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Cases Series

Large myelomeningocele closure: a case series from a regional neurosurgical centre in northwestern Nigeria.

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Abstract

Background: Achieving a tension-free wound closure of large myelomeningocele remains a major concern for all neurosurgeons. Even though this could be achieved by a simple method of undermining the skin surrounding the defect, it can be riddled with technical challenges. As such, surgeons developed various methods to achieve wound closure without tension of large myelomeningocele defects. In this paper, we report our experience in the wound closure of large myelomeningoceles in a regional neurosurgical centre in northwestern Nigeria and review the literature. **Methodology:** A retrospective study that reviewed all patients with large myelomeningoceles who had surgical intervention at Usmanu Danfodiyo University Teaching Hospital (UDUTH) from January 2021 to December 2023. Data was obtained from the patients' case notes. **Results:** A total of six patients with large myelomeningocele were operated on during the study period. Five were males with a male-to-female ratio of 5:1. All the patients presented during infancy with a mean age of 3.5 months. Hydrocephalus was the most common associated abnormality. All had excision and simple wound closure after undermining the skin surrounding the defects. Five (83.3%) patients had no complications in the post-operative period. One patient (16.7%) had a pseudomeningocele that was treated by wound exploration and dural repair. **Conclusion:** By undermining the edges of a large myelomeningocele, tension-free closure is achieved with favourable outcomes.

Keywords: *Large myelomeningoceles, Outcomes, Wound closure.*

Introduction

Myelomeningocele is a congenital defect in the vertebral arches with cystic dilatation of meninges, and structural or functional abnormality of the spinal cord or cauda equina due to failure of the spinal cord to fuse dorsally during primary neurulation, leaving a flat plate of neural tissue called the neural placode.[1,2] It is the most common open neural tube defect in our centre,[3] and is considered large when the defect covers more than half of the child's back.[4] The goal of surgical repair is to free the neural placode from its dural attachment (to avoid tethering), to ensure water-tight dural repair, and to ensure skin closure to protect the underlying neural tissues from the external environment and infection.[1] In most myelomeningoceles, wound closure could be accomplished by undermining the surrounding skin and tension-free approximation.[4] This could not be reliably achieved in large defects.[5] Other factors that may hinder simple wound closure of large defects, in addition to defect size, include location and shape of the defect, associated kyphosis, the general status of the patient, and the condition of the surrounding tissues.[4] As such, various techniques were developed to circumvent the technical challenges of closing large defects using the simple technique. These include V-Y rotation advancement flap, vertical relieving incisions, musculocutaneous flap, and skin graft, among others.[4,6] However, most of these techniques prolong the duration of surgery and anaesthesia,[4] and so may increase morbidity and mortality. We report our experience in the wound closure of large

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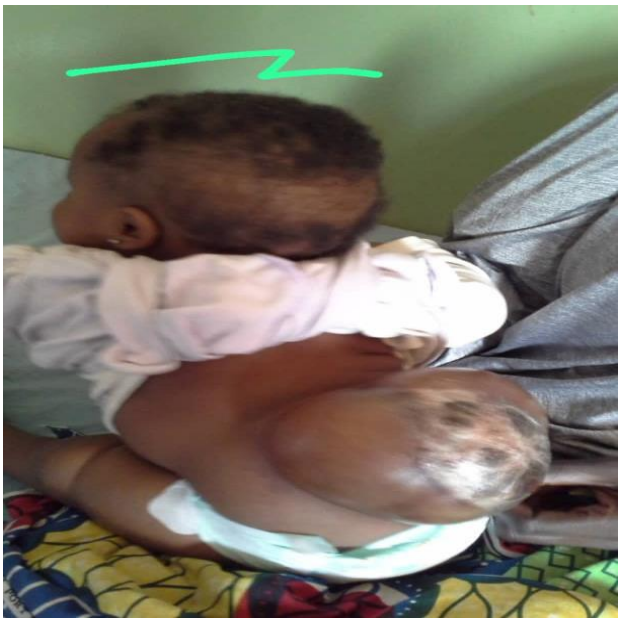
myelomeningoceles, as well as a few nuances that decrease wound complications in a regional neurological centre in northwest Nigeria.

Materials and methods: This was a retrospective study that reviewed all patients with large myelomeningoceles (maximum diameter of defect exceeding 50% width of the patient's back) who had surgical intervention at Usmanu Danfodiyo University Teaching Hospital (UDUTH) from January 2021 to December 2023. Data was obtained from patients' case notes and the operating theatre register. All the patients had excision and simple wound closure by undermining the skin surrounding the defects and tension-free approximation of the wound edges. Some technical nuances we employed during the wound closure included: avoiding local infiltration of the surrounding skin with adrenaline and use of monopolar diathermy, minimal use of bipolar diathermy cauterization, kyphectomy, among others. Postoperatively, we educated parents/caregivers on wound care by instructing them to avoid wearing a diaper on the child, which may lead to faecal contamination of the surgical wound.

Case 1: A 4-month-old female infant who presented with a lumbosacral myelomeningocele measuring about 24x16x8cm. No clinical features of symptomatic hydrocephalus. Transfontanelle ultrasound scan revealed communicating hydrocephalus. The patient had an excision and simple wound closure by undermining the surrounding skin around the defect. .A



Developed a post-operative pseudomeningocele despite watertight closure that was confirmed intraoperatively by the Valsalva manoeuvre and the absence of overt hydrocephalus. She had wound re-exploration and dural repair. No other complications B

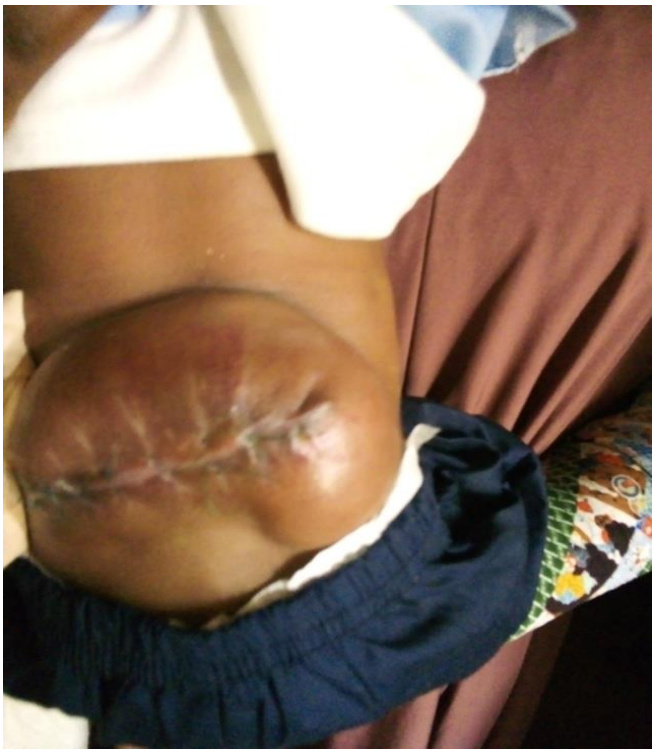


FIGURE 1: Showing (A) a female infant with a large lumbosacral myelomeningocele B) post-operative pseudomeningocele in the same patient.

Case 2: A 5-month-old male infant who presented with a leaking thoracolumbar myelomeningocele measuring about 26x20x6cm. No associated fever or seizure. Had excision and simple wound closure with no complications.

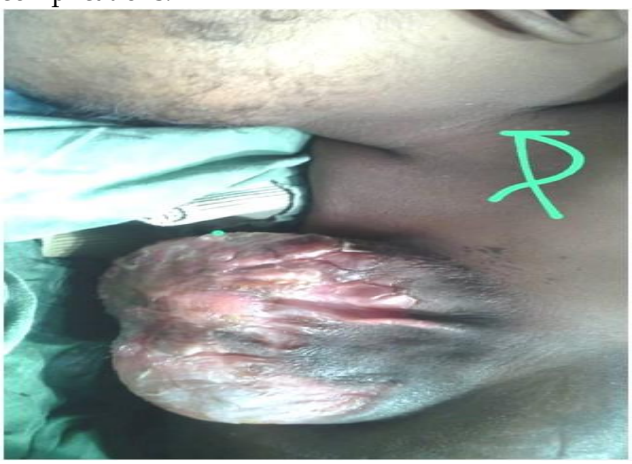


FIGURE 2: Showing a male infant with a large leaking thoracolumbar myelomeningocele.

Case 3: A 3-month-old male infant who presented with a lumbosacral myelomeningocele measuring about 32x24x10cm. No clinical features of symptomatic hydrocephalus. Transfontanelle ultrasound scan revealed communicating hydrocephalus. The patient had an excision and simple wound closure. No postoperative complications.

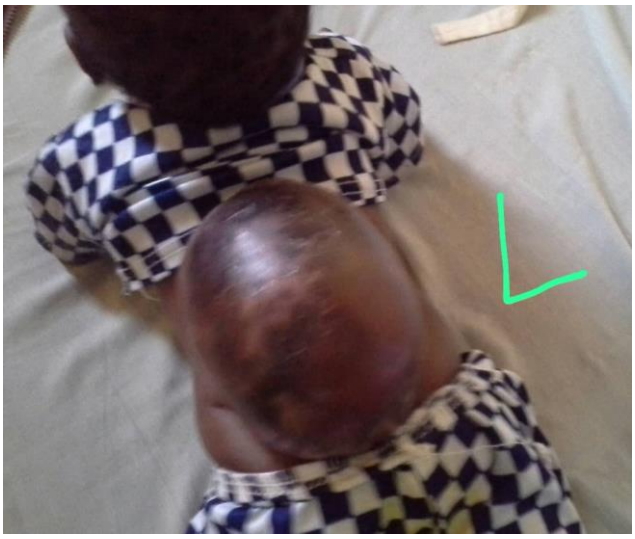


FIGURE 3: Showing a male infant with a large lumbosacral myelomeningocele.

Case 4: A 2-month-old male infant who presented with a large lumbosacral myelomeningocele measuring about 16x16x6cm. No clinical features of symptomatic hydrocephalus. Transfontanelle ultrasound scan revealed communicating hydrocephalus. The patient had an excision and simple wound closure. No postoperative complications.

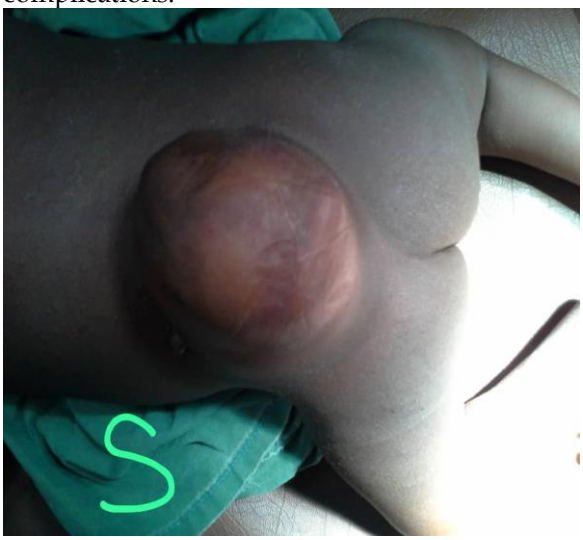


Figure 4: Showing a male infant with a large lumbosacral myelomeningocele.

Case 5: A 6-month-old male infant who presented with a lumbosacral myelomeningocele measuring about 26x24x10cm. No clinical features of symptomatic hydrocephalus. Transfontanelle ultrasound scan revealed communicating hydrocephalus. The patient had an excision and simple wound closure. No postoperative complications.

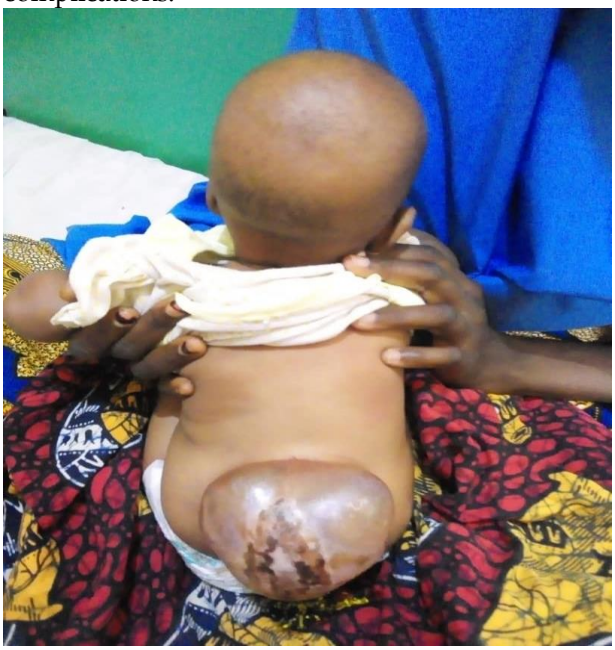
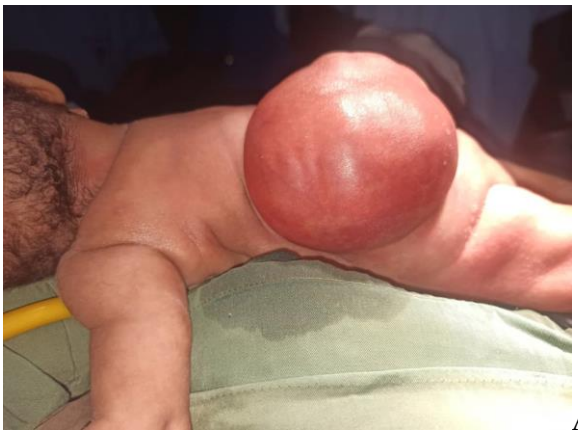


FIGURE 5: Showing a male infant with a large lumbosacral myelomeningocele.

Case 6: A one-month-old male infant who presented with a lumbosacral myelomeningocele measuring about 32x24x10cm and cloacal exstrophy. No clinical features of symptomatic hydrocephalus. Transfontanelle ultrasound scan revealed communicating hydrocephalus. The patient had an excision and simple wound closure as well as cloacal exstrophy repair in the same sitting. No postoperative complications.



A

FIGURE 6: Showing a child with a large lumbosacral myelomeningocele (A), and a cloacal exstrophy in the same patient (B)

Results

A total of six patients with large myelomeningoceles were operated on during the study period. Five were males with a male-to-female ratio of 5:1. All the patients presented during infancy with a mean age of 3.5 months. The most common location of the myelomeningocele was in the lumbosacral area. Hydrocephalus was the most common associated abnormality seen in all patients, though asymptomatic. One patient had cloacal exstrophy, which was repaired in the same sitting. All had excision and simple wound closure by undermining the skin surrounding the defects. Five (83.3%) patients had no complications in the post-operative period. One patient (16.7%) had a pseudomeningocele that was treated by wound exploration and dural repair. None of the patients had post-operative symptomatic hydrocephalus during the follow-up period of six months.

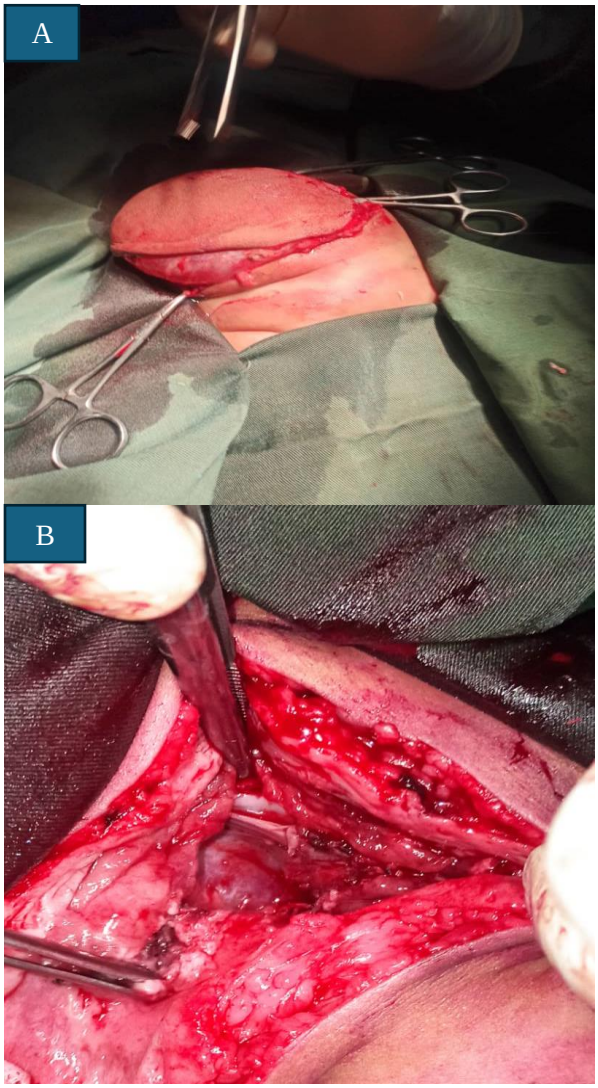


FIGURE 7: Intraoperative images showing a circumferential skin incision exposing the dura (A), dural dissection and skin undermining (B), and tension-free skin closure (C).

Discussion

Wound closure is achieved in most myelomeningoceles by the simple technique of undermining the skin edges surrounding the defects. However, closure of large defects that cover more than half of the width of the child's back cannot be reliably achieved by the simple technique.[4] The restricted dermal circulation in the newborn makes extensive mobilization of the skin hazardous, with possible consequent complications.[4] As such, V-Y rotation advancement flap, vertical relieving incisions, bilateral musculocutaneous flap (based on the thoracolumbar perforators of the latissimus dorsi), en bloc medial advancement of the latissimus dorsi and gluteus maximus musculocutaneous units with re-approximation in the midline and subcutaneous insertion of silicon tissue expanders were introduced to mitigate the technical challenges of simple closure of large myelomeningoceles. [4,6-10] These techniques were found to prolong the duration of anaesthesia and surgery in these patients,[4,] and so may increase morbidity and mortality.

Our series showed male predominance with a mean age of 3.5 months at the time of surgery, which was similar to the finding of Mnguni *et al* in South Africa.[11] It was, however, contrary to the mean age of 7.7 months reported by Nejat *et al*,[4] probably due to a large sample size of 40 patients compared to 6 patients in our series. Repair of myelomeningocele should be performed soon after birth, provided the newborn's general condition is good, and signs of infection are absent.[12] Surgery should not be delayed more than 72 hours of life, as it has been demonstrated that after this time there is a 37% risk of ventriculitis, compared to only 7% when operated upon in a more timely fashion.[13,14] A delay in surgical repair also exposes the myelodysplastic newborn to the risk of deterioration in neurological and bladder function.[15] The delay in surgical repair in our series could be attributed to the long chain of referral patients went through before presenting to our facility.

Simple wound closure of myelomeningocele is easier in very young than older patients due to the greater skin elasticity and mobility, smaller defect-to-surface area ratio (due to their smaller body size), among others.

Large-sized myelomeningocele was commonly found in the thoracolumbar and lumbar areas.[4] Our series showed lumbosacral predominance, due to few numbers of cases. We were able to achieve tension-free wound closure by a simple method of undermining skin edges surrounding the defect in all our patients without the need for additional procedures that facilitate tension-free closure of large defects described by other authors. It has been found that as the defect gets larger, closure becomes more challenging, and more complex techniques (flap-based) are more frequently required.[4,8] None of our patients had wound necrosis or infection, likely because local infiltration was avoided and the predominantly lumbosacral location facilitated undermining. Our small sample size may also account for the absence of these complications. Our finding was contrary to that of Nejat *et al* that reported superficial skin infection and partial wound dehiscence as the main complications in a series of 40 patients with large myelomeningoceles predominantly located at the thoracolumbar region. [4] Only one patient in our series had a pseudomeningocele that was treated by wound exploration and dural repair following failed conservative measures. Some of the technical nuances that might have contributed to our success with low rate of complications include: avoidance of local infiltration of the surrounding skin with adrenaline to prevent local vasoconstriction of regional arteries and consequent skin ischemia, avoided the use of monopolar diathermy that may cause channelling effect and skin ischemia, use of bipolar diathermy to the barest minimum to minimize tissue necrosis that may serve as nidus for infection, kyphectomy for those with kyphosis and educating the parents/caregiver on postoperative wound care by avoiding wearing of diaper to the patients which may lead to faecal wound contamination and consequent wound infection.

Nejat *et al* employed a simple closure technique with vertical skin incision on one or two flanks parallel to the midline and a ventriculoperitoneal (VP) shunt for those with symptomatic hydrocephalus to decrease tension at the wound site in 36 out of 40 patients with large myelomeningoceles with a favourable outcome, as only 3 patients had superficial skin infection and partial wound dehiscence.[4] None of our patients had symptomatic hydrocephalus at the time of surgery or during the follow-up period, and so a VP shunt was not inserted to reduce tension at the wound site. Also, vertical tension-reducing incisions in one or both

flanks were not done in our series, as the majority (5 out of 6) of the lesions in our series were lumbosacral, which can be adequately undermined and approximated without undue tension, as opposed to thoracolumbar in Nejat *et al* study.

Surgical site infection is a common complication of myelomeningocele repair,[16] more so in large myelomeningocele, where skin necrosis may occur, especially when closure is done under tension. Risk factors for surgical site infection include delayed presentation, size of the defect, length of the operative procedure, and the use of flap reconstruction.[16,17] Even though presentation was delayed in our series, the fact that our surgery time was not unnecessarily prolonged, as we did not employ the use of flap reconstruction that lengthens operation time, could probably explain why none of our patients had this complication.

Approximately 25% of large myelomeningocele defects cannot be managed with primary closure alone and require more advanced correction procedures.[6] Forceful attempts to achieve primary closure may lead to skin necrosis, suture detachment, and, consequently, wound infection. [18] The difficulty in achieving a tension-free closure of large myelomeningocele defects has prompted the innovations of several advanced closure techniques. However, no technique has been proven superior to others, and there are no fixed criteria that guide surgeons regarding the technique used for defect closure.[19] The common surgical procedures described in the literature for the closure of large myelomeningocele defects include skin grafting, local skin flaps, and muscular and musculocutaneous flaps.[20]

Some authors initially advocated the use of a skin graft to cover large myelomeningocele defects because of its simplicity.[21,22] However, it was later abandoned in favour of flap cover due to its numerous complications, which included graft ulceration, gibbus deformity, severe kyphosis, lack of soft tissue padding to protect underlying neural structures, donor site morbidity, graft contraction, especially when a split-thickness graft is used, among others.[21,22]

The local skin flaps employed in the closure of large defects vary in shape and in the technique of transfer.[20] These include rotation, transposition, bilateral V-Y advancement flaps, among others. Even though the local skin flaps were found to provide an efficient padding for protection of the underlying neural tissues in the late term, some drawbacks of rotation and transposition flaps include prolonged surgery time, excessive blood loss, and donor site morbidity, as the flap sites need to be covered with a split-thickness skin graft.[20] Suture lines overlie the neural repair and make cerebrospinal fluid leakage and infection more likely when the V-Y advancement flap is used.[23,24] However, Mortada *et al* recently reported a late small distal flap vascular compromise as the only complication of V-Y rotation advancement (butterfly) flap and mentioned short operation time, early healing, one-step surgery with excellent texture and contour as some of its advantages.[6]

The muscle and musculocutaneous flaps provide better padding with a well-vascularized tissue over the neural repair, but the procedures prolong surgery time with significant blood loss.[20] They also compromise the back musculature, which may subsequently affect the patient's ability to use crutches for ambulation and effective bladder emptying during a Valsalva manoeuvre. [24,25]

Basilotta *et al* described the use of a human cadaveric pericardial graft to close a large myelomeningocele defect in a newborn with good outcomes and no complications, following a failed Z-plasty done to close the defect.[26] However, accessibility to the donor graft may be challenging in some settings.

Taking into consideration the pros and cons of the different techniques, we therefore advocate the simple technique of undermining skin around the defects for closure of a large myelomeningocele. However, other techniques that provide better soft tissue padding over the neural repair without compromising the back musculature, with minimal blood loss and short surgery time, may be considered if simple closure could not be achieved without tension.

The small number of patients managed over the study period and the single-centre nature of the study are some of our limitations.

Conclusion

We achieved an acceptable tension-free wound closure of large myelomeningoceles in our series using a simple technique of undermining the skin edges around the defects. Therefore, we recommend it whenever feasible for patients with large myelomeningoceles. This recommendation shortens the duration of anaesthesia and surgery and so has less morbidity than other techniques that prolong the duration of anaesthesia and surgery in these patients.

References

1. Greenberg MS. *Handbook of Neurosurgery*. 8th ed. New York: Thieme; 2016.
2. Cohen AR, Robinson S. Myelomeningocele and myelocystocele. In: Winn RH (ed). *Youman Neurological Surgery,* 5th ed. Philadelphia: Saunders; 2004: 3215–3228.
3. Shehu BB. Repair of myelomeningocele. How I do it. *J Surg Tech Case Report*. 2009;1(1):42–47.
4. Nejat F, Baradaran N, El Khashab M. Large myelomeningocele repair. *Indian J Plast Surg*. 2011;44:(1):87–90.
5. Ersahin Y, Yurtseven T. Delayed repair of large myelomeningoceles. *Childs Nerv Syst.* 2004; 20:427–9.
6. Mortada H, Alhablany TA, Bhat T, Al Tamimi A. Closure of a large myelomeningocele defect using the V-Y rotation advancement flap (butterfly flap): a case report and literature review. *Case Reports Plast Surg Hand Surg*. 2021;8:(1):134–139.
7. Mowatt DJ, Thomson DN, Dunawy DJ. Tissue expansion for the delayed closure of large myelomeningoceles. *J Neurosurg.* 2005; 103:544–8.
8. Ozveren MF, Erol FS, Topsakal C, Tiftikci MT, Akdemir I. The significance of the defect size in spina bifida cystica in determination of the surgical technique. *Childs Nerv Syst*. 2002; 18:614–20.
9. Ozcelik D, Yildiz KH, Is M, Dosoglu M. Soft tissue closure and plastic surgical aspects of large dorsal myelomeningoceles defects (review of techniques). *Neurosurg Rev*. 2005; 28:218–25.
10. Sarifakioglu N, Bingul F, Terzioglu A, Ates L, Aslan G. Bilateral split latissimus dorsi V-Y flaps for closure of large thoracolumbar meningomyelocele defects. *Br J Plast Surg.* 2003; 56:3030–6.
11. Mnguni MN, Enicker BC, Madiba TE. A perspective in the management of myelomeningocele in the Kwazulu-Natal province of South Africa. *Child Nerv Syst.* 2020; 36:1521–1527.
12. Caldarelli M, Rocco CD. Myelomeningocele Primary Repair Surgical Technique. In: *The Spina Bifida: Management and outcome*. Springer: Milano; 2008: 143–155.
13. Charney EB, Weller SC, Sutton LN, Bruce DA, Schut LB. Management of newborns with Myelomeningocele: time for a decision-making process. *Pediatrics*. 1985; 75: 58–64.
14. Mclone DG. Care of the neonate with myelomeningocele. *Neurosurg Clin North Am.* 1998; 9: 111–120.
15. Tarcan T, Onol FF, Ilker Y, Alpay H, Simsek F, Ozek M. The timing of primary neurosurgical repair significantly affects neurogenic bladder prognosis in children with myelomeningocele. *J Urol.* 2006; 176: 1161–1165.
16. 16. Neves N, Noleto M, Ribeiro V. Prevalence of and risk factors for surgical site infection in patients with myelomeningocele. *Revista SOBECC.* 2017;22:(1):10–16
17. 17. Demir N, Peker E, Gulsen I, Agengin K, Tuncer O. Factors affecting infection development after myelomeningocele repair in newborns and efficacy of antibiotic prophylaxis. *Childs Nerv Syst.* 2015;31:(8):1355–1359.
18. 18. Ramirez OM, Romasastry SS, Granick MS, Pang D, Futrell JW. A new surgical approach to closure of large lumbosacral myelomeningocele defects. *Plast Reconstr Surg*. 1987;80:(6):799–809.
19. 19. NM, Tunjung N, Sadikin PM. Closure of myelomeningocele defects using various types of keystone-design perforator island flaps. *Arch Plast Surg.* 2021;48:(3): 261–268.
20. 20. Mutaf, M, Bekereciog˘lu M, Erkutlu I, Bulut O. A new technique for closure of large meningomyelocele defects. *Ann Plast Surg*. 2007;59:(5):538–43.
21. 21. Mustarde JC. Myelomeningocele: the problem of skin cover. Br J Surg. 1966; 53:36–41.
22. 22. Luce EA, Walsh J. Wound closure of the myelomeningocoele defect. *Plast Reconstr Surg*. 1985; 75:389–393.
23. 23. Lapid O, Rosenberg L, Cohen A. Meningomyelocele reconstruction with bilobed flaps. *Br J Plast Surg*. 2001; 54:570–572.
24. 24. Campobasso P, Pesce C, Costa L, Cimaglia ML. The use of Limberg skin flap for closure of large lumbosacral myelomeningoceles. *Pediatr Surg Int*. 2004; 20:144 –147.
25. 25. VanderKolk CA, Adson MH, Stevenson TR. The reverse latissimus dorsi muscle flap for closure of meningomyelocele. *Plast Reconstr Surg*.1988; 81:454–456.
26. 26. Basilotta Marauez Y, Ruiz Johnson A, Uez Pata A, Mantese B. Closure of a large lumbosacral myelomeningocele defect with human pericardial graft: a case report. *Childs Nerv Syst*.2022; 38:851–854.