Laparoscopic Morgagni Hernia Repair without Sutures Using Only Composite Mesh in Patients with Large Defects

Büyük Defektli Hastalarda Sadece Kompozit Meş Kullanarak Dikişsiz Laparoskopik Morgagni Hernisi Tamiri

Abstract

In this report, we present the clinical characteristics and surgical outcomes of three pediatric patients who presented to our clinic with congenital Morgagni hernia and were treated with laparoscopic surgery using only mesh.

Keywords: congenital diaphragmatic hernia; laparoscopic procedures; Morgagni hernia; surgical mesh

Öz

Bu raporda konjenital Morgagni hernisi ile kliniğimize getirilen ve sadece meş kullanılan laparoskopik cerrahi yoluyla tedavi edilen üç pediyatrik hastanın klinik özellikleri ve cerrahi sonuçları sunulmuştur.

Anahtar Sözcükler: cerrahi meş; konjenital diyafragmatik herni; laparoskopik işlemler; Morgagni hernisi

Murat Kabaklioglu[1], Murat Kaya[1]

[1] Department of Pediatric Surgery, Faculty of Medicine, Düzce University

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Corresponding author/*Yazışma yazarı*

Murat Kabaklıoğlu

Düzce Üniversitesi, Tıp Fakültesi, Çocuk Cerrahisi Kliniği, Düzce, Turkey
E-mail: mkabaklioglu@gmail.com

ORCID

Murat Kabaklioglu: 000-0002-2894-0470
Murat Kaya: 0000-0001-6650-0145

INTRODUCTION

Congenital Morgagni hernia (CMH) is a rare midline defect that occurs when intra-abdominal organs pass into the thoracic cavity from the section known as the Larrey's gap, where the superior epigastric arteries pass. It constitutes 2–6% of all diaphragm hernias (1). It is thought to be caused by the failure of the costochondral arch and the tendinous sternal part of the diaphragm. Most of the cases involve the omentum and colon (2), while cases involving the liver, stomach, and small intestines are rare. Most of the patients are asymptomatic and diagnosed incidentally in chest radiographs. The incidence of accompanying anomalies, especially malrotation, ranges from 30 to 50%.

While it is agreed that patients with CMH should be treated surgically, the treatment to be carried out in asymptomatic cases remains controversial, although surgical treatment still seems to be preferable because of the risk of strangulation in herniated organs and the recent advances in minimally invasive surgery. In this report, we present the clinical characteristics and surgical outcomes of pediatric patients who presented to our clinic with CMH and were treated with laparoscopic surgery using only mesh.

CASES

Case 1

The 4-month-old male patient was admitted to the emergency department with complaints of cough and fever and diagnosed with CMH at the consultation requested because of suspicious chest radiographs (CXR) (Figure 1-I). He was scheduled for elective surgery and the diagnosis was confirmed by tomography (Figure 2). Cardiac echo was evaluated as normal. However, the patient developed a perianal abscess during follow-up and the operation was postponed. At the request of the family, the surgery was performed in the summer period, when the patient was 10 months old, and by then he received pneumonia treatment four times for his fever and cough. A wide CMH was detected in the operation, which was completed with the placement of a 12x16 cm mesh. During the operation, it was found that the stomach and transverse colon were herniated, and the hernia was reduced. The pouch was very close to the pericardium and was not removed. Oral feeding was started 20 hours after the operation. The patient, who was discharged on the second postoperative day, was followed up for 2 years. Chest radiographs showed that the residue due to the sac left gradually decreased until it remained minimal (Figure 1-IV).

Case 2

A 10-year-old girl was under follow-up for Down syndrome, hypothyroidism and ASD, and a CMH was detected in the chest X-ray (Figure 1-II) taken due to recurrent lung infections. The diagnosis was confirmed by tomography. (Figure 2). After cardiac echo examination, the patient was operated on under elective conditions. It was found that she had a rather large hernia and malrotation, and that the cecum was herniated together with the appendix. Appendectomy was performed after reduction. The Ladd procedure was not needed because the patient was 10 years old and had no malrotation-related complaint. Removal of the sac was not considered because its borders were very close to the pericardium. The process was completed with the placement of a 12x13 cm mesh. The artifact due to the sac seen in the early postoperative radiographs disappeared completely in the follow-up films (Figure 1-V). There was no complication after 3 years of follow-up.

Case 3

A 23-month-old female patient who was under follow-up for nephrolithiasis was diagnosed with CMH after recurrent lung infections, and the decision for surgical treatment could be made one year later. The patient was operated on after cardiology consultation, and hernia repair was performed laparoscopically by placing only mesh. After the cecum and appendix were withdrawn from the hernia sac, only appendectomy was performed without considering the Ladd procedure as no malrotation-related change was detected in the gastrointestinal system. Feeding was started at the postoperative 16th hour. The patient, whose chest radiographs were normal, was discharged on the second day (Figure 1-VI).

Report ethics

After the surgical procedures were explained in detail to the parents of the patients, their written informed consent, together with the approval of the Düzce Uni-

Table 1. Patient pre-, peri- and postoperative data

Patient	Age	Sex	Accompanying pathology	Symptoms	Operation time	Start of oral feeding	Length of hospital stay	Postoperative follow-up time	Complications
I	10 months	Male	—	Recurrent lung infections	50 min	16th hour	2 days	18 months	Residual appearance on CXR
II	10 years	Female	Down syndrome, hypothyroidism	Recurrent lung infections	45 min	20th hour	2 days	36 months	—
III	23 months	Female	Nephrolithiasis	Recurrent lung infections	40 min	20th hour	2 days	24 months	—

versity Institutional Review Board (2020/257), was obtained for the use of the patient data and the publication of the present report.

OPERATIONS

Operative technique

All three of the patients underwent diaphragmatic hernia repair under elective conditions with use of standard laparoscopic equipment. Peritoneal access was achieved by placing a 5-mm subumbilical camera port using the open Hasson technique. Then, two 5-mm ports were placed into the abdomen under the direct view of the camera so that the foramen was the center point of the triangle. For optimal access to the diaphragmatic defect, splitting of the falciform ligament and all necessary adhesiolysis procedures were performed. It helped to reduce the contents of the sac by using the reverse Trendelenburg position. The hernia contents were carefully lowered into the peritoneal cavity. The maximum defect diameters were measured to be 7.0×10.5 cm, 5.8×7.0 cm, and 6.4×9.8 cm, respectively. According to the CXR and CT findings, the cecum and omentum were in the hernia sac in the second and third patients. These patients with malrotation additionally underwent appendectomy. In all cases, the hernia sac was not touched because there was an unacceptably high risk of damage to the mediastinal structures.

A Parietex™ polyester composite mesh (Covidien) was attached to the diaphragm to close the defects. A laparoscopic fixation device (AbsorbaTack™, Covidien) was used to place 5-mm non-absorbable nails circumferentially around the web using the double crown technique, with the outermost nails being placed 1 cm from the edge. Closing the diaphragm defect prior to mesh fixation, together with the pins being only 4.1-mm-long, reduces the likelihood of damage to the mediastinal structures at this step. However, maximum care should be taken when fixing the mesh, and excessive upward force should be avoided when spiking the diaphragm.

Outcome and follow-up

Postoperatively, all patients were followed up in the outpatient clinic for 2 years with intermittent physical examination and CXR. All patients recovered without recurrence in a mean follow-up time of 20 months. In one patient, CXR showed residual appearance due to the sac left, although there was no clinical manifestation. None of the patients had any gastroesophageal reflex-related complaint.

DISCUSSION

CMH, first described in 1769, is a rare diaphragmatic anomaly that occurs when abdominal contents herniate into the chest cavity through a congenital defect in the retrosternal region (3). Although the true incidence of CMH, which accounts for 2 to 6% of all congenital diaphragmatic hernias (CDHs), is not known, it is estimated to affect 1 in 2000–5000 live births. Among all CDHs, it has an increasing incidence with the increase in the diagnosis of asymptomatic patients (11% in recent publications) (4). CMH is located on the right side in most (90%) of the cases while it is bilateral in 8%. CMH located on the left side is rare, probably because the pericardium adheres to the diaphragm and supports it (5). All of our patients had CMH located on the right side.

In the literature, the rate of CMH patients with chromosomal and congenital anomalies has been re-

ported around 20% (6), with the most common (38%) anomaly being Down syndrome (DS) (7). Consistently, one (33.3%) of our patients had DS. Clinicians should consider CMH in children with DS who are admitted to hospital for recurrent chest infections. A 2-way chest X-ray can help to prevent CMH misdiagnosis (8). In the literature the rate of concurrent anomaly in CMH patients ranges from 34 to 50% (9), with congenital heart disease being the most common accompanying anomaly. Thus, a comprehensive cardiac evaluation, including echocardiography, is required before CMH surgery. Furthermore, a remarkable feature of CMH is its association with malrotation, which should be considered during the surgical repair. Malrotation was present in 2 (66.6%) of our patients, and appendectomy was added to the surgery.

As survival rates in children with congenital syndromes have increased, the rate of CMH diagnosis has also increased and the age of symptom onset has gradually decreased. However, although the rate of diagnosis has recently increased in children, CMH may remain asymptomatic until adulthood and most children are diagnosed incidentally by CXR taken for other reasons. Respiratory complaints have become more pronounced as the age at diagnosis has decreased (10). Also, like Bochdalek hernia, CMH can occur acutely in infants (9). One of our patients was diagnosed at the age of 4 months when he was admitted for recurrent chest infection, and he was operated on electively at 8 months of age.

While there is a general consensus on the surgical treatment of patients with clinically manifest CMH, opinions differ as to the approach to be taken in asymptomatic cases. Surgeons tend to advocate surgical repair for eliminating potential strangulation complications, despite their low frequency (11,12). The choice of transthoracic or transabdominal approach seems to be a controversial point in the surgical treatment of patients with CMH (13). The thoracoscopic approach used by thoracic surgeons has not attracted attention in the treatment of pediatric patients because of various factors including narrow working area, reduction difficulty, presence of malrotation, inefficiency in bilateral cases, and increased risk of perioperative complication (14,15).

Both open and laparoscopic transabdominal procedures have proven highly efficient in the surgical

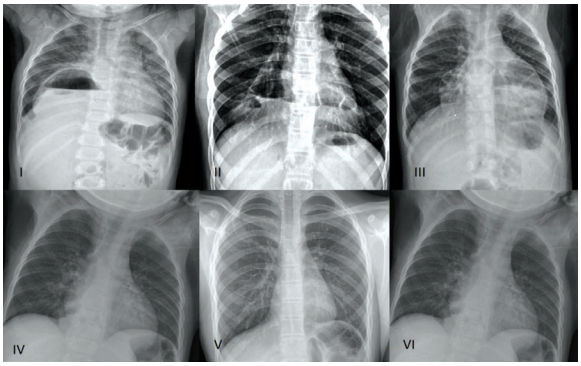

Figure 1. The pre- (I, II, III) and postoperative (IV, V, VI) chest X-rays

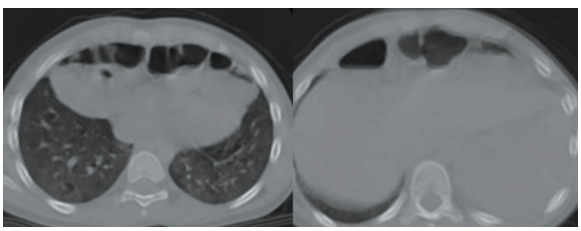

Figure 2. Tomographic images of two patients

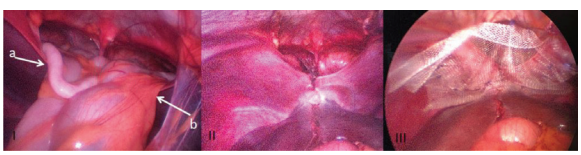

Figure 3. Laparoscopic images: I) herniation of the cecum and appendix due to malrotation, II) appearance of the defect after reduction, III) placement of mesh.

treatment of CMH. The recent advances in minimally invasive surgery have made laparoscopic repair an effective and safe option for use in children with CMH. Following the first successful laparoscopic CMH repair in 1992, several laparoscopic techniques have been described for the repair of this type of hernia, such as primary closure with interrupted or continuous suture and a supportive mesh (16–19). The laparoscopic suture technique is straightforward in experienced hands but, in the presence of an undeveloped anterior edge, does not allow the direct closing of the defect, with the risk of recurrence. One way to avoid this is to stitch the posterior edge to the sternum and rib edge. However, this technique is not easy laparoscopically, and some authors reported a method of removing sutures and tying subcutaneous tissue nodes extracorporeally to join the posterior edge of the hernia along the entire anterior abdominal wall (19,20).

In these methods, respiratory distress and pain caused by the stretched diaphragm are inevitable. In order to avoid these complications and difficulties, we recommend repair without sutures using only mesh. We used this technique in all three of our laparoscopically treated patients and none of them had recurrence during the follow-up period.

The issue of hernia sac removal during surgical treatment remains controversial. In the past it was done in all patients treated with an open approach, but the rate of hernia sac excision is now reduced by the laparoscopic-assisted approach. It was reported that during follow-up the rate of recurrence was higher in patients who underwent open surgery and whose sac was removed, compared to groups who were treated with the laparoscopic-assisted approach without this procedure (5,20). Although it is thought that unremoved hernia sacs may cause residual appearance on postoperative radiographs, it should be kept in mind that pericardial injury may occur while removing sacs adhered to the surrounding tissues (21). In addition to making the surgery easier, the greatest benefit of not touching the hernia sac is the prevention of complications from unnecessary dissection, including pericardial injury, which can be fatal because of pneumopericardium (22). We found that the appearance due to the untouched hernia sacs in two of our patients disappeared on follow-up CXR, but the artifact image, albeit minimal, continued to be seen in one of our patients operated on at a young age. However, no problem was observed in any of our patients during the follow-up period.

Although there are case series showing that all CMHs can be successfully repaired without using mesh, the use of composite mesh materials has become routine in CMH repair today. Some authors even maintain that mesh use is sometimes the best or only option in the surgical treatment of large CMHs (23,24).

Although mesh use is common among surgeons treating CMHs, studies on the mesh use alone without suturing have so far been inadequate. In our patients, we aimed to prevent the possible suture-related complications during repair, and also we believe that we could reduce the pain and respiratory distress caused by suture-related tension. Our approach can be particularly useful in the treatment of large defects, facilitating the operation and shortening the operation time. However, the small patient number and the short follow-up time are the main limitations of our study and more evidence is needed.

Conflict-of-Interest and Financial Disclosure

The authors declare that they have no conflict of interest to disclose. The authors also declare that they did not receive any financial support for the study.

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