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Laparoscopic diaphragm repair with bioabsorbable mesh in congenital and acquired diaphragmatic hernia

Naveed Ullah Khan

Surgeon, General Surgery department, Federal Government Polyclinic Hospital, Islamabad, Pakistan

Zahoor Ahmed

Surgeon, General Surgery department, Federal Government Polyclinic Hospital, Islamabad, Pakistan

Corresponding author email: drzahoor76@gmail.com

Sarwat Saeed

Senior Registrar, General Surgery department, Federal Government Polyclinic Hospital, Islamabad, Pakistan

Fatima Batool

Medical Officer, General Surgery department, Federal Government Polyclinic Hospital, Islamabad, Pakistan

Asad Sami

Medical Officer, General Surgery department, Federal Government Polyclinic Hospital, Islamabad, Pakistan

Maria Zafar

Medical Officer, General Surgery department, Federal Government Polyclinic Hospital, Islamabad, Pakistan

Abstract--Background and Aim: Congenital or acquired diaphragmatic hernias are both possible. The present study aimed to investigate the superiority of laparoscopic surgery over open repair of congenital diaphragmatic hernias with bioabsorbable mesh in congenital and acquired diaphragmatic hernia. Patients and Methods: This retrospective study was conducted on 7 diaphragmatic hernia cases in the General Surgery Unit of Federal Government Polyclinic Hospital, Islamabad from January 2015 to December 2022. Diaphragmatic hernia was diagnosed and confirmed on CT scan. Patients with Bochdalek hernia (BH), right-sided eventration of diaphragm, and left eventration of diaphragm (ED) cases were

enrolled. Individual demographic details, clinical manifestations, hernia description, treatment modalities, and complications were recorded. Results: The overall mean age was 42 years with an age range 30-62 years. Of the total cases, there were 6 (85.7%) male and 1 (14.3%) female. The incidence of Bochdalek hernia (BH), left-sided ED, and right-sided ED was 2 (28.6%), 4 (57.1%), and 1 (14.3%) respectively. The major defect on left and right side was 15× 7 cm and 15× 8 cm respectively. Abdominal pain, GERD, dysphagia, respiratory distress, cough, vomiting, and intestinal obstruction were different clinical manifestations of diaphragmatic hernia found in 71.4%, 57.1%, 28.6%, 28.6%, 14.3%, 14.3%, and 14.3% respectively. Regarding treatment modalities, the laparoscopic and open repair was used in 57.1% (n=4) and 42.9% (n=3) respectively. Dyspepsia was the most prevalent post-operative complication 3 (42.9%) found followed by persistence of pain 1 (14.3%) and respiratory distress 1 (14.3%) during follow-up. Patients underwent laparoscopic surgery were discharged after 4 or 5 days whereas open surgery patients were discharged after 9 or 10 days. Conclusion: Laparoscopic repair is superior as compared to open repair in terms of post-operative pain, less hospital stay and early recovery. Congenital diaphragmatic hernias can occur through a Morgagni foramen through the anterior parasternal area or through a Bochdalek foramen through the left side.

Keywords--laparoscopic diaphragm repair, congenital diaphragmatic hernia, acquired diaphragmatic hernia.

Introduction

Diaphragmatic hernias, which allow abdominal contents to flow into the chest cavity might be acquired or congenital [1, 2]. Clinical signs might vary from mild to severe respiratory or gastrointestinal problems. Computed tomography scan validate the clinically diagnosed diaphragmatic hernia [3]. Compared to open surgery treatment, diaphragmatic hernia repair through laparoscopy is considered as safe and effective procedure [4]. Congenital diaphragmatic hernias are classified into four types: posterolateral hernia of Bochdalek, peritoneal pericardial hernia, diaphragmatic eventration, and Morgagni-Larrey parasternal hernia. Bochdalek hernia is the most common hernia type of congenital diaphragmatic hernia is Bochdalek hernia [5]. It occurs when the posterolateral side of the pleuroperitoneal canal fails to close in a time span of 8 to 10 weeks of gestation. This occurs in 85% of cases since the left canal closes later than the right [6].

Diaphragm eventration is a congenital condition characterized by the loss of muscular development of one or both hemidiaphragms [7]. Diaphragm eventration is defined clinically as an intact diaphragm aberrant elevation caused by atrophy of varied degrees of muscular fibres [8]. Both patients with symptoms and those with no symptoms are recommended to undergo surgery if they meet the physical conditions [9, 10]. It is possible to do it by laparotomy, thoracotomy,

thoracoscopy, or laparoscopy [11, 12]. Hernia repair by open surgery has become less common with the emergence of reduced access procedures. Laparoscopic repair facilitates the delineation of unambiguous anatomy, the establishment of a working area, return to work, and early recovery. There is limited data available regarding diaphragmatic hernia repair. Therefore, the present study aimed to investigate the laparoscopic repair of congenital diaphragmatic hernia with bio-absorbable mesh in congenital and acquired diaphragmatic hernia.

Methodology

This retrospective study was conducted on 7 diaphragmatic hernia cases in the General Surgery Unit of Federal Government Polyclinic Hospital, Islamabad from January 2015 to December 2022. Diaphragmatic hernia was diagnosed and confirmed on CT scan. Patients with Bochdalek hernia (BH), left ED, and right-sided ED cases were enrolled. Individual demographic details, clinical manifestations, hernia description, treatment modalities, and complications were recorded. Regular blood tests were the norm. Chest X-ray revealed that a raised left hemidiaphragm and left sided ED hernia pleural effusion as well as an elevated right hemidiaphragm in the right sided. With an obstructed diaphragmatic hernia, the stomach, first and second parts of the duodenum were significantly enlarged. Laparoscopic repair was planned with diaphragmatic hernia based on preoperative diagnosis. A sand bag was placed beneath the patient's left lower chest in a 30 degree reverse trendelenburg position. Five ports were implanted following abdominal insufflations.

Results

The overall mean age was 42 years with an age range 30-62 years. Of the total cases, there were 6 (85.7%) male and 1 (14.3%) female. The incidence of Bochdalek hernia (BH), left-sided ED, and right-sided ED was 2 (28.6%), 4 (57.1%), and 1 (14.3%) respectively. The major defect on left and right side was 15× 7 cm and 15× 8 cm respectively. Abdominal pain, GERD, dysphagia, respiratory distress, cough, vomiting, and intestinal obstruction were different clinical manifestations of diaphragmatic hernia found in 71.4%, 57.1%, 28.6%, 28.6%, 14.3%, 14.3%, and 14.3% respectively. Regarding treatment modalities, the laparoscopic and open repair was used in 57.1% (n=4) and 42.9% (n=3) respectively. Dyspepsia was the most prevalent post-operative complication 3 (42.9%) found followed by persistence of pain 1 (14.3%) and respiratory distress 1 (14.3%) during follow-up. Patients underwent laparoscopic surgery were discharge after 4 or 5 days whereas open surgery patients were discharged after 9 or 10 days. The laparoscopic surgery for congenital diaphragmatic hernia was found superior than open surgery in terms of post-operative pain, early discharge, and recovery. Table-I represent the demographic details of all cases. Clinical manifestation is depicted in Figure-1. Different types of hernia are illustrated in Figure-2. Treatment modalities and post-operative complications are shown in Table-II.

Table I
Demographic details of cases

Variables	Value
Age (years) (age range)	42 (30-62)
Gender N (%)	
Male	6 (85.7)
Female	1 (14.3)
Associated Factors N (%)	
Trauma	4 (57.1)
Congenital	2 (28.6)
Pregnancy	1 (14.3)

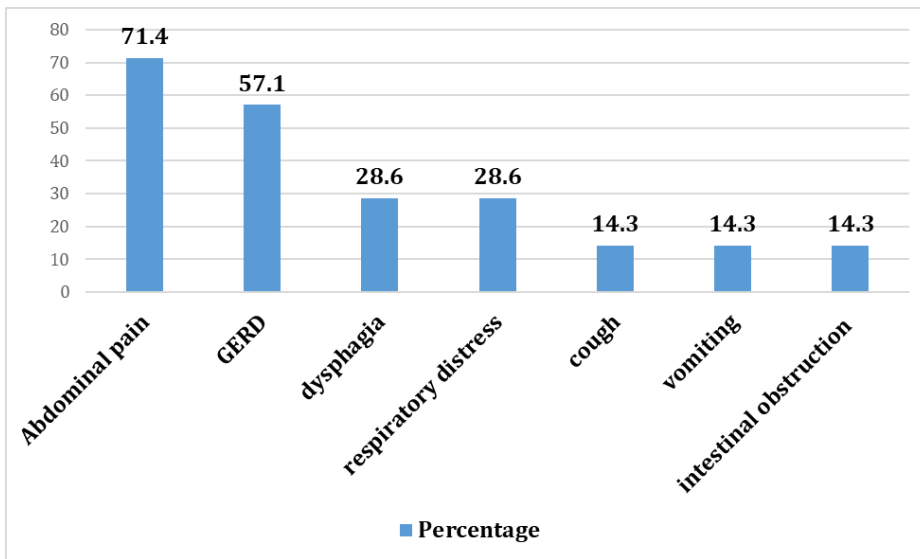


Figure 1. Clinical manifestation

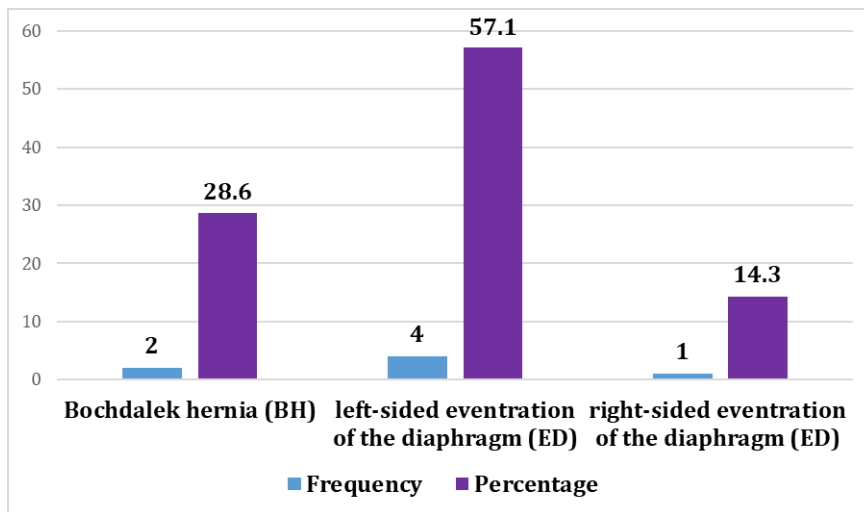


Figure 2. Description of hernia

Table II
Treatment modalities and post-operative complications

Treatment Modalities	N (%)
Laparoscopic surgery	4 (57.1)
Open surgery	3 (42.9)
Post-operative complications	
Dyspepsia	3 (42.9)
Pain persistence	1 (14.3)
Respiratory distress	1 (14.3)

Discussion

The present study mainly focused on repair of diaphragmatic hernia with bio-absorbable mesh in congenital and acquired hernia and found that diaphragmatic hernias can be inherited or acquired. Hernias can be either primary or secondary. An anterior parasternal Morgagni foramen or a posterolateral, primarily left sided, Bochdalek hernia can cause adult congenital diaphragmatic hernia. These findings were comparable to a previous study by Chen et al., [13] conducted on two cases of atraumatic herniation of the liver. The upper abdomen and lower chest associated blunt trauma could be the prevalent causes for diaphragmatic hernia rupture. Traumatic diaphragmatic hernias are caused by a sudden increase in the pleuroperitoneal pressure gradient at possible weak sites at embryological lines of fusion [14].

Diaphragmatic hernia of congenital type manifests differently in children than adults. In infants and infancy, cyanosis and respiratory distress predominate, but it manifests as chest discomfort, stomach pain, difficulty breathing, and occasionally intestinal blockage among adults [15]. Because to the blocking of the diaphragmatic defect by intra-abdominal viscous fluid, some cases may be asymptomatic [16]. Two-thirds of asymptomatic cases were found to be on the right side, owing to the liver's ability to inhibit herniation of other organs [17]. The clinical presentation is used to make the diagnosis, which is then verified by abdomen CT scan imaging and magnetic resonance imaging. Typical radiographic abnormalities comprise of a raised hemidiaphragm, costophrenic angle of blunt, distortion of diaphragm border, and gastric tube curving into pleural effusion, the thorax, and thoracic cavity with air-filled gastrointestinal structures. Exploration in the operating room is the most accurate means of diagnosing diaphragmatic hernia. Diaphragmatic hernias are surgically treated and often include diaphragm patch closure by laparoscopy and an open surgical repairing procedure.

In congenital diaphragmatic hernia, various organs especially intra-abdominal herniate into thorax. The stomach, ileum, colon, and spleen are the most usually herniated organs. Cardiac abnormalities, hypoplasia, and malrotation of midgut are associated with Bochdalek hernia of left sided whereas a right side hernia is frequently related with right lobe liver hypoplasia [18]. The most reliable imaging modality for diagnosing and evaluating the hernia content is a CT scan [19, 20]. When a CT scan is not performed, misdiagnosis of patients in 38% leads to a lung cyst, pleural effusion, and pneumothorax [21]. Before the CT scan, one of our

patients was diagnosed with pleural effusion. The CT scan also detected the existence of spleen considered as content, which aided in the careful management of this fragile organ to avoid the disaster [22]. Merely 10-15% of people with Bochdalek hernia have a hernia sac, which can be removed or left alone. Pleural damage may also result after sac dissection [23]. A postoperative 30 days CT scan performed verified the left over hernia sac, and observed that sac had vanished [24].

Several approaches can be used to close the defect. Whenever the deficiency is slight, it may be sutured closed, whereas if it's large (>10 cm square), it requires prosthetic reinforcement [25, 26]. There is insufficient data to support any particular type of mesh [27]. In our study, the whole hemidiaphragm with a huge piece of composite mesh was used for cover. Mesh repair was employed to reinforce the frail diaphragm. Barroso et al [28] reported that Pleural Effusion, Pneumothorax, long term-morbidity, recurrence, bowel obstruction, and mortality were different post-operative complications of congenital diaphragmatic hernia repair. Post-operative complications (musculoskeletal, respiratory, neurological, nutritional, and gastrointestinal morbidities) may affect a sizable portion of CDH patients, resulting in a low quality of life. However, in our study, the post-operative complications were dyspnea, respiratory distress, and persistence pain. We preferred bioabsorbable mesh because it is cost-effective and had a great advantage in optimal placement and fixation of the mesh. The present study found that patients who underwent laparoscopic surgery were discharged early (4 to 5 days) as compared to open surgery (9 to 10 days). The post-operative pain was lower in laparoscopic surgery. Overall, the laparoscopic surgery was superior to open surgery due to lesser post-operative pain, early discharge, and early recovery.

Conclusion

Laparoscopic repair is superior as compared to open repair in terms of post-operative pain, less hospital stay and early recovery. Congenital diaphragmatic hernias can occur through a Morgagni foramen through the anterior parasternal area or through a Bochdalek foramen through the left side. If performed by an experienced surgeon, laparoscopic surgery is safe and effective treatment modality.

References

1. Saroj SK, Kumar S, Afaq Y, Bhartia AK, Bhartia VK. Laparoscopic repair of congenital diaphragmatic hernia in adults. Minimally invasive surgery. 2016 Dec 15;2016.
2. Nambara S, Sakaguchi Y, Shoji F, Tsuda Y, Kudou K, Kusumoto E, Hashimoto K, Kusumoto T, Ikejiri K. Combined laparoscopic and thoracoscopic surgical repair of Bochdalek hernia in an adult: a case report. *Surgical Case Reports*. 2021 Dec;7(1):1-5.
3. Hietaniemi H, Järvinen T, Ilonen I, Räsänen J. Congenital diaphragmatic hernia in adults: a decade of experience from a single tertiary center. *Scandinavian Journal of Gastroenterology*. 2022 Nov 2;57(11):1291-5.

4. Hietaniemi H, Järvinen T, Ilonen I, Räsänen J. Congenital diaphragmatic hernia in adults: a decade of experience from a single tertiary center. *Scandinavian Journal of Gastroenterology*. 2022 Nov 2;57(11):1291-5.
5. Mittal A, Cay P, Singh K. Laparoscopic management of acute presentations of obstructed congenital, diaphragmatic hernias in adults. *Ann Laparosc Endosc Surg*. 2020;5:20.
6. Testini M, Girardi A, Isernia RM, et al. Emergency surgery due to diaphragmatic hernia: case series and review. *World J Emerg Surg* 2017;12:23.
7. Amboss. Acquired Diaphragmatic Hernias. Available online: http://www.amboss.com/us/knowledge/Acquired_diaphragmatic_hernias.
8. Godazandeh G, Mokhtari-esbuie F. Laparoscopic Repair of Morgagni Hernia: Three-Case Presentation and the Literature. *Case Rep Surg* 2016;2016:4268539.
9. Arikan S, Dogan MB, Kocakusak A, et al. Morgagni's Hernia: Analysis of 21 Patients with Our Clinical Experience in Diagnosis and Treatment. *Indian J Surg* 2018;80:239-44.
10. Taskin M, Zengin K, Unal E, Eren D, Korman U. Laparoscopic repair of congenital diaphragmatic hernias. *Surgical endoscopy*. 2002 Feb 28;16(5):869-.
11. Ağalar C, Atila K, Arslan NÇ, et al. Adult Morgagni hernia: a single-center experience of five cases and a review of literature. *Turk J Surg* 2018;11:1-4.
12. Machado NO. Laparoscopic Repair of Bochdalek Diaphragmatic Hernia in Adults. *N Am J Med Sci* 2016; 8:65-74.
13. Chen B, Finnerty BM, Schamberg NJ, et al. Transabdominal robotic repair of a congenital right diaphragmatic hernia containing an intrathoracic kidney: a case report. *J Robot Surg* 2015; 9:357-60.
14. Sanford Z, Weltz AS, Brown J, et al. Morgagni Hernia Repair: A Review. *Surg Innov* 2018; 25:389-99.
15. Arevalo G, Harris K, Sadiq A, et al. Repair of Morgagni Hernia in Adults with Primary Closure and Mesh Placement: First Robotic Experience. *J Laparoendosc Adv Surg Tech A* 2017; 27:529-32.
16. Ryan JM, Rogers AC, Hannan EJ, et al. Technical description of laparoscopic Morgagni hernia repair with primary closure and onlay composite mesh placement. *Hernia* 2018; 22:697-705.
17. Costa Almeida C, Caroco TV, Nogueira O, et al. Laparoscopic repair of a Morgagni hernia with extraabdominal transfascial sutures. *BMJ Case Rep* 2019;12. doi: 10.1136/bcr-2018-227600.
18. Başol Ö, Bilge H. Our surgical experience in traumatic and congenital diaphragmatic hernia: Single-center study. *Niger J Clin Pract* 2022;25:391-4.
19. Yu M, Chen F, Wei S, Xie H. Treatment for right-sided intrathoracic kidney with congenital diaphragmatic hernia by combined thoracoscopic and laparoscopic approach: a case report and literature review. *Urology*. 2022 Jul 1;165:e36-8.
20. Fukutomi S, Arai S, Fujisaki M, Naritomi K, Kawabata M, Mano M. Hand-assisted laparoscopic surgery for Bochdalek hernia in an adult patient with a history of laparotomy: a case report. *International Journal of Surgery Case Reports*. 2019 Jan 1;60:164-7.
21. N.O. Machado Laparoscopic repair of Bochdalek diaphragmatic hernia in adults *N. Am. J. Med. Sci.*, 8 (2) (2016), pp. 65-74.

22. Miyasaka T, Matsutani T, Nomura T, Hagiwara N, Chihara N, Takahashi K, Mishima K, Tani N, Yoshida H. Laparoscopic repair of a Bochdalek hernia in an elderly patient: a case report with a review from 1999 to 2019 in Japan. *Surgical Case Reports*. 2020 Dec;6(1):1-6.
23. Cho SH, Lim KH. Laparoscopic repair of colonoscopy-induced adult Bochdalek hernia: Case report. *International Journal of Surgery Case Reports*. 2022 Oct 1;99:107591.
24. Oppelt PU, Askevold I, Bender F, Liese J, Padberg W, Hecker A, Reichert M. Morgagni-Larrey diaphragmatic hernia repair in adult patients: A retrospective single-center experience. *Hernia*. 2021 Apr;25:479-89.
25. Aydin Y, Altuntas B, Ulas AB, Daharli C, Eroglu A (2014) Morgagni hernia: transabdominal or transthoracic approach? *Acta Chir Belg* 114:131-135
26. Tarcoveanu E, Georgescu S, Vasilescu A, Andronic D, Danila N, Lupascu C, Bradea C (2018) Laparoscopic management in Morgagni Hernia - short series and review of literature. *Chirurgia (Bucur)* 113:551-557. <https://doi.org/10.21614/chirurgia.113.4.551>.
27. Agalar C, Atila K, Arslan NC, Derici ZS, Bora S (2018) Adult morgagni hernia: A single-center experience of five cases and a review of literature. *Turkish J Surg*. <https://doi.org/10.5152/turkjsurg.2018.3929>.
28. Barroso C, Correia-Pinto J. Perioperative complications of congenital diaphragmatic hernia repair. *European Journal of Pediatric Surgery*. 2018 Apr;28(02):141-7.