RESEARCH BRIEF

Presence of Hernia Sac in Prediction of Postoperative Outcome in Congenital Diaphragmatic Hernia

SHASANKA S PANDA, MINU BAJPAI AND M SRINIVAS

From Department of Pediatric Surgery, All India Institute of Medical Sciences, New Delhi 110 029, India.
drshasank_aiims@yahoo.co.in

Correspondence to:
Dr M Bajpai, Professor of Paediatric Surgery, All India Institute of Medical Sciences, New Delhi 110 029, India.
bajpai2@hotmail.com
Received: January 01, 2013;
Initial review: February 08, 2013;
Accepted: April 26, 2013.

We conducted this study to assess the value of presence of hernia sac in prediction of postoperative outcome in congenital diaphragmatic hernia (CDH). Data were obtained form medical records of 70 children operated for CDH between 2002-12. Postoperative neonatal death occurred in 1/10 (10%) of infants with a hernia sac and 26/60 (43.3%) in cases without a hernia sac, respectively (P =0.04). Perinatal morbidity in surviving infants was lower in the group with a hernia sac although not significantly. We conclude that the presence of a hernia sac is associated with better postoperative outcome and overall prognosis of CDH.

Keywords: *Congenital diaphragmatic hernia, Hernia sac, Perinatal morbidity, Postoperative outcome.*

Published online: May 5, 2013; PII: S097475591300004

Congenital diaphragmatic hernia (CDH) occurs in about one out of 2000 to 5000 births with high mortality and morbidity rates. Associations with other anomalies occur in about 10% to 50% of cases and thereby affect the overall prognosis. The diaphragmatic defect usually features a completely open space between the chest and abdomen, although some infants have a membrane of parietal pleura and peritoneum acting as a hernia sac. To find clinically relevant prognostic factors that predict the outcome of infants with CDH has been unsuccessful. The overall mortality rate ranges from 30% to 50% [1-3]. Many anatomic prognostic factors like liver position, lung-to-head ratio, pulmonary volume, location of stomach, presence of polyhydramnios, fetal pulmonary vasculature affect the overall outcome of CDH patients [4]. We assessed the role of the presence of a hernia sac in prediction of postoperative outcome in CDH patients.

METHODS

This study was a retrospective single-centre study done at Department of Pediatric Surgery, All India Institute of Medical Sciences, New Delhi, India between January 2002 and November 2012. Medical records of all cases of CDH either born or referred to our institute were searched. Children born alive with CDH and undergone surgery were selected for final analysis. All newborns with chromosomal abnormalities or other malformations were excluded from the study.

Following delivery, CDH neonates were intubated according to their arterial blood gas parameters and respiratory distress, and transferred to the neonatal surgical intensive care unit. ECMO was not used in the studied population. Pulmonary artery hypertension (PAH) was evaluated by pre and post-ductal saturation or by echocardiography and was managed by gentle low pressure high FIO_2 ventilation, and sometimes by inhaled nitric oxide. After respiratory and hemodynamic stabilization, surgical repair was done. Survival was defined as discharge from the hospital. The presence of a hernia sac was noted at the time of surgery. All the surgeries were done by a single surgeon both in the sac and non-sac group. Morbidity in surviving infants was defined as the length of assisted ventilation, need for supplemental oxygen 4 weeks after surgery, need for prosthetic patch repair, and time in neonatal surgical intensive care unit.

We analyzed our data using the Stata software version 11.0 (Stata Corp. College Station, TX). Results were calculated as median and inter-quartile range or proportions accordingly. Medians were compared using the Mann-Whitney test, and proportions were compared using the Fisher's exact test. A 2-sided P value of 0.05 or less was considered statistically significant. Institute's ethical committee approval for the study was obtained.

RESULTS

Between January 2002 and November 2012, 84 patients with diagnosis of CDH were admitted to our NSICU either born in or referred to our institute. Two cases with

WHAT THIS STUDY ADDS

- Presence of a hernia sac in congenital diaphragmatic hernia is associated with a better post-operative outcome.

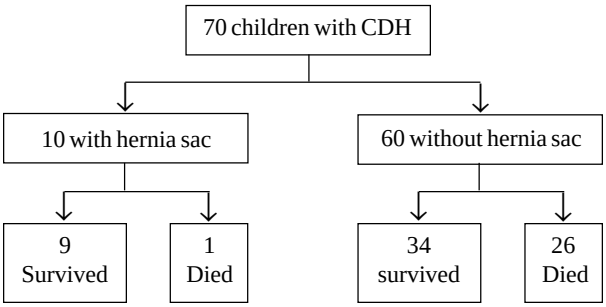

FIG. 1 *Outcome of Congenital diaphragmatic hernia (CDH).*

associated malformations were excluded. Twelve patients died before surgery. Surgery was performed in 70 cases. Outcome of CDH patients according to presence of hernia sac is depicted in ***Fig.* 1**. Median gestational age at birth was 37 weeks (range 34-40) and median birth weight was 3010 grams (range 1500-4120). There were 40 male babies (57.1%). The relationship between outcome, especially neonatal morbidity in surviving infants and the presence of a hernia sac is presented in ***Table* I**.

TABLE I MORBIDITY AND OUTCOME IN CDH PATIENTS ACCORDING TO THE PRESENCE/ABSENCE OF HERNIA SAC

Patient characteristics	*Diaphragmatic Hernia with sac*	*Diaphragmatic Hernia without sac*	*P value*
Total *n* = 60	10	60	
Survival*	9 (90)	34 (56.6)	0.04[#]
PAH *	3 (30)	37 (61.6)	0.06
Right side*	0 (0)	5 (9.6)	-
Intrathoracic liver*	2 (20)	14 (23.3)	0.81
Intrathoracic stomach*	3 (30)	32 (53.3)	0.17
Need for patch repair*	0 (0)	6 (10)	-
Need for supplemental O2 after 4 weeks days*	0 (0)	9 (15)	-
Duration of hospitalization[$] (days)	9 (6-15)	15 (9-34)	0.12
Duration of assisted ventilation[$] (days)	3 (2-8)	6 (4-11)	0.24

**Data is represented as n (%); [$]Data is represented as median; [#]P value is significant (≤0.05); PAH, pulmonary artery hypertension; O2, oxygen. CDH: congenital diaphragmatic hernia.*

DISCUSSION

The present study showed that the presence of a hernia sac significantly improves the prognosis in CDH. Hernia sac is formed of parietal peritoneum and lung pleura and has been reported in approximately 20% of cases [5]. In our study it was 14.3%. Only few studies have addressed the impact of hernia sacs, and mostly in cases with a late postnatal diagnosis of CDH [6,7]. In such cases of late presentation of CDH, a hernia sac is found in about 35% [6,7]. Sac prevents the upward movement of the abdominal organs and decreases the risk of compression of the lungs and thereby there is lesser risk and degree of pulmonary hypoplasia. The rate of herniation of liver and stomach was not significantly different in the two groups in our study suggesting the mechanism to be more complex. CDH originates from the failure of closure of the pleuroperitoneal canal resulting in a complete defect without peritoneum, pleura or muscle. A hernia sac may result from a timely closure of the pleuroperitoneal canal without the appropriate subsequent muscularization of the defect. Therefore, the presence of a hernia sac could be the visible evidence of a late herniation during the embryological period [8]. The timing of the defect had more impact on prognosis rather than the contents of the hernia.

In a recent study by Spaggiari, *et al*. [9], patients with a hernia sac had a significantly higher pulmonary volume on prenatal magnetic resonance imaging (51.9% *vs* 39.3%, *P*=0.01). In their study, neonatal death, either preoperative or postoperative, occurred in 5.6% of infants with a hernia sac and 32.7% in cases without a hernia sac, respectively (*P* =0.03). Neonatal morbidity in surviving infants was lower in the group with a hernia sac although not significantly [9].

Contributors: All the authors have contributed, designed and approved the study; MB: will act as guarantor of the study.
Funding: None; *Competing interests*: None stated.

REFERENCES

1. Beresford MW, Shaw NJ. Outcome of congenital diaphragmatic hernia. Pediatr Pulmonol. 2000;30:249-56.
2. Mah VK, Zamakhshary M, Mah DY, Cameron B, Bass J, Bohn D, *et al*. Absolute vs relative improvements in congenital diaphragmatic hernia survival: what happened to "hidden mortality". J Pediatr Surg. 2009;44:877-82.
3. Brownlee EM, Howatson AG, Davis CF. The hidden mortality of congenital diaphragmatic hernia: a 20-year review. J Pediatr Surg. 2009;44:317-20.
4. Arora M, Bajpai M, Soni TR, Prasad TR. Congenital diaphragmatic hernia. Indian J Pediatr. 2000;67:665-70.

5. Puri P. Congenital diaphragmatic hernia. Curr Prob Surg. 1994;31:787-846.
6. Baglaj M, Dorobisz U. Late-presenting congenital diaphragmatic hernia in children: a literature review. Pediatr Radiol. 2005;35:478-88.
7. Cigdem MK, Onen A, Otcu S, Okur H. Late presentation of bochdalek-type congenital diaphragmatic hernia in children: a 23-year experience at a single center. Surg Today. 2007;37:642-45.
8. Skarsgad ED, Harrison MR. Congenital diaphragmatic hernia: the surgeon's perspective. Pediatr Rev. 1999;20:71-8.
9. Spaggiari E, Stirnemann J, Bernard JP, De Saint Blanquat L, Beaudoin S, Ville Y. Prognostic value of a hernia sac in congenital diaphragmatic hernia. Ultrasound Obstet Gynecol. 2012 May 17. [Epub ahead of print].