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Congenital diaphragmatic hernia in the newborn: postoperative CPAP treatment

By

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Newborn patients operated upon for diaphragmatic hernia were subjected postoperatively to CPAP breathing. Of a total of 28 cases 8 patients were lost. The relatively low mortality rate seems to justify the use of a complex therapy based on postoperative CPAP breathing.

The treatment of congenital diaphragmatic hernia causing respiratory distress soon after delivery is not solved satisfactorily. The respiratory difficulty persists after the surgical repair and is the cause of the high mortality rate reaching about 60% [1, 2, 3, 5]. Losses in later infancy and childhood are estimated not to exceed 2% [12]. In the last decade the high mortality rate has significantly diminished due to the cooperation of paediatricians, surgeons and anaesthesists in perinatal intensive care units.

The incidence of the malformation is between 1 : 2000 and 1 : 4000 live births [5, 12, 13].

Clinical picture. Diagnosis

Cyanosis and dyspnoea appearing after delivery and quickly increasing in intensity are the leading symptoms. The apex beat of the heart is displaced to the opposite side. The scaphoid abdomen and the difference in the auscultatory findings on the two sides of the chest underline the suspicion of diaphragmatic hernia. A single X-ray picture in the AP position decides the correct diagnosis, in exceptional cases a contrast enema is needed. With a definite diagnosis, intratracheal intubation is a life-saving first aid. Artificial respiration by mask should be discouraged being an erroneous intervention.

Description of the material

Between October, 1973, and September, 1980, we have observed 28 cases of congenital diaphragmatic hernia. Data concerning sex, diagnosis, surgery, respiratory treatment, complications and results are summarized in Table I.

In 20 cases the defect was of the Bochdalek type, and in 2 cases of the Morgagni type on the right side. In 6 cases the defect showed a total absence of diaphragmatic muscle.

For anaesthesia, ketamine-N_2O-O_2 combination was applied. The type of

TABLE I

No	Initials and sex	Diagnosis	Surgery	Respiratory therapy	Complications	Follow up
1	P.A. ♂	Left, Bochdalek type	Abdominal approach Direct reconstruction	CPAP 48h	—	Full recovery
2	R.B. ♂	Left, Bochdalek type Pulmonary hypoplasia	Abdominal approach Reconstruction with Dacron patch	PEEP 72h CPAP 140h(!)	PTX on right side	Full recovery
3	K.A. ♂	Right, Morgagni type	Thoracic approach Direct reconstruction	CPAP 24h	—	Full recovery
4	P.J. ♂	Aplasia of the left Pulmonary hypoplasia	Abdominal approach Abdominal muscle flap	PEEP 160h	PTX on both sides	Died
5	S.Sz. ♀	Right, Morgagni type Pulmonary hypoplasia	Thoracic approach Direct reconstruction	CPAP 60h	—	Full recovery
6	V.E. ♀	Left, Bochdalek type Pulmonary hypoplasia Malrotation	Abdominal approach; Direct reconstruction	CPAP 10h	Intracranial haemorrhage	Died
7	K.Zs. ♂	Left, Bochdalek type	Abdominal approach Direct reconstruction	CPAP 24h	—	Full recovery
8	H.I. ♂	Left, Bochdalek type	Abdominal approach Direct reconstruction	CPAP 48h	—	Full recovery
9	K.P. ♂	Left, Bochdalek type Large defect. Pulmonary hypoplasia	Abdominal approach Reconstruction with Dacron patch. Skin suture only	CPAP 8h	Atelectasis	Died
10	Gy.Á. ♂	Left, Bochdalek type Large defect. Pulmonary hypoplasia	Abdominal approach Reconstruction with Dacron patch	CPAP 96 h	—	Full recovery
11	S.T. ♂	Right, Bochdalek type	Thoracic approach Direct reconstruction	CPAP 48h	Intestinal obstruction at 9 mo	Full recovery
12	F.K. ♀	Left, Bochdalek type	Abdominal approach Direct reconstruction	CPAP 24h	—	Full recovery
13	M.A. ♂	Left, Bochdalek type	Abdominal approach Direct reconstruction	PEEP 1h	Intracranial haemorrhage	Died

14	B.T. ♂	Aplasia of left diaphragm. Heart defect. Pulmonary hypoplasia	Abdominal approach. Reconstruction with Dacron patch	CPAP 72h	—	Full recovery
15	H.Z. ♀	Left, Bochdalek type	Abdominal approach Direct reconstruction	PEEP 44h	PTX on right side. Pulmonary and intracranial haemorrhage	Died
16	T.R. ♂	Aplasia of left diaphrag. Pulmonary hypoplasia Duplicated renal pelvis	Abdominal approach Reconstruction with Dacron patch	PEEP 48h CPAP 72h	Pneumonia on right side	Full recovery
17	Á.Zs. ♀	Left, Bochdalek type Pulmonary hypoplasia	Abdominal approach Direct reconstruction	CPAP 24h	—	Full recovery
18	G.Zs. ♀	Aplasia of left diaphragm. Pulmonary hypoplasia	Abdominal approach Reconstruction with Dacron patch	PEEP 13h	Atelectasis Intracranial haemorrhage	Died
19	Zs.D. ♂	Left, Bochdalek type Pulmonary hypoplasia	Abdominal approach Direct reconstruction	CPAP 48h	—	Full recovery
20	M.Zs. ♂	Left, Bochdalek type	Abdominal approach Direct reconstruction	CPAP 96h	—	Full recovery
21	W.Á. ♂	Left, Bochdalek type Artificial stomach perforation	Abdominal approach Direct reconstruction. Stomach suture	CPAP 72h	—	Full recovery
22	Sz.E. ♀	Aplasia of left diaphragm. Pulmonary hypoplasia	Abdominal approach Reconstruction with Dacron patch	PEEP 7h	Atelectasis Intracranial haemorrhage	Died
23	M.K. ♂	Left, Bochdalek type	Abdominal approach Direct reconstruction	CPAP 12h	Pneumonia on left side	Full recovery
24	L.E. ♀	Aplasia of left diaphragm. Pulmonary hypoplasia	Abdominal approach Reconstruction with Dacron patch	CPAP 18h	Atelectasis	Died
25	P.Sz. ♀	Left, Bochdalek type	Abdominal approach Direct reconstruction	CPAP 12h	—	Full recovery
26	E.T. ♂	Left, Bochdalek type Pulmonary hypoplasia	Abdominal approach Direct reconstruction	CPAP 48h	Chylothorax	Full recovery
27	Sz.A. ♂	Right, Bochdalek type Pulmonary hypoplasia	Thoracic approach Direct reconstruction	CPAP 72h	PTX on right side	Full recovery
28	O.T. ♂	Left, Bochdalek type Pulmonary hypoplasia	Abdominal approach Direct reconstruction	CPAP 92h	—	Full recovery

approach was laparotomy in the left, thoracotomy in the right sided cases, according to the known possibilities of malrotation and other malformations accompanying left-sided hernias.

In the majority of cases, reconstruction of the diaphragm could be done by direct suture using 3/0 atraumatic silk. In 9 patients the defect was too large for direct suture; of these, in 8 cases a Dacron graft was applied and in one case of total agenesis, the left internal abdominal muscle was used as a pedicle flap for closure [6]. In two patients the abdominal cavity was too small for accomodation of viscera, only the skin could be closed. Draiage of the pleural cavity for continuous suction at —3—4 cm water was done in every case.

All patients needed postoperative respiratory treatment. The CPAP (continuous positive airway pressure) technique was used [3, 9, 10, 11]; this ensured a gentle expansion of the lung and gas transport through the diminished alveolar surface [4, 7, 8]. The airway pressure never exceeded +2 +4 cm water. Some of the patients without spontaneous breathing needed artificial ventilation with positive end expiratory pressure (PEEP).

Cannulation of the external jugular vein was used for parenteral nutrition until the appearance of bowel motility. Subsequent gastric tube feeding was possible also in intubated patients.

Systematic follow-up of blood gases and continuous X-ray control was used for the control of alveolar gas transport and expansion of the lung. These procedures allowed to detect complications and establish the correct therapy.

During CPAP treatment, pneumothorax occurred in 4 cases. Cerebral haemorrhage was observed in 3 patients. In another patient the atelectatic lung was resistant to treatment.

Of the total of 28 cases 8 patients were lost, due to the complications described in Table I.

The small number of cases does not allow definite conclusions. The relatively low mortality rate seems, however, to justify the use of a complex therapy based on early diagnosis, on adequate respiration before operation, a well-chosen type of operative technique and postoperative respiratory treatment mostly by the CPAP technique.

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