

Reversed latissimus dorsi muscle flap versus skin flaps in closure of myelomeningocele defects: Comparative study

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In cases of closure of myelomeningocele defects, soft tissue coverage is needed as soon as the dural closure has been achieved. Small myelomeningocele defects can be managed by undermining of the surrounding skin but in the cases of large thoracolumbar or lumbosacral defects local flaps (skin or muscle flaps) are widely used.

Purpose: To compare between two surgical techniques in repair of large myelomeningocele defects with muscle flaps and skin flaps in the different aspects and to provide a durable, protective, and tension-free soft tissue covering.

Methods: We presented a review of our 3-year experience using this approach for closure of myelomeningocele. Our study included 10 consecutive patients treated using reversed latissimus dorsi muscle flap (group A) and other 10 cases treated with skin flaps (group B) for reconstruction of the myelomeningocele defects.

Results: In all patients operated on a tension free closure was obtained. Complications developed in cases covered with skin flaps were one hematoma, one subclinical infection and 3 wound dehiscence while there was only one case that developed hematoma after coverage with reversed latissimus dorsi flaps. There was no patient with late breakdown of the wound during 2 years of mean follow-up.

Conclusion: Instead of less donor site morbidity the skin flaps have higher operative complication rate (dehiscence, hematoma and subclinical infection) than with reversed latissimus dorsi flaps, so we can conclude that reversed latissimus dorsi flaps are still preferred to skin flaps in closure of large myelomeningocele defects.

Key words: Myelomeningocele, reversed, latissimus dorsi flap, skin flap.

Introduction:

Myelomeningocele is a defect of spinal cord, vertebral spine, and overlying skin, and is the most common congenital defect of the central nervous system.¹

In the past, the abnormal anatomy of the neural placode and spinal canal has received more attention among neurosurgeons than the corresponding defects in muscle, fascia, subcutaneous fat, and skin.^{2,3}

The majority of the defects are small enough to be closed primarily with simple undermining of the skin edges and a tension-free approximation. Although effective in many cases, this technique is associated with

complications such as cerebrospinal fluid (CSF) leak, subcutaneous or deep infection.⁴

Several procedures have been described to manage large defects, including skin grafts, lateral relaxing incisions with bipedicle flap closure, rotation flaps, double-rhomboid z-plasty, muscle, and composite musculocutaneous flaps.⁵⁻¹⁰

In this report we described a comparative study between reverse LD and local skin flaps in covering of large myelomeningocele defects.

Patients and methods:

Twenty patients in Zagazig University

hospitals were operated on for repair of myelomeningocele defects between October 2010 and November 2013. Patients were randomized into two groups (group A odd numbers and group B even numbers). The mean age for group A was 5.5 days (range from 3 to 10 days) and 5.1 days for group B (range from 2 to 9 days). Medical records were performed to document preoperative demographics, defect characteristics, operative techniques, postoperative hospital course, and early and late complications. Major wound failure was that requiring reoperation for closure. Isolation and repair of the neural placode and dural closure were carried out. Ten patients were operated on for repair of the myelomeningocele defect by reversed latissimus dorsi flap and the other ten cases were operated on by skin flaps.

Operative technique: After stabilization, thorough examination and documentation of any deficit or other congenital anomalies of the baby by neonatal intensive care unit (NICU) staff was done. General anaesthesia was given and the patient was placed in prone position. A neurosurgeon started exploration by lysis of the tethered cord, then repositioning of neurofilaments followed by water-tight closure of the dural sac.

Group A patients: The LD outline was marked as well as its upper limit. An oblique incision was extended from the axilla to the defect. The superficial surface of the LD superficial surface was identified. The thoracodorsal artery, vein and nerve were exposed, tied off and then detached. After resection of its humerus insertion, the deep lateral surface of the muscle was then identified and dissection continued toward the posterior trunk midline. As we approached the midline care was taken to preserve the segmental pedicles. The sacrifice of the superior pedicle was necessary to allow the muscle to reach the defect satisfactorily without tension. The muscular flap was then tacked with some absorbable sutures after covering of the dural membrane. The donor area was closed primarily then a partial thickness skin graft was then harvested from the thigh and applied over the muscle. The

estimated amount of blood loss ranged from 15 to 25 cc.

Group B patients: Skin Flaps: Several variations of local random skin flaps were used to close myelomeningocele defects. Of them the lateral relaxing incisions with bipedicle flap (2 patients), rotation flaps (2 patients), V-Y advancement flaps (1 patient), double-rhomboid z-plasty (2 patients) or their combination (3 patients) were applied however all of them shared same characters of having random blood supply and required wide skin undermining. After the flaps had been harvested and inset the donor sites were primarily closed.

The estimated amount of blood loss ranged from 5 to 15 cc.

Figures(1-5) are explaining the operative procedures.

Results:

Most of our patients (13 patients) were operated on in the first week of life, and the other 7 patients were operated on in the second week. The defect sizes ranged between 8x5 cm and 9.5-7cm.

In all patients a tension free closure was obtained and there was no patient with late breakdown of the wound during 2 years of mean follow-up (ranged from 6 months to 3 years).

The mean operative time in group A was 120 min while in group B it was 55 min.

One patient from group A developed minimal hematoma that resolved spontaneously while the remaining patients healed without complications.

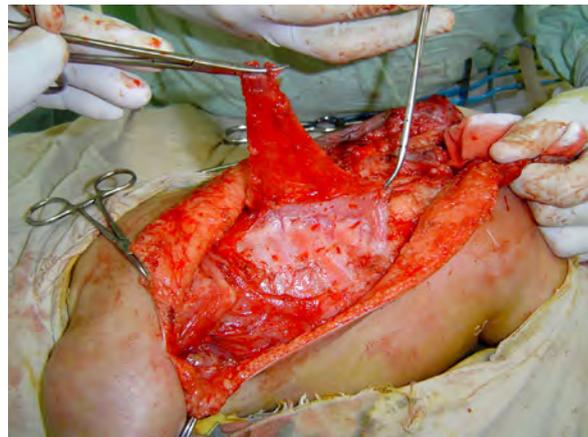
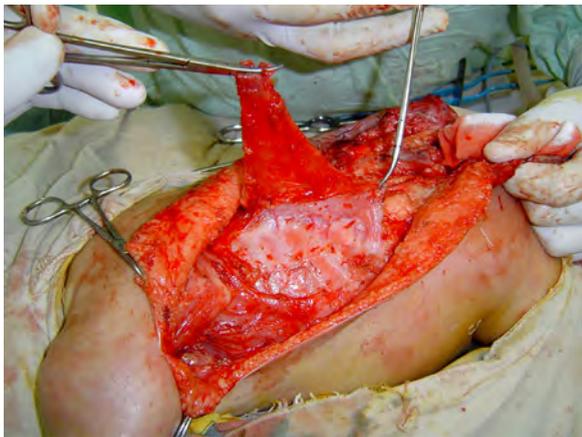
Group B patient's experienced one subclinical infection that resolved with medical treatment, one minimal hematoma and lastly three partial wound dehiscence but all healed with secondary intention after daily wound care. There was no further compromise affecting the vascularity of the tissues that leads to total wound breakdown over the dural repair **Table (1)**.

Discussion:

The majority of the myelomeningocele defects are so small that skin closure can



Figure (1): Preoperative.



Figures (2,3): Intraoperative: reversed latissimus dorsi and local skin flaps.



Figures (4,5): Postoperative: reversed latissimus covered by split thickness skin graft and sutured local skin flaps.

Table (1)

	Group(A)	Group(B)
Mean operative time	120 min.	55min.
Major complication (Flap failure)	-	-
Minor complication(partial dehiscence, seroma, hematoma and subclinical infection)	1 hematoma	1hematoma 1subclinical infection
Long term sequelae	-	3 dehiscence

be accomplished by a simple procedure such as undermining and direct closure of the wound edges.^{11,12} The skin closure of large myelomeningocele defects is difficult to obtain, and in need for more complicated procedures.

The surgical procedures which have been currently known for the closure of large myelomeningocele defects can be categorized in 3 groups as (1) skin grafting, (2) local skin flaps, and (3) muscular and musculocutaneous flap procedures.¹¹ Skin grafting of a myelomeningocele is a simple procedure with low immediate complication rate, but late problems of gibbus deformity, ulceration or infection are not uncommon and may necessitate secondary surgical interventions.^{13,14} Therefore, several authors prefer flap closure to skin grafting. The local skin flap procedures described for closure of large meningomyelocele defects are various in shape and in the way of flap transfer.¹⁵ Although the initial experience with these skin flaps was quite encouraging, the use of the flaps for coverage of myelomeningoceles are associated with high complication rates owing to ischemia caused by wide skin undermining, relaxing incisions, back cuts or tension at the skin closure.¹⁶ Of these complications are the high incidence of necrosis of wound edges and not providing as good amount of padding as the muscle flaps.^{10,12}

The use of musculocutaneous flaps have been reported as a superior alternative to surgical repair of large myelomeningoceles.¹⁷

The reversed latissimus dorsi flap needs to be covered with a split thickness skin graft, which causes an additional donor wound. Although the muscle and musculocutaneous

flaps provide a good padding with a well-vascularized tissue over neural repair, they have 2 major drawbacks as increased blood loss and longer operating time. As another potential drawback, is that the musculocutaneous flaps have been implicated in compromising the structural integrity of the spine. Since these patients often need crutches for ambulation, and sacrifice of the back muscles may adversely affect crutch walking which is not present with the cutaneous flap.¹⁸ Preserving the integrity of back musculature was also reported to be important for effective bladder emptying during the valsalva maneuver.¹⁹

Other studies reported that removal of the latissimus dorsi muscle does not functionally impair the strength nor the range of upper extremity motion.^{17,20} However long follow up periods should be available to detect any functional disability related to the procedure.

Conclusion:

The use of the skin flap in repair of myelomeningocele shows short operative time and less operative blood loss, less or no need to be covered with a split thickness skin graft, less compromising the structural integrity of the spine but higher operative complication rate (dehiscence, hematoma and subclinical infection), than with reversed latissimus dorsi flaps. We can conclude that reversed latissimus flaps are still preferred to skin flaps.

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