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INGUINODYNIA AFTER HERNIOPLASTY WITH VIDEO LAPAROSCOPIC TECHNIQUES: PREDICTIVE RISK FACTORS

**E.A. Gallyamov^{1,2,*}, S.N. Perekhodov², M.I. Vasilchenko²,
Yu.B. Busyrev³, S.A. Kuliev⁴, G.S. Gadlevskiy^{1,2}**

¹*I.M. Sechenov First Moscow State Medical University (Sechenov University),*

²*MEDSI Clinical Hospital, Krasnogorsk,*

³*“New World Surgery” Medical Clinic, Zbukovskiy*

⁴*Yusupovskaya Hospital (“Neuro-Clinic” LLC), Moscow, Russian Federation*

ИНГВИНОДИНИЯ ПОСЛЕ ГЕРНИОПЛАСТИКИ ВИДЕОЛАПАРОСКОПИЧЕСКИМИ ТЕХНИКАМИ: ПРОГНОЗИРУЕМЫЕ ФАКТОРЫ РИСКА

**Э.А. Галлямов^{1,2,*}, С.Н. Переходов², М.И. Васильченко²,
Ю.Б. Бусырев³, С.А. Кулиев⁴, Г.С. Гадлевский^{1,2}**

¹*Первый московский государственный медицинский университет имени И.М. Сеченова
(Сеченовский Университет),*

²*Клиническая больница МЕДСИ, г. Красногорск,*

³*Медицинская клиника «Новая мировая хирургия», г. Жуковский,*

⁴*Юсуповская больница (ООО «Нейро-клиника»), г. Москва, Российская Федерация*

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e-mail: eduardgal62@gail.com

[Gallyamov E.A. (*contact person) – DSc (Medicine), Head of the Department of General Surgery, Surgeon, ORCID: 0000-0002-6359-0998; Perekhodov S.N. – DSc (Medicine), Professor, Corresponding Member of the Russian Academy of Sciences, Director of the Clinical Hospital, ORCID: 0000-0001-7166-0290; Vasilchenko M.I. – DSc (Medicine), Professor, Deputy Chief Physician for Surgical Care; Busyrev Yu.B. – PhD (Medicine), Chief Physician, ORCID: 0000-0002-5475-4284; Kuliev S.A. – DSc (Medicine), Surgeon, ORCID: 0000-0002-7220-7292; Gadlevskiy G.S. – Assistant of the Department of General Surgery, Surgeon, ORCID: 0000-0003-0547-2085].

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e-mail: eduardgal62@gail.com

[Галлямов Э.А. (*контактное лицо) – доктор медицинских наук, заведующий кафедрой общей хирургии, врач-хирург, ORCID: 0000-0002-6359-0998; Переходов С.Н. – член-корреспондент РАН, доктор медицинских наук, профессор, директор, ORCID: 0000-0001-7166-0290; Васильченко М.И. – доктор медицинских наук, профессор, заместитель главного врача по хирургической помощи; Бусырев Ю.Б. – кандидат медицинских наук, главный врач, ORCID: 0000-0002-5475-4284; Кулиев С.А. – доктор медицинских наук, врач-хирург, ORCID: 0000-0002-7220-7292; Гадлевский Г.С. – ассистент кафедры общей хирургии Института клинической медицины, врач-хирург, ORCID: 0000-0003-0547-2085].

Objective. To identify predictive risk factors for pain syndrome following two video laparoscopic methods: transabdominal preperitoneal repair (TAPP) and total extraperitoneal repair (eTEP).

Materials and methods. 460 patients (aged 18–85 years) who underwent surgical treatment for inguinal hernia at Davydovsky City Clinical Hospital from January 2019 to May 2022 were included in the study. The patients were divided into two groups: 348 patients underwent laparoscopic TAPP, and 112 patients underwent laparoscopic eTEP. To assess inguinodynia the Visual Analogue Scale (VAS) was used one day and six months after the surgery.

Results. Body mass index (BMI), hypertension, the type of hernioplasty, and prior surgeries in the lower abdomen were determined as key risk factors for inguinodynia. ROC analysis revealed negative influence of prior lower abdominal surgeries on postoperative pain, with these patients reporting less discomfort. Both early postoperative pain and chronic inguinodynia were significantly more frequent after TAPP, which we considered to be associated with the features of this method, particularly the dissection of the parietal peritoneum.

Conclusions. Advantages of laparoscopic hernioplasty in reducing the risk of chronic pain compared to open inguinal hernia repair techniques were demonstrated. However, among laparoscopic methods, TAPP is associated with a higher incidence of both early and chronic postoperative pain, likely due to the dissection of the parietal peritoneum. The lowest pain levels were observed with the use of adhesive fixation for the implant. The analysis identified significant predictors of inguinodynia risk, including BMI, hypertension, and the type of hernioplasty, emphasizing the importance of an individualized approach to choosing the method of treatment.

Keywords. Inguinal hernia, laparoscopic inguinal hernia repair, minimally invasive inguinal hernia repair, hernioplasty, TAPP, eTEP.

Цель. Определение прогнозируемых факторов риска болевого синдрома после двух видеолaparоскопических методов – трансабдоминальной преперитонеальной пластики (TAPP) и полностью экстрапреперитонеальной пластики (eTEP).

Материалы и методы. В исследование включены 460 пациентов (18–85 лет), перенесших хирургическое лечение паховой грыжи в ГКБ им. И.В. Давыдовского с января 2019 г. по май 2022 г. Пациентов разделили на две группы: 348 человек с видеолaparоскопической TAPP и 112 человек с видеолaparоскопической eTEP. Для оценки ингинодинии использовалась шкала ВАШ спустя сутки и шесть месяцев после операции.

Результаты. Установлено, что основными факторами риска ингинодинии является индекс массы тела (ИМТ), гипертоническая болезнь, тип герниопластики, а также ранее проводимое вмешательство на нижнем этаже брюшной полости. При ROC-анализе выявлено, что при ранее проводимых оперативных вмешательствах на нижнем этаже брюшной полости пациенты меньше испытывали болевой дискомфорт. Как ранняя послеоперационная боль, так и хроническая ингинодиния достоверно чаще развиваются после TAPP, и это, на наш взгляд, может быть связано с особенностями данного метода, а именно диссекцией париетальной брюшины.

Выводы. Лапарoэндоскопическая герниопластика демонстрирует преимущества в снижении риска хронической боли по сравнению с открытыми методами коррекции паховой грыжи. Однако среди видеолaparоскопических методик TAPP ассоциирована с более высокой частотой как ранней, так и хронической послеоперационной боли, что может быть связано с диссекцией париетальной брюшины. Наиболее низкий уровень болевых ощущений наблюдался при использовании клеевой фиксации имплантата. Проведенный анализ выявил значимые предикторы риска развития ингинодинии, включая ИМТ, гипертоническую болезнь и тип пластики, что подчеркивает необходимость индивидуализированного подхода к выбору метода лечения.

Ключевые слова. Паховая грыжа, видеолaparоскопическая пластика паховой грыжи, минимально инвазивная пластика паховой грыжи, герниопластика, TAPP, eTEP.

INTRODUCTION

The laparoscopic approach to the treatment of inguinal hernia (IH) was first proposed by R. Ger et al. in 1982 [1]. A decade later, M.E. Arregui et al. (1992) presented preliminary results on the benefits of transabdominal preperitoneal repair (TAPP) in 52 patients [2], while J.L. Dulucq (1992), G.S. Ferzli et al. (1992), J.B. McKernan, H.L. Laws (1993), E.H. Phillips et al. (1993) recommended total extraperitoneal repair (eTEP), which would avoid complications due to disruption of the integrity of the peritoneal cavity [3–6]. Thus, the introduction of these two methods into practice has opened a new chapter in IH surgery.

Minimally invasive techniques IH repair versus open repair, and then the comparison of these two methods with each other, became a hot topic of debate about the advantages of one or another method in abdominal surgery [7]. However, even at present, the choice of videolaparoscopic technique remains an unresolved issue in terms of reducing postoperative inguinal pain (inguinodynia), the overall prevalence of which after IH repair is from 10 to 12 % [8]. In addition, current international recommendations do not provide specific algorithms regarding the preference of the TAPP or TEP method [9; 10]. We believe that both of these methods require additional study of the risk factors that determine the formation of inguinodynia in the postoperative period in patients with IH, in connection with which this study was conducted.

The aim of the study is to determine the predicted risk factors for inguinodynia after hernioplasty using various videolaparoscopic techniques.

MATERIALS AND METHODS

The prospective study included 460 patients aged 18–85 years who underwent surgical treatment for IH at Davydovsky City Clinical Hospital between January 2019 and May 2022. Depending on the type of hernioplasty performed, the patients were divided into two groups. Group I included 348 patients who underwent videolaparoscopic transabdominal preperitoneal repair (TAPP). Group II included 112 patients who underwent videolaparoscopic total extraperitoneal repair with improved visibility (eTEP). To analyze the factors of development of inguinodynia after hernioplasty, each study participant was questioned about pain sensation using Visual Analogue Scale (VAS) on the first day and six months after surgery. Statistical analysis of the obtained data was performed in the IBM SPSS Statistics software environment, version 28.0.1.

RESULTS AND DISCUSSION

Statistically significant differences ($p < 0.05$) were obtained between the severity of inguinodynia on the first day after surgery: the average VAS score in Group I (TAPP) was 5.5 ± 1.4 , while in Group II (eTEP) it was 3.4 ± 0.8 points. Six months after surgery, the VAS scores in the compared groups also had statistically significant differences (2.1 ± 0.24 and 1.4 ± 0.17 points, respectively, $p < 0.05$). That is, when performing hernioplasty using the TAPP method, the pain syndrome remained more pronounced than after eTEP.

Analyzing the nature of inguinodynia in the postoperative period, we also identified such

a factor as the method of positioning the implant ($p < 0.05$). The most pronounced pain sensations on the first day after surgery were observed in patients whose implant was fixed with a herniostapler (6.3 ± 0.4 points). The least pronounced pain sensations were observed in patients with adhesive fixation of the implant (3.3 ± 0.21 points). A similar trend was observed six months after the operation (Table 1).

mesh fixation. It was established that the main risk factors for inguinodynia are BMI, hypertension, type of hernioplasty, as well as previous intervention on the lower floor of the abdominal cavity (Table 2).

Table 1

Severity of inguinodynia after hernioplasty using TAPP and eTEP methods, points on a visual analogue scale

Observation period after surgery	Herniostapler	adhesive	Com-bined method	p
For the first day	6.3 ± 0.4	3.3 ± 0.21	5.4 ± 0.7	$p < 0.05$
In six months	2.2 ± 0.24	0.7 ± 0.15	1.9 ± 0.3	$p < 0.05$

Comparative assessment of the intensity of inguinodynia in the postoperative period depending on the surgical intervention technique, the type of implant fixation and the observation period is graphically presented in Fig. 1.

Further analysis of factors potentially influencing the development of inguinodynia in the postoperative period was performed, such as age, body mass index (BMI), type of hernia, diabetes mellitus, bronchial asthma, hypertension, connective tissue diseases, chronic venous insufficiency, hemorrhoids, the degree of anesthetic risks according to the ASA scale, type of hernioplasty, history of surgical intervention, history of herniotomy, duration of surgery, and method of

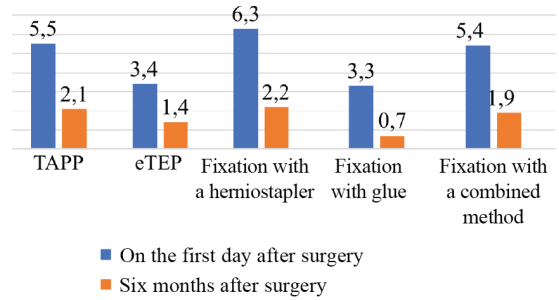


Fig. 1. Intensity of inguinodynia in the early postoperative period depending on the method of surgical intervention and the type of implant fixation, the number of points on the visual analogue scale

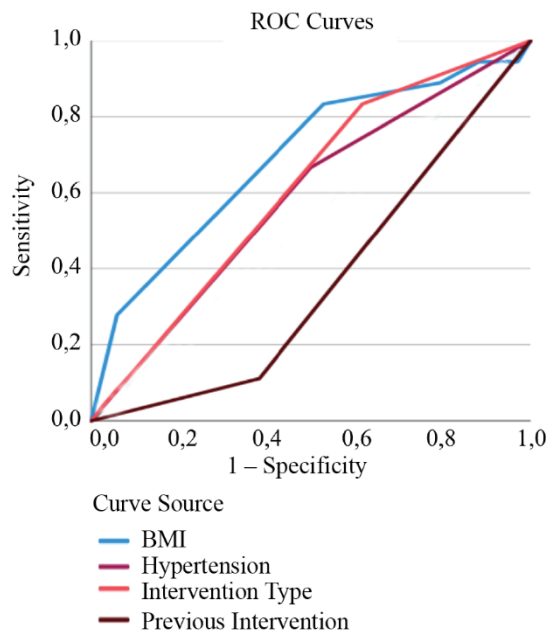


Fig. 2. ROC curves for assessing risk factors influencing the occurrence of inguinodynia in the postoperative period

ROC analysis (Fig. 2) revealed that patients with previous surgical interventions on the lower floor of the abdominal cavity

experienced less pain discomfort in the post-operative period.

Table 2

**Identification of predicted risk factors for inguinodynia
after videolaparoscopic inguinal hernia repair**

Variable	Regression equation coefficient (B)	Standard error of the coefficient B	Wald test	Number of degrees of freedom	Significance	B Exponent	95 % CI for Exp (B)	
Age	0.55	0.054	1.043	1	0.307	1.057	0.950	1.176
BMI	1.541	0.668	5.329	1	0.021	4.671	1.262	17.291
Hernia type	-0.930	1.300	0.512	1	0.474	0.394	0.031	5.042
Diabetes mellitus	3.486	2.247	2.406	1	0.121	32.647	0.399	2671.791
Bronchial asthma	-1.277	2.340	0.298	1	0.585	0.279	0.003	27.399
Hypertension	3.196	1.548	4.264	1	0.039	24.429	1.176	507.357
Connective tissue diseases	20.762	20404.213	0.000	1	0.999	1039814623	0.000	.
CVD	2.897	2.198	1.737	1	0.188	18.126	0.244	1347.471
Hemorrhoids	-20: 295	22035.757	0.000	1	0.999	0.000	0.000	.
The degree of anesthetic risks according to the ASA scale	4.034	2.668	2.286	1	0.131	56.483	0.303	10537.533
Type of hernioplasty	6.063	2.868	4.470	1	0.034	429.833	1.557	118693.460
History of surgical intervention	-3.389	1.595	4.511	1	0.034	0.034	0.001	0.770
History of hernia repair	2.669	1.654	2.603	1	0.107	14.419	0.564	368.712
Duration of operation	0.005	0.020	0.076	1	0.783	1.006	0.967	1.046
Mesh fixation method	-0.586	1.764	0.110	1	0.740	0.556	0.018	17.674

Note: BMI – body mass index, CVD – chronic venous disorder.

Most patients were discharged on the first day after surgery ($n = 398$; 86.5 %). On the second day, 44 (9.5 %) patients were discharged, which was due to the need for dynamic monitoring in the postoperative period. In addition, 18 (4 %) patients were discharged on the third day after surgery due to the peculiarities of hospital administration.

According to the definition of the International Association for the Study of Pain (IASP),

pain is an unpleasant sensory and emotional experience associated with actual or potential tissue damage or described by a person in terms of such damage. Chronic pain is any pain that persists beyond an uncomplicated healing period of 12 weeks. Post-hernia groin pain is pain that lasts longer than three months after surgery and is one of the most serious complications that occurs after IH removal; it is more common than previously thought [11].

Although hernioplasty is a relatively safe operation, it is associated with a number of potential complications, such as inguinodynia, the incidence of which, according to published data, varies widely (0 to 62.9 %) and averages from 10 to 12% [8]. However, 2–4 % of patients after IH repair experience chronic inguinodynia for many years, and this prevalence rate of inguinal pain is quite high given the volume of procedures performed worldwide [12].

Laparoendoscopic repair has been shown to be superior in terms of reducing the risk of inguinodynia compared to open methods of IH correction such as the Lichtenstein operation [9; 13]. However, sporadic results of comparison of various videolaparoscopic techniques of IH plastic surgery in terms of studying the incidence and risk of inguinodynia have been published. In this study, we found that both early postoperative pain and chronic inguinodynia develop significantly more often after TAPP, and this, in our opinion, may be associated with the features of this method, namely, dissection of the parietal peritoneum.

No statistical differences were found in the study by A. Elhadidi et al. [8] in the incidence of inguinodynia depending on the type of fixation, whereas in our study, when studying risk factors, it was found that the least pronounced pain was

observed in patients with adhesive fixation of the implant compared to fixation with a stapler or the use of a combined method.

According to the results of a systematic review and meta-analysis [14], the factors for inguinodynia are young age, the presence of other postoperative complications, a hernial sac defect of less than 3 cm, female gender, pre- and early postoperative pain. In our study, we did not receive confirmation of these prognostic factors. Our multivariate analysis showed that statistically significant predictors increasing the risk of developing inguinodynia after IH plastic surgery using videolaparoscopic methods were BMI, hypertension, and the type of plastic surgery, while a history of lower abdominal surgery, on the contrary, reduced the risk of inguinodynia.

CONCLUSIONS

The incidence of inguinodynia after IH plastic surgery in modern clinical practice remains at a fairly high level. Despite the fact that videolaparoscopic methods of hernioplasty are the least traumatic, it is necessary to take into account individual risk factors for inguinodynia in order to improve the quality of life of patients in the postoperative period.

REFERENCES

1. Ger R. The management of certain abdominal herniae by intra-abdominal closure of the neck of the sac. Preliminary communication. *Ann. R. Coll. Surg. Engl.* 1982; 64 (5): 342–344.
2. Arregui M.E., Davis C.J., Yucel O., Nagan R.F. Laparoscopic mesh repair of inguinal hernia using a preperitoneal approach: a preliminary report. *Surg. Laparosc. Endosc.* 1992; 2 (1): 53–58.
3. Dulucq J.L. Treatment of inguinal hernia by insertion of a subperitoneal patch under preperitoneoscopy. *Chir. Memoires Acad. Chir.* 1992; 118 (1–2): 83–85.
4. Ferzli G.S., Massad A., Albert P. Extraperitoneal endoscopic inguinal hernia repair. *J. Laparoendosc. Surg.* 1992; 2 (6): 281–286. DOI: 10.1089/lps.1992.2.281
5. McKernan J.B., Laws H.L. Laparoscopic repair of inguinal hernias using a totally extraperitoneal prosthetic approach. *Surg. Endosc.* 1993; 7 (1): 26–28. DOI: 10.1007/BF00591232

6. *Phillips E.H., Carroll B.J., Fallas M.J.* Laparoscopic preperitoneal inguinal hernia repair without peritoneal incision. Technique and early clinical results. *Surg. Endosc.* 1993; 7 (3): 159–162. DOI: 10.1007/BF00594098
7. *Iossa A., Traumueller Tamagnini G., De Angelis F., Micalizzi A., Lelli G., Cavallaro G.* TEP or TAPP: who, when, and how? *Front. Surg.* 2024; 11: 1352196. DOI: 10.3389/fsurg.2024.1352196
8. *Elbadidi A., Negm A., Shouma A.* Comparing stapler and sutured mesh fixation techniques for laparoscopic TAPP repair: a study on chronic groin pain on 3-year follow-up. *Updat. Surg.* 2024; 76 (4): 1467–1473. DOI: 10.1007/s00423-023-03207-6
9. International guidelines for groin hernia management. *Hernia* 2018; 22 (1): 1–165.
10. *Van Veenendaal N., Simons M., Hope W., Tumtavitikul S., Bonjer J.* HerniaSurge Group. Consensus on international guidelines for management of groin hernias. *Surg. Endosc.* 2020; 34 (6): 2359–2377. DOI: 10.1007/s00464-020-07516-5
11. *Prabhu T., Indransh A.K., Sanjana L.* A longitudinal study of the prevalence of post-surgical inguinodynia and the factors responsible for the development of chronic pain among the patients undergoing open hernioplasty at a tertiary care center. *Asian J. Med. Sci.* 2024; 15 (2): 212–217. DOI: 10.3126/ajms.v15i2.59890
12. *Pathak A.A., Fouzdar A., Kumar K., Agrawal V., Sharma N., Aggarwal V.* Long-term outcomes after surgery for inguinal hernia: a retrospective cohort study comparing outcomes of Desarda and Lichtenstein repairs with three years of follow-up. *Maedica J. Clin. Med.* 2024; 19 (3). DOI: 10.26574/maedica.2024.19.3.573
13. *Chen D.C., Morrison J.* State of the art: open mesh-based inguinal hernia repair. *Hernia* 2019; 23 (3): 485–492. DOI: 10.1007/s10029-019-01983-z
14. *Chu Z., Zheng B., Yan L.* Incidence and predictors of chronic pain after inguinal hernia surgery: a systematic review and meta-analysis. *Hernia* 2024; 28 (4): 1–21. DOI: 10.1007/s10029-024-02980-7

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Limitation of the study. The study complies with the standards of the Declaration of Helsinki and was approved by the Ethics Committee of the First Moscow State Medical University named after I.M. Sechenov (Sechenov University), protocol No. 13-23 dated July 20, 2023. Before the start of the study, all patients confirmed their participation by written informed voluntary consent.

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