International Journal of Research in Medical Sciences
Lopez DEC et al. Int J Res Med Sci. 2022 Dec;10(12):2967-2970
www.msjonline.org
pISSN 2320-6071 | eISSN 2320-6012

DOI: https://dx.doi.org/10.18203/2320-6012.ijrms20223041

Case Report

Closure of a large lumbosacral myelomeningocele post-operative defect with a human cadaveric split-thickness skin graft: a case report

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Received: 05 November 2022
Accepted: 19 November 2022

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ABSTRACT

Spina bifida is the most common birth defect of the central nervous system that is compatible with life, and myelomeningocele represents its most frequent form. Congenital myelomeningocele (CMM) has a worldwide incidence of 0.5 to 0.8 per 1,000 live newborns. CMM is a complex condition resulting from incomplete closure of the neural tube, mainly in the lumbosacral region. The objective of the surgical repair of the CMM is the reconstruction of all the tissue layers of the defect, avoiding possible postoperative complications. The aim of this case review is to present a re-epithelialization closure in a patient with a large CMM defect in who primary hermetic closure was not possible because there was too much tension at the edges of the defect. Therefore, human cadaveric split-thickness skin grafts were placed over the dura mater and the aponeurotic layer, covering the entire defect and an adequate healing and completely closure of the defect were observed in eight weeks. The surgical management of large meningomyelocele defects represents a major challenge and no single protocol exists for its reconstruction. The repair of an MMC defect should be performed during the first 72 hours after birth. After neurosurgical closure of the neural tube and dura, the myelomeningocele defect requires good quality skin and subcutaneous tissue with minimal wound tension for stable coverage. Human cadaveric skin grafts are considered a useful technique for temporary wound coverage because they lead to a more natural healing environment, possess ideal properties, and provide a physiological barrier that reduces microbiological contamination, in addition, it acts as a bridge to adhere to and to seal wound beds.

Keywords: Myelomeningocele, Split-thickness skin graft, Cadaveric, Skin closure, Wound healing

INTRODUCTION

Meningomyelocele (MMC) is a defect of spinal cord, vertebral spine, and overlying skin.[1] It is characterized by failure of the neural tube to close in the lumbosacral region during embryonic development on day 22 (fourth-week post-fertilization), leading to the herniation of the meninges and spinal cord through a vertebral defect.[2] Spina bifida is the most common birth defect of the central nervous system with myelomeningocele being the most common form of spina bifida cystica.[2]

The rates of myelomeningocele are higher in the Latino population. It is more common in females with a 3-7:1

ratio. There are racial differences; for example, the incidence is several times higher in some regions in China, parts of Africa, the Middle East, Thailand, and India. Folate supplementation guidelines in these countries may play a role in these racial differences.[3]

The global prevalence of neural tube defects is estimated at 4 per 1,000 live births; in industrialized countries such as the United States of America (USA) and most European countries it ranges from 0.5 to 0.8 per 1,000 live newborns each year, but it is higher in developing countries, and even in some regions of China this value increases up to 20 times.[4] The low prevalence in Western countries reflects the implementation of maternal folate fortification programs.[3]

Non-genetic risk factors include reduced folate intake, maternal anticonvulsant therapy, diabetes mellitus and obesity.[3]

Traditionally, myelomeningocele closure consists of spinal cord repair, closure of the dura, and closure of the soft tissue and skin adjacent to the defect.[4]

The use of a human cadaveric split-thickness skin graft as a safe, stable, and durable surgical option with excellent aesthetic results in patients with MMC, who presented failed primary closures, is shown.

CASE REPORT

The patient is a female, product of the sixth gestation, born at 40 weeks old gestation and weighing 2,600 grams, the mother referred not having an adequate prenatal control. The product was diagnosed with congenital myelomeningocele at birth in another institution, and was later referred to our institution, after four days of extrauterine life. On admission, a lumbosacral cutaneous defect of 15×12 cm was visualized.

Surgical closure of the defect was performed at 12 days of extrauterine life by the neurosurgery. Poorly developed dura mater was found at the moment of intervention and hermetically closure could not be done.

There was great cutaneous tension at the wound margins and the defect could not be completely closed. After tree post operative days it was decided to place a human cadaveric split-thickness skin graft, which was moulded to the shape of the epidermal defect and placed over the dura mater and the aponeurotic layer, covering the entire defect (Figure 1).

A second surgical intervention was performed one week after the first surgery, placing a new cadaveric skin graft.

Adequate healing of the defect edges was observed in follow-up examinations, eight weeks after the first intervention, the defect was completely closed (Figure 2).

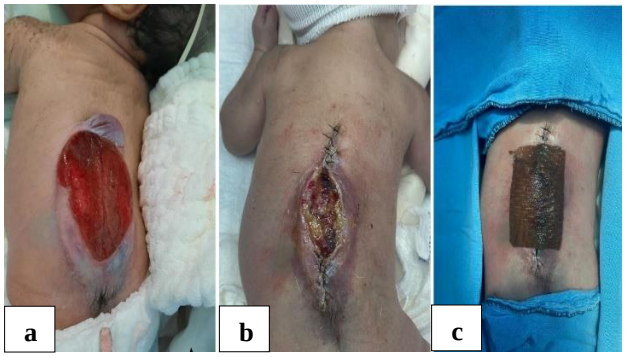

Figure 1: (a) Preoperative photograph of myelomeningocele, (b) postoperative photograph, and (c) after skin graft closure with human cadaveric skin graft.

Figure 2: (a) Initial postoperative photograph after 1 week skin graft closure with human cadaveric skin graft, (b) placing a new cadaveric skin graft, and (c) postoperative photograph at 8 weeks.

DISCUSSION

MMC is a complex condition and the most common congenital defect resulting from incomplete closure of the neural tube. The surgical management of large meningomyelocele defects represents a major challenge and no single protocol exists for its reconstruction in the actual literature. The repair of an MMC defect should be generally performed during the first 72 hours after birth and consists of primary closure of the dura and closure of a fascial layer before skin closure. The closure of the skin defect is an essential step that determines the quality of the surgical outcome. Because of the risk of central nervous system infection, the repair of MMC has been considered a neurosurgical emergency, with additional plastic surgical intervention mainly in large defects.[6,7]

Primary closure is possible by undermining of the wound margins in 75% of cases, the remaining 25% of patients with large defects require more complex procedure.[8]

After neurosurgical closure of the neural tube and dura, the meningomyelocele defect requires good quality skin and subcutaneous tissue and minimal wound tension for stable coverage.[6] Most of the patients with MMC have a small

defect that can be closed by a simple procedure such as simple soft tissue approximation, but for large defects, several reconstructive techniques have been described.[4-7]

According to the literature, flap reconstruction is recommended for defects that are >5 cm in diameter, but this is not suitable for all patients because of different weights and usable skin tissue on the back.[9] Closure of the skin defect has been performed by skin rotation or advancement and using latissimus dorsi or myocutaneous flaps.[10] Many techniques have been described, among all of them, the most used are: simple linear closure, unilateral rhomboid flap, rotational advancement flap, bilateral rhomboid flap, and keystone flap.[4,5]

Regardless of the technique used, it should be tension free, provide good soft tissue padding of the neural tube, prevent cerebrospinal fluid (CSF) leakage, and provide stable and durable wound healing, especially for large defects.[8]

Postoperative complications following MMC wound closure are we CSF leakage, meningitis, seroma, hematoma, skin flap necrosis wound infection, and dehiscence. The average complication rates have been reported between 7.7% and 33%.[8]

Due the inability to achieve tension-free closure with simple undermining of the skin or the use of several techniques involving both neurosurgical and plastic surgery principles, different authors have reported numerous alternative techniques to cover the wound, instead of using musculocutaneous and skin flaps, using the same sac membrane, human pericardial graft, cryopreserved human skin allografts, and autologous amnion grafts, over the MMC site that cannot be primarily closed.[6,10]

Human cadaveric skin grafts are considered a useful technique for temporary wound coverage because they lead to a more natural healing environment. Among the covering materials, temporary skin substitutes are preferred because they possess ideal properties and provide a physiological barrier that reduces microbiological contamination, in addition, the dermis of these grafts acts as a bridge to adhere to and to seal wound beds. The drawbacks of human cadaveric skin grafts are their high cost, hazard of disease transmission, and the low availability on demand. Human cadaveric split-thickness skin grafts can be lyophilized, packed, and finally sterilized with γ-irradiation to facilitate their application. This process seals these grafts in dry and sterile packs, which are easily stored at room temperature, transported, and handled.[11,12]

CMM should ideally be repaired within the first 72 hours after birth. Different techniques have been described for its reconstruction. In most cases, closure of the primary longitudinal defect is feasible. For large defects that are not suited for direct closure the most used techniques are Z-plasty, and musculocutaneous flaps based on the thoracolumbar muscle fibers of the latissimus dorsi. These techniques are generally invasive, cause considerable morbidity, and require extensive surgical experience.

CONCLUSION

In the case described here, an accessible technique was used. Given the positive outcome of our patient without complications related to the surgery performed, we believe that this technique should be considered for patients with large skin defects. The use of a split-thickness human cadaveric skin graft can lead to a successful cosmetic result for large myelomeningocele management, without the use of complicated skin incisions or flap advancements and its implications.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: Not required

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Cite this article as: Lopez DEC, Elenes NCS, Jimenez MAM, Cruz CC, Santana LJ, Sierra MGJ, et al. Closure of a large lumbosacral myelomeningocele post operative defect with a human cadaveric split-thickness skin graft: a case report. Int J Res Med Sci 2022;10:2967-70.