

# Visceral coverage with absorbable mesh followed by split-thickness skin graft in the treatment of ruptured giant omphalocele

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**Abstract** We report a case of ruptured giant omphalocele in whom herniated organs were successfully covered by an absorbable mesh and a subsequent skin graft. A 2,200 g male baby was born at 35 weeks of gestation. An abdominal wall abnormality was detected by prenatal ultrasound at 21 weeks of gestation. At birth, the entire liver, stomach, and small and large bowel had herniated from the defect of the abdominal wall. The thorax and abdomen were highly underdeveloped, and attempts to reduce the organs into the abdomen were unsuccessful due to the extremely small abdominal cavity and associated pulmonary hypoplasia. To protect the herniated organs and prevent abdominal infections, the organs were covered by a polyglycan mesh and subsequently a meshed split-thickness skin graft. Ten weeks later, it was confirmed that the organs were completely covered by epithelialized tissue. However, the patient suffered from frequent respiratory infections and finally died of respiratory insufficiency. Based on the experience of the patient, we conclude that coverage of

the herniated organs with an absorbable mesh and a skin graft is a recommendable treatment in ruptured giant omphalocele.

**Keywords** Ruptured omphalocele · Skin graft

## Introduction

Omphalocele, with an incidence of approximately 1 in 2,500 deliveries, has higher risks of associated anomalies, chromosomal abnormalities, prematurity, and neonatal death, and its prognosis is poorer than that of gastroschisis [1]. Large or giant omphaloceles are challenging to manage, because entire abdominal viscera including the liver, stomach, and small and large bowel may herniate from the underdeveloped abdominal cavity. In addition, in patients with ruptured omphaloceles, the chance of survival is lower than that in patients with an intact sac due to associated pulmonary hypoplasia [2]. We herein describe a successful coverage of herniated organs with an absorbable mesh and a subsequent skin graft in a patient with ruptured giant omphalocele who finally died of respiratory insufficiency.

## Case report

A male baby, 2,200 g at birth, was born at 35 weeks of gestation by cesarean section from a mother whose pregnancy was complicated by premature delivery and polyhydramnios. Ultrasound examination of the fetus showed an abnormality of the abdominal wall at 21 weeks of gestation. At birth, the entire liver,

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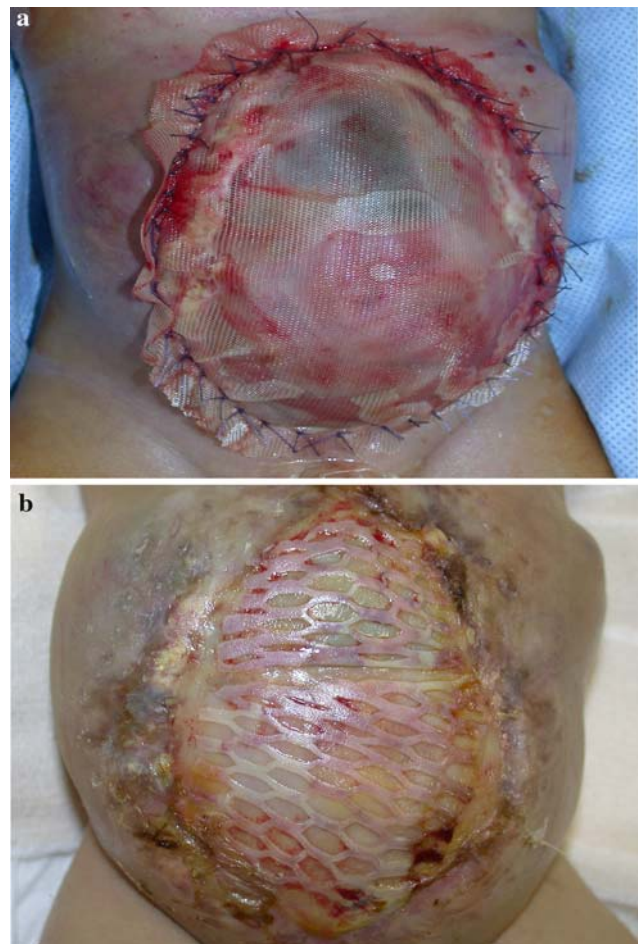
stomach, and small and large bowel had herniated from the abdominal wall defect that was located adjacent to left of the umbilical cord (Fig. 1). The liver was globular in shape and not fixed to the diaphragm. The stomach was covered with a membrane that appeared to be a sac remnant and contained serous fluids. The bowel was thickened, foreshortened, and looked similar to that in gastroschisis. The chest and abdomen were highly underdeveloped, and the abdominal cavity was extremely small. A chest X-ray showed a narrow bell-shaped thorax, and a diagnosis of ruptured giant omphalocele was made. The baby was intubated immediately after birth due to compromised respiration. After several hours of stabilization with high-frequency oscillation, a Silastic® silo was constructed (Fig. 2). Although an attempt was made to gradually reduce the abdominal viscera into the abdomen over a week, only half of the herniated organs could be reduced. On Day 8, extensive skin flaps were made to cover the organs, but abdominal closure was also unsuccessful because tight skin approximation made the patient's circulation and respiration unstable. The arterial SaO<sub>2</sub> easily dropped to <90% even with 100% oxygen. On Day 22, the Silastic® sheet was removed and a polyglycan (Vicryl®) mesh was sutured to the skin edges of the abdominal defect (Fig. 3a). After the procedure, the patient's respiration slowly improved, and high frequency oscillation was converted to conventional IMV. On Day 39, the polyglycan mesh was removed and skin grafting was performed. The meshed split-thickness skin grafts, obtained from the buttock and thigh, were transplanted over the granulation tissue at the surface of the organs (Fig. 3b). The skin grafting



**Fig. 1** The entire liver, stomach, and small and large bowel herniated from the abdominal wall defect



**Fig. 2** A Silastic® silo was constructed following several hours of stabilization after birth



**Fig. 3** A polyglycan (Vicryl®) mesh coverage (a) and a subsequent meshed split-thickness skin graft (b)

was successful and complete coverage of the herniated organs with epithelialized tissue was confirmed 10 weeks after the transplantation. Meanwhile, enteral

feeding was initiated and the patient's body weight slowly increased. However, the patient suffered from frequent respiratory infections since the age of 6 months and died of respiratory insufficiency at the age of 8 months.

## Discussion

Omphalocele is a congenital abdominal wall defect that is thought to be caused by an abnormality of body infolding during the early weeks of gestation. Rupture of an omphalocele sac may occur in utero, during labor, or after delivery, and is observed in 7.4–22.6% of fetuses with omphalocele [1, 2]. Although rupture of a sac during delivery has no prognostic significance, rupture or its absence with accompanying liver herniation in a fetus is an indicator of a poor prognosis due to associated pulmonary hypoplasia [2]. Whether rupture of an omphalocele sac is present or not, giant omphalocele is often associated with underdevelopment of the thorax as well as the abdomen. Thoracic underdevelopment and coexisting pulmonary hypoplasia cause respiratory insufficiency that may be fatal.

Reduction of herniated organs in giant omphaloceles is usually performed in a staged manner. An attempt to rapidly close the abdominal wall defect compromises the circulation and respiration of patients with omphalocele. Silo construction with Silastic® sheeting has been a preferred method. The sheeting can be sutured to the fascia or skin surrounding the abdominal defect. The silo is suspended from above to promote gradual enlargement of the abdominal cavity and reduction of the organs by gravity. Alternatives include the Gross procedure, in which initial coverage of the organs with extensive skin flaps is followed by delayed repair of the ventral hernia. In patients with severe malformations or chromosomal abnormalities, topical ointment with bacteriocidal agents is used to induce granulation and eventual epithelialization over the omphalocele sac.

In the present patient, the omphalocele sac was ruptured and the abdominal organs, including the liver, stomach, and small and large bowel, were herniated from the extremely small underdeveloped abdominal cavity. When abdominal closure was attempted, an excessive intraabdominal pressure caused circulatory

disturbance, compartment syndrome, reducing systemic venous flow. With increasing abdominal pressure, the patient's respiration deteriorated.

In ruptured omphaloceles, herniated organs must be covered by some material to prevent infections of the abdomen. Biodegradable (absorbable) meshes or polypropylene meshes have been used as such materials [3–7]. Unless implanted materials are infected, epithelialization with wound healing of the granulation tissue that has replaced the degrading materials occurs. However, it takes a relatively long time before epithelialization is completed, and skin grafting can be performed over the granulation tissue. Removal of implanted meshes is not always necessary prior to skin grafting, but the polyglycan mesh was not completely covered with granulation and we removed the mesh to avoid infection and graft failure in our patient. Although the patient finally died of respiratory insufficiency due to pulmonary hypoplasia and frequent respiratory infections, coverage with a polyglycan mesh followed by skin grafting was an effective method to protect the herniated organs and prevent infections. Based on the experience in the present patient, we conclude that the coverage of herniated organs with an absorbable mesh and a skin graft is a recommendable treatment in patients with a ruptured giant omphalocele.

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