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Original research

A systematic review of laparoscopic versus open abdominal incisional hernia repair, with meta-analysis of randomized controlled trials

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HIGHLIGHTS

- Safe and reliable method of hernia repair.
- The hospital stay between the two arms of the study is equal.
- The infection rate post operatively is higher in the open hernia repair group.
- The operation time is longer in the laparoscopic group but not statistically significant.
- The recurrence of hernia is the same between the study cohorts.

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ABSTRACT

Introduction: Development of an incisional hernia after abdominal surgery is a common complication following laparotomy. Following recent advancements in laparoscopic and open repair a literature review has demonstrated no difference in the short term outcomes between open and laparoscopic repair, concluding there was no favourable method of repair over the other and that both techniques are appropriate methods of surgical repair. However, long term outcomes in the available literature between these two approaches were not clearly analysed or described.

The objective of this study is to assess the effectiveness and safety of laparoscopic versus open abdominal incisional hernia repair, and to evaluate the short and long term outcomes in regards to hernia recurrence using meta-analysis of all randomised controlled trials from 2008 to end of 2013.

Study aims and objectives: **Population**: Patients who developed an abdominal hernia or abdominal incisional hernia following a laparotomy.

Intervention: Two methods of surgical repair, laparoscopic and open abdominal wall hernia repair.

Comparison: To compare between laparoscopic and open repair in abdominal wall incisional hernia.

Outcome: length of hospital stay, operation time, wound infection and hernia recurrence rate.

Methods: This study is a systematic review on all randomized controlled trials of laparoscopic versus open abdominal wall and incisional hernia repair. Medline, Pubmed, Cochrane library, Cinahl and Embase were the databases interrogated.

Inclusion & exclusion criteria had been defined. The relevant studies identified from January 2008 to December 2013, are included in the analysis. The primary end point can be described as hernia recurrence, and secondary outcomes can be described as length of hospital stay post operatively, operation time and wound infection.

Results: Five randomized controlled trials (RCTs) were identified and included in the final analysis with a total number of 611 patients randomized. Three hundreds and six patients were in the laparoscopic group and 305 patients in the open repair group. The range of follow up in the studies was two months to 35 months. The recurrence rate was similar ($P = 0.30$), wound infection was higher in the open repair group ($P < 0.001$), length of hospital stay was not statistically different ($P = 0.92$), and finally the operation time was longer in the laparoscopic group but did not reach statistical significance ($P = 0.05$)

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Conclusion: The short and long-term outcomes of laparoscopic and open abdominal wall hernia repairs are equivalent; both techniques are safe and credible and the outcomes are very comparable.

1. Introduction

Ventral hernias can be defined as protrusion of a portion of organ or tissue through an abdominal wall defect [1,2]. The incidence of these hernias can be as high as 13% following abdominal wall surgery [3,4]. An incisional hernia is perceived as a morbidity following an abdominal wall operation. Risk factors that increase the chances of developing these hernias are wound infection, male sex, obesity, abdominal distension, underlying disease process and occasionally poor surgical closure [5,6]. Incisional hernia is associated with significant morbidity such as pain, intestinal obstruction, strangulation, and ischemia of the hernia contents. Despite the improvement in the methods of repair, there is still significant morbidity and even mortality associated with repairs [7]. Surgical intervention is the only method of repair [8], with two techniques available: open repair with or without mesh, and laparoscopic mesh repair.

It is estimated that over 120,000 laparotomies are carried out in the United Kingdom every year, with more than 7000 incisional hernia repairs subsequently performed. This represents almost 6%, but the actual incidence of incisional hernia development may be higher, as this figure does not take into account patients who opt not to consider or attend for surgery for either personal or medical reasons [9]. Considering this incidence and the morbidity and mortality associated with the condition and the methods of repair [10], it is quite evident that selecting the ideal method of repair is crucial.

Some early evidence showed that laparoscopic incisional hernia repair had a number of disadvantages: the longer operating times, the costs involved with equipment provision and the specialised tools and mesh used. However, several studies have demonstrated that in experienced hands laparoscopic repair takes a similar amount of time compared to open repair [11,12]. Cost benefit analysis has also demonstrated that laparoscopic incisional hernia repair is cost comparable to the open incisional hernia repair even without considering patients benefits such as early hospital discharge and early return to work [13].

Laparoscopic incisional hernia repair was first described by Le Blanc and Booth in 1993 [14]. They demonstrated the benefit of laparoscopic repair in hernia surgery, showing better results and lower complication rates compared to the open method [15]. In the current times, only massive tissue defect with complete loss of abdominal muscle structure is considered unsuitable for laparoscopic approach [16].

But despite the improvement in the hernia repair in the last two decades in terms of the overall technique, results in the eyes of many experts are still unsatisfactory. Incisional hernias repaired with primary suturing have a recurrence rate between 12% and 54% [17,18], whereas the mesh repair recurrence rate can be as high as 36% [19,20]. In addition, the introduction of a foreign body such as the Prolene mesh can lead to serious adverse results, such as pain, infection, fistula, bowel injury and bowel adhesions [21]. The newer models of the mesh products have evolved over time, with more attention in the manufacturing features to avoid the above mentioned complications. Laparoscopic repair had then been recognised as a credible alternative to open hernia repair and had been widely practised since.

The laparoscopic approach entails a minimal access technique with a few stab-like incisions for the use of laparoscopic instruments. The technique does not involve repairing the fascial defect; rather the defect is covered using mesh with or without reducing the hernia sac. A careful and meticulous dissection is fundamental to safe surgery with fewer complications like seroma, infection, bleeding and intestinal injury.

Some reports suggest improved results with laparoscopic incisional hernia repair, where recurrence rate is very low at 4.3%, and less wound complication compared to the open technique [22,23].

1.1. Literature review

There is a lack of evidence to support one method of repair over the other. The efficiency and efficacy of laparoscopic repair compared to the open technique is lacking. It is still unclear if one method of repair is superior to the other [24], and it is unknown if one repair method is more appropriate to certain types of hernia in comparison to the other. The clinical guidelines of the Society for Surgery of The Alimentary Tract (SSAT 2005) showed that hernia of less than 3 cm can be repaired primarily without the use of the prosthetic mesh, and any hernia where extensive tissues dissection is required such as in component separation technique is then qualified for open repair, yet any other hernia types that do not fall in the above category can be considered where possible for laparoscopic repair [25]. Hence, the success of the repair need to address the guidelines with taking into consideration the individual circumstances of each hernia, and to plan in advance the best method of repair. Additionally, the current evidence available looks at the best method of repair with various outcomes like recurrence rate, the costs involved, post-operative complications and long term results [32–34].

Sajid 2009 had demonstrated that laparoscopic incisional hernia repair is an acceptable method of surgical approach. The recurrence rate was similar to the open technique, but shorter hospital stay and better pain tolerance. Although the short term results were promising for both techniques, the study could not comment on the long term outcomes similar to Cochrane review 2011 results [26].

Forbes 2009 on the other hand demonstrated that laparoscopic incisional hernia repair is not superior to the open technique in terms of hernia recurrence, but this study included patients with primary hernias also. This potentially could bias some of the results as primary ventral hernias are much easier to repair compared to incisional hernias; however results showed less wound infection rate, less haemorrhage and earlier return to work by almost 50%, but the laparoscopic repair carries higher rate of bowel injury with 2.9% compared to only 0.9% in the open group. Therefore, the study concluded laparoscopic repair is still as safe as the open conventional repair and rather open repair has significant advantages of less small bowel injury and seroma formation [27].

Furthermore, recent researchers have shown that laparoscopic incisional hernia repair is far better than open hernia repair in the short term outcomes, like blood loss and hospital stay, with earlier return to work [28,29], however the long term results remain the main challenge to identify in many of randomised controlled

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