Journal of Plastic, Reconstructive & Aesthetic Surgery (2010) **63**, 1513—1518

JPRAS
An International Journal of Surgical Reconstruction
www.JPRASurg.com

Reversed turnover latissimus dorsi muscle flap for closure of large myelomeningocele defects☆

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Received 11 May 2009; accepted 7 August 2009

KEYWORDS
Myelomeningocele;
Reversed;
Turnover;
Latissimus dorsi

Summary Soft-tissue coverage of large myelomeningocele defects is a major surgical challenge that requires close co-operation between neurosurgeons and plastic surgeons to achieve adequate, durable and tension-free coverage of the neural tube. This study was conducted in Zagazig university hospitals on 11 infants, born with large thoracolumbar myelomeningocele defects, presented from June 2004 to February 2007. These defects were reconstructed by using reversed turnover latissimus dorsi muscle flap covered by split-thickness skin graft. The infants were between the ages of 2 and 5 days at the time of surgery and were followed up for 6—12 months postoperatively. All patients tolerated the procedure without major complications. This method provides a tension-free, stable and durable soft-tissue coverage with well-vascularised tissue over the dural repair.

Myelomeningocele is the most complex congenital malformation of the central nervous system that is compatible with life. It results when the neural tube fails to fold normally during the postovulatory days 21 to 27.[1] Myelomeningocele within the context of this article refers only to lesions, which involve an open caudal neural tube defect on the surface of the skin (Figure 1). There is wide geographic and racial difference in incidence of myelomeningocele.[2] Within the category of spina bifida, the incidence of myelomeningocele varies from 0.8 to 1 per 1000 live births.[3,4] The incidence in Qatar, as a representative of the Arab world, was reported as 0.6 per 1000 live births.[2]

Following the introduction of cerebrospinal fluid (CSF) shunts, there was a fourfold increase in the survival of babies with open spina bifida, and the mean age of the survivors was 35 years.[5] This increased the need for stable and durable coverage for these defects.

Whenever possible, open myelomeningocele defects should be closed as early as possible after birth to minimise the risk of sepsis and to protect the exposed neural structures from desiccation and further damage; early closure has been shown to be a determinant in the neurosurgical outcome.[6,7] The majority of these defects can be closed by primary skin closure within the first 48—72 h after birth.[8] When such defects are large enough and cannot be closed

☆ 10th Pan Arab Plastic & Reconstructive Surgery Conference, 20—24 April 2008, Kuwait.

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doi:10.1016/j.bjps.2009.08.001

Figure 1 Large thoracolumbar myelomeningocele in a 2-day-old female newborn.

primarily, a more technically demanding procedure may be required, together with close co-operation between the neurosurgeon and the plastic surgeon.[9,10]

Several reconstructive techniques were described in the literature for the closure of large myelomeningocele defects; of these are the muscle flaps which generally have better blood supply and therefore possess a superior ability to withstand infection and other adverse conditions such as wound breakdown.[11] Muscle flaps also deliver antibiotics, improve the leucocyte function in the recipient site, obliterate dead spaces and seal the defect and prevent CSF leakage especially in such deep irregular three-dimensional defects.[7,8]

The reversed latissimus dorsi muscle flap is based on perforators of the 9th, 10th and 11th posterior intercostal vessels that arise approximately 3—5 cm from the midline.[12] They pierce the lumbar fascia and overlying sacrospinalis muscle to enter the latissimus dorsi muscle on its ventral surface.[13]

According to De Fontaine et al.,[11] there are only two cases reported in the literature where a reversed turnover latissimus dorsi muscle flap was used to reconstruct a large lumbar defect.

Patients and methods

From June 2004 to February 2007, 11 infants born with large thoracolumbar myelomeningocele defects, sizes ranging from 8.5 × 5.5 cm to 10.5 × 8.5 cm, underwent excision of the myelomeningocele sac and dural repair Figure 2, followed by immediate reconstruction of the defect by reversed turnover latissimus dorsi muscle flap with split-thickness skin graft on top.

The age of the patients at the time of surgery ranged between 2 and 5 days (mean: 3.3 days), except for one patient in whom surgery was delayed till the age of 10 days because of chest infection.

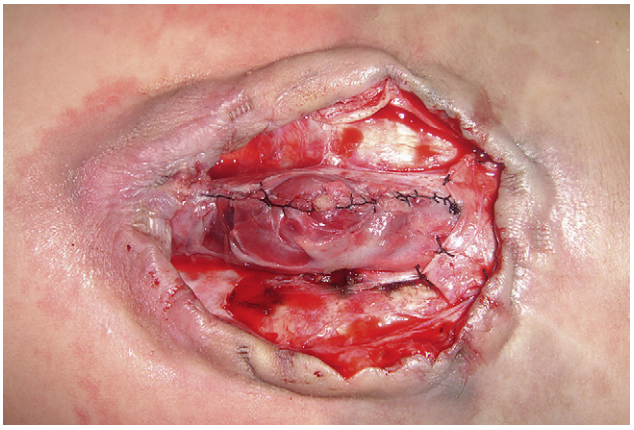

Figure 2 The defect created following excision of myelomeningocele sac and repair of the dura and the neural tube.

Surgical technique

The operation was performed under general anaesthesia with endotracheal intubation in prone position and a Foley's catheter inserted in place. The ipsilateral upper extremity was prepped and draped in the operative field to allow shoulder abduction during flap dissection. All patients were given a dose of antibiotic (third-generation cephalosporin) according to body weight with induction of anaesthesia and continued for 5 days postoperatively. All the procedures were done under 2.5 × loupe magnification. Adrenaline in saline (1:200 000) was injected subcutaneously along the line of incision, which extended obliquely from the axilla to the defect, to maintain haemostasis. The superficial surface of the muscle was identified through that incision, then dissection continued and the muscle insertion was identified and divided within the axilla (Figure 3). Then, the thoracodorsal artery, venae comitantes and the nerve were identified, secured and divided. The deep lateral surface of the muscle was then identified and dissection continued towards the posterior trunk midline. As we approached the midline, care was taken to preserve the segmental pedicles from the posterior intercostal arteries (Figure 4). Division of the superior muscle fibres of origin and the superior segmental pedicles was then completed as required to obtain adequate and tension-free turnover of the muscle to the defect. It was essential to preserve the inferior segmental pedicles to the muscle to ensure adequate blood supply. Turning over was done along the oblique line connecting the segmental pedicles (Figures 4 and 5). Partial-thickness skin graft was then harvested from the thigh and applied on the muscle (Figure 6). The muscle flap donor site

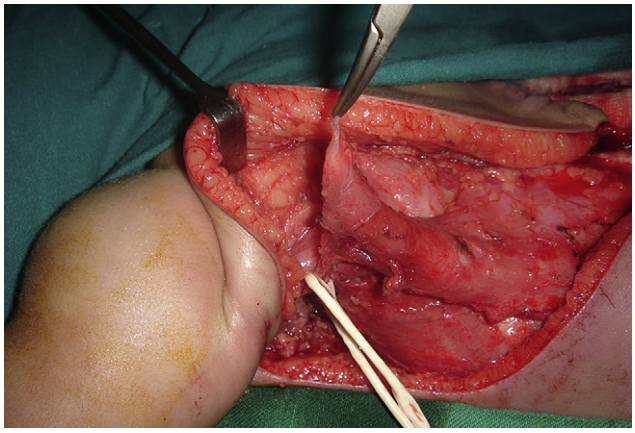

Figure 3 Elevation of the' reversed turnover latissimus dorsi flap'; the muscle insertion was divided and the thoracodorsal vessels were prepared to be secured and divided.