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CASE REPORT

# Closure of a large lumbosacral myelomeningocele defect with a human pericardial graft: a case report

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## Abstract

**Introduction** Myelomeningocele (MMC) is a complex congenital defect resulting from incomplete closure of the neural tube. The aim of this study is to present an unusual technique for the closure of a large defect.

**Case report** Here we report a patient that was prenatally diagnosed with MMC. At birth, a skin defect of approximately 5 x 7 cm was observed. To repair the defect, a Z-plasty was performed; however, necrosis of the flap developed 3 days after the surgery. The devitalized tissue was removed, and a human pericardial graft was used to cover the defect.

**Discussion** Different techniques have been described for the repair of MMC with a large skin defect, such as rotation skin flaps as well as synthetic and biological grafts. In our patient, a new technique without prior experience consisting of the application of human cadaveric pericardial graft was used with good results and no complications.

**Conclusion** Closure of MMC is often a surgical challenge. Here we describe a surgical technique for the closure of large skin defects.

**Keywords** Myelomeningocele · Pericardium · Spina bifida · Case report

## Introduction

Myelomeningocele (MMC) is the most common birth defect of the nervous system [1–4]. It is a complex condition resulting from incomplete closure of the neural tube most commonly located in the lumbosacral region [5, 6]. The defect can be prenatally diagnosed on ultrasonography and a strong association with maternal folic acid deficiency has been reported [7]. The main goal of surgical repair of MMC is the reconstruction of all tissue layers of the defect while avoiding possible postoperative complications [5].

Here we report a patient with a large defect requiring a heterologous graft of cadaveric human pericardium for the closure of the skin wound.

## Case report

The patient was a female neonate, born at 37 weeks of gestation by elective cesarean section with a weight of 3180 g. Prenatal diagnosis of MMC was made at 21 weeks of gestation by ultrasonography.

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The child was born at another center and subsequently referred to our institution. On admission, a lumbosacral skin defect measuring 5 × 7 cm was observed (Fig. 1). On physical examination the patient had hypotonia and marked areflexia in the lower limbs, without spontaneous movements or response to motor stimulation (grade 1) [8].

Surgical closure of the defect was performed on the day of birth (5 h of life) by a team of neurosurgeons and plastic surgeons. The placode was identified and dissected and released from the transitional epithelium while sparing the underlying nerve roots. Subsequently, the dura was dissected and watertight closure of the dura was performed with silk 4–0 sutures. The musculoaponeurotic layer was not repaired. As wound closure was difficult, Z-plasty was performed. Nevertheless, there was high skin tension at the wound margins and the superior part of the defect could not be completely closed (Fig. 2).

After the surgery, the patient developed skin necrosis. Therefore, 3 days postoperatively, wound toilet was performed and a human cadaveric pericardial graft was placed.

Initially, debridement of necrotic tissue was performed in the operating theatre. Subsequently, the graft was prepared in lukewarm saline solution and molded into the shape of the epidermal defect. The graft was placed over the dura and musculoaponeurotic layer and attached to the healthy skin with uninterrupted nylon 4–0 sutures covering the entire defect (Fig. 3).

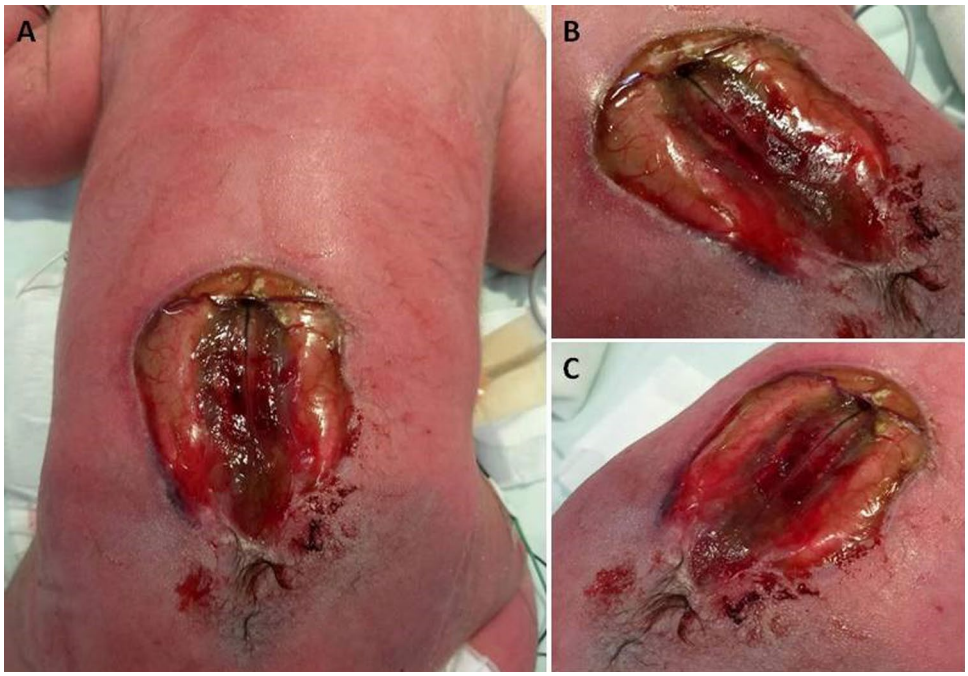


**Fig. 1** **a** Image of a patient with lumbosacral MMC prior to performing the closure surgery. **b** Presurgical image left lateral view. **c** Presurgical image right lateral view

The pericardium used in the intervention was obtained from a cadaveric donor and prepared and stored at the Tissue Bank of our institution according to the protocols for tissue management and cryopreservation.

The patient received antibiotic prophylaxis with cephalothin during the procedure and subsequently ampicillin-cefotaxime for 10 days and was monitored with blood cultures, which remained negative. The patient was kept in the ventral decubitus position and wound dressings were changed every 48 h using sterile liquid vaseline petrolatum. The skin sutures were removed 2 weeks after the surgery.

Fourteen days later, a ventriculo-peritoneal shunt was placed due to increased head circumference, a bulging fontanel, and ventricular enlargement on follow-up brain ultrasound.

As the patient was evolving well, he was discharged by neurosurgery after 4 weeks of hospital stay. Centripetal scarring was observed with concomitant scaling of the dry edges of the graft that required manual removal. Twelve weeks after the intervention, the defect was completely closed. Postoperative follow-up is 25 months so far; the patient does not present pain in the lumbar wound, and she performs intermittent catheterization every 3 h with good results in the urodynamic study.

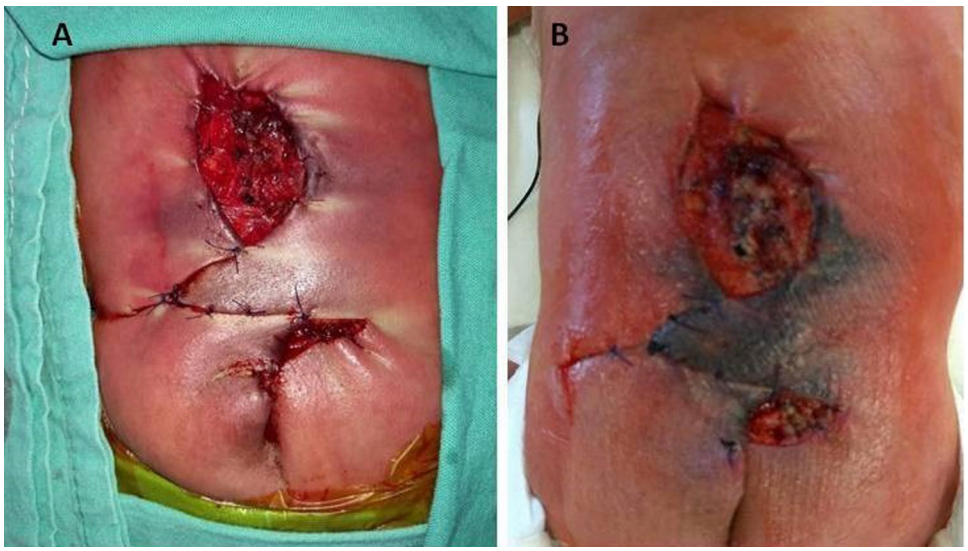


**Fig. 2** **a** Intraoperative image of the closure of the MMC with the Z-plasty technique, where insufficient closure of the cutaneous plane is observed, leaving the lower tissue exposed. **b** Image of a surgical wound at 72 h of evolution with necrosis of the edges

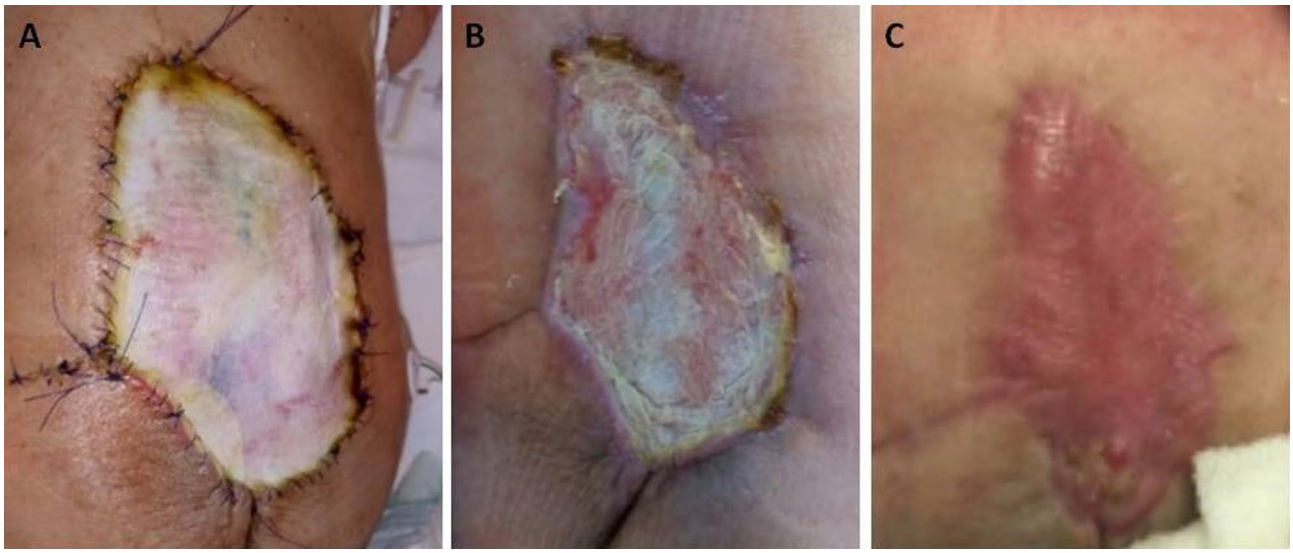


**Fig. 3** **a** Postsurgical image of a toilet and placement of the human pericardium. **b** Image 3 weeks after surgery. **c** Image at 12 weeks, showing complete healing

## Discussion

MMC is characterized by the defective closure of the neural tube. The defect should be closed within the first 72 h after birth to avoid complications, such as cerebrospinal fluid fistula, infections, subcutaneous collections, dehiscence of the layers, and wound necrosis [2, 9, 10]. Postnatal repair of the tissue layers does not improve but only prevents worsening of the motor outcome [11].

Patients with MMC may need more than one surgical intervention throughout life and require continuous interdisciplinary follow-up [12].

Different techniques for closure of the defect have been described. In the majority of cases, primary longitudinal defect closure is feasible after prior removal of the dysplastic transitional epithelium [1–7, 9–20].

For large defects that are not amenable to direct closure, evaluation together with plastic surgery is recommended to consider the use of tissue expanders or, more commonly, flaps or grafts [15].

Z-shaped transposition of two flaps (Z-plasty), bilateral musculocutaneous flaps based on the thoracolumbar perforators of the latissimus dorsi, and superior gluteal artery perforator flap are the most commonly used flaps [7, 16, 17].

These techniques are generally invasive causing considerable morbidity and requiring substantial surgical experience. In addition, they may complicate future approaches to the spine.

Different authors have reported the use of autologous amniotic membrane grafts for dural closure and others the use of synthetic grafts, such as the *dermal regeneration template* (Integra), or even the use of pericardium of animal origin for the repair of large defects for the repair of large defects; however, to our knowledge, no studies describing skin closure with a human cadaveric pericardium graft have been published [5, 6, 10, 18, 19].

Although the human pericardium is thinner than the bovino and its mesothelium appears less delicate, in the present case it represents a good and low-cost option for the repair of myelomeningocele. It had sufficient strength to resist the closing tension, allowing time for the proliferation of the skin without spaces or dehiscence [21].

In our case, rotation of cutaneous flaps with Z-plasty was performed without success. As the defect was exceptionally large, tension was observed at the skin margins of the defect and signs of necrosis developed a few days after the first intervention.

Although at our hospital experience with the use of cadaveric pericardium was limited to the treatment of dural defects, in this patient a surgical toilet removing the devitalized tissue and repair of the remnant skin defect with this type of graft was opted for.

In the bibliography there are multiple articles about the use of the pericardium in different surgical techniques. Some examples of its use are carotid artery repair, corrective surgery in Peyronie's disease, and aortic valve reconstruction, among others [22–24]. So far, there is no reported use of this tissue for the closure of the MMC.

Moist wound care with vaseline was preferred, as it favors granulation due to its proinflammatory action, and new tissue was spared during dressing changes to achieve optimal conditions for epidermization [25].

## Conclusions

MMC is a complex congenital defect. Occasionally, its size and morphology pose a challenge for the surgeon. In the case reported here, a new technique was used.

Given the good outcome of our patient without surgery-related complications, we believe this technique may be considered for patients with large skin defects.

## Declarations

**Conflict of interest** The authors declare no conflict of interest.

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