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# Outcome of Laparoscopic Repair of Morgagni Hernia with Sac Excision in Children: Single Center Experience

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## Abstract

*Background:* Morgagni hernia is a rare anomaly in which abdominal organs herniate into the thorax through an anteromedial diaphragmatic opening. The standard approach for repair was traditionally through laparotomy or, less commonly, thoracotomy. However, in the era of minimally invasive surgery, laparoscopic repair of Morgagni hernia has become the most common approach.

*Aim of Study:* This study aims to assess the outcomes of laparoscopic repair of MH with sac excision.

*Material and Methods:* We retrospectively reviewed the medical records of all cases of Morgagni hernia operated by laparoscopic assisted approach with sac excision from Jan. 2020 to Jan. 2024 in Mansoura University Children's Hospital. We reviewed demographic data, symptoms, operative findings, operation details, and postoperative follow up of the patients.

*Results:* A total of 10 patients with Morgagni hernia were operated via laparoscopic approach with extracorporeal sutures. There were 4 girls (40%) and 6 boys (60%). Median age of surgery was 19 months. Associated malformations were present in 6 children (60%). All children underwent laparoscopic approach with sac excision and extracorporeally ligated sutures. Mean operative time was 71.2±10.4 minutes. The duration of hospital stay ranged from 1 to 2 days postoperatively. There were no intraoperative or early postoperative complications. There was no recurrence during the period of follow-up.

*Conclusions:* Laparoscopic-assisted approach is safe and effective choice for repair of MH. Excision of the sac may have a role in minimizing recurrences in those patients.

***Key Words:*** *Morgagni hernia – Laparoscopy – Children.*

## Introduction

**MORGAGNI** hernia, a rare congenital defect causing abdominal contents to herniate through the diaphragm, occurs in approximately 1 in 5,000 births. It was traditionally repaired with an open approach, however,with advancements in minimally invasive techniques, laparoscopic repair is used to reduce trauma, improve recovery and enhance cosmetic outcomes in pediatric patients **[1]**. The laparoscopic technique enables precise hernia repair with high success and low complication rates in children **[2]**.

Excision of the hernial sac is a controversial step in the laparoscopic repair of Morgagni hernia. There is a debate if this step has an effective role in elimination of recurrence **[3,4]**. This study aims to evaluate the outcomes of laparoscopic repair of Morgagni hernia (MH) with the excision of the hernia sac, focusing on the safety, effectiveness, and potential benefits of this approach in improving patient recovery and minimizing postoperative complications.

## Material and Methods

This is a retrospective review that was conducted on all children who underwent repair of Morgagni hernia with sac excision from Jan. 2020 to Jan. 2024 in Mansoura University Children's Hospital, Mansoura, Egypt. An approval was obtained from the institutional research board (IRB) (R.24.11.2869). Preoperative data were reviewed includingsex, age at operation, associated conditions and radiological investigations such as chest X-ray and CT scan if done. Operative details were collected from the surgical reports including side of the defect, operative time and intraoperative complications. Postoperative data were collected including enteral feeding, length of hospital stay and follow-up.

*Surgical technique:*

The patient is positioned in a supine position with the surgeons at the caudal end of the table. Routinely, three ports 5mm were located. The umbilical port was inserted by open approach and a 30º

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scope was used. The defect and herniated organs were then inspected, and the two other working ports were inserted in the midclavicular lines. After reduction of contents, the falciform ligament was usually divided using monopolar hook diathermy or bipolar energy device for better exposure of the diaphragm. In the same way, hernial sac was grasped, dissected and separated from the pleura and pericardium (Fig. 1).

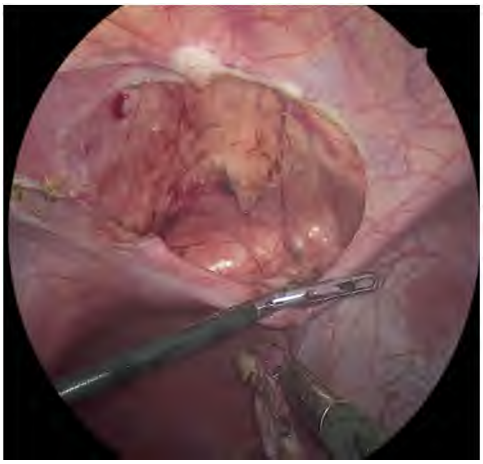

Fig. (1-A): Dissection from pleura and pericardium.

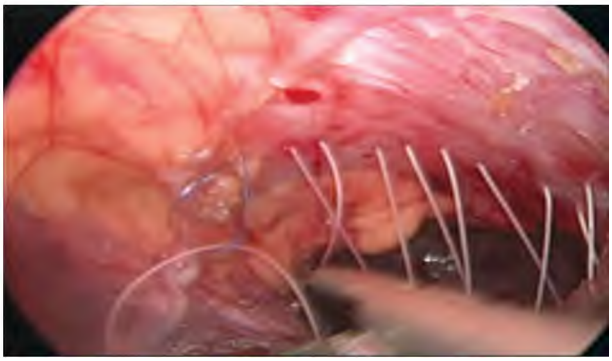

Fig. (1-B): Complete closure extracorporeal.

The defect was closed with 2/0 non-absorbable polyfilament polyester sutures using an interrupted simple suture technique tied extracorporeally. Each suture passed through the full thickness of the anterior abdominal wall, incorporating the posterior edge of the diaphragmatic defect, then was exteriorized using an 18-G intravenous cannula with a loop formed by a fixed polypropylene thread. After placement of all stitches, they were tied and buried into a tunnel formed in the subcutaneous tissues using multiple small incisions or a single incision in the epigastric region.

Enteral feeds were introduced 6 hours postoperatively. Outpatient follow-up visits were scheduled at 1-month and 6-month intervals. A follow-up chest X-ray was obtained for all patients 6 months after operation.

## Results

Ten children (6 boys and 4 girls) were diagnosed with Morgagni hernia and underwent laparoscopic hernia repair with sac excision. The median age at surgery was 19.2 months (inter quartile range (IQR) 14.25-30.75). Associated conditions were present in 6 children (60%) and included: Down syndrome with associated cardiac anomalies in 3 children, cystic fibrosis in 1 patient, craniosynostosis in 1 patient and Hirschsprung disease underwent transanal endorectal pull through in 1 patient. Six patients presented with recurrent chest infections and were referred to our department by pediatricians while other four cases were diagnosed accidentally by imaging done for other indications. One of these cases was diagnosed by echocardiography done for Patent Ductus Arteriosus. The diagnosis was made in 8 out of 10 cases (80%) with a chest X-ray only. In 2 cases the findings of X-ray were not clear and abdominal CT with oral contrast was done (Table 1).

Table (1): Patients' data are summarized.

| Patient Number | Age at surgery (months) | Sex | Side | Symptoms at presentat | Associated anomalies | Operative Time (minutes) |
|---|---|---|---|---|---|---|
| 1 | 14 | F | Bilateral | Chest Infection | Cystic fibrosis | 60 |
| 2 | 15 | F | Bilateral | Accidental | Down Syndrome, cardiac: (VSD) | 70 |
| 3 | 6 | M | Bilateral | Chest Infection | Craniosynostosis | 75 |
| 4 | 12 | M | Bilateral | Accidental | No | 80 |
| 5 | 24 | M | Left | Chest Infection | No | 55 |
| 6 | 51 | M | Bilateral | Chest Infection | Congenital megacolon | 75 |
| 7 | 42 | M | Bilateral | Accidental | Down Syndrome, Cardiac (ASD, PDA) | 70 |
| 8 | 22 | F | Right | Chest Infection | No | 92 |
| 9 | 33 | M | Bilateral | Chest Infection | Down Syndrome, cardiac: ASD | 70 |
| 10 | 16 | F | Bilateral | Accidental | No | 65 |

All patients underwent a laparoscopic approach. In 8 cases (80%) the hernia was bilateral while the defect was right-sided in one patient and left-sided in one patient. Conversion to open surgery was not required in any patient. The hernia was closed primarily with sac excision in all children. There were no intraoperative or early postoperative complications. The mean operative time was 71.2±10.4 minutes.

Enteral feeds were started six hours postoperatively and increased as tolerated. Three patients (30%) were discharged on the 1st postoperative day while 7 patients (70%) discharged on the 2nd postoperative day. The median follow-up duration was 14.33 months (IQR 9.06-32.25). One patient (10%) has stitch sinus at the site of extracorporeal sutures, in which treated by curettage and suture removal under general anesthesia. No recurrences were reported during this period.

## Discussion

Morgagni hernia may sometimes be linked with chromosomal and congenital anomalies, including trisomy 21 and pentalogy of Cantrell **[1,5-7]**. The recent study found that 30% of patients were diagnosed with Down syndrome.

In contrast to the more common Bochdalek hernia, Morgagni hernia, often appears later in life with vague respiratory or gastrointestinal symptoms or is discovered incidentally. Common presentations include recurrent chest infections or respiratory distress, as reported in previous case series **[8].** Similarly, in our series, 60% of patients exhibited respiratory symptoms. However, some patients may be asymptomatic, with the diagnosis being incidental, as seen in one of our cases where Morgagni hernia was discovered during an echocardiogram performed for a PDA follow-up. The diagnosis was later confirmed through a chest X-ray and CT scan.

Surgical repair of asymptomatic Morgagni hernia is recommended to prevent complications like obstruction, volvulus and perforation **[7].** Abdominal exploration with primary closure is the standard approach, but some surgeons recommend a transthoracic approach for better access, phrenic nerve identification, and hernia sac removal **[9].**

Laparoscopic repair, initially introduced by Kuster et al., is increasingly recognized as the preferred procedure for both children and adults **[10].** Danielson documented the successful closure of a Morgagni hernia in a case performed using a single-port technique **[11]**. Robotic-assisted laparoscopic repair of Morgagni hernia in children has been shown to be safe and feasible, though it typically involves a longer operating time compared to traditional laparoscopic repair, primarily due to the docking process **[12,13].**

There is ongoing debate about certain technical aspects of surgical repair, particularly the decision to excise or retain the hernia sac. Excision is advocated by some, including Rau **[14]**. Other surgeons recommend leaving the hernia sac intact to prevent potential damage to the phrenic nerve **[15,16].** In all cases of the study, the hernial sac was removed without causing any damage to vital thoracic or abdominal structures. Interestingly, sac excision is considered essential to avoid leaving a cyst like lesion in the chest **[17].** Moreover, sac excision is not a technically demanding procedure and the operative time is reported to be comparable to those patients without sac removal **[18].**

In all of our patients, non-absorbable sutures were used, and they were tied extra corporeally. Aside from a stitch sinus, no other complications such as bleeding, bowel obstruction, or port-site hernia were observed. We attribute the absence of recurrence to the excision of the hernia sac and the tension-free repair. To ensure a tension-free closure, it is essential to release all adhesions between the defect and the surrounding structures. In our series, we did not encounter any cases with large diaphragmatic defects that required the use of a prosthetic patch.

*Conclusion:*

Laparoscopic repair of Morgagni hernia with extracorporeal suturing, is safe and efficient. Excision of sac has no risk of injury to important structures and may have a benefit in eliminating the risk of recurrence.

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# تقييم نتائج اصلاح فتق الحجاب الحاجز الامامى بمنظار البطن الجراحى

فتق مورغانى هو تشوه خلقى نادر فى الحجاب الحاجز الامامى مع بروز أعضاء البطن فى الصدر. تحدث فتق مورغانى فى واحد من كل ٤٨٠٠ ولادة حية وتمثل أقل من ٥٪ من فتق الحجاب الحاجز الخلقى. عادة ما تكون محتويات الفتق هى القولون والكبد والأمعاء الدقيقة. كان النهج القياسى للإصلاح من خلال استكشاف البطن، أو نادرا ما يكون عن طريق استكشاف الصدر.

الهدف من هذه الدراسة هو تقييم اصلاح فتق الحجاب الحاجز الامامى بمنظار البطن الجراحى.

يُعتقد عمومًا أن إصلاح فتق مورغانى جراحيًا يجب أن يتم حتى في الأطفال الذين لا تظهر عليهم أعراض لمنع حدوث مضاعفات كبيرة مثل انسداد الأمعاء، التواء الأمعاء أو التمزق. يتم عادةً استكشاف البطن وتقليل محتويات الفتق وإغلاق العيب الأساسى. يفضل بعض الجراحين النهج الصدرى المباشر لأنه يوفر رؤية مباشرة للعيب ويسمح بتحديد العصب الحجابى وإزالة كيس الفتق. ومع ذلك، فقد أصبح الإصلاح بالمنظار، الذي اقترحه كوستر وآخرون، أكثر قبولًا كخيار للمرضى الأطفال والبالغين. وقد أفاد دانيالسون بنجاح إصلاح فتق مورغانى باستخدام مدخل واحد، وتم الإبلاغ عن أن إصلاح فتق مورغانى بمساعدة الروبوت آمن وقابل للتنفيذ في الأطفال، رغم زيادة وقت العملية مقارنةً بالإصلاح التقليدى بسبب وقت التحضير.

توجد بعض الجوانب الفنية للإصلاح الجراحى التى لا تزال مثيرة للجدل، مثل ما إذا كان يجب استئصال كيس الفتق أو تركه. يوصي بعض الجراحين باستئصال الكيس، بينما يفضل آخرون تركه لتجنب إصابة العصب الحجابى. تم وصف طى الكيس كبديل عن استئصاله من قبل بعض الأطباء. فى جميع حالاتنا، تم استئصال كيس الفتق ولم نتعرض لأى إصابة فى الهياكل الهامة فى الصدر أو البطن. يُعتقد أن استئصال الكيس مهم لتجنب ترك كيس مغلق يحتل مساحة فى الصدر. كما أن استئصال الكيس ليس إجراءً معقدًا من الناحية الفنية، ومدة العملية تتساوى مع تلك الحالات التى لم يتم فيها إزالة الكيس.

هناك ثلاث تقنيات خياطة يمكن استخدامها لإصلاح العيب: الخياطة المتواصلة داخل البطن، أو المتقطعة، أو خياطة خارجية أو مزيج من الاثنين. فى جميع مرضانا، استخدمنا خيوطًا غير قابلة للامتصاص وربطناها خارج البطن. باستثناء مشكلة بسيطة فى الغرز، لم نلاحظ أى مضاعفات أخرى مثل النزيف، انسداد الأمعاء، أو فتق في موقع الجراحة. نعتقد أنه لم يحدث تكرار للفتق بسبب استئصال الكيس والإصلاح دون شد. لتحقيق الإغلاق دون شد، يجب فصل جميع الالتصاقات بين العيب والهياكل المحيطة. في دراستنا لم نسجل حالات بعيب حجاب حاجز كبير يستدعى وضع رقعة صناعية.

الخلاصة: يعتبر إصلاح فتق مورغانى بالمنظار مع الخياطة الخارجية آمنًا وفعالًا. استئصال الكيس لا ينطوى على خطر إصابة الهياكل الهامة وقد يساعد فى تقليل احتمالية التكرار.