

# Laparoscopic Treatment Experience In Morgagni Hernia Repair In Children

Ali İhsan Anadolu (✉ [dr.ali.ihsan.anadolulu@gmail.com](mailto:dr.ali.ihsan.anadolulu@gmail.com))

Şanlıurfa Mehmet Akif İnan Training and Research Hospital <https://orcid.org/0000-0002-9742-930X>

Gonca Gerçel

Şanlıurfa Training and Research Hospital

Osman Hakan Kocaman

Harran Üniversitesi

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## Research article

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# Abstract

**Background:** We aimed to present our laparoscopic treatment experience in Morgagni hernia repair.

**Methods:** The patients who underwent laparoscopic surgery with diagnosis of Morgagni hernia between 2016-2019 were evaluated retrospectively.

**Results:** Their mean age at diagnosis was  $4,1 \pm 2,6$  years (1 year-13 years). All patients were male. The presenting complaints were respiratory tract infection in 3 patients and vomiting in 3. Two patients were diagnosed incidentally. Associated Down's Syndrome was detected in 3 (38%) cases. The defect was left-sided in 7 (87.5%) patients and bilateral in 1 (12,5%). Omentum was herniated in 2 patients, colon and omentum were in 6 and colon, omentum and stomach were in one. All patients underwent primary repair extracorporeally by removing sutures from single incision, without removal of the hernia sac. There were no complications or recurrence in the mean  $19,2 \pm 15,8$  months (6-42 months) follow-up period

**Conclusion:** Minimal invasive repair of MH is efficient and safe. It should be the first choice because of fast recovery and better cosmetic results. In this series, it was seen that leaving the hernia sac had no effect on early and late complications. Leaving the hernia sac may prevent potential complications due to unnecessary dissection.

## Background

The foramen of Morgagni is a retrosternal space that develops when the fibrotendinous portion of the pars sternalis does not fuse with the fibrotendinous tissue arising from the costochondral arches [1]. A patent foramen of Morgagni offers a path through which the abdominal viscera can herniate into thoracic cavity and has unique features in terms of clinical presentation and associated anomalies [2].

Morgagni hernia (MH) is extremely rare, occurring approximately in 1 out of 5000 live births, and accounts for less than 5% of all congenital diaphragmatic defects [3,4]. Patients may present with an incidental diagnosis or nonspecific respiratory symptoms such as frequent lung infection, dyspnea or ileus and abdominal pain [5–8]. MH may also be associated with heart defects and Down syndrome [9]. Clinical experience with this entity is limited owing to its rare occurrence. The treatment of MH is surgical repair of the defect either by open or laparoscopic techniques by abdominal or thoracic route [10,11]. With this study we aimed to present our experience with the laparoscopic repair of MH.

## Methods

The medical records of the children operated on from January 2016 to June 2019 with the diagnosis of MH were reviewed retrospectively. We used the institutional database that included information on the composition of the surgical team. Surgical technique performed by laparoscopic-assisted approach using three ports and when sutures were passed separately and percutaneously through the full thickness of the anterior abdominal wall (Figure 1) and the knots were tied in the subcutaneous tissue by a single

incision. The following information was obtained: age at diagnosis, sex, presenting symptoms, method of diagnosis, associated anomalies, site of hernia, operative repair and outcome.

## Results

Eight male children with MH were operated during the study period. Their mean age at diagnosis was  $4,1 \pm 2,6$  years (1 year–13 years). Three patients (37,5%) were presented with vomiting (Table 1). Three (37,5%) had nonspecific upper respiratory tract symptoms at admission and recurrent lung infection history. In two (25%) the hernia was discovered incidentally. Diagnosis was reached by two sided plain chest X-Ray and/or computed tomography (Figure 2). Down syndrome was noted in 3 (38%) patients.

The correction of the defect was performed using transabdominal laparoscopic-assisted technique in all patients. At the operation, defect and sac of hernia was checked. Seven (87,5%) patients had left-sided and one (12,5%) patient had bilateral hernia (Table 2). Hernia sacs were present in all of the patients. None of the sacs were removed. The hernial contents were only omentum in two patients, omentum and colon in six and colon, omentum and stomach in one patient. There were no intraoperative complications. The average discharge time was 2.6 days. There is only one suture reaction in subcutaneous tissue at postoperative 2 months. There were no complications or recurrence in the mean  $19,2 \pm 15,8$  months (6–42 months) follow-up period.

## Discussion

Congenital MHs are a rare form of diaphragmatic hernia that make up 2–4% of all congenital diaphragmatic hernias [3,4]. MHs have a variety of clinical presentations ranging from severely life-threatening at the time of birth to remaining asymptomatic until adulthood. Gastrointestinal and more commonly respiratory complaints could be the first admission symptoms or it can be discovered incidentally [8,12]. The majority of our patients presented with repeated attacks of chest infections, secondarily presentations were vomiting and abdominal pain,

Chromosomal disorders and congenital abnormalities with MH have been reported to be around 20% in the literature [7,13]. As in earlier reports, Down syndrome was a frequent association (38%) [14,15]. In present study, three of our patients (37,5%) had Down syndrome. Two of the 3 patients with Down syndrome had vomiting and the other had a history of frequent lung infection. MH should be considered as the differential diagnosis in patients with Down syndrome that admitted with frequent recurrent lung infections or vomiting.

It is generally accepted that surgical repair of Morgagni hernia should be performed even in asymptomatic children to prevent major complications like intestinal obstruction, volvulus or perforation. Thoracotomy and specially laparotomy in open approach have been the standard surgical methods in the past. After using laparoscopy for repair of MH, minimally invasive techniques became rapidly popular in recently [16–19].

Thoracoscopic approach of thoracic surgeons has not received any interest in pediatric surgery because of the necessity of opening hernia sac, narrowed study area, ineffectiveness in bilateral cases and the risk of peroperative complications [20]. Laparoscopically defect may clousure by using either primary closure with a continuous suture, interrupted suture, or using a mesh [21,22]. The patients included in this series had variable sizes of hernia defects but we did not use a patch in none of them because the defect could be closed without tension.

In this study, in all cases, the correction was performed using transabdominal laparoscopic-assisted technique using three ports. Nonabsorbable sutures were performed with, separated, percutaneously through the full thickness of the anterior abdominal wall and the knots were tied in the subcutaneous tissue by a single incision. Cosmetic appearance was obtained by removing all sutures from the same skin incision. The full thickness stitches allows for maximum strength repair. There were no recurrence in this series. We believe that full thickness stitches is useful for preventing recurrence.

Removing the associated hernia sac at the time of repair is debated issue. In literature it is claimed that excision of the sac reduce the recurrence rate but there are vital importance body structures such as pericardium, pleura, or phrenic nerve in this area and it may be potentially dangerous that might be associated with the hernia sac excision [6,8,23,24]. In present study, hernia sac was not removed in any patient and we had no adverse events leaving the hernia sac in place and no effect on recurrence. And also there were no residual cavity in chest X-ray in follow up period.

## Conclusions

In conclusion, laparoscopic-assisted repair of MH is effective, safe, and reliable in children. It should be the first choice because of fast recovery and better cosmetic results. In this series, it was seen that leaving the hernia sac had no effect on early and late complications. Leaving the hernia sac may prevent potential complications due to unnecessary dissection.

## Declarations

*Ethics approval and consent to participate:* Ethics committee approval was not obtained because this was a retrospective study and there is no legal obligation for retrospective studies in our country. Written informed consent was obtained from all patients prior to surgery included in this study.

*Consent for Publication:* Not applicable

*Availibility of data and materials:* All patient data accessible from the Republic of Turkey Ministry of Health system.

*Competing Interests:* No conflict of interest was declared by the authors.

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*Author's contributions:* Study Concept and Design: AIA, GG. Data collection: AIA, GG, OHK. Analysis and interpretation of data: GG, AIA, OHK. Drafting of the manuscript: GG, AIA. All authors read and approved the final manuscript.

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## Tables

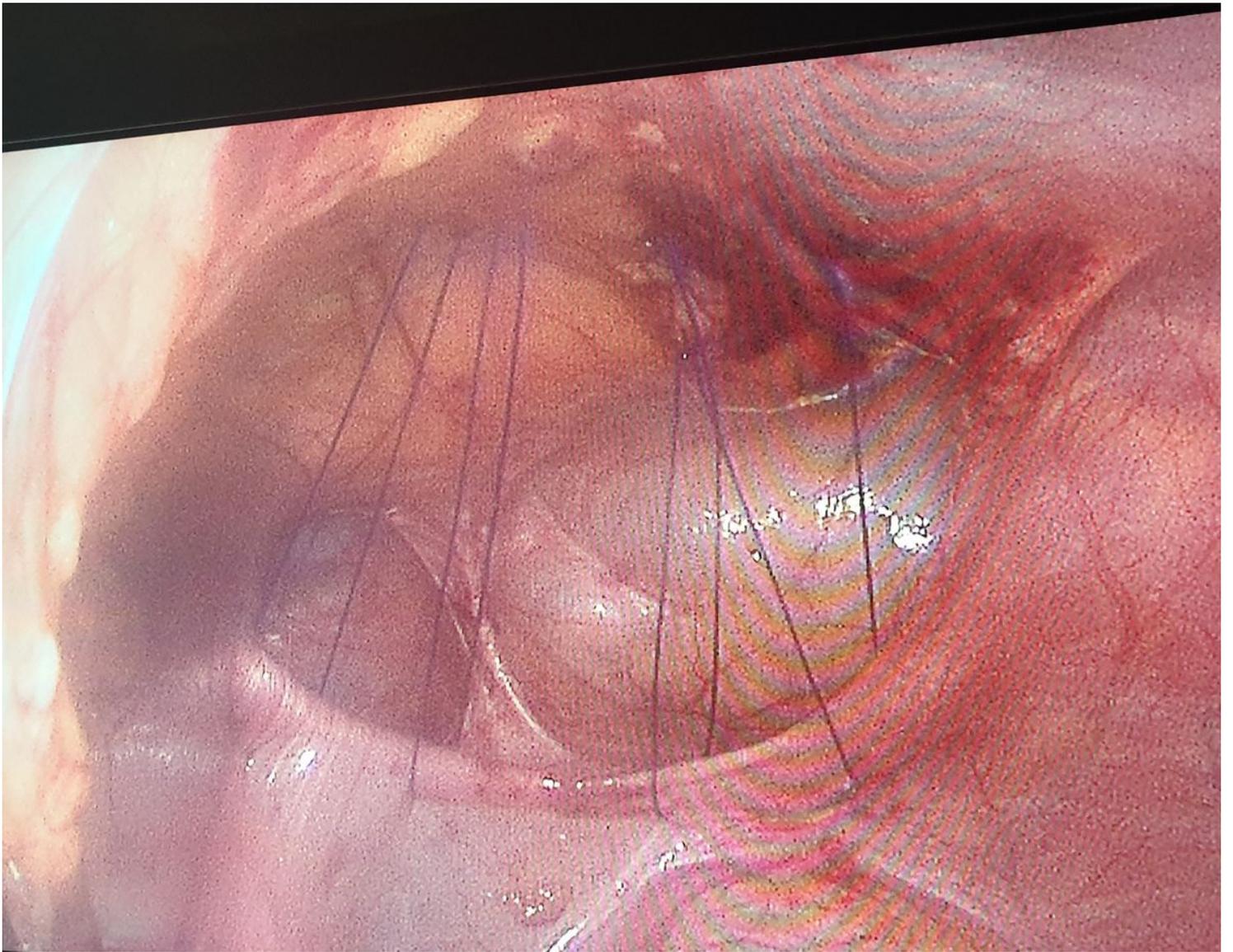
Table 1 Demographics and clinical presentation. CXR - plain chest X-Ray, CT- computed tomography

Case	Gender	Age at diagnosis (year)	Clinical presentation	Diagnosis	Chromosomopathy
1	Male	1	Vomiting	CXR	Down syndrome
2	Male	1	Incidentally	CXR	No
3	Male	2	Incidentally	CXR,CT	No
4	Male	2	Vomiting	CXR,CT	Down syndrome
5	Male	3	Frequent lung infection	CXR,CT	No
6	Male	4	Frequent lung infection	CXR,CT	No
7	Male	7	Vomiting	CXR	No
8	Male	13	Frequent lung infection	CXR,CT	Down syndrome

Table 2 Perioperative and follow-up details. CXR- plain chest X-Ray

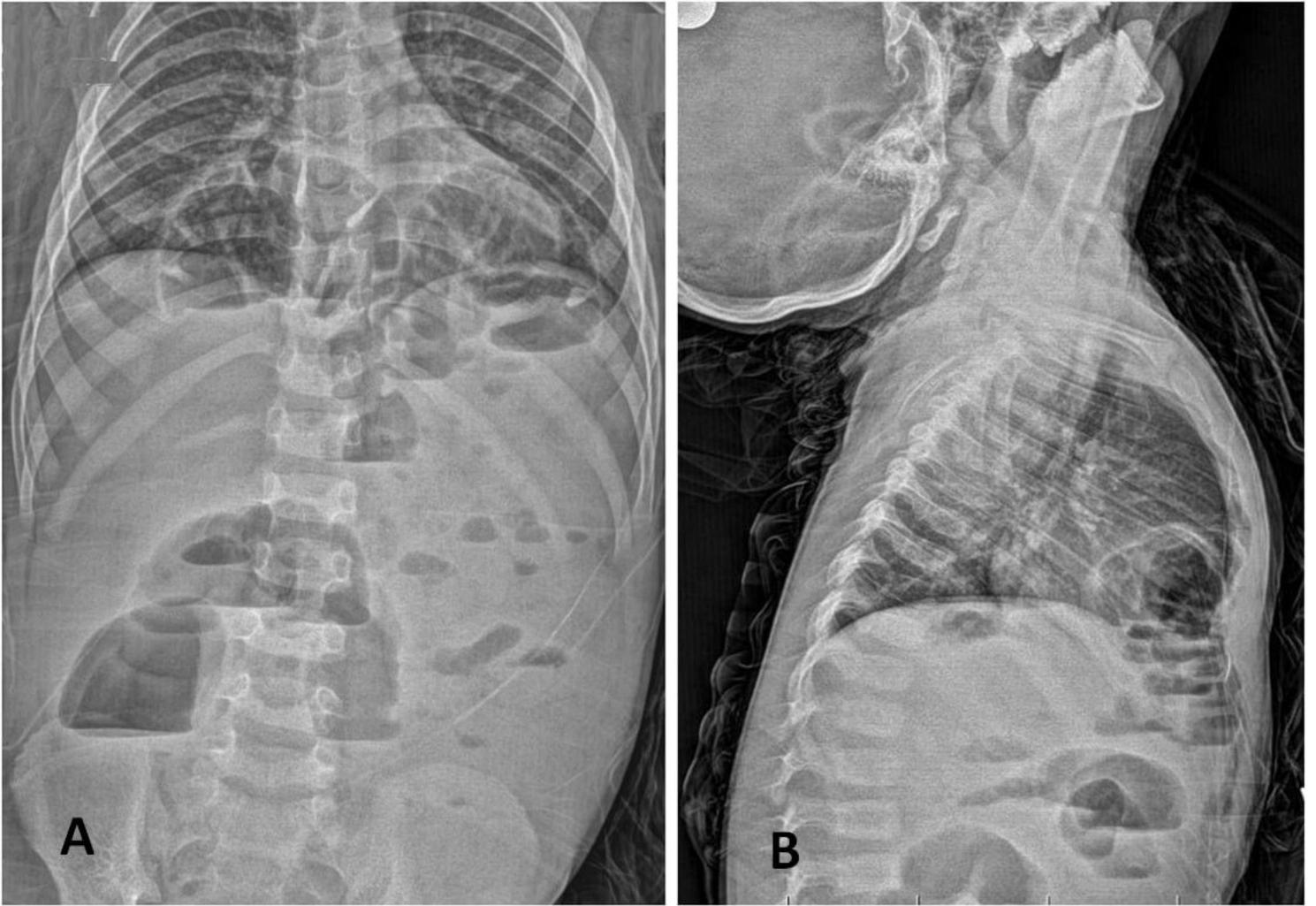
Case	Age at surgery (year)	Laterality	Hernia contents	Suture	Length of hospital stay (days)	Residual cavity (CXR)	Recurrence	Follow-up (months)
1	1	Left	Stomach, colon, omentum	Nonabsorbable	4	No	No	42
2	1	Left	Omentum	Nonabsorbable	2	-	No	26
3	2	Left	Colon, omentum	Nonabsorbable	2	No	No	15
4	2	Left	Stomach, colon, omentum	Nonabsorbable	3	-	No	32
5	3	Left	Omentum	Nonabsorbable	2	No	No	
6	4	Left	Colon, omentum	Nonabsorbable	2	No	No	13
7	7	Bilateral	Colon, omentum	Nonabsorbable	2	No	No	22
1	13	Left	Colon, omentum	Nonabsorbable	4	No	No	6

## Figures



**Figure 1**

Operative view of the defect and stitches including the sac



**Figure 2**

Anteroposterior (A) and lateral (B) chest x-ray showing anterior herniation of bowel loops into the chest and abdominal air fluid levels