



Long-term follow-up of myelomeningocele defect closure with dorsal intercostal artery perforator propeller flaps

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Abstract

Background Closure of the skin defect in myelomeningocele repair determines the quality of the surgical result. In large myelomeningoceles, the direct closure or by skin undermining may not be possible. In these cases, the skin defect must be closed using flaps to provide a tension-free and successful closure.

Methods In this procedure, after neurosurgical repair and closure of the placode, the defect surgically becomes an ovoid in shape. Then, this defect is closed by transposition of two dorsal intercostal artery perforator propeller flaps. The defect size was > 5 cm in diameter. The localization of the lesion was lumbosacral.

Result A successful tension-free one-stage closure was obtained, without necrosis. Healing was uneventful without any complications and the coverage remained stable over 9 years with the child growth.

Conclusion The dorsal intercostal artery perforator propeller flap enables the surgeon to achieve a tension-free defect closure of considerably large myelomeningocele defects. This type of closure provides a durable coverage and a soft tissue padding over the neural tissues that persist with the child growth. The dorsal intercostal artery perforator propeller flap seems to be a useful closure of large myelomeningocele defects.

Keywords Myelomeningocele · Propeller flap · Dorsal intercostal artery flap

Introduction

Myelomeningocele is a congenital anomaly. Although the incidence [1] is declining as a result of prenatal screening for neural-tube defects, the incidence is still 1–2/1000 newborn in the USA (Fig. 1). It is characterized by insertion of neural elements into a pouch floored by meninx through a vertebral defect. The lumbosacral area is the site of approximately 66% of the cases. This abnormality should be surgically repaired immediately after birth to prevent infection and leakage of cerebrospinal fluid, besides protecting the neural elements. Several methods have been described for closure of large myelomeningocele defects but using the dorsal intercostal artery perforator propeller flap [2, 3] enables the surgeon to

achieve a tension-free defect one stage-closure of considerably large myelomeningocele defects providing a good and stable coverage over the child growth.

Surgical technique

After neural repair is done by a neurosurgeon within first 24 h of life, the design of the dorsal intercostal artery perforator propeller flap is outlined on the patient mapped using a hand-held Doppler in the perimeter of the spinous processes of the vertebral column. The width of the flap is determined by a pinch test to determine the maximum width of the flap that will allow an adequate coverage of the defect and a primary close of the donor area. Flap and pedicle dissection was performed under × 3.5-loupe dissection. The flap was incised circumferentially and the dissection was performed subfascially from lateral to medial [4, 5]. A meticulous dissection was performed especially around the perforator using microsurgical instruments (Fig. 2). We included one perforator in each flap and that was enough to provide enough arterial supply and venous drainage. We barely needed intramuscular

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Fig. 1 A view of a newborn baby with lumbosacral myelomeningocele

dissection of the perforators from the surrounding muscle to gain pedicle length. Donor sites were closed primarily (Fig. 3).

Results

A successful tension-free closure of the defect was obtained (Fig. 4). The operation time was between 90 and 120 min. There was no minor necrosis and the patient healed uneventfully without cerebral fluid leakage. The patient was discharged 7 days after. We did not performed suture removal because we used Biosyn 5/0™ (Glycomer 631), and follow-up visits took place every 2 weeks during the first 3 months and annually after. We have observed a good coverage with a very acceptable padding through the years with the growth of the child. Over the years, we have not observed any problem with the scars; they are pliable with no sign of constriction.

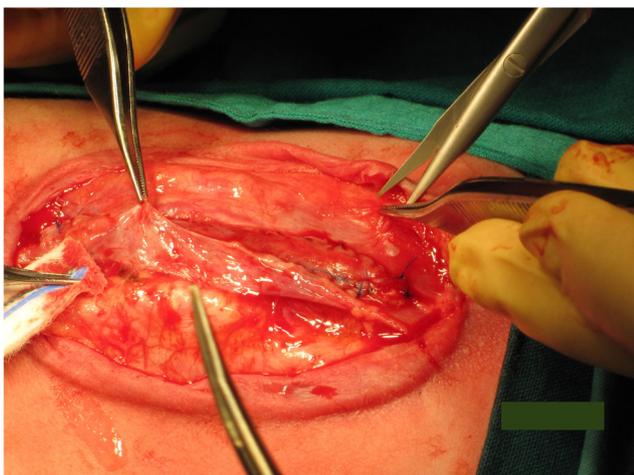


Fig. 2 Repair of the myelomeningocele



Fig. 3 A long lumbosacral myelomeningocele defect and dorsal intercostal artery perforator propeller flap planning

Discussion

Reconstruction of myelomeningocele defects is very important early in the postpartum period to prevent central nervous system infections such as meningitis, encephalitis, and sequelae or death secondary to infections. Primary closure is possible with undermining of the wound margins in almost 75% of patients, but the cases of myelomeningocele with large defects (> 5 cm in diameter) must be reconstructed using flaps.

Several skin flaps procedures have been described for closure of myelomeningocele, including transposition, rotation flaps, V-Y flaps, and bilobed and Limberg flap [6–12]. Although they are useful and easy to perform, the transposition and rotation flaps usually require a split-thickness skin graft to cover the donor site.

The development of perforator-based flaps meant a great leap in the way of facing coverage defects. Salmon's skin irrigation studies, the mapping of perforators that irrigate the



Fig. 4 Posterior intraoperative view of the patient with the myelomeningocele repaired and covered



Fig. 5 Posterior view of the patient 9 years after

skin, and the systematization of angiosomes of Taylor and Palmer constitute the anatomical bases of perforator-based flaps. Thus, the so-called perforating flaps consist of segments of skin and subcutaneous tissue, which are mobilized based on one or more perforators. Through perforator mapping and retrograde dissection, it is possible to mobilize segments of tissues with adequate irrigation and safety, preserving the underlying musculature. Propeller flaps are more reliable because they are not random, so they are tension-free and thus we can avoid dehiscence or necrosis over the suture line. A propeller flap can move freely around a pivot point, the vascular pedicle. In other parts of the body, this flap is usually designed based on perforators of the posterior tibial artery and peroneal artery, giving solution to small and medium defects of the distal third of the leg and ankle, with good results.

To repair these large myelomeningoceles, the team is composed by two neurosurgeons and two pediatric plastic surgeons. We use microsurgical instruments and 3.5-loupe magnification for pedicle dissection in this newborn population.



Fig. 6 Postoperative view 9 years later

Some authors are hopeful in decreasing the incidence of chronic pain at the closure site. If this can be proven, we should extend the indication of this type of closure for all myelomeningoceles, including the ones < 5 cm in diameter.

Dorsal intercostal artery perforator flaps [10] are much more reliable when we compare them with random pattern flaps and cover the defect without tension and with a good padding.

Here, we have introduced a case report of a myelomeningocele treated with this closure within the first 24 h of life and the evolution over 9 years without any problem of constrictive scarring and coverage despite of the child growth (Figs. 5 and 6).

Conclusion

Dorsal intercostal artery perforator flaps are much more reliable when we compare them with random pattern flaps, and cover the defect without tension and with a good padding. Here, we have introduced a case report of a myelomeningocele treated with this closure within the first 24 h of life and the evolution over 9 years without any problem of pain, constrictive scarring, and coverage despite of the child growth.

Compliance with ethical standards

Conflict of interest N/A

Disclaimer None of the authors has a financial interest in any of the products, devices or drugs mentioned in this article.

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References

1. Reigel DH (1996) Myelomeningocele. In: Cheek WR (ed) Atlas of pediatric neurosurgery, 1st edn. W.B. Saunders, Philadelphia, p 1e9
2. Basterzi Y, Tenekeci G (2016) Dorsal intercostal artery perforator propeller flaps: a reliable option in reconstruction of large meningomyelocele defects. *Ann Plast Surg* 76(4):434e7
3. Isik D, Tekes L, Eseoğlu M et al (2011) Closure of large myelomeningocele defects using dorsal intercostal artery perforator flap. *Ann Plast Surg* 67:159e63
4. Mutaf M, Sunay M, Bulut Ö (2008) The “reading man” procedure a new technique for the closure of circular skin defects. *Ann Plast Surg* 60:420e5
5. Mutaf M, Temel M, Günel E (2012) The reading man flap for closure of large meningomyelocele defects. *J Plast Reconstr Aesthet Surg* 65:578e83
6. Campobasso P, Pesce C, Costa L et al (2004) The use of Limberg skin flap for closure of large lumbosacral myelomeningoceles. *Pediatr Surg Int* 20:144e7
7. Lapid O, Rosenberg L, Cohen A (2001) Meningomyelocele reconstruction with bilobed flaps. *Br J Plast Surg* 54:570e2

8. McCraw JB, Penix JO, Freeman BG et al (1987) Soft-tissue repair of myelomeningocele defects using bilateral latissimus dorsi and trapezius musculocutaneous flaps. *Ann Plast Surg* 18:147e55
9. Sarifakioglu N, Bingul F, Terzioglu A et al (2003) Bilateral split latissimus dorsi V-Y flaps for closure of large thoracolumbar meningomyelocele defects. *Br J Plast Surg* 56:303e6
10. Isik D, Tekes L, Eseoğlu M, Isik Y, Bilici S, Atik B (2011) Closure of large myelomeningocele defects using dorsal intercostal artery perforator flap. *Ann Plast Surg* 67(2):159-163
11. Duffy FJ Jr, Weprin BE, Swift DM (2004) A new approach to closure of large lumbosacral myelomeningoceles: the superior gluteal artery perforator flap. *Plast Reconstr Surg* 53:305e10
12. Mangels KJ, Tulipan N, Bruner JP et al (2000) Use of bipedicular advancement flaps for intrauterine closure of myeloschisis. *Pediatr Neurosurg* 32:52e6