





# Primary umbilical hernia: Best surgical management in adults

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## ABSTRACT

**Study design:** Systematic review. **Objective:** Evaluate whether surgical mesh is optional or essential for the repair small primary umbilical hernias, with an orifice smaller than 2 cm, in order to provide better evidence for surgeons, thus enhancing surgical method and its outcomes. **Methods:** This is a literature review, whose search was directed towards papers that depicted surgical management of abdominal hernias, especially small umbilical hernias. The research was carried out in the primary the primary databases PubMed, LILACS, Cochrane Library, and *Periódicos* CAPES. **Results:** A total of four studies were included. Recurrence rates, as well as postoperative complications, were assessed after an umbilical hernia was corrected with or without the use of a mesh, observing the size of the abdominal defect. A reduction in the re-occurrence of hernias was observed when using a mesh. However, complications, such as surgical site infection, were more commonly noticed with the use of the prosthesis. There was no consensus regarding the use of the mesh in hernias smaller than 1 cm. **Conclusion:** The use of surgical mesh may prove to be the treatment of choice for the repair of primary umbilical hernias. However, more studies are needed to evaluate the role of this strategy in the management of hernias smaller than 1 cm.

**Keywords:** Umbilical Hernia; Abdominal Wall; Surgical Mesh.

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## INTRODUCTION

Umbilical hernia is a surgical condition of high prevalence in the population and surgical elective correction is recommended at the time of its identification. It is known that repair by simple suture has unacceptable high recurrence rates, as it has been reported in some series of studies rates of up to 54% of recurrence and recent studies have shown rates of up to 14 %<sup>1</sup>, indicating that this type of repair is little effective. Therefore, it has been increasingly frequent in medical literature to discuss the benefits of applying mesh in order to repair umbilical hernias, as is performed for other abdominal wall hernias, and evidence suggests that mesh repair is recommended<sup>2,3</sup>. The use of surgical meshes has its main indication because it reduces the possibility or avoids recurrences, pain and excessive tension at the site of the abdominal wall defect.

The meshes can be applied by means of open surgical or laparoscopic approaches, with both techniques presenting good clinical results<sup>4-6</sup>. However, laparoscopic placement, by promoting discontinuities in the fasciae of the abdominal muscles, thereby generating several new points of weakness in the abdominal wall, presents a certain disadvantage. This difficulty, however, helped the development of patches, small devices that can be inserted and fixed below the peritoneum and that do not produce new defects in the abdominal fasciae<sup>7-9</sup>. The "pieces of meshes" seem to be especially suitable for the repair of small hernias, since they require less tissue dissection for their placement, besides significantly stimulating the multiplication and migration of fibroblasts locally.

The use of meshes to reinforce surgical repair of large hernias in the abdominal wall reduces the risk of recurrence from 15-40% to 1-10%, approximately<sup>2,10-15</sup>. To date, most hernias with small orifices are treated by simple suture repair because the preperitoneal plane, to which the meshes are usually fixed, is a difficult surface to handle in this scenario. This explains, in part, the small number of studies on the use of meshes for the repair of wall defects with small hernial orifices. The use of the meshes, in addition to altering the therapeutic outcomes of small umbilical and epigastric hernias,

may also have positive implications for incisional hernias smaller than 2 cm, as is the case of hernias that originate at the site of insertion of trocars in laparoscopic surgeries.

The degree of difficulty in performing a surgical procedure is not a parameter of great clinical relevance, however this factor can be determinant to the surgeon's decision: the difficulties related to the mesh placement and the possible complications resulting from its use may be the reason for which a large part of the small abdominal hernias of any type are still repaired using a simple raffia, without reinforcement with meshes.

Considering the high prevalence of abdominal wall hernias, especially the common small and primary umbilical hernias, the technological advances in the surgical field, the evolution of the meshes available for use and the high recurrence rates after correction using simple raffia, this systematic review aims to evaluate whether it's optional or essential to use meshes in the repair of small umbilical hernias in adults. This study aims, therefore, to provide surgeons the best available evidence and, thus, to improve the surgical method and its outcomes.

## METHODOLOGY

This is a systematic review of the literature, conducted in the primary databases PubMed, LILACS, *Periódicos* CAPES and Cochrane Library. The keywords "umbilical hernia", "mesh repair" and "suture repair" were used and the search strategy formulated, "(umbilical hernia) AND (mesh repair) AND (suture repair)", was used in all databases for the recovery of studies.

After the research, the studies were crossed for the identification and exclusion of duplicates, so that the articles could be selected. This was done by screening through titles and abstracts, followed by critical reading of the entire text of those studies considered potentially eligible. In addition, the bibliographic references of the relevant articles were verified to complement the research.

Intervention studies, such as randomized clinical trials (RCT), published in English between 2000 and 2020 and which aimed to compare the results of the repair of umbilical hernias with and

without the use of meshes were included. Inclusion criteria were studies conducted with adults of both sexes, diagnosed with primary umbilical hernias, submitted to elective corrections. Articles that included only patients with umbilical hernias greater than 3 cm, related to incarcerated/strangled, recurrent or secondary umbilical hernias or other types of hernias were excluded, as well as studies of other types of hernias, book chapters, congress/other scientific events annals and articles not fully available.

The following data were extracted from each study: first author and year of publication, sample size, age group, inclusion and exclusion criteria, duration of follow-up, size of the hernial orifice, repair techniques used and recurrence rates and

post-op complications, such as seroma, hematoma and surgical wound infection (SWI).

The research was conducted by two researchers (M.M.A and M.F.G) independently and the disagreements were resolved through discussion between them. Furthermore, the Cochrane Risk of Bias Tool was used to analyze the methodological quality of the studies. This tool allows the assessment of the risk of bias in low, high or uncertain by characterizing the following domains of the research: selection, performance, detection, attrition, reporting and other bias<sup>16</sup> (Table 1).

The systematic review was carried out in accordance with the recommendations of the *Preferred Reporting Items for Systematic Review and Meta-Analyses* (PRISMA).

**Table 1**

Evaluation of the methodological quality of the included studies. Adapted from Cochrane Risk of Bias Tool.

	Arroyo et al. 2001	Kaufmann et al. 2018	Khattab et al. 2020	Polat et al. 2005
Random sequence generation	Low	Low	Uncertain	Low
Allocation concealment	Low	Low	Low	Uncertain
Selective outcome report	Low	Low	Low	Low
Blinding of participants and staff	Uncertain	Low	Uncertain	Uncertain
Blinding outcome evaluation	Uncertain	Low	Uncertain	Uncertain
Incomplete outcomes	Low	Low	Low	Low
Other sources of bias	Low	Low	Low	Uncertain

## RESULTS

Of a total of 1118 studies found, only 4 were included in this review. Articles that analyzed the management of primary umbilical hernias greater than 3 cm, complicated, recurrent or secondary umbilical hernias, as well as those that referred to other types of hernias were excluded. Studies of other types, book chapters and congress/other scientific events annals were also not included in the analysis (Figure 1).

The sample size of the selected studies ranged from 50 to 300 patients, obtaining a total of 650 individuals, aged between 14 and 82 years.

Primary umbilical hernias smaller than or equal to 4 cm were considered in most studies, except for one study, which did not make restrictions regarding the size of the abdominal wall defect. Patients were followed up for at least 6 months (Table 2).

According to Arroyo et al. (2001), the recurrence rate after the use of meshes in the surgical correction of the umbilical hernia is significantly lower (1%) when compared to simple suture correction (11%), regardless of the size of its orifice. In addition, in this study, complications, such as seroma, hematoma and SWI, had similar incidences in both approaches<sup>17</sup>.

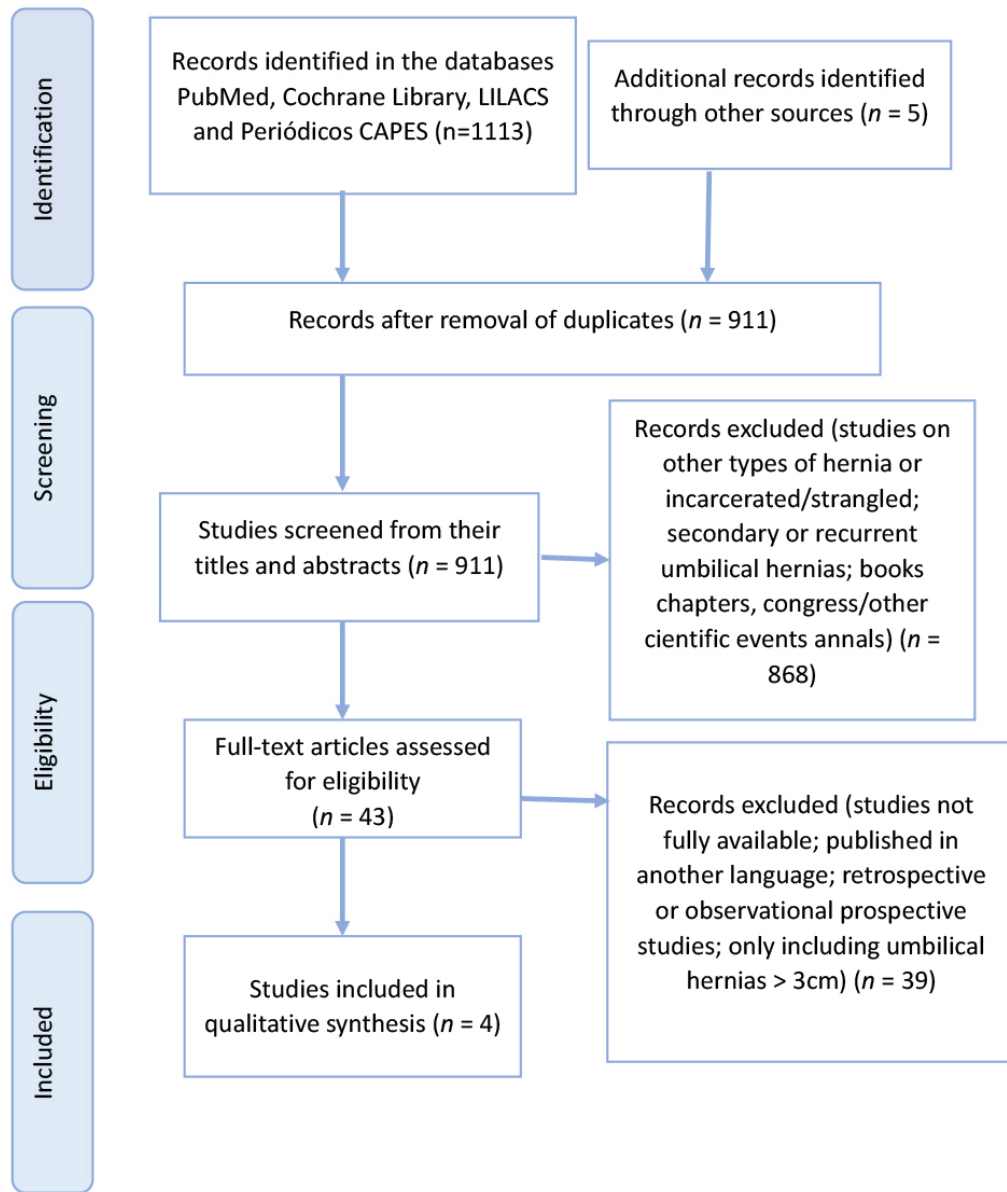


Figure 1: Systematization flowchart of the studies included in this review.

Table 2

Characteristics of the included studies.

Author & year	Sample	Age group (years)	Duration of follow-up (months)	Size of the hernial orifice
Arroyo et al. 2001	200	14 to 79	64 (21 to 80; mean)	> 0 cm
Kaufmann et al. 2018	300	20 to 77	25.1 (0 to 87.8; median)	1 - 4 cm
Khattab et al. 2020	100	27 to 55	6	< 3 cm
Polat et al. 2005	50	27 to 82	22 (6 to 44; mean)	< 4 cm

Kaufmann et al. (2018) found a recurrence rate of 4% after the use of meshes in the surgical correction of these hernias and 12% after the use of the classical strategy, after a period of 24 to 30 months of follow-up. Furthermore, it was observed that recurrences presented faster among individuals submitted to correction without the use of meshes: recurrences presented approximately 3.6 months after the classical strategy, whereas using meshes, recurrences presented after 12.6 months. However, hernias smaller than 1 cm were excluded from the study due to the difficulty of inserting the mesh, given the small size of the orifice, which could require an increase in the abdominal defect. In addition, a small higher incidence rate of SWI was observed in the post-op period in the group of patients treated with meshes, a difference, however, not statistically significant. Regarding the other complications evaluated, hematoma and seroma, no significant differences were found between the approaches<sup>18</sup>.

Contrary to what was observed in the aforementioned studies, Polat et al. (2005) found that the occurrence of complications and of recurrence was similar among individuals submitted to correction with or without meshes.

It is noteworthy that 2 recurrences were detected after the use of simple suture, whereas none was observed after the use of meshes<sup>19</sup>. Similar findings were reported by Khattab et al. (2020). The authors reported recurrences were identified only in the group of individuals who had their hernias treated by simple suture (2%), whereas SWI and seroma were more frequent among individuals who were treated with meshes (8% and 6% compared to 2% and 2%, respectively)<sup>20</sup>. However, these differences between surgical correction techniques were not statistically significant. Moreover, despite the similarity between these findings, the first author suggests the superiority of the use of meshes in the surgical correction of umbilical hernias, whereas the second author points to the simple use of herniorrhaphy in the correction of hernias as the best approach strategy in patients affected by this abdominal defect: Polat et al. attest to the usefulness of the use of meshes based on findings of lower rates of postoperative pain and, consequently, less need for the use of analgesics. Khattab et al., on the other hand, relied on the lower costs of the procedure without the use of prostheses to make their recommendation<sup>19,20</sup>.

**Table 3**

Characteristics and main results obtained in the included studies.

Author	Groups	Technique	Number of patients	Results			
				Recurrence	SWI	Hematoma	Seroma
Arroyo et al.	Suture	Simple Suture	100	11 (11 %)	3 (3 %)	1 (1 %)	5 (5 %)
	Mesh	Polypropylene mesh fixed in preperitoneal plane	100	1 (1 %)	2 (2 %)	1 (1 %)	6 (6 %)
Kaufmann et al.	Suture	Transverse Simple Suture	138	17 (12 %)	1 (<1 %)	2 (1 %)	1 (<1 %)
	Mesh	Polypropylene mesh fixed in preperitoneal plane	146	6 (4 %)	3 (2 %)	3 (2 %)	5 (3 %)
Khattab et al.	Suture	Simple Suture	50	1 (2 %)	1 (2%)	–	1 (2 %)
	Mesh	–	50	0	4 (8 %)	–	3 (6 %)
Polat et al.	Suture	Mayo's Technique	18	2 (11 %)	1 (5.5 %)	2 (11 %)	0
	Tela	Prolene Hernia System (PHS) or polypropylene mesh fixed to the anterior sheath of the rectum abdominal muscle	32	0	2 (6 %)	2 (6 %)	1 (3 %)

## DISCUSSION

In healthy individuals, surgical management of umbilical hernias provides good results. The main complications related to this procedure are seromas, hematomas and SWI, more common when surgical meshes are used. Respiratory and cardiovascular complications can also occur, which can imply prolonged hospitalizations. In addition, the hernia size, the age of the individual and the presence of comorbidities are the main factors related to the morbidity and mortality of the surgery.

There are multiple possibilities for the surgical approach of umbilical hernias: open or laparoscopic, with or without the use of meshes, with or without closure of the hernial defect - and the choice that guides its correction should take into account several factors, including the details of the hernia itself, especially the sizes of the orifice and hernial sac<sup>1</sup>. In recent years, herniorrhaphy through the Mayo technique has been the most widely used method in the repair of umbilical hernias and, despite the high recurrence rates associated with this methodology, due to the absence of proven effective alternatives, it remains the choice of many surgeons. However, the common use of surgical meshes in the management of inguinal, femoral and incisional hernias, with low recurrence rates, brought to light the possibility of using this technique for the correction of umbilical hernias<sup>17</sup>. From a structural point of view, the main goal of a hernia repair is to avoid or decrease the possibility that the contents of the abdominal cavity will once again insinuate through the wall defect. Thus, regardless of the technique chosen by the surgeon, in all cases, the sutures should be able to resist the tension exerted by intra-abdominal pressure, ensuring the integrity of the abdominal wall until healing is established, avoiding ruptures and recurrences<sup>21</sup>.

The synthetic fabric or mesh is the main instrument available to surgeons capable of reducing relapses. There is a wide variety of meshes available for use in the corrections of hernial defects, but the fabric made from polypropylene is the most used in these procedures, since its introduction to the market. However, contrary to what has been established

for the management of inguinal hernia, there is still no consensus as to the best choice in the repair of umbilical hernias. In addition, it is worth mentioning that, despite the significant benefits associated with the use of these exogenous prostheses, the associated complications should also be considered.

Repair by suture, the classical strategy, is a heterogenous method, given the variety of techniques that can be used in the correction of the defect, and causes a high recurrence rate. However, it has lower costs and lower rate of postoperative complications. On the other hand, the use of meshes, which is also a complex procedure - as it involves, in addition to the technical skills, the choice of material and design of the prosthesis and its fixation point - implies a lower recurrence rate, but generates a greater potential for complications, which are related to the prosthesis, such as mesh contracture, infection and chronic pain, which, however, have a low incidence. It is also worth mentioning that, despite the higher cost of the procedure when using the prosthesis, the costs associated with a new surgery, due to recurrence, are also considerable<sup>1</sup>.

With the exception of 1 study analyzed, all studies recommend that repair with surgical mesh should be performed, preferably, in patients with umbilical hernia whose orifice has a diameter equal to or greater than 1 cm<sup>17-20</sup>. However, controversies related to the approach of umbilical hernias smaller than 1 cm remain. The discussions related to this point lie in the suggestion that, because they are very small, the risk of recurrence using the classical approach would be similar to the risk with the use of meshes. In addition, many surgeons are concerned about the need to increase the defect so that the prosthesis can be inserted<sup>18,22</sup>.

In our practice, the choice on the technique to be used in the correction of umbilical hernia is individualized and takes into account characteristics such as the presence of comorbidities, BMI, functional reserve and the need for high performance in daily activities, in addition to the size of the hernial defect. In general, for adults and healthy patients, we always prefer the use of meshes, as well as for patients with hernias whose

orifice has a diameter equal to or greater than 3 cm or with recurrent hernias. However, for those patients with immunodeficiency, either by the use of medications or resulting from some precondition, the indication of the use of a mesh, especially in the repair of hernias with orifices smaller than 3 cm, is done more judiciously. When we opt for the surgical management with prosthesis in small orifice hernias, we make intraperitoneal fixation of the mesh, which has allowed the avoidance of the increase of the hernial orifice for its insertion and fixation.

This review had some limitations. First, only 1 study had a low risk of bias, and the methodological quality of most of the included studies was considered intermediate. Secondly, not all varieties of meshes available on the market were considered, nor were the different techniques of fixation of the prostheses to the abdominal wall taken into account, details that may be relevant for the execution of this strategy of correction of umbilical hernia and for obtaining good results. Finally, the research was limited to articles published in English, which may have introduced a bias to this study. However, it is worth mentioning that, since the search was performed in several databases, this risk may have been significantly reduced.

## CONCLUSION

Evidence indicates the superiority of the use of surgical meshes in the repair of small primary umbilical hernias, due to the good results observed regarding the reduction of the recurrence rate of these hernias after the use of this approach, which makes it possible to say that the use of prostheses may become the treatment of choice. However, the role of the use of meshes in the management of primary umbilical hernias with orifices equal to or greater than 1 cm and smaller than 3 cm remains uncertain, which leads to the need for further studies.

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**Authors' contribution:**

CAB: conception and design of the research; data collection and writing of the manuscript. DCO: data collection, and critical review of the manuscript. MMA: data analysis and interpretation, writing of the manuscript and critical revision of the manuscript. MFG: data analysis and interpretation, writing of the manuscript and critical revision of the manuscript.

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