



## REVIEW ARTICLE

## Human Fibrin Glue in Laparoscopic Inguinal Hernia Repair: An Alternative to Invasive Mesh Fixation: A Review of Literature

Sohail Y Bakkar, RK Mishra

**ABSTRACT**

The popularity of laparoscopic inguinal herniorrhaphy has been growing. It has become the method of choice for bilateral and recurrent inguinal hernias. Mesh and its fixation have contributed profoundly to the effectiveness of repair. However, the conventional invasive methods of mesh fixation have been a major source of morbidity. Therefore, noninvasive alternatives have been sought. One such alternative is the use of human fibrin glue (Tissucol).

**Objective:** The aim of this review was to compare the effectiveness of noninvasive mesh fixation using human fibrin glue (Tissucol) to the conventional invasive method (stapled fixation) in laparoscopic inguinal hernia repair and point out any additional advantages of this atraumatic method.

**Materials and methods:** A literature search was conducted using SpringerLink journal electronic library, Highwire press and the search engine Google. The following terms were used: Human fibrin glue, Tissucol, laparoscopic inguinal hernia repair and mesh fixation. Of the retrieved citations, 24 were selected for further referencing.

**Keywords:** Human fibrin glue, Tissucol, Laparoscopic inguinal hernia repair, Mesh fixation.

**How to cite this article:** Bakkar SY, Mishra RK. Human Fibrin Glue in Laparoscopic Inguinal Hernia Repair: An Alternative to Invasive Mesh Fixation: A Review of Literature. World J Lap Surg 2012;5(3):143-145.

**Source of support:** Nil

**Conflict of interest:** None

**INTRODUCTION**

Inguinal herniorrhaphy is among the commonest procedures performed in surgical practice. The lifetime risk of developing an inguinal hernia is 27 and 3% in men and women respectively.<sup>1</sup>

**SIGNIFICANCE OF PROSTHESIS IN INGUINAL HERNIA REPAIR**

The use of prosthetic material has revolutionized surgical procedures performed for inguinal hernias. Repair using prostheses has significantly reduced failure rates (recurrences) by eliminating what all previous repair techniques had in common: Suture line tension, (i.e. suturing together, under tension, structures that are not normally anatomically in opposition), the main etiologic factor for the majority of recurrences. Tension free or tension-eliminating mesh repair can be achieved via open posterior (first described by Stoppa in 1975),<sup>2</sup> open anterior (first described by Lichtenstein in 1989)<sup>3</sup> approaches and laparoscopically.

**LAPAROSCOPIC INGUINAL HERNIA REPAIR**

The first laparoscopic hernia repair was reported by Ralph Ger in 1982. Mesh was not used. Instead, simple closure of the peritoneal opening of the hernia sac using interrupted stainless steel clips was performed.<sup>4</sup> Since the early 1990s, laparoscopic herniorrhaphy has been performed via the transabdominal preperitoneal (TAPP) or totally extraperitoneal (TEP) approaches.<sup>5,6</sup> Both can be looked at as Stoppa's repair performed laparoscopically. As they follow the same principle of placing, a large mesh in the preperitoneal space (posterior repair) that would cover the entire myopectineal orifice of Fruchaud.

Compared to conventional open repair, laparoscopic repair is associated with fewer recurrences and reduced chronic inguinal pain.<sup>7</sup> For these reasons, laparoscopic inguinal herniorrhaphy has been gaining popularity. It has become the method of choice for bilateral and recurrent inguinal hernias.<sup>8,9</sup> Both techniques (TAPP and TEP) are safe and have the same advantages, but TAPP is easier; a better view of the anatomy is achieved, shortening the learning curve.<sup>10</sup> Furthermore, TAPP allows visualization of both sides and, in case of a large hernia sac, continuous visualization of sac contents.<sup>11</sup>

**SIGNIFICANCE OF MESH FIXATION AND AN ALTERNATIVE TO INVASIVE FIXATION**

The key to a successful preperitoneal mesh repair is proper dissection and exposure of the myopectineal orifice, adequate mesh size

achieving adequate overlap with the defect and proper mesh fixation. Hematoma mesh lifting and mesh migration are the most common causes of repair failure (hernia recurrence).<sup>12,13</sup> In conventional laparoscopic inguinal hernia, repair mesh fixation is accomplished using staples. Such invasive fixation carries with it the risk of misplacement of staples and subsequently damaging nearby nerves and vessels leading to complications, such as postoperative neuralgia, bleeding and hematoma formation.<sup>14</sup> The effectiveness and safety of nonfixation as an alternative to invasive fixation for small and medium sized defects, and where there was adequate overlap of the defect

*World Journal of Laparoscopic Surgery*

*Sohail Y Bakkar, RK Mishra*

by the mesh has been reported in the literature. It has been demonstrated that nonfixation in this selected group of patients is negatively associated with an increased risk of recurrence and positively associated with reduced risk of some of the complications related to invasive fixation as well as reduced operative cost.<sup>15-18</sup> However, additional studies with larger numbers of patients and longer periods of follow-up are required for unequivocal confirmation. Furthermore, eliminating the requirement for mesh fixation in patients with large defects (> 4 cm) has not been demonstrated. Because of all what was mentioned earlier, the ideal solution would be to seek a noninvasive method of mesh anchoring. One such method often referred to as 'biologic soft fixation' involves the use of human fibrin glue also known as Tissucol<sup>19</sup> (Fig. 1).

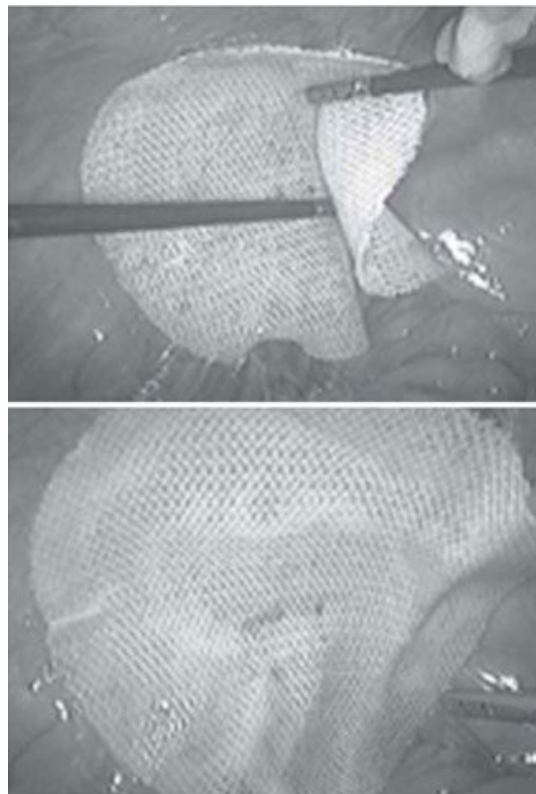
## HUMAN FIBRIN GLUE (TISSUCOL)

The use of fibrin as a surgical sealant goes back to more than a 100 years ago. Tissucol (Fig. 2) is composed of two components contained in separate vials: The first component is the sealant which is a freeze dried concentrate of mainly fibrinogen, transglutaminase (factor XIII) and fibronectin reconstituted in a natural antiprotease substance (aprotinin) that inhibits tissue fibrinolysis. The second component is the catalyst, which is thrombin, dissolved with calcium chloride. Therefore, Tissucol in its composition mimics the final step of the coagulation cascade conferring hemostatic and sealing properties as well as promoting the formation of granulation tissue (biostimulation) independent of the patient's coagulation status.<sup>20</sup>

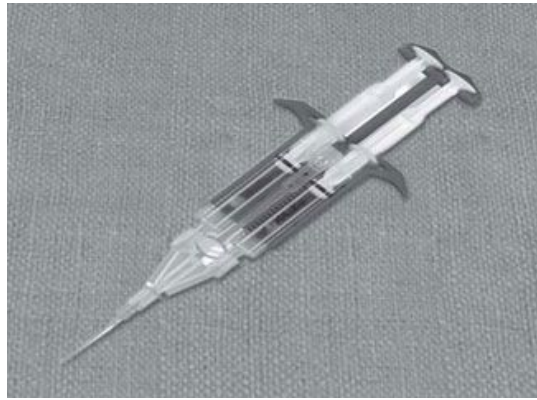
Human fibrin glue has been used effectively in the various fields of surgery, including general surgery, cardiac, vascular, thoracic, urological and plastic surgeries. And, in order to ease its application in its limitless indications, special devices have been designed that meet that purpose, but, are beyond the scope of this discussion.

## STAPLED FIXATION VS FIXATION WITH TISSUCOL IN INGUINAL HERNIA REPAIR

Stapled fixation and biologic soft fixation have been compared in many regards, including mesh migration, the tensile strength achieved between the mesh and surrounding tissues, tissue incorporation (the ability to promote granulation tissue formation), postoperative hemorrhagic complications and postoperative neuralgia as well as cost. In terms of mesh migration and the tensile strength achieved between the mesh and surrounding tissues both methods of fixation were equally effective. However, regarding tissue incorporation, Tissucol demonstrated improved ability to promote granulation tissue formation.<sup>21</sup> Tissucol also proved to be superior regarding postoperative morbidity as postoperative hemorrhagic complications and neuralgia were significantly reduced by its use and earlier return to physical and social activities achieved.<sup>20-24</sup> Tissucol even proved effective in preventing local hemorrhagic complications after inguinal hernia repair in patients with coagulopathies.<sup>20</sup> The effectiveness of fibrin glue as a mesh fixing method was also demonstrated by Ceccarelli et al<sup>25</sup> who reported a recurrence rate similar to



**Fig. 1:** Mesh fixed using tissucol



**Fig. 2:** Tissucol

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*Human Fibrin Glue in Laparoscopic Inguinal Hernia Repair: An Alternative to Invasive Mesh Fixation: A Review of Literature*

that of stapled fixation. They also reported reduced intraoperative bleeding, postoperative trocar site pain as well as incisional hernias. These observations were related to the use of a 5 mm trocar instead of a 10 mm trocar when fixating using tissucol. Biologic soft fixation does not bring additional cost as when compared to stapled fixation. It may even be financially beneficial by saving the cost of staple-related complications and reducing the length of hospital stay.<sup>21,22</sup>

## CONCLUSION

Mesh fixation is a key to a successful laparoscopic inguinal hernia repair. Noninvasive fixation using Tissucol has always been confirmed by the literature to be as effective as its invasive counterpart with additional advantages over the latter related to its sealing, hemostatic and biostimulatory properties mainly in the form of significantly reducing the morbidity associated with the use of traumatic fixation.

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