Limitations of the “Augmentation Technique” in Laparoscopic Incisional Ventral Hernia Repair: Observations and Personal Experience

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Abstract

Background: Several meta - analyses have validated the “Augmentation” or “Intra - peritoneal on lay mesh (IPOM) - Plus” techniques in laparoscopic incisional and ventral hernia repair (LIVHR) and assessed their safety and efficiency after long - term follow - up.

The aim of this article is to elaborate on the different techniques available for closing defects by laparoscopy or by combined methods; and defend basic principles with the proper limitations for total laparoscopic use.

Methods: Through our extensive experience, we observed certain limitations in the use of the total laparoscopic technique when intracorporeal closure of defects exceeding 8 cm in width. The optimal method for laparoscopic defect closure was determined to be the transparietal U reverse stich.

We found an alternative tailored “Hybrid extracorporeal closure” to be optimal for approximating the linea alba under physiological tension when the defect was 8-14 cm in width. If the width exceeded 15 cm, we preferred to optimize the closure by an anterior component separation technique (CST) followed by laparoscopic IPOM reinforcement.

Results: Based on personal recently published data, this observational study highlights that the rate of recurrence was optimized but remain greater than 7.08% for larger defects (W4 >15 cm), 9.92% for defects 10-15 cm (W3), and 3.51% for defects 5-10 cm (W2), resulting in an acceptable overall rate of recurrence (4.72%) in comparison to the standard IPOM (4,4-29%).

Conclusion: The current, best indications for a successful LIVHR should be tailored to the width of the defect and proper patient selection. The Augmentation technique, limited to 8cm width when applied fully by laparoscopy, is highly recommended, for treating incisional and ventral hernias.

INTRODUCTION

The standard LIVHR, when indicated, should be customized using a combination of adapted products and matched to the surgeon’s skills [1]. Recent literature has revealed a higher recurrence rate, as well as more associated complications, if the overlap is < 5 cm and for large defects with widths > 10 cm [2-5]. Thus, it is of paramount importance to measure the abdominal wall and defect surfaces and to adapt the size of an appropriate mesh accordingly.

An increasing number of recent articles suggest a “closure of the defect” by medialization of fascia and approximation of the Linea Alba (LA). Several techniques for closure of the defect have been recommended in order to reconstruct the anatomy using the “Augmentation technique” [6-9].

The aim of this article is to elaborate on this concept and highlight its limitations as a total laparoscopic approach while recommending a tailored technique depending on the width of the defect, patient characteristics and the surgeon’s skills.

MATERIALS AND METHODS

The well - established basic parameters for a successful tailored LIVHR, are respected:

1. Quality of mesh: macro pores with an absorbable barrier
2. Quality of fixation: combination of sutures and absorbable tackers
3. The choice of an appropriate size of mesh according to hernia width, BMI, risk factors and network force of the patient
4. The appropriate physiologic suturing: “Augmentation technique” with either method or an overlap of > 5 cm before closing the defect.

Based on this observational study, and garnered personal experience, the preferred optimal method for total laparoscopic defect closure was determined to be the transparietal U reverse stitch when the width of the defect was less than 8 cm (Figures 1,2).

We observed limitations for the total laparoscopic, intracorporeal closure of defects exceeding 10 cm in width because routine closure under tension by laparoscopy could produce potential risks. The defect closure in moderate to large incisional and ventral hernias (IVHs) (> 10-15 cm), W2-W3 in the EHS Classification, was more difficult to achieve and necessitated the so - called “Hybrid technique” consisting of a combination of
a mini Laparotomy on the top of the defect to re approximate the LA, with an additional anterior relaxation incision of Clotteau, followed by a large Parietex composite mesh (Covidien®) reinforcement with adequate fixation using trans fascial sutures (TFS) in a crown manner with two on the midline. Finally, due to technical understanding of failure to simply re approximate the LA for large defects (W4 > 15 cm), an anterior component separation technique or trans abdominal release (TAR) was privileged.

RESULTS

This observational study corresponds to a personal experience and analysis of a single institution cohort that was recently published, in which we achieved an acceptable overall recurrence rate (4.72%) in comparison to the standard IPOM (4.4 - 29%), by tailoring a reliable “suturing concept”. However, regarding the size of the defect and proper management of repair, the overall recurrence rate after 1326 LIVHR, according to the Chevrel & Rath classification, was optimized and remain higher (7.08%) for large defects (W4 > 15 cm), 9.92% for defects of 10-15 cm (W3), and 3.51% in defects of 5-10 cm (W2), with an overall recurrence rate of 4.72%. The recurrence rate for primary ventral hernia was minimal (1.72%), as opposed to the higher rate for incisional ventral hernias (3.45%) (Table 1).

DISCUSSION

The best LIVHR’ outcomes in terms of overall incidence of complications and recurrence were achieved under the following conditions:

1. When PFC by U reverse stitches was applied with LIVHR under physiological tension and the defect had a width < 8 cm and an overlap of 4-6 cm before closure and 5-7 cm after closure.

2. Preparation of a good “Landing zone” in all cases; the proper excision of all fatty tissue or lax hanging peritoneum should be performed to enable a secure fixation of the mesh to the healthy fascial layers for better tissue in growth.

3. Complete covering of the underlying fascial incision with the mesh unless contraindications exist.

4. For M4-M5 cases, the preferred method involves pre - peritoneal flap dissection and positioning of the mesh up to Cooper’s ligament and laterally beyond the limit of the epigastric vessels, completed by reattachment of the peritoneal flap to the mesh with a running barbed VLoc3/0 suture (Covidien®) [10].

5. Adoption of a decreased use of TFS with an increased use of resorbable tackers (such as Absorbatack®), except for obese patients or complex, large or recurrent incisional and ventral hernias (IVH), in which more permanent TFS are required [9].

6. When the abdominal wall was totally reconstructed, in moderate or large hernia, preserving an optimal approximation of the LA either by Hybrid or combined CST, respectively.

Supportive meta - analyses and randomized controlled trials have shown superior outcomes in favor of LIVHR compared to open ventral incisional hernia repair [11-13]. As reported in a previous article [9] and supported by others [14-22] in different manners, these essential technical steps have been emphasized and reproduced for the success of total LIVHR, even by robotic surgery [23]. However different factors that have been suggested for the failure of LIVHR, aside from technical errors caused by the surgeon’s skills, include obesity, smoking, longer operating time, inadequate fixation, infections, previous hernia repair, large defects especially close to bone, and complications [24-27].

Increasing concern exists regarding measurement of the surface of the abdominal wall in relation to the defect surface, patient characteristics, BMI and the ratio of the mesh surface (M)/ defect surface (D) (M/D). Hollinsky, according to La Place’s law, and recently Hauters et al., reviewed 213 cases and concluded that single defect ventral hernias could be represented by a circle with surface A = πr² and incisional hernias could be represented by a rectangle with S = WxL or an ellipse with S = πaxb [28]. They concluded that the extent of mesh overlap and subsequently the
value of M/D is undoubtedly the main parameter that is under the surgeon’s control. The multivariate analysis showed that the M/D ratio is the only independent predictable factor for recurrence (PFR). For an M/D ratio ≤ 8, between 9-12, between 13-16 or ≥ 17, the recurrence rates were 70%, 35%, 9% and 0%, respectively. Thirteen was the threshold value under which LVHR with the “Bridging technique” cannot be recommended, and 16 was the threshold over which the risk of recurrence was virtually null.

With respect to the formula, equation and PFR, Hauters hypothesized that the limitation of the “Bridging technique” in LVHR would be a maximum width of 8 or 10 cm covered, respectively, by a large reinforcement IPOM of 20 cm or 25 cm for reducing the incidence of recurrence while providing a sufficient overlap of > 5 cm. This width measurement of 8cm was found to be also the limitation for the total laparoscopic “Augmentation technique”, in order to be reproduced efficiently.

As a personal recommendation for defect widths (8-14 cm), tailoring a hybrid combination of anterior closure of the defect, with or without relaxation incisions, would be sufficient in terms of physiological approximation and has the added benefit of larger composite mesh reinforcement without wide dissection or risk of wound complications [29]. This technique reduces the dead space and decreases seroma formation at the IH site to 2.56%, compared to 7.6% in Palanivelu’s study using a posterior separation technique or TAR, are preferred in complex cases despite the risk of skin necrosis in the absence of perforated vessel preservation [37,38].

With proper knowledge of a technique’s limitations, and with appropriate tailoring using an alternative augmentation technique based on defect width, the rate of recurrence on long term could be further minimized.

CONCLUSION

Based on our experience garnered over the past 15 years to achieve a successful LVHR, the technique should be tailored to the defect width and proper patient selection. The “Augmentation technique” is highly recommended, but is limited to treating IVH under physiological tension (width < 8cm) when applied by laparoscopy, and has more favorable surgical outcomes.

Tailoring of a hybrid or combined VAT might be necessary for defects with widths 8-14 cm, and the alternative component separation technique or TAR should be considered for complex or large IVHs (> 15 cm, W3-4).

REFERENCES

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