USE OF BOVINE PERICARDIUM FOR CONGENITAL ABSENCE OF LEFT DIAPHRAGM

Meral Barlas*** ∩ Aydın Yaşmurlu** ∩ Meltem Bingöl-Koloğlu** ∩ Begüm Atasay*

SUMMARY

The bovine pericardium was successfully used for the repair of congenital absence of left diaphragm in a neonate.

In diaphragmatic agenesis (DA) there is a very large diaphragmatic defect requiring a prosthetic patch or muscle flap for closure, whereas in classical congenital diaphragmatic hernia (CDH), the defect is amenable to repair by direct primary suture. On the basis of different data, it is believed that DA is a subgroup of CDH and not a separate entity.

We present a case of the left sided agenesis of diaphragm in which bovine pericardium is used for repair who developed severe respiratory symptoms both in early and late postnatal period.

Key Words: Diaphragmatic Agenesis, Bovine Pericardium

CASE REPORT

A female full-term neonate weighing 3500 g was born by vaginal delivery to a 34 year old mother. Prenatally, ultrasound examinations failed to show any abnormalities. On delivery, she was intubated, ventilated, and an umbilical catheter was placed. A chest x-ray showed a left–sided CDH. Pre-operative echocardiogram revealed persistence of left superior vena cava, which was the only associated cardiovascular abnormality. Radial artery blood gas analysis was made on admission and again when stabilized preoperatively. She underwent surgery within the first 12 hours of life. A laparotomy was performed

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revealing complete absence of the left diaphragm and all of the abdominal organs, with the exception of the kidneys, descending colon and rectum were in left thorax. Severe hypoplasia of the left lung was observed. The defect was repaired by suturing the bovine pericardium to the ribs with 000 polypropylene. Postoperative course was complicated by three weeks of ventilator therapy and persistence of oxygen need beyond neonatal period. Early in the post extubation period the infant was started on inhalation therapy comprised of salbutamol (0.15mg/kg qid) and budenosid (375 ucg bid). FiO₂ requirement of 0.3-0.4 in order to maintain SaO₂ of 95% was persisted for 3 months. Contrast x-ray of the chest and the abdomen showed a repaired left sided DA with bovine pericardium at one year of age (Figure 1). Quantitative analysis of scintigraphic examination showed that 81% of the lung perfusion was provided by the right and 19% by the left lung (Figure 2). Though, the caloric and protein intake was provided by parenteral and enteral nutrition, growth of the infant was not optimal. The weight and height of the infant is currently was at the 3rd and 10th percentile respectively. She is now 12 months old, and free of supplemental oxygen therapy.

**Discussion**

Many operative techniques such as; suturing the liver(2), prerrenal fascia(3), synthetic materials(4), and muscle flap from the anterior and lateral lower thoracic wall(5) have been proposed for the repair of this large defect of the diaphragm when the muscular remnants cannot be approximated. Organic materials have their disadvantage of technical availability, whereas synthetic materials have been suggested to demonstrate dehiscence(2-5). Despite these disadvantages, most of these materials especially synthetic ones were found to be acceptable. But the surgeons keep searching for a better prosthetic material. The bovine pericardium was used for the repair of congenital absence of left diaphragm in a newborn. Though this material have been used for hernia repair and as a bioprothesis for the closure of abdominal wall defects(6), present case is one of the first to report of its use in diaphragmatic hernia repair. It has been suggested that preserved bovine pericardium demonstrates similar characteristics to dura; it was shown to be firmly incorporated

![Figure 1: A chest and abdominal x-ray with contrast material showed a repaired left-sided Diaphragmatic Agenesis with bovine pericardium at one year of age.](image1)

![Figure 2: Quantitative analysis of lung perfusion scintigraphy showed 81% of lung perfusion provided by right and 19% by left lung.](image2)
into the host tissue and maintains its strength over a prolonged period of time(6).

In the last 10 years period there is only a single case of DA among 53 CDH cases at our department. DA is relatively rare and possesses an unfavorable prognosis. The mean survival rate of 63 % indicates that despite decades of individual effort, the CDH problem is far from solved(7). Valantene and Brereton found in their review of 57 patients with CDH, 10 of whom had DA, that the degree of pulmonary hypoplasia rather than the size of the diaphragmatic defect was the main prognostic factor. They found little difference in the outcome of 10 infants with DA and 27 infants with CDH. However Tsang et al claimed that DA is associated with significantly higher morbidity and mortality when compared to classical posterolateral defects of the diaphragm, and therefore should be recognized as separate clinical entity. Baglaj et al.(8) reported that, of 108 babies with CDH, 16 (14.8%) were identified as having DA. Nine were subjected to operation and all required diaphragmatic replacement. Only 3 survived; thus, mortality in the DA group was 81.25 %, and among those who underwent surgery 66.6%.

Post operative course was complicated with three weeks of artificial ventilation and persistence of oxygen need beyond neonatal period in the present case. Fio2 requirement of 0.3-0.4 in order to maintain SaO2 of 95 % was persisted for 3 months. From that period till 12 months, no further oxygen supplementation nor any medication for ventilatory support was needed.

On the basis of these data it is believed that DA is a subgroup of CDH and not a separate entity. Whether the large defect in the diaphragm is secondary to a greater volume of herniated contents or is the primary event leading to more herniation of contents is not known (1). Their observations support the hypothesis that DA occurs in the very early stages of embryonic life and may be attributed to developmental arrest of the septum transversum . Berman et al.(10) reported that, of 26 infants and children of CDH, 16 were misdiagnosed. Twenty-six patients were evaluated late presenting of CDH between 2 months and 12 years of age. It was collected that, of 394 CDH babies 44 were identified as having DA (Table1).

It is our impression that bovine pericardium is a good not even worse alternative to other prosthetic materials. More rapidly and firmly fixing to the chest wall, retaining its tensile strength for a long period of time, the formation of a cicatricial plate provided satisfactory stabilisation of the diaphragm are the possible advantages of bovine pericardium in the repair of large defects of the diaphragm when the muscular remnants cannot be approximated.

<table>
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<th>Reference</th>
<th>Number of CDH* cases</th>
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<th>DA**</th>
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<td>Total</td>
<td>394</td>
<td>303</td>
<td>44 (11)</td>
<td>13 (30)</td>
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*CDH: Congenital Diaphragmatic herniation  
**DA: Diaphragmatic Agenesis
REFERENCES


