THORACOSCOPIC TREATMENT OF DIAPHRAMMATIC HERNIA: A CASE REPORT

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Abstract. Congenital diaphragmatic hernia (CDH) occurs in 1 of every 2000 to 5000 live births and accounts for 8% of all major congenital anomalies. CDH is a diagnosis with multiple, mostly unknown origin and its clinical presentation is highly variable. We are presenting a case of CDH hernia in a neonate, whith prenatal diagnosis at 32 week without any other associated malformation, that was repaired successfully using a staged thoracoscopic approach. Bochdalek described CDH in 1848, and the first surgical repair in a child was reported in 1905. Silen et al first reported thoracoscopic repair in 1995, but the reported world experience includes very few cases in neonates.

Key words: Congenital diaphragmatic hernia, thoracoscopic approach, high frequency oscillatory ventilation.

INTRODUCTION

Congenital diaphragmatic hernia (CDH) occurs approximately in 1 of every 2000 to 5000 live births and accounts for 8% of all major congenital anomalies. Medical and surgical management of these patients has changed over the patients has changed over tha past several decades. "Gentle ventilation" strategies, high-frequency oscillatory ventilation (HFOV), and other methods of supportive care have changed the intensive care management of CDH [1,2,3]. Parallel with this intensive care improvements has been a paradigm shift over the past 20 years from emergent operation to elective repair [4,5]. The combination of innovations in intensive care and elective operation has resulted in an opportunities to use minimally invasive surgery (MIS) to the correction of CDH. In other thoracic conditions, thoracoscopy has been suggested to have significant advantages over the traditional open approaches. These benefits may include a decrease in the pain and incisional morbidity of a thoracotomy (*i.e.* subsequent scoliosis, chest deformities, and shoulder muscle girdle weakness), reduced surgical stress and immunologic derangement, faster recovery and shorter hospitalizations [6-14]. Very little is Known about the outcomes in selected patients receiving a thoracoscopic approach, compared with a laparoscopic and with an open repair.

This report decribes a case of thoracic treatment of a postero-lateral diaphragmatic hernia.

CLINICAL PRESENTATION

A 3190kg male neonate was delivered with a gestational age 38 *2 /weeks. A prenatal diagnosis of CDH with ultrasound was made at 32 weeks gestation, with both lungs present and in the absence of other malformations. At the birth the newborn was intubated as the protocol. Upon admission to the neonatal intensive care unit haemoglobin O2 saturation was 78%, cardiac frequency 108, peak inspiratory pressures 23 and high frequency oscillatory ventilation and inhaled nitric oxide were initiated, including sedation and plasma infusion.

Chest x-ray showed shift of the mediastinal structures to the right side and elevated left hemidiaphragms (Figure 1). The neonate required moderate mechanical ventilator support.

Operative repair was performed when the patient demonstrated both hemodynamic and pulmonary stability. The decision to perform MIS was supported by the surgeon because thorax x-ray showed the nasogastric tube in the abdomen so the presence of the stomach under the diaphragm and there was the absence of pulmonary hypertension.

Thoracoscopir repair was performed with the patient in the lateral decubitus with the affected side elevated. The patient is placed on a stack of towels with the position of the head slightly lower on a cushion (Figure 2). A 5 mm port is placed subscapularly. A pneumothorax is created by gradual insufflations of carboc dioxide to a pressure of 4-6 mmHg, 0.5 l/min. A 5 mm telescope is

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inserted through the subscapular port. Two additional 3mm working ports are placed under direct vision; one on the anterior axillary line at the 4th intercostals space and other one on the posterior axillary line in the 5th intercostals space. Herniated organs (small bowel, colon and spleen) are gently reduced into the abdomen through the defect. After reduction of hernia contents, insufflations pressure was decreased to 4 mmHg, and a transparietal stitch is positioned at half of the defect in order to facilitate the closure. Primary repair was performed with interrupted 3/0 Vicryl sutures, with most lateral anchorated stitches to the rib. At the end drainage was positioned above the diaphragm (Video 1).

Chest tube was placed wich was removed in fourth postoperative day. Postoperative chest film revealed satisfactory result of the left sided repair without sign of recurrence (Figure 3).

Postoperatively, the patient was estubated on the fourth day. The follow-up was of 6 months.

He grows and feeds regularly. At the x-ray at three months, he has no sign of recurrence.

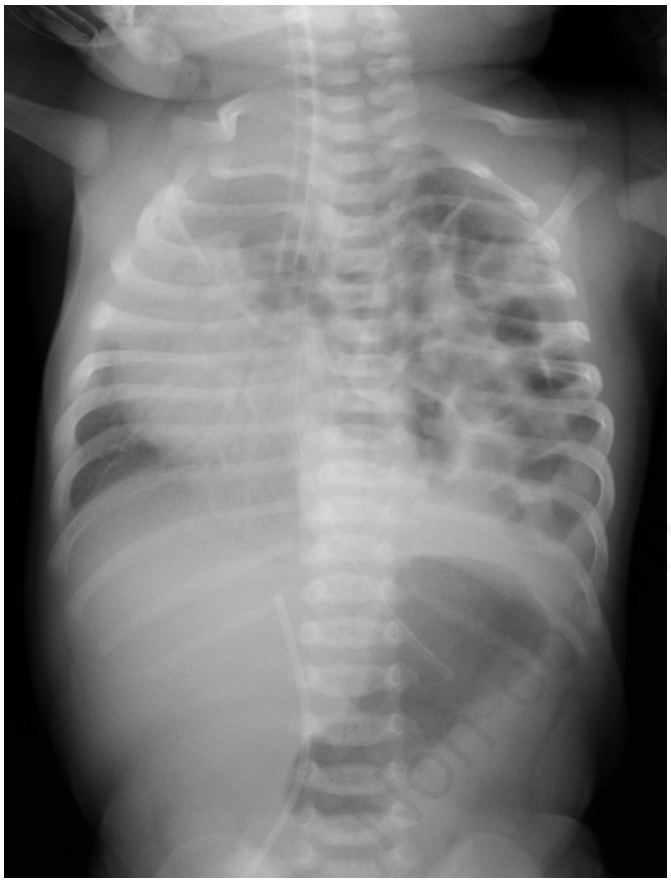

Figure 1. Preoperative X-Ray chest showing left side diaphragmatic hernia.

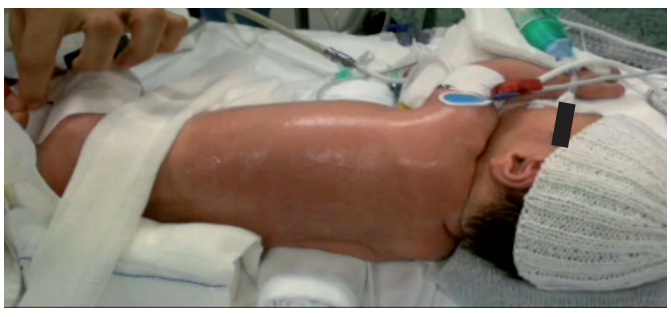

Figure 2. Position of the patient.

DISCUSSION

Congenital diaphragmatic hernia is the result of incomplete closure of the normal pleuroperitoneal canal during fetal development. Recently, there have been increasing reports of the use of thoracoscopy for the repair of CDH. Minimally invasive surgery (MIS) for infants and children continues to grow. MIS was introduced first treatment of congenital diaphragmatic hernia (CDH) in 1995; Silen *et al.* [15] used thoracoscopy, while Van der Zee and Bax [16] used laparoscopy. However, most pediatric surgeons have started to apply MIS to CDH because of associated fragile respiratory status and pulmonary hypertension (PH) . Neverthless, thoracoscopic repair under high-frequency oscillatory ventilation (HFOV) [17] or after extracorporeal membrane oxygenation (ECMO) therapy have been reported recently, and MIS appears to be gaining added acceptance for CDH repair without any fixed selection criteria being established [18-21].

There are few reports about indication for thoracoscopic repair (TR) of CDH. Yang *et al.* proposed selection criteria for TR from anatomic and physiologic aspects: stomach in the abdomen, minimal ventilator support

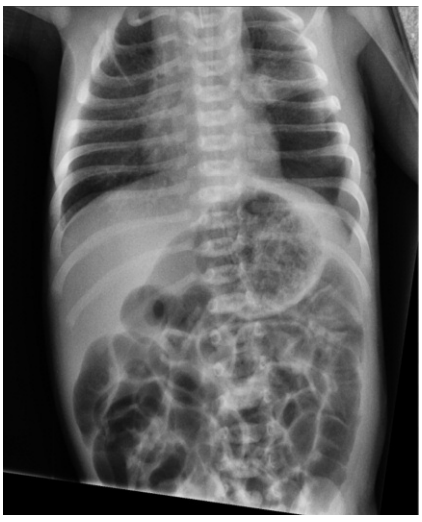

Figure 3. Postoperative X-Ray.

with low peak inspiratory pressure (<24mmHg), and no evidence of pulmonary hypertension at the time of surgery. Similar criteria were also proposed by Guner *et al.*, but from our experience this criteria are not contraindications to thoracoscopic treatment in the pulmonary hypertension is controlled even through HFOV may be required.

Our patient corresponded to the Yang criteria so we have practised a thoracoscopic approach.

Another disadvantages was that the recurrence rate was significantly higher in the TR. The cause of this is not known, but certain technical factors may contribute to it. As in other minimally invasive operations, the operative field is magnified. This may lead to overestimating the space between sutures on the diaphragm. A second explanation may be the tension placed on the sutures during the repair. Tension is difficult to disperse among several sutures when tying knots thoracoscopically, and an excessive amount may be placed on each suture during the repair. A third explanation may be inadequate mobilization of the rim of diaphragm. During the open procedure, the diaphragm is routinely "unfurled", exposing a larger area of posterior diaphragm to allow suture placement for repair. Another possible explanation is the learning curve of this new operation [22].

In our case, to reduce the risk of recurrence, we placed a transparietal point in order to show the defect especially in its postero-lateral portion of the diaphragm because this is the most difficult point to close correctly, performing thoracoscopy. And finally, we have used Vycril points which have the advantage of having a greater stability with a reduced possibility damnage the edge of the defect.

Moreover a number of surgeons have used laparoscopy to repair CDH [23-26]. However, the thoracoscopic approach has some advantages compared to the laparoscopic approach. In the laparoscopic approach was difficult to bring the spleen back into the abdominal cavity. The sutures could be difficult to place because the intestine is an obstacle to observe the diaphragmatic defect. With thoracoscopic approach, one could directly visualize the hernia and the organs, and gently push them down into the abdominal cavity. Suturing of the hernia defect was performed easily because there was unobstructed access to the posterior lateral defect. Also, the insufflations facilitates the return of the hernia contents into the abdominal cavity. Thoracoscopy is better approach when compare with an open procedure because muscles are not divided; hence, postoperative respiratory function is minimally impaired [27].

CONCLUSIONS

In conclusion, thoracoscopic repair for CDH is feasible and safe in good hands, it could be indicated for selective newborn patients as well as for infants and elders. Easy access, minimal trauma, good cosmetic results, and rapid recovery are all important advantages for this thecnique.

More cases and longer follow-up are required tp validate this findings.

This study is limited for the presence of only one patient and the low follow-up. However, the details of the report suggest that careful review and quality control regarding surgical technique are likely to improve outcomes in patient undergoing TR. It is necessary that all surgeons who will approach this new technique have a good learning curve.

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