



Laparoscopic bilateral inguinal hernia repair: Should it be the preferred technique?

Christos Doudakmanis, Christina Kolla, Konstantinos Bouliaris, Matthaïos Efthimiou, Georgios D Koukoulis

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Christos Doudakmanis, Christina Kolla, Konstantinos Bouliaris, Matthaïos Efthimiou, Georgios D Koukoulis, Department of General Surgery, General Hospital of Larissa, Larissa 41221, Greece

Corresponding author: Georgios D Koukoulis, MD, MSc, PhD, Surgeon, Department of General Surgery, General Hospital of Larissa, Tsakalof 1, Larissa 41221, Greece.
georgios.koukoulis@gmail.com

Abstract

Inguinal hernias are amongst the most common conditions requiring general surgical intervention. For decades, the preferred approach was the open repair. As laparoscopy became more popular and available and more surgeons became familiarized with this modality, laparoscopic inguinal hernia repair became an alternative. The aim of this study is to assess the effectiveness of laparoscopic inguinal repair, with a focus on bilateral inguinal hernias. Initial reports have shown promising clinical outcomes compared to those of conventional repair of bilateral hernias. However, there are only a few studies concerning laparoscopic repair of bilateral hernias. It is yet to be proven that laparoscopy is the “gold standard” in the treatment of bilateral inguinal hernias. So far, the choice of an inguinal hernia repair technique has been up to each surgeon, depending on their expertise and available resources after taking into consideration each patient's needs.

Key Words: Bilateral inguinal hernia; Laparoscopic repair; Open repair; Gold standard; Chronic pain; Recurrence

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Core Tip: Laparoscopic repair of bilateral inguinal hernias has become a common procedure over the past few years. It is associated with less pain and faster return to daily life compared to the open repair. As yet, there is little evidence to sufficiently support that it should be the preferred technique, as it depends on each surgeon to choose the repair technique that they will use.

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INTRODUCTION

Inguinal hernias are amongst the most frequent clinical manifestations of a general surgery department. Therefore, surgical procedures, both elective and emergent, are in most cases necessary to relieve the symptoms caused by hernias. Incidence of inguinal hernias is greater in patients older than 50 years of age, although they are also common in young children and infants. The vast majority of patients are male[1,2]. Bilateral hernias represent approximately 8% to 30% of inguinal hernias[3].

Mesh repair, such as the Lichtenstein or laparoscopic mesh repair approach, should be considered first by a surgeon. When considering non-mesh techniques, the Shouldice repair should be the primary choice[4]. Currently, open mesh repair remains the most widely used technique[5]. The European Hernia Society recommends laparoscopic repair for recurrent inguinal hernias. Regarding unilateral hernias, the choice between an open or laparoscopic approach depends on each surgeon and their expertise, as a surgeon needs to perform 50 to 100 repairs to master the laparoscopic repair technique [5]. When it comes to bilateral inguinal hernias, there is no official recommendation; however the European Hernia Society highlights that laparoscopic repair of bilateral hernias is associated with better short-term results without undermining long-term results[4,6]. This is stated as “self-evident” in the 2018 HerniaSurge guidelines, as a laparoscopic operation of two inguinal hernias through the same three incisions is considered superior in terms of recovery, chronic pain and cost-effectiveness[5]. Time to recovery and postoperative pain are considered to be less in laparoscopic repair due to less surgical trauma as it promotes diminished acute inflammatory postoperative response, proven by smaller quantities of cytokines[7].

The purpose of this study was to evaluate the effectiveness of laparoscopic repair techniques in bilateral inguinal hernias and to examine whether laparoscopic repair is superior compared to open repair based on the existing literature.

SEARCH OF THE LITERATURE

We conducted a thorough search of the literature using PubMed, the Scopus Elsevier Database and Cochrane Database. The search terms we used were: “bilateral hernias”, “inguinal hernias”, “laparoscopic hernia repair”, “laparoscopic *vs* open hernia repair”, “postoperative pain”, “chronic groin pain”, “cost-effectiveness”, “quality-of-life” and “recovery”. We collected the international guidelines regarding hernia repair issued by the European Hernia Society and HerniaSurge Group in order to review the official recommendations.

As there was no official recommendation on using laparoscopic repair in bilateral inguinal hernias as the “gold standard,” our main goal was to review the available literature to examine whether there is evidence supporting this assumption. We reviewed all available literature on this subject, with emphasis on prospective randomized trials. We included data from six prospective randomized studies regarding bilateral hernias (Table 1) and from one prospective randomized study, which focused on unilateral hernias but was the first to suggest beneficial results of laparoscopic repair on bilateral hernias. We also retrieved data from one prospective randomized trial that compared different techniques of laparoscopic repair. We reviewed comparative studies, meta-analysis and one large-scale retrospective study. The draft of this manuscript was written on Microsoft Word v.16 of Microsoft Corporation.

LAPAROSCOPIC HERNIA REPAIR

Since the introduction of laparoscopic repair techniques, there has been a debate regarding the superiority of laparoscopic over open inguinal hernia repair. Initial analysis has shown that laparoscopic repair is at least not inferior compared to the open approach in terms of operative time, postoperative pain, recovery and hospital stay[8]. The main factors used to compare the two approaches are immediate postoperative pain and pain following the months after surgery as well as mean postoperative recovery time to daily activities[9]. As there has been tremendous progress in laparoscopic surgery in the past decades, laparoscopic hernia repair techniques are now becoming widely available to surgeons, and there is a belief that these techniques may supersede open repair procedures.

Table 1 Prospective randomized trials regarding bilateral hernias

Ref.	Journal	Title of study	Compared techniques	Patients	Subject
Sarli <i>et al</i> [20], 2001	<i>Surg Laparosc Endosc Percutan Tech</i>	Simultaneous repair of bilateral inguinal hernias: A prospective, randomized study of open, tension-free <i>vs</i> laparoscopic approach	TAPP <i>vs</i> Lichtenstein	43 (20 <i>vs</i> 23)	Surgical procedure, postoperative pain and course, follow-up, cost analysis
Mahon <i>et al</i> [21], 2003	<i>Surg Endosc</i>	Prospective randomized trial of laparoscopic (transabdominal preperitoneal) <i>vs</i> open (mesh) repair for bilateral and recurrent inguinal hernia	TAPP <i>vs</i> Lichtenstein	120 (60 <i>vs</i> 60)	Surgical procedure, postoperative pain and course, recovery
Ielpo <i>et al</i> [22], 2018	<i>Am J Surg</i>	A prospective randomized study comparing laparoscopic TAPP <i>vs</i> Lichtenstein repair for bilateral inguinal hernias	TAPP <i>vs</i> Lichtenstein	134 (61 <i>vs</i> 73)	Surgical procedure, postoperative course, recovery, quality of life, chronic pain
Bignell <i>et al</i> [23], 2012	<i>Hernia</i>	Prospective randomized trial of laparoscopic (TAPP) <i>vs</i> open (mesh) repair for bilateral and recurrent inguinal hernia: incidence of chronic groin pain and impact on quality of life: Results of 10-yr follow-up	TAPP <i>vs</i> Lichtenstein	120 (60 <i>vs</i> 60)	Chronic groin pain, quality of life
Hynes <i>et al</i> [24], 2006	<i>J Am Coll Surg</i>	Cost effectiveness of laparoscopic <i>vs</i> open mesh hernia operation: Results of a department of veterans affairs randomized clinical trial	All laparoscopic <i>vs</i> all open	1395 (687 <i>vs</i> 708)	Quality of life, cost-effectiveness
Ielpo <i>et al</i> [25], 2018	<i>Ann Surg</i>	Cost-effectiveness of randomized study of laparoscopic <i>vs</i> open bilateral inguinal hernia repair	TAPP <i>vs</i> Lichtenstein	165 (81 <i>vs</i> 84)	Quality of life, cost-effectiveness, cost analysis

TAPP: Transabdominal preperitoneal.

LAPAROSCOPIC REPAIR TECHNIQUES

Laparoscopic inguinal hernia repair may be conducted using two different techniques the transabdominal preperitoneal procedure (TAPP) and the totally extraperitoneal procedure (TEP). These approaches may differ in terms of access but share the same concepts of laparoscopic surgery. So far, they have shown similar outcomes in terms of recovery, hospital stay, chronic pain and quality of life [10]. TAPP, although it is easier to learn and perform, has a longer operating time and greater incidence of postoperative pain, while TEP is associated with a greater incidence of seroma formation. The differences between the two approaches are not significant, thus the techniques are comparable. It is reported that the risk for seroma and hematoma formation is also comparable regarding TAPP, TEP and the open repair [11]. The cost for both laparoscopic procedures is similar [10,12].

Since the first studies regarding laparoscopic hernia repair techniques were published, these techniques have progressed. Newer lightweight meshes are associated with less pain and a lower recurrence rate, in contrast to outdated heavyweight meshes [13]. Mesh fixation techniques have also undergone changes in the past few years. Tack fixation while widely used, is associated with considerable postoperative pain due to the presence of a foreign body in the inguinal region. In recent years, titanium tacks have gradually been replaced by absorbable tacks, which cause less pain [14]. Transfacial suture fixation and fibrin glue fixation are new techniques associated with significantly less pain compared to the use of tacks [15,16]. The technique shown to cause minimal pain, both postoperatively and long-term, is the use of a lightweight mesh fixed using fibrin glue [17,18]. We must note that in the totally extraperitoneal procedure, mesh fixation is not a prerequisite, and it can be avoided without putting the effectiveness of the procedure in danger [19].

DO SHORT-TERM RESULTS INDICATE LAPAROSCOPIC REPAIR OF BILATERAL INGUINAL HERNIAS AS A BETTER OPTION?

There are three randomized prospective trials in the literature that compare laparoscopic to open repair of bilateral inguinal hernias. Sarli *et al* [20] published the first prospective randomized control trial, which included 43 patients, comparing open mesh repair to laparoscopic repair of bilateral inguinal hernias. In their study, the Lichtenstein procedure was compared to the TAPP, and factors such as operating time, complications, postoperative pain, time to recovery and cost-effectiveness were analyzed, with a follow-up of up to 3 years postoperatively. Despite a higher cost, laparoscopic repair was associated with faster recovery and less pain in the immediate postoperative period, while complications, days of hospitalization and recurrence rates were similar in both groups [20].

These first results were subsequently supported by the randomized control trial of Mahon *et al*[21]. In this study, a total of 120 patients were included. The endpoint of this study was the superiority of TAPP over the open repair for bilateral hernias, in terms of postoperative pain, days of hospitalization and time to recovery[21]. Ielpo *et al*[22] published their randomized control trial in 2018, comparing TAPP with the open repair for bilateral inguinal hernias. In their study, a total of 134 patients were included over a 2-year span. Their results supported those of prior randomized controlled trials, in terms of beneficial short-term results, such as recovery, postoperative pain and complications[22].

Clinical outcomes of laparoscopic surgery outperformed those of open repair and supported the concept of establishing laparoscopic repair in bilateral inguinal hernias as the “gold standard,” regardless of the technique performed (as TAPP and TEP are associated with similar outcomes)[12,20-22].

IS THERE SUFFICIENT EVIDENCE OF LONG-TERM SUPERIORITY OF THE METHOD?

Chronic pain, quality of life and recurrence rates are the most important factors to evaluate long-term superiority. In the study of Ielpo *et al*[22], chronic pain and long-term quality of life are under investigation, and it is one of the two published randomized controlled trials regarding chronic pain, along with the 2012 study of Bignell *et al*[23]. The results of the study by Ielpo *et al*[22] indicated that patients undergoing laparoscopic repair had less postoperative pain, fewer complications and, more importantly, less chronic pain, but there was no statistically significant difference regarding the long-term quality of life.

Chronic groin pain is one of the factors indicative of long-term success of the method. The existing literature suggests that laparoscopic repair is superior in terms of short-term clinical outcomes but, so far, has failed to provide adequate evidence of superiority in the years following surgery. Incidence of chronic pain in the inguinal area is higher, but pain is milder in patients who have undergone laparoscopic repair compared to open repair. The most representative indicator of the long-term success of the procedure is quality-adjusted life years, which is presumed higher in laparoscopic repair, demonstrating the superiority of the method. However, overall quality of life as determined through questionnaires was found to be similar in laparoscopic and open repair groups[23]. This result was also supported by data derived from studies focusing on the effectiveness of the techniques. Data from these two studies underline the comparable quality of life of patients from both repair groups. There were no statistically significant differences[24,25].

Besides quality-of-life markers, recurrence rates depict the success of the procedure in the years following surgery. Available data from prospective randomized studies have shown that only a few cases of recurrence following both laparoscopic and open repair were recorded. In addition, recurrence rates are similar between laparoscopic and open repair groups[20-23,25,26]. In five studies, more cases of recurrence were recorded in the laparoscopic group as an absolute number of cases, but the two groups did not differ significantly. A statistically significant difference ($P < 0.001$) in recurrence rates was only recorded in the retrospective study of Hynes *et al*[24], with a higher recurrence in the laparoscopic repair group. This was mostly attributed to operations performed by less experienced surgeons [24,26]. It must be noted that the study of Hynes *et al*[24] refers to operations performed in the early 2000s with the techniques and consumables available at that time. This may have been a contributing factor to the difference in recurrence in this study (Table 2).

IS LAPAROSCOPY WORTH THE COST?

A critical issue about laparoscopic repair is the cost in accordance with the postoperative quality of life. Two randomized prospective trials about cost-effectiveness of laparoscopic repair were found in the literature. Early data from a randomized controlled trial published in 2006 demonstrated that laparoscopic repair had a significantly higher cost and higher quality of life. The data supported the concept of open repair being more cost-effective for bilateral inguinal hernias[24]. In contrast, Ielpo *et al*[25] analyzed clinical outcomes, such as pain, recovery, recurrence and complications, costs, quality-adjusted life years and calculated cost-effectiveness. Their study showed a significantly higher cost of laparoscopic repair. At the same time, clinical outcomes of laparoscopic repair outperformed those of open repair. This demonstrates that laparoscopic repair may be cost-effective for bilateral inguinal hernias [25].

Laparoscopy has a priori higher cost, which is even higher when consumables are included. Although laparoscopic instruments may be reusable, making their use affordable, the main factor increasing the cost is the mesh fixation technique. Newer fixation techniques, such as self-gripping meshes and fibrin glue fixation have been proposed as more cost-effective fixation techniques[27]. It is of utmost importance to investigate cost-effectiveness. It must be noted that the latest randomized controlled trial analyzing cost-effectiveness indicated that laparoscopic repair in bilateral inguinal hernias is considered cost-effective. This difference between prior studies[24] and this one[25] likely derives from the fact that

Table 2 Recurrence rates

Ref.	Patients	Laparoscopic	Open
Sarli <i>et al</i> [20], 2001	43 (20 <i>vs</i> 23)	0%	4.34%
Mahon <i>et al</i> [21], 2003	120 (60 <i>vs</i> 60)	6.7%	1.7%
Ielpo <i>et al</i> [22], 2018	134 (61 <i>vs</i> 73)	6.6%	5.5%
Bignell <i>et al</i> [23], 2012	120 (60 <i>vs</i> 60)	7%	8%
Hynes <i>et al</i> [24], 2006 ¹	1395 (687 <i>vs</i> 708)	8%	4% ^a
Neumayer <i>et al</i> [26], 2004	353 (175 <i>vs</i> 178)	4.57%	2.80%
Ielpo <i>et al</i> [25], 2018	165 (81 <i>vs</i> 84)	7.4%	4.8%

¹Recurrence rates for both unilateral and bilateral hernias.

^a $P < 0.01$.

with advances in laparoscopic surgery, necessary equipment along with consumables have become more accessible and more affordable. It should be emphasized that in the past few years more patients have undergone laparoscopic repair, so more patients have been enrolled in newer studies. This evidence is considered more representative[25].

IS THERE SUFFICIENT EVIDENCE?

All of the trials supporting the superiority of laparoscopic repair of bilateral hernias included only a small number of patients[20-27]. In the literature, there is only one large-scale retrospective non-randomized study. This particular study, which included more than 2800 patients with bilateral inguinal hernias, concluded that laparoscopic repair was at least non-inferior to the open repair and that it should be considered as “gold standard”[28]. As this study is retrospective, the level of evidence is not considered sufficient to set a “gold standard,” but it still provides an indication. It is more than clear that more large-scale prospective randomized trials are needed to prove this point. The first studies regarding bilateral hernias were published in the late 1990s and early 2000s. Until recently, and for approximately 15 years, there were only a few studies published underlining the fact that there is research progress to be made to define laparoscopic repair of bilateral inguinal hernias as the “gold standard.” The wide range of techniques used explains the diversity of the results of the existing trials. Uniformity of future studies is an issue that should be addressed. A consensus on the methods used between different study groups should be determined if significant results are to be extracted. In existing studies, study design depends mostly on each researcher and their clinical practice. Another issue is that some studies investigated laparoscopic repair in both unilateral and bilateral hernias. Newer studies have greater uniformity as they compare TAPP *vs* open repairs, but they lag behind in terms of patients enrolled[20-23].

WHICH TECHNIQUE SHOULD A SURGEON USE?

Laparoscopic techniques in hernia repair surgery have progressed over the past decades. Clinical outcomes of laparoscopic repair in bilateral hernias are very promising, as they outperform those of open repair in terms of pain in the immediate postoperative period and recovery. Over the years, these techniques have become more cost-effective. There is a shortage of evidence supporting the long-term superiority of these surgical procedures regarding quality of life as well as chronic groin pain. So far the results are controversial. To this day, it is still not possible to recommend a specific repair technique for bilateral hernias.

Available evidence is in favor of laparoscopic repair, but there is a lack of solid data. Future prospective studies are needed to compare the use of different techniques and surgical instruments as well as different meshes and fixation techniques. As existing evidence supports short-term superiority of the laparoscopic repair and suggests that it is a safe procedure when performed by a suitably trained surgeon, alongside the diminishing cost, it is promising to await future studies focusing on the long-term results of this method.

The answer to a surgeon's question “which technique should I use” is multifactorial. First, as there is still progress to be made in laparoscopy in order to establish it as the “gold standard” procedure, willingness of patients to undergo laparoscopic repair must be taken into consideration. It is crucial to

explain to them that a laparoscopic repair requires general anesthesia, whereas an open repair may be conducted in most cases under spinal anesthesia. In addition, we should not undermine the expertise of surgeons. As laparoscopic repair has a prolonged learning curve, it is more than clear that reforms in surgical training alongside special training programs are required to train surgeons, in order to familiarize them with these techniques. Only when these procedures are widely available and can be done safely, can we conclude that laparoscopic repair is the “gold standard” technique for the treatment of bilateral inguinal hernias.

CONCLUSION

Laparoscopic repair of bilateral inguinal hernias is associated with less postoperative pain and faster return to daily life compared to the open repair, but we do not have solid evidence supporting the long-term superiority of laparoscopic procedures over open repair regarding quality of life as well as chronic groin pain.

FOOTNOTES

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Country/Territory of origin: Greece

ORCID number: Christos Doudakmanis 0000-0001-8242-0452; Christina Kolla 0000-0002-0177-1240; Konstantinos Bouliaris 0000-0001-8403-8177; Matthaios Efthimiou 0000-0002-3644-6069; Georgios D Koukoulis 0000-0002-6958-6447.

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