

## “All-in-One Mesh” Hernioplasty for Inguinal Hernia: A Systematic Review

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### Abstract

The inguinal hernia is the most common abdominal wall hernia and consequently one of the most commonly performed surgical procedures. Surgical repair of inguinal hernia includes mesh-based or suture-based, following a posterior or anterior approach, through open surgical or laparoscopic/endoscopic procedures. Over the past years, various mesh types and surgical techniques were proposed to decrease postoperative pain; however, the results were not satisfactory. For that, we conducted a systematic electronic database search for suitable studies from inception till 31st May 2020 in seven databases. Finally, we included 2 papers for this systematic review and meta-analysis. The most-reported early complications were a limitation of normal activity and bruising of external genitalia with a prevalence of 9%, and 3.5% respectively. There was no report of late postoperative complications in terms of postoperative neuralgia, discomfort and sensation of a foreign body. All patients were discharged within 24h from surgery with slight pain reported by the majority of patients and no postoperative neuralgia. In conclusion, the “All-in-one mesh hernioplasty” technique is considered a promising approach in terms of minimizing post-operative complications such as post-operative pain, the sensation of foreign body, and recurrence rates. However, large-scale studies are needed with longer follow up the duration to assess the safety and efficacy of this technique in inguinal hernia repair.

**Keywords:** All-in-One Mesh; Hernioplasty; Inguinal Hernia

### Introduction

The most common abdominal wall hernia is inguinal hernia; hence, one of the most commonly performed surgical procedures is the inguinal hernia repair [1,2]. About 20 million inguinal hernia repairs are conducted yearly, around the globe [1,2]. About one-third of the patients would be asymptomatic and up to half of them would be unaware of having inguinal hernia [2,3]. Hernia incarceration is

experienced in < 3% of the diagnosed patients, if the non-surgical option was chosen and 5 - 10% of all surgical repair would be done as an emergency procedure, mostly due to incarceration [4-6]. Femoral repairs responsible for a considerable portion of all inguinal hernia repairs; in men, it accounts for 7% of emergency repairs and 1% of all repairs, while in females it represents 53% of emergency repairs and 15% in elective ones [7-9]. Noteworthy, the 30-day mortality of femoral hernia repair is seven times more than other background population [10,11].

Watchful monitoring in patients with no symptoms or progression has shown to be an acceptable option, instead of surgery [4,12]. Nevertheless, patients with surgical repair showed a superior quality of life in the following year compared to those with watchful waiting [13]. Although surgical treatment is not always recommended in asymptomatic men with inguinal hernia, it is the standard practice in women if they were not pregnant [3,12]. Surgical repair of inguinal hernia includes mesh-based or suture-based, following a posterior or anterior approach, through open surgical or laparoscopic/endoscopic procedures [12,14,15]. Minimally invasive surgical repair (laparoscopic) found to be an acceptable option to replace the standard open repair. The long-term outcomes of the laparoscopic approach shown to be comparable between laparoscopic and open repairs; the rates of post-operative chronic numbness were 9.2% and 21.5% in open and minimally invasive procedures, respectively.

Post-operative pain following inguinal hernia repair, in most cases, is transient and controlled with pain medications and variable among patients [16]. In some cases, neuropathic pain can become chronic disabling pain, mostly caused by entrapment of nerves in the subaponeurotic layer [17,18]. Over the past years, various mesh types and surgical techniques were proposed to decrease postoperative pain; however, the results were not satisfactory [19-22]. This paved the way to propose a new surgical technique; in this study, we provide a review of the outcomes of the newly described "all-in-one mesh" hernioplasty.

## Methods

### Search strategy and study selection

The study process was conducted following the accepted methodology recommendations of the PRISMA checklist for systematic review and meta-analysis where registration of the protocol is not mandated [23]. We conducted a systematic electronic database search for suitable studies from inception till 31<sup>st</sup> May 2020 in seven databases including Google Scholar, System for Information on Grey Literature in Europe (SIGLE), Scopus, Web of Science (ISI), PubMed, Virtual Health Library (VHL), Clinical trials.gov, and the New York Academy of Medicine (NYAM) Library, using keywords, medical subject (MeSH) terms. In databases not supporting MeSH terms, combinations of all possible terms were used. Moreover, We conducted a manual search of references from the included articles by searching the primary studies that had cited our included papers and scanning references of the relevant papers in PubMed and Google Scholar to avoid missing any relevant publications [24].

We included all original studies reporting "All-in-one mesh" hernioplasty for inguinal hernia. There were no restrictions on study design, country, language or publication date. Papers were excluded if there were one of the following exclusion criteria: 1) *in vitro* or animal studies; 2) data duplication, overlapping or unreliably extracted or incomplete data; 3) abstract only articles, reviews, thesis, books, conference papers or articles without available full texts (conferences, editorials, author response, letters, and comments. Three independent reviewers screened titles and abstracts for selecting eligible papers. Further full-text screening was performed to ensure the inclusion of relevant papers in our systematic review. Any disagreement was done by discussion and consulting the senior member when necessary.

### Data extraction

The data extraction form was developed by two authors, using a Microsoft Excel file. Three reviewers independently extracted data from included studies using the excel sheet. Data checking was performed through a fourth reviewer. All the disagreements and discrepancies were resolved by discussion and consultation with a senior member when necessary.

Quality assessment

Three independent reviewers evaluated the risk of bias in included studies. The National Institutes of Health (NIH) quality assessment tool was used to assess the quality of each included study [25]. Quality assessment of each study was obtained through a scoring system including 14 questions. The criterion was judged as following; a score of 13 to 14 was good, 9 to 12 was fair, and studies scoring below 9 are considered of poor quality [26]. Any discrepancy between the reviewers was solved by discussion.

Results

Study selection and characteristics

We searched for included studies in 828 records using the title and abstract screening method after the exclusion of 124 duplicated records. The process resulted in the inclusion of 10 papers for a further full-text screening assessment. Manual search trials did not result in the inclusion of any new study. Finally, we included 2 papers for this systematic review and meta-analysis (Figure 1 and table 1) [18].

Reference ID	Study design	Sample size	Follow up period	Male (%)	Mean age	Quality assessment
Guttadauro/2017/Italy [18]	Prospective cohort	250	24 months	241 (96%)	61.7	Fair
Testa/2018/Italy [27]	Prospective cohort	400	24 months	384 (96%)	56	Fair

Table 1: Characteristics of the included studies.

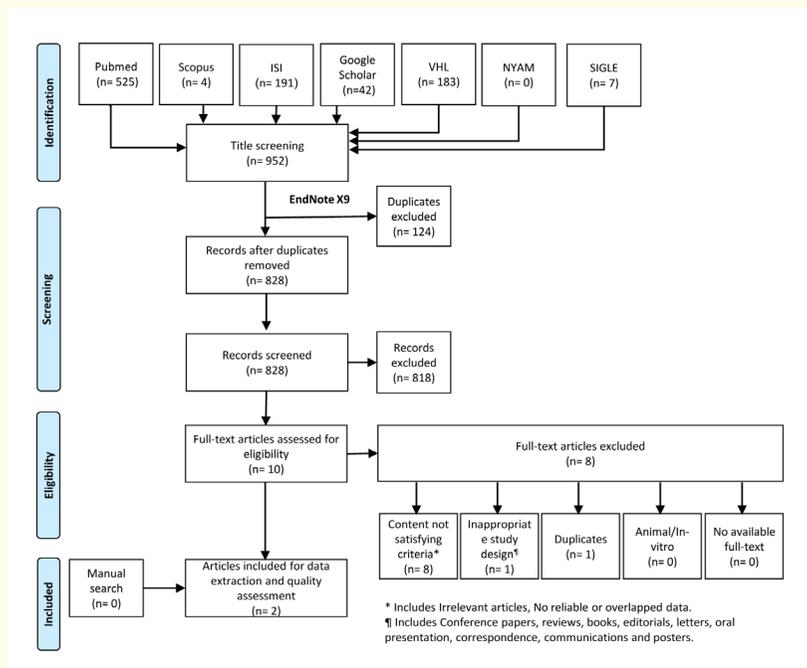


Figure 1: PRISMA flowchart of the screening and review process.

The two studies were prospective cohorts. The total sample size was 650 patients with a mean age of 61.7 and 56 years. The follow-up duration in the two studies was 24 months with a male prevalence of 96%. The two studies were of fair quality.

**Postoperative complications**

**Early complications**

There were 5 reported early complications. The most-reported early complications were a limitation of normal activity and bruising of external genitalia with a prevalence of 9% and 3.5% respectively (Table 2). The least reported complications were urinary retention and orchitis with a percentage of 0.04%, 0.03% in order.

Complications		Event N (%)
Early	1-Bruising of the external genitalia	23 (3.5%)
	2-Urinary retention	3 (0.4%)
	3-Orchitis	2 (0.3%)
	4-Limitation of normal activities	59 (9.1)
Late	1-Post-operative neuralgia	0 (0%)
	2-Sensation of foreign body	0 (0%)
	3-Discomfort	0 (0%)
	4-Recurrence	1 (0.02%)

**Table 2:** Complications of the procedure.

**Late complications**

There was no report of late postoperative complications in terms of postoperative neuralgia, discomfort, and sensation of a foreign body. While only one case of hernia recurrence was reported (0.02%).

**Mean postoperative pain**

The mean postoperative pain on the first day was 2.1 in Guttadauro., *et al.* [18] while it was 3 in Testa., *et al* [27]. In the first weak it was 1.2 in Guttadauro., *et al.* [18] and 1.6 in Testa., *et al* [27]. In the second and the third weak it was 0.06 and 0.01, respectively in Guttadauro., *et al.* [18], while it was 0 in the second and third weeks in Testa., *et al.* [27] (Table 3).

Study	Pain medication N (%)	Pain score*	Mean
Guttadauro/2017/Italy [18]	171 (68.4)	First day	2.1
	121 (42.4)	First week	1.2
	0 (0%)	Second week	0.06
	0 (0%)	Third week	0.01
Testa/2018/Italy	400 (100%)	First day	3
	0 (0%)	First week	1.6
	0 (0%)	Second week	0
	0 (0%)	Third week	0

\*Measured by Numerical Rating Scale, NR = Not Reported

**Table 3:** Pain after the procedures.

### Medications for controlling post-operative pain

All patients in Testa, *et al.* [27], required pain medication on the first day, while no patients required pain medication in the first, second, and third week. While 68% and 42% of patients required pain medication on the first day and first week, respectively [18]. No pain medication was required in the second and third weeks [18].

### Discussion

A physician with general surgery specialty usually performs a lot of daily surgeries; however, hernia repair is the common procedure that the surgeon met throughout his entire career. There are many types of abdominal hernia; with the main predominance of inguinal hernia compared to other types [28]. Due to its higher incidence, in some countries, clinical centers were developed for treating hernia in affected patients [29]. In the past hernia repair was a difficult procedure with many complications-mostly failure of the operation with high recurrence rate. At the beginning of 1990, a new technique was proposed by Lichtenstein and colleagues using an artificial mesh repair procedure [30]. Consequently, followed by the introduction of certain laparoscopic techniques such as transabdominal preperitoneal repair and extraperitoneal repair as potential therapeutic modalities for minimizing post-operative hernia complications [31].

Hernia repair in pediatrics is essential for resorting to the normal function of the abdomen, maintaining normal cosmetic appearance compared to normal peers, and decreasing complication rates arisen in the adult period [32]. However, hernia repair in adults differs according to the presenting symptoms of the patients. In a randomized controlled trial where asymptomatic or minimally symptomatic hernia patients' allocated to watchful for the waiting group and surgical repair group, the results indicated the safety of watchful waiting technique in hernia patients presenting with minimal symptoms and the surgical option was only necessitated when the pain originates from hernia increases to a limit that alternate with normal daily activities [33].

Concerning the method used for hernia repair, a survey conducted by Estridge, *et al.* indicated that mesh repair is the most common technique used in developed countries; however, in low-income countries suture repair comprises the main technique that surgeons have been using for hernia repair [34]. With the advancement of the medical field, the context of “paying for the highest quality of care” has been adopted between both the patient and the clinician. To our knowledge, the mesh is synthesized from a synthetic polymer that mostly causes no harm to the human body. Recent evidence has shown certain complications of the synthetic mesh part. The sensation of foreign body in the hernia region and post-operative pain originating for stimulation of the neighboring nerves have indicated the need for well-developed techniques for crossing these obstacles [35].

Though, a new approach was developed in 2017 by Guttadauro and colleagues for hernia repair named “All-in-one mesh hernioplasty” [18]. The main domain of the approach was to spare the interference of any nerve structure lying below the aponeurosis for the sake of the decrease the nerve irritation by the synthetic mesh and consequently the decrease of chronic pain developed years after the operation. Lichtenstein repair method was reported to induce a mean pain score of 2.8, 1.5 and 0.1 during the first day, first week, and second week, respectively [36]. In Guttadauro procedure the mean pain score was massively decreased yielding a mean of 2.1, 1.2, and 0.6 during the first day, first week, and second week, in order [18]. Regarding hernia recurrence, Dulucq, *et al.* indicated a total recurrence rate of hernia 0.46% including 0.1% early and 0.3% late recurrence [37]. In the Guttadauro technique, only one case of recurrence was reported with a percentage of 0.4% [18]. Additionally, in the Testa, *et al.* study which demonstrated the usage of the Guttadauro technique on 400 patients, no recurrence of hernia was reported on a 2-year follow up period [27]. Additionally, the technique was extremely successful in preventing post-operative neuralgia and sensation of foreign body of a follow up period of 2 years in both Guttadauro, *et al.* [18] and Testa, *et al.* [27].

## **Conclusion**

In conclusion, the “All-in-one mesh hernioplasty” technique is considered a promising approach in terms of minimizing post-operative complications such as post-operative pain, the sensation of foreign body, and recurrence rates. However, more studies are needed, with longer follow up durations, to assess the safety and efficacy of this technique in inguinal hernia repair.

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## **Conflicts of Interest**

No conflicts related to this work.

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