

Review Article

Laparoscopic versus open ventral hernia repair

**Rayan Alsadiqi^{1*}, Abdullah Albishri², Ahmad Almaghrabi², Badr Aljedaani²,
Khalid Alghamdi³, Fatimah Alhijab⁴, Mohammed Alsulami², Abdullah Hussain²,
Mohammad Alshaikh⁵, Nafisah Jaad⁶**

¹Imam Mohammed Bin Saud University, Riyadh, KSA

²King Abduaziz University, Rabigh, KSA

³Albaha Universty, Albaha, KSA

⁴King Faisal University, Alahsa, KSA

⁵Prince Saud Bin Jalawi Hospital, Ahsa, KSA

⁶Umm Al-Qura University, Makkah, KSA

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*Correspondence:

Dr. Rayan Alsadiqi,

E-mail: Rayan.alsiddiqi@hotmail.com

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ABSTRACT

From the patient's perspective, a ventral hernia can cause pain, adversely affect function, increase size, cosmetically distort the abdomen, and incarcerate/strangulate abdominal contents. The only known cure for a ventral hernia is surgical repair. The purpose of the current analysis was to review the published randomized controlled trials (RCTs) of the surgical care of ventral hernia. We conducted this meta-analysis using a comprehensive search of EMBASE, MEDLINE, PubMed, Cochrane Database of Systematic Reviews, and Cochrane Central Register of Controlled Trials till 01 March 2018 for randomized controlled trials on the use of mesh reinforcement in abdominal wall hernia repair. 15 studies met the search criteria, laparoscopic repair (OR 0.59; 95% CI 0.02–6.71) had the highest probability of having the lowest rate of surgical site infection. Among open mesh repair techniques, sublay repair (OR 1.41; 95% CI 0.01–5.99) had the highest probability of being the best treatment. Among patients experiencing ventral hernia repair, mesh reinforcement ought to be used regularly when there is no infection. Sublay mesh might outcome in fewer reappearances and surgical site infections. The quality of evidence to support these recommendations is moderate to high.

Keywords: Laparoscopic, Open, Hernia, Randomized controlled trial, Ventral hernia

INTRODUCTION

Ventral and incisional hernia repair is one of the most mutual operations implemented in daily clinical practice. Incisional hernia is a common long-term complication of abdominal surgery and is estimated to occur in 11–20% of laparotomy incisions.¹ Almost 50% of incisional hernias develop within the first 2 years after the primary surgery, and 74% develop after 3 years.² The reappearance rate of incisional hernia after primary suture repair is more than 50% and has been reduced to 10–23%

after the introduction of prosthetic materials (meshes) in hernia repair.^{3,4}

A vast majority of open surgical repair of incisional hernias are achieved using a prosthetic mesh. Even though it is a tensionless repair, it is still associated with early or late complications such as mesh infection, surgical site infection, chronic pain, seroma, hematoma, mesh shrinkage, etc. The recurrence rate following mesh repair is still as high as approximately 32 % over a 10-year follow-up period.⁵ A number of factors can influence these complication rates, comprising the position and site

in which the mesh is placed and the type of mesh used. It is extensively recognized that mesh ought to be utilized for Ventral hernia repair in a clean setting; nevertheless, the type of mesh that ought to be used and where the mesh ought to be placed are still argued.

Open hernia repair can be a main operation with significant morbidity affected by infectious complications. An increasing interest in laparoscopic surgery and the availability of new materials have encouraged the adoption of laparoscopic techniques in ventral hernia repair. In order to improve upon the recurrence rate of open mesh repair of incisional hernia, LeBlanc, in 1993, reported the first case of laparoscopic incisional hernia repair using a synthetic mesh.⁶ This procedure apparently decreases the surgical offense, permitting better visualization of the defect, decreasing the risk of bleeding, infectious complications, seroma formation and recurrence rate. Since the introduction of this technique, a number of randomized control trials (RCTs) comparing laparoscopic and open methods have been published analyzing various aspects of these approaches. The purpose of the current analysis was to review the published randomized controlled trials (RCTs) of the surgical care of ventral hernia.

METHODS

Data sources and searches

We conducted this meta-analysis using a comprehensive search of EMBASE, MEDLINE, PubMed, Cochrane Database of Systematic Reviews, and Cochrane Central Register of Controlled Trials till 01 March 2018 for randomized controlled trials on the use of mesh reinforcement in abdominal wall hernia repair. Both semiparametric and parametric methods were used. No language restrictions were imposed. We followed the standard guidelines for conducting and reporting meta-analyses of observational studies.⁷

Selection criteria

Studies were included in this meta-analysis if they satisfied the following criteria: randomized controlled trials studies on ventral hernia repair among adult patients in which there was reporting of incision infection, surgical site infection, or hernia recurrence., and the investigators reported relative risks (RRs) with 95% Ci, all studies with at least one arm evaluating open ventral hernia repair with mesh placed in the onlay, sublay, or underlay position were included. Exclusion criteria were failure to define the location in which meshes were placed or the use of mixed techniques without reporting the stratified results.

Data extraction

The final data were abstracted from each study using standardized form: the first author's name, year of

publication, number of patients, hernia type and size, age, study location, body mass index (BMI), follow-up duration, mesh material and density, and elective/emergency nature of the operation. These factors were chosen because they represent the most important variables for classifying ventral hernias, assessing patient risk, and treatment of patients. The outcomes assessed were hernia recurrence and surgical site infection. Flow diagram showing the selection criteria of assessed studies.⁸

Statistical analysis

The present meta-analysis utilized Stata version 12.0 software for statistical analysis. Mean difference (MD) were calculated for continuous variables. Pooled odds ratios (OR) were calculated for discrete variables. Heterogeneity amongst the trials was determined by means of the Cochrane Q value and quantified using the I^2 inconsistency test with a significance set at the P-value <0.10 or I^2 score $>50\%$.⁹ DerSimonian-Laird random-effect meta-analysis was adopted when obvious heterogeneity existed.¹⁰

RESULTS

We recognized 883 citations using the search strategy. Of these, we excluded 292 after examining the title and abstract including removal of duplicates. We retrieved and evaluated 32 articles in more detail, of which 17 articles were excluded, leaving 15 studies that were eligible for inclusion (Figure 1). Main characteristics of included studies have been summarized in Table 1.

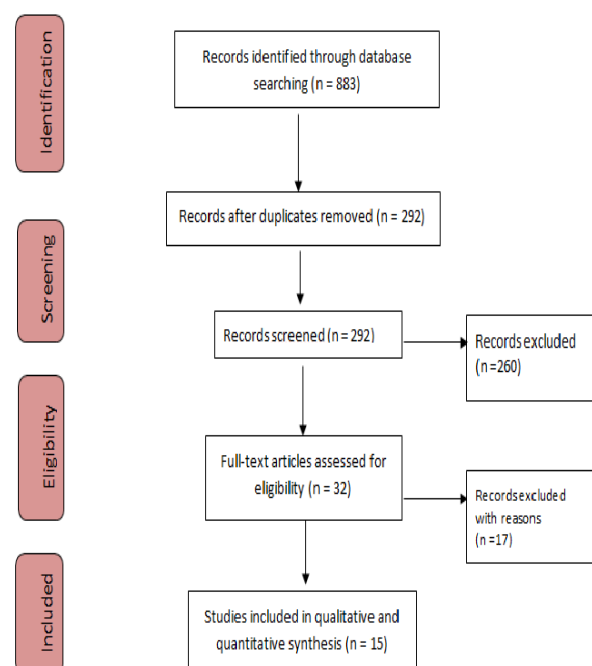


Figure 1: Flow diagram showing the selection criteria of assessed studies.

All studies compared locations for mesh placement and met the criteria for evaluation (Table 2). The studies were adequately comparable to produce the data. Suture-only and laparoscopic ventral hernia repair characterize the controls. It is expected that the suture-only group will

have the highest risk of hernia recurrence while both groups (suture-only and laparoscopic) will have the lowest risks of surgical site infection. Cases of infection were stated in the studies; though, the results related with these cases were not described individually.

Table 1: Characteristics of included studies.

Study	Year	N	Control/intervention	Hernia type
Abdel-Baki ¹¹	2007	48	Suture onlay	Mixed
Hur ¹²	2010	146	Onlay lap	Incisional
Pring ¹³	2008	54	Underlay/lap	Mixed
Ammar ¹⁴	2010	80	Suture onlay	Primary
De Vries Reilingh ¹⁵	2007	37	Suture underlay	Incisional
Laghari ¹⁶	2012	62	Suture onlay	Incisional
Afifi ¹⁷	2005	41	Onlay underlay	Incisional
Polat ¹⁸	2005	32	Suture onlay	Primary
Venclauskas ¹⁹	2010	161	Suture onlay sublay	Incisional
Baracs ²⁰	2010	370	Sublay onlay	Mixed
Eker ²¹	2013	194	Sublay lap	Incisional
Barbaros ²²	2007	46	Onlay lap	Mixed
Navara ²³	2007	24	Sublay lap	Incisional
Rogmark ²⁴	2013	131	Sublay/ lap	Incisional
El-Khadrawy ²⁵	2015	60	Onlay sublay	Primary

Table 2: Mesh placement outcomes.

Study	Surgical site infections, RR 95% CI	Recurrence, RR 95% CI
Abdel-Baki ¹¹	0.67 (0.12– 3.59)	0.11 (0.01– 1.94)
Hur ¹²	0.13 (0.03– 0.52)	1.5 (0.56– 4.00)
Pring ¹³	0.19 (0.02– 1.62)	0.77 (0.05–11.8)
Ammar ¹⁴	1.60 (0.52– 4.93)	0.09 (0.01– 1.50)
De Vries Reilingh ¹⁵	3.17 (1.02– 9.87)	1.16 (0.67– 2.04)
Laghari ¹⁶	0.38 (0.08– 1.79)	0.13 (0.01– 2.49)
Afifi ¹⁷	1.16 (0.08– 17.3)	0.09 (0.01– 1.47)
Polat ¹⁸	0.94 (0.06– 13.9)	0.19 (0.01– 3.68)
Venclauskas ¹⁹	3.79 (0.84– 17.1)	0.95 (0.47– 1.92)
Baracs ²⁰	-	0.60 (0.37– 0.98)
Eker ²¹	0.85 (0.24– 3.07)	1.29 (0.68– 2.47)
Barbaros ²²	0.5 (0.10– 2.46)	0.35 (0.01– 8.11)
Navara ²³	0.33 (0.01– 7.45)	0.92 (0.02–43.0)
Rogmark ²⁴	0.07 (0.01– 0.48)	1.05 (0.02–52.0)
El-Khadrawy ²⁵	0.67 (0.12– 3.71)	1.00 (0.68– 2.47)

Laparoscopic repair (OR 0.59; 95% CI 0.02–6.71) had the highest probability of having the lowest rate of surgical site infection. Among open mesh repair techniques, sublay repair (OR 1.41; 95% CI 0.01–5.99) had the highest probability of being the best treatment. Evidence indicates that mesh reinforcement in clean cases can decrease hernia recurrence but increase risk of surgical site infection. Placing mesh in the sublay position (as opposed to the onlay or underlay position) may decrease the risk of hernia recurrence and surgical site infection.

DISCUSSION

In the modern surgical period, laparoscopic repair has increasingly been employed in the administration of incisional hernia. First defined by LeBlank, the procedure has advanced and is now replacing open repairs where possible.⁶ Large multi-centered series have designated outstanding results with laparoscopic procedures mentioning less complications and reappearance rates of less than 10 %.²⁶ Throughout clean repairs of both incisional and primary ventral hernias, mesh reinforcement is suggested. High-density mesh ought to

be operated rather than low-density mesh. Mesh ought to be located as a sublay (in the retrorectus or preperitoneal space) when this is harmless and possible. These suggestions signify the most comprehensive combination of high-quality RCTs on the role of mesh reinforcement throughout ventral hernia repair. There was no difference in the demographics of the patient population included in the present analysis. The mean patients' age in the laparoscopic and open repair groups displayed little variation.

Patient characteristics that increase the risk of surgical site infection include smoking, old age, steroid use, obesity, diabetes, malnutrition, and remote site infection. Before surgery, any known risk factors for surgical site infection should be treated if feasible. To reduce the risk of perioperative infection, the operative time and the hospital stay should be as short as possible.²⁷ Studies have shown that generally the size of hernia defects and size of mesh used were bigger with laparoscopy, and just wider coverage of the anterior abdominal wall with mesh can hence also be hypothesized to result in reduced recurrence rates with laparoscopy.²⁸ Laparoscopic repair is a form of underlay repair, however, open underlay repair had a significantly higher recurrence rate while a lower surgical site infection rate than laparoscopic underlay repair. Adjustments among these results must be reflected. Additional studies can measure different procedures and materials for each of these repair types to optimize both strategies and to determine the best setting for each.

Several studies use less postoperative pain or neuralgia as strong supportive indication for laparoscopic technology.^{6,26} Extensive tissue dissection in open repair and transfacial sutures might be accountable for more pain in open repair while direct tacking of the mesh on to the peritoneum may be accountable for pain in laparoscopic repair. Liberal use of local anesthesia or infiltration of the same in the abdominal cavity may reduce the occurrence of this complication.

Limitations of the analysis is that though ventral hernias are between the most common pathology perceived by the surgeons, few RCTs exist to direct the treatment of these patients. A few challenges must be faced. There is restricted regularization of terminology to define hernia type and outcome measurements. Lately, classification system for ventral hernias been developed, the field of ventral hernia repair is intimately associated with industry, which often drives and supports low-quality studies at high risk for bias.²⁹

CONCLUSION

Among patients experiencing ventral hernia repair, mesh reinforcement ought to be used regularly when there is no infection. Sublay mesh might outcome in fewer reappearances and surgical site infections. The quality of evidence to support these recommendations is moderate

to high. To confirm these results, further studies should be made to make a better understanding comparing different mesh locations directly and mesh type.

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