

Primary closure of large thoracolumbar myelomeningocele with bilateral latissimus dorsi flaps

Technical note

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Object. Myelomeningocele (MMC) is the most complex congenital malformation of the CNS that is compatible with life. Different closure techniques are available for defect reconstruction, but wound healing and tension-free closure of the skin in the midline remain major considerations in large MMCs. In this study, the authors used bilateral proximally based latissimus dorsi (LD) skin island muscle pedicle flaps for closure of large thoracolumbar MMC defects.

Methods. Twenty infants with very large thoracolumbar MMCs were enrolled in the study. The mean of age of the patients was 4.1 ± 2.3 months. The width of the MMC was 6 ± 1.2 cm. At operation, 2 triangular V-Y flaps were designed on each side of the defect; the tip of the triangle was extended to the posterior axillary line. The LD flaps based on the thoracodorsal arteries were elevated bilaterally and advanced toward the midline with moderate tension and sutured together. Postoperatively, infants were positioned prone for 7 days and discharged on the 8th day after the operation. They were followed every 2 weeks for evaluation of wound healing.

Results. The wounds healed without any major complication. There was no dehiscence in the postoperative period.

Conclusions. The authors recommended bilateral superiorly based LD skin flaps as an effective method for closure of large thoracolumbar MMC defects. Neural tube defects are among the most common of all human birth defects. (DOI: 10.3171/2008.12.PEDS08226)

KEY WORDS • latissimus dorsi flap • myelomeningocele • neural tube defect

MYELOMENINGOCELE is the most complex congenital malformation of the CNS that is compatible with life.³ An MMC is typically closed within 24–48 hours after birth, and the goal of surgery is to close the neural placode into a neural tube to establish a microenvironment conducive to neuronal function.

Different closure techniques are available for defect reconstruction, but wound healing and tension-free closure of the skin in the midline remain major considerations in large MMCs. Therefore, several case reports in the literature are referenced that describe closure of large MMCs by using local and complex flaps, with varying outcomes.²

In this report, we used bilateral proximally based LD skin island muscle pedicle flaps for closure of large thoracolumbar MMC defects.

Methods

In a prospective study in which patients were enrolled between April 2006 and April 2008, 20 infants with very large thoracolumbar MMCs were referred to our center for defect closure. Thirteen of the patients were male. The mean of age of the infants was 4.1 ± 2.3 months, and the width of the MMC was 6 ± 1.2 cm. Patients were chosen based on the size of the MMC and the inability to close the defect by using simple closure surgery. All patients had flaccid paralysis of both lower extremities and hydrocephalus with frontal bossing, and their hydrocephalus was treated with shunt placement at birth by neurosurgeons. Normally we refer to the width of the MMC by measuring the gap between the divided spinous process; as mentioned above, this distance was 6 ± 1.2 cm.

Abbreviations used in this paper: LD = latissimus dorsi; MMC = myelomeningocele.

This article contains some figures that are displayed in color online but in black and white in the print edition.



FIG. 1. Preoperative photograph of an infant with a large MMC showing the line drawn to delineate the flaps.

In the operating room, after induction of general anesthesia and insertion of a latex-free Foley catheter, patients were positioned prone and the design of the flaps was made with the aid of a line drawn on the skin (Fig. 1). The neural placode was dissected from the surrounding tissue by incising the junctional zone (the margin between the arachnoid of the neural placode and the dystrophic epidermis) (Fig. 2).

All dermal remnants were resected, and the neural tube was reconstituted by closing the pia mater with a 6-0 monofilament suture (Fig. 3). For reconstruction of the thecal sac, the dura mater was dissected free from its junction with the fascia and skin by developing a plane in the epidural space from the rostral to caudal direction bilaterally. Because these were large defects, duraplasty was performed with thoracolumbar fascia. Bilateral relaxing incisions were used to mobilize an adequate amount of fascia.

Two triangular V-Y flaps were then incised (Fig. 4) on each side of the defect. The tip of the triangle was extended to the posterior axillary line. The incision was started at the caudal line of the triangle, and thoracolumbar fascia was



FIG. 2. Intraoperative photograph showing neural placode dissection.

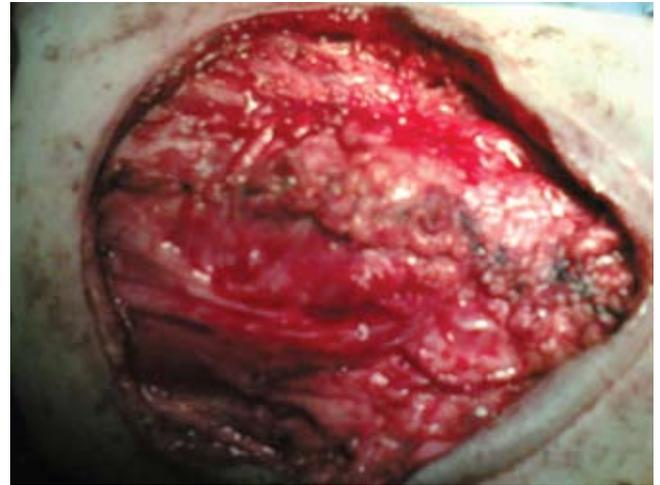


FIG. 3. Intraoperative photograph showing neural tube reconstruction.

freed from the paraspinous muscles. The cranial border of the skin island was deepened to the muscle fascia and under the muscle, to create a proximally based muscle pedicle. The LD flaps based on the thoracodorsal arteries were elevated bilaterally and advanced toward the midline with moderate tension (Fig. 5) and sutured together. The donor sites were closed in a V-Y fashion. Postoperatively, infants were positioned prone for 7 days and discharged on the 8th day after the operation. They were scheduled for follow-up visits every 2 weeks for evaluation of wound healing.

Results

In this study 20 infants with large MMCs were enrolled. The maximum size of the skin defect was 15 × 15 cm² (in an Afghani child). Figure 6 shows this child's back 2 months after the operation; the wound had healed without any major complication. There was no dehiscence in any of the patients' wounds in the postoperative period.

Discussion

Myelomeningocele, the most common neural tube defect compatible with life, consists of an open neural placode surrounded by an intermediate zone of thin epithe-



FIG. 4. Intraoperative photograph showing V-Y flap incisions.



FIG. 5. Intraoperative photograph showing midline closure.



FIG. 6. Photograph showing appearance of the repair after 2 months.

lium, which in turn is surrounded by normal skin. Various methods have been suggested for MMC defect closure.

Luce and Walsh⁶ applied delayed skin grafting, and in the study by McCraw et al.,⁷ bilateral bipedicle LD myocutaneous flaps were used for MMC closure. Moore et al.⁸ showed that relaxing flank incisions were necessary for primary tension-free closure of the MMC defect.

Blaiklock et al.¹ used LD myocutaneous flaps in the repair of spinal defects. Ramirez et al.⁹ used combined LD and gluteus maximus myocutaneous flaps for reconstruction of large thoracolumbar and lumbosacral defects. Hayashi and Maruyama⁴ used bilateral V-Y LD myocutaneous flaps for thoracolumbar defects. In 2 case reports, Vanderkolk et al.¹¹ used reverse LD muscle flaps. Lapid et al.⁵ used a bilobed cutaneous flap based superiorly and laterally, with no suture line over the spinal cord closure.

Sarifakioglu et al.¹⁰ used bilateral split superolateral sliding V-Y LD flaps for closure of large thoracolumbar MMC defects. These authors noted that formal flaps, such as “double-Z” plasty, rotation flaps, and Limberg flaps, require extensive undermining of the skin and have a greater risk of wound complications. Furthermore, Ramirez et al.⁹ showed that padding of muscle flaps yields better results than local skin flaps.

However, when there are several methods available for repair of a defect, their results are not always optimal. In our patients, the skin defect was the major intraoperative problem.

In this study, our findings showed that bilateral superiorly based LD skin muscle pedicle flaps covered the 15 × 15-cm² MMC defect without any major wound complications, and muscle flaps had a well-visualized blood supply and soft-tissue padding.

Conclusions

An LD flap can be designed to be proximally based on the thoracodorsal artery or distally based on the 2 segmental posterior intercostal perforating vessels. The limitation of a distally based flap is that Doppler images obtained using a fine probe should be used to delineate the location of perforating vessels, and this probe is not available in all operating rooms. We recommend bilateral superiorly based LD skin flaps as an effective method for closure of large

thoracolumbar MMC defects. We believe that this method is simple to perform. The cosmetic appearance of the flaps is good and acceptable for parents, and there are no major wound healing complications.

Disclaimer

The authors report no conflict of interest concerning the materials or methods used in this study or the findings specified in this paper.

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