Rare Case Report: Robotic Assisted Bilateral Morgagni Hernia Repair Challenged by Loss of Abdominal Domain

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Introduction

Bilateral Morgagni hernias are rare congenital diaphragmatic defects due to the failure of fusion of the seventh costochondral arch with the pars sternalis. Chronic diaphragmatic hernias require a challenging complex closure due to loss of abdominal domain (also referred to as loss of domain (LOD)). Loss of domain comprises the visceral content in the hernia sac being greater than the abdominal cavity's capacity which compromises a tension-free hernia repair and poses an increased risk of compartment syndrome, fascial dehiscence, respiratory compromise, or poor bowel function.

Conclusions

Preoperative optimization is crucial in the success and outcome of large diaphragm hernia repair. Incorporating progressive preoperative pneumoperitoneum and Botulinum Toxin injection can combat the challenges faced in patients who have loss of abdominal domain.

References

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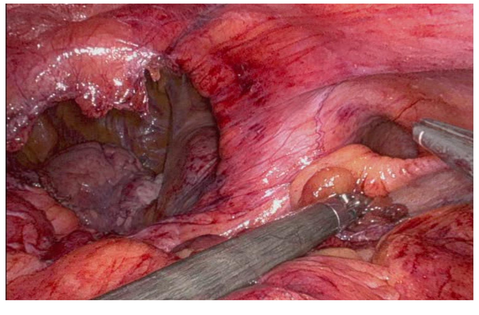
Case Description

A 50-year-old male who underwent repair of laparoscopic approach combined with right VATS and Gore-Tex patch for large bilateral Morgagni hernia who then sustained complete diaphragm avulsion secondary to loss of domain and increase intraabdominal pressure and had a reconstruction via right thoracotomy with Gore-Tex mesh. This case report discusses the challenges faced with loss of domain with chronic diaphragm hernias, parallel challenges faced in both diaphragm and abdominal hernia repairs, and the goal for techniques such as progressive preoperative pneumoperitoneum and injection of Botulinum toxin to the lateral abdominal wall to be incorporated for preoperative optimization for large complex diaphragm hernia repairs which both significantly lengthened the abdominal wall muscle and increased cavity compliance.

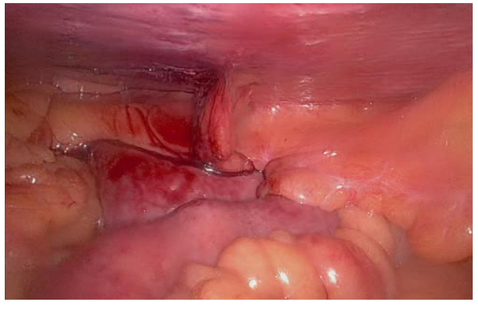
Significance of LOD

To date, there are no clear criteria for addressing LOD in patients who undergo diaphragmatic hernia repair. Both large abdominal hernias and large diaphragmatic hernias reintroduce viscera into the abdominal cavity. In the case of LOD, the abdominal cavity is unable to fully accommodate the reintroduced abdominal content, posing an increased risk of compartment syndrome, fascial dehiscence, respiratory compromise, or poor bowel function. Surgical planning for large abdominal hernias in patients for whom LOD is a concern should involve methods for achieving enlargement of the abdominal space.

Figure 1. Bilateral Morgagni Hernia



Figures 2. Loss of Domain



PPP & Botulinum Toxin Injection

Currently, there are no clear criteria for managing loss of domain (LOD) in patients undergoing diaphragmatic hernia repair. Both large abdominal and diaphragmatic hernias reintroduce viscera into the abdominal cavity. Surgical planning for these patients should focus on expanding the abdominal space, using techniques like component separation, progressive preoperative pneumoperitoneum (PPP), tissue expanders, and botulinum toxin injection. These methods can also be applied to chronic diaphragmatic hernia repairs.

Studies suggest PPP is suitable for patients with hernia sac volumes and abdominal cavity volumes ≥25, as determined by CT scans. One study of 45 patients showed a 38% increase in abdominal volume post-PPP, facilitating complete hernia reduction and defect closure. Another study confirmed PPP's safety and effectiveness in reducing abdominal wall tension and improving cavity expansion before repair.

Botulinum toxin, used for abdominal wall reconstruction, can lengthen muscles and increase cavity compliance. While no clear guidelines exist for its use in diaphragmatic hernia repair, it can be considered for patients with transverse hernia widths >100mm and specific abdominal cavity-to-hernia volume ratios. Typically, 300 units are injected into the abdominal wall muscles, with reported muscle length gains of 5 cm. Botulinum toxin also offers pain relief and reduces opioid use. A study combining PPP and botulinum toxin for LOD hernias reported a 5.7% recurrence rate.

Consideration for Progressive Preoperative Pneumoperitoneum & Botulin Toxin Injection
Concern for loss of abdominal domain in a diaphragm hernia not containing strangulated or perforated bowel
Hernia sac volume ratio to abdominal cavity ratio > 25%
Transverse hernia width >10cm
Available multidisciplinary team of experts in diaphragm hernia repair, abdominal wall reconstruction, interventional radiology