。TEP途径在脐上或脐下做长约2 cm纵行切口,在腹直肌前鞘中间纵向切开,将腹直肌向两侧牵拉,分离达腹直肌后鞘,用手分离后鞘的间隙,然后经脐部切口插入10 mm Trocar,并缝扎固定于切口腹壁上,以防漏气;导入腹腔镜,先用镜头推剥,使原腔隙扩大。建立腹膜外“气腹”,调整患者头低足高位。再在腹腔镜直视下用腹腔镜镜头钝性分离腹膜外间隙进入腹膜前间隙,直至疝囊周围<sup>[11-12]</sup>。TAPP途径沿脐上或脐下作弧形切口,切开皮肤约1.2 cm,插入气腹针,建立气腹,在脐部切口部位旋转插入10 mm Trocar,在腹腔镜直视下,于两侧分别置入1个5 mm Trocar。沿疝环边缘4 cm处切开腹膜,进入腹膜前间隙<sup>[13]</sup>。在疝环周围准备至少5 cm的腹膜前区域。测量疝环缺损并尽可能予以关闭,方法包括腹腔镜下连续缝合和钩针体外闭合。将普通疝修补片置于游离的腹膜前间隙,自固定补片可以无需其他固定方法,其余类型补片使用缝线或可吸收钉进行固定。然后以可吸收缝线闭合腹膜瓣<sup>[14]</sup>。自固定补片或普通平片(柯惠公司75例,型号:TEM1515G,规格:15 cm×15 cm;天助公司36例,型号:轻量型平片,规格:15 cm×10 cm;巴德公司13例,型号:疝修补平片和预裁补片,规格:15 cm×15 cm)。

**1.2.3 术后处理** 术后采用快速康复理念促进患者早期康复,包括早期下床活动、限制性液体复苏、镇痛、不常规留置导尿及预防静脉血栓等。

### 1.3 统计学处理

采用SPSS 26.0统计软件进行统计学分析。计数资料以例数(百分数)[ $n(\%)$ ]表示,采用 $\chi^2$ 检验或Fisher精确检验进行比较。计量资料满足正态分布的以均数±标准差( $\bar{x} \pm s$ )表示, $t$ 检验进行比较,不满足正态分布的以中位数(四分位间距)[ $M(IQR)$ ]表示,采用非参数检验中的秩和检验进行比较。 $P < 0.05$ 为差异有统计学意义。

## 2 结果

### 2.1 ESR组与IPOM组一般资料的比较

ESR组平均年龄( $58.55 \pm 14.19$ )岁,男性占比40.3%,平均BMI( $25.2 \pm 4.1$ ) kg/m<sup>2</sup>,IPOM组平

均年龄( $63.3 \pm 11.8$ )岁,男性占比33.3%,平均BMI( $25.7 \pm 2.6$ ) kg/m<sup>2</sup>,差异均无统计学意义( $P > 0.05$ )。两组的病程、腹部手术史和吸烟史相比均无明显统计学差异( $P > 0.05$ )。IPOM组合并高血压、冠心病、糖尿病的比例比ESR组高,差异有统计学意义( $P < 0.05$ ),而两组慢性阻塞性肺疾病(COPD)的比例差异无统计学意义( $P > 0.05$ )。ESR组包括脐疝11例(11/124),白线疝11例(11/124),切口疝102例(102/124);IPOM组脐疝4例(4/33),切口疝29例(29/33),两组差异无统计学意义( $P > 0.05$ )(表1)。

表1 ESR组与IPOM组患者一般资料比较

Table 1 Comparison of the general data between ESR group and IPOM group

资料	ESR组( $n=124$ )	IPOM组( $n=33$ )	$P$
年龄(岁, $\bar{x} \pm s$ )	58.55±14.191	63.27±11.761	0.081
性别[ $n(\%)$ ]			
男	50(40.3)	11(33.3)	0.464
女	74(59.7)	22(66.7)	
BMI(kg/m <sup>2</sup> , $\bar{x} \pm s$ )	25.2±4.1	25.7±2.6	0.596
病程[年, $M(IQR)$ ]	0.75(0.1~2.0)	1.0(0.26~2.0)	0.908
腹部手术史[ $n(\%)$ ]	78(62.9)	22(66.7)	0.689
吸烟史[ $n(\%)$ ]	31(25.0)	4(12.1)	0.114
高血压[ $n(\%)$ ]	18(14.5)	11(33.3)	0.013
冠心病[ $n(\%)$ ]	5(4.0)	6(18.2)	0.005
糖尿病[ $n(\%)$ ]	4(3.2)	6(18.2)	0.002
COPD[ $n(\%)$ ]	2(1.6)	2(6.1)	0.150
诊断[ $n(\%)$ ]			
脐疝	11(8.9)	4(12.1)	0.216
白线疝	11(8.9)	0(0.0)	
切口疝	102(82.2)	29(87.9)	

### 2.2 ESR组与IPOM组手术指标的比较

两组的疝环大小、疝环闭合概率、手术时间、术中出血量等差异均无统计学意义(均 $P > 0.05$ )。两组的补片固定方式存在明显的差异( $P < 0.05$ ),ESR组以缝线固定为主,占比67.7%(21例),自固定免缝占比25.8%(8例),钉枪固定占比6.5%(2例);IPOM组以钉枪固定为主,占比71%(22例),钉枪和缝线固定占比为9.7%(3例),缝线固定占比为19.3%(6例)(表2)。

### 2.3 ESR组与IPOM组临床结局的比较

所有患者均顺利完成手术,无中转开腹及死亡病例。ESR组术后疼痛评分显著低于IPOM组( $2.4 \pm 0.8$  vs.  $2.8 \pm 1.0$ ,  $P < 0.05$ ),住院费用明显低于



IPOM组(21 001元 vs. 38 437元,  $P<0.05$ )。两组术后住院时间和近期并发症无明显差异(均  $P>0.05$ )。ESR组术后8例伤口并发症,2例血清肿,6例伤口感染。根据Clavien-Dindo分类,7例为一级并发症,仅通过换药及引流治愈,1例为三级并发症,行再次补片取出术。中位随访10.3个月,ESR组无复发病例,IPOM组2例复发(6.1%),差异有统计学意义( $P<0.05$ )(表3)。

表2 ESR组与IPOM组手术指标的比较

Table 2 Comparison of surgical indexes between ESR group and IPOM group

指标	ESR组(n=124)	IPOM组(n=33)	P
疝环横径(cm, $\bar{x} \pm s$ )	4.6±2.8	5.5±2.6	0.122
手术时间(min, $\bar{x} \pm s$ )	130.6±61.4	116.4±39.3	0.225
出血量[mL, $M(IQR)$ ]	10(6.3~20)	20(10~50)	0.223
疝环闭合[n(%)]	118(95.2)	33(100.0)	0.198
网片固定方式[n(%)]			
自固定	41(33.0)	0(0.0)	0.000
缝线	72(58.1)	6(18.2)	
钉枪	10(8.1)	23(69.7)	
缝线+钉枪	1(0.8)	4(12.1)	

表3 ESR组与IPOM组临床结局的比较

Table 3 Comparison of clinical outcomes between ESR group and IPOM group

项目	ESR组(n=124)	IPOM组(n=33)	P
术后疼痛评分( $\bar{x} \pm s$ )	2.4±0.8	2.8±1.0	0.022
术后住院时间[d, $M(IQR)$ ]	5(3~9)	8(5~12)	0.955
住院费用[元, $M(IQR)$ ]	21 001(13 781~37 519)	38 437(25 706~63 775)	0.000
术后近期并发症[n(%)]	8(6.5)	0(0.0)	0.134
术后复发[n(%)]	0(0.0)	2(6.1)	0.006

### 3 讨论

以IPOM术式为代表的腹腔镜下腹壁疝修补术已成为治疗腹壁疝最常用的方法之一<sup>[2,7]</sup>。文献<sup>[15-16]</sup>报道,与传统的开放式腹壁疝修补术相比,IPOM术后伤口并发症发生率较低,住院时间较短,患者恢复较快。但IPOM手术必须使用特殊的防粘网片,一方面价格较贵,另一方面,也是更重要的是,置入腹腔的补片与腹腔内的肠管直接接触,有可能导致粘连、侵蚀,甚至引起肠梗阻、肠瘘等严重并发症<sup>[17-21]</sup>。Chelala等<sup>[22]</sup>发现,1 326例患者接受IPOM手术后,有126例因各种原因进行了二次手术,术中发现12.69%的患者有重度粘连。Sharma等<sup>[17]</sup>对既往IPOM手术组、既往其余腹部手术组和既往无腹部手术组三组患者进行比较,结果显示IPOM组的粘连明显高于另外两组。由于腹腔镜手术的微创特性以及IPOM存在的这两个固有缺陷,近年来,外科医生不断探索技术突破,逐渐兴起了腹腔镜下腹膜外补片置入技术来治疗腹壁疝<sup>[23-24]</sup>。

Ruiz等<sup>[25]</sup>报道了59例采用TAPP和TEP技术来修补腹壁疝的队列,发现ESR能很好地避免了补片与肠管的接触,效果良好,成本明显降低,未

来有可能成为腹壁疝治疗的金标准。Megas等<sup>[26]</sup>详细对比了IPOM与TAPP两项技术的材料成本,发现TAPP的材料成本明显低于IPOM[(34.4±4)欧元 vs. (742.6±128.4)欧元]。本研究的结果也印证了上述优势,且由于湖南地区的经济仍欠发达,手术及住院费用仍为患者及医生选择治疗方案时的重要考量指标之一,因此本次多中心研究队列中ESR的占比高达79%,成为湖南地区腹腔镜下腹壁疝修补术的主流术式。

由于ESR需要在腹膜前间隙建立操作空间,理论上,这一操作较之IPOM而言更为复杂,手术时间更长。Prasad等<sup>[23]</sup>表明,与IPOM相比,TAPP的手术时间明显更长。但近期研究结果已有所不同,Gokcal等<sup>[27]</sup>对比机器人辅助下IPOM(r-IPOM)和TAPP(r-TAPP)在腹壁疝修补术中的结果,发现两组的手术时间无显著差异。而在Megas等<sup>[26]</sup>研究中,IPOM组的手术时间甚至长于TAPP组,虽然差异并无统计学意义。在本研究中,两组的手术时间无显著差异。究其原因,主要是由于近年湖南省整体腹腔镜疝修补术水平有显著提高,绝大多数的ESR手术均是由具有丰富腹腔镜疝修补术经验的外科医生施行<sup>[28-29]</sup>。

本研究的另一个有趣的发现是,ESR组术后

的疼痛评分明显低于 IPOM 组。笔者分析原因认为，这主要与两种手术方式的网片固定方式有关。ESR 组仅有 6.5% 的病例使用了钉枪固定，而 IPOM 组则有高达 80% 的病例使用了钉枪固定。这也成为 ESR 相较于 IPOM 的另一个重要优势<sup>[30-34]</sup>，Li 等<sup>[35]</sup>也印证了这个发现。此外，虽然 ESR 组术后有 1 例患者因发生补片感染而再次手术取出补片，但总体而言，近期并发症率和 IPOM 无显著差异。

综上所述，ESR 已成为湖南地区腹腔镜下腹壁疝修补的主流术式之一，且由于固定方式和网片选择的不同，ESR 较 IPOM 而言，术后疼痛更轻微、费用更低、复发率更低，且并不明显增加手术时间和术后近期并发症。本项研究是湖南地区首个比较 ESR 和 IPOM 两种术式的多中心临床研究，结果具有较好的代表性和适用性。但本研究也存在一些不足之处，本研究结果显示，ESR 组的复发率明显低于 IPOM 组，差异有统计学意义，但这可能与 IPOM 组的随访时间长于 ESR 组有关；此外，由于本研究是回顾性研究，且两组之间的病例数差异较大，故难免存在系统性偏倚可能。笔者建议，应设计更大规模的多中心前瞻性随机对照研究来对比两种术式的优缺点。

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