

Repair of Wide Myelomeningocele Defects with the Bilateral Fasciocutaneous Flap Method

Geniş Myelomeningosel Defektlerinin Bilateral Fasiokutan Flep Yöntemi ile Kapatılması

ABSTRACT

OBJECTIVE: Five large myelomeningocele defects repaired by bilateral fasciocutaneous flaps are presented in this article.

PATIENTS and METHODS: After the neurological repair, bilateral fasciocutaneous flaps were raised, transposed over the midline, and sutured to each other.

RESULTS: All operations lasted shorter than one hour and no major complication was noted in the follow-up. Three of the defects were in the thoracolumbar and two in the lumbosacral regions. The areas of the defects were between 5x6 cm (30 cm²) and 8x10 cm (80 cm²).

CONCLUSION: The bilateral fasciocutaneous flap technique offers a shorter operation duration and lower bleeding rate; it is simple to learn and practice and does not abolish alternative operation techniques.

KEY WORDS: Myelomeningocele, Flap, Reconstruction

ÖZ

AMAÇ: Bu yazı da geniş myelomeningosel defektlerini bilateral fasiokutan flep yöntemi ile onardığımız beş hastayı sunuyoruz.

HASTALAR ve YÖNTEM: Myelomeningoselli beş yenidoğanda nöral onarımdan sonra bilateral fasiokutan flep kaldırılıp orta hat üzerinden transpoze edilerek birbirine sütüre edildi.

BULGULAR: Tüm hastalarda operasyon bir saatten kısa sürdü ve takipte majör komplikasyon oluşmadı. Defektlerin üçü torakolomber, ikisi ise lumbosakral bölgedeydi. Onarılan defektlerin alanları 5x6 cm (30 cm²) ile 8x10 cm (80 cm²) arasında değişiyordu.

SONUÇ: Bilateral fasiokutan flep tekniği ameliyat süresi nispeten kısa, kanama oranı daha az, öğrenmesi ve uygulaması kolay, problem çıktığında alternatif seçeneklerini ortadan kaldırmayan bir yöntemdir.

ANAHTAR SÖZCÜKLER: Myelomeningosel, Flep, Rekonstrüksiyon

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INTRODUCTION

Myelomeningocele is characterized with posterior pouching of the spinal canal, posterior fusion defect of the vertebral column, and accompanying skin defects. Although its incidence shows regional variance, it is the most common congenital abnormality of the central nervous system with a rate of one case per a thousand births (10). However, precautions against folic acid deficiency that is thought as the etiologic factor and termination of pregnancies with the advance of intrauterine diagnosis have decreased this incidence.

Treatment of myelomeningocele is immediate closure of the neural tube and dura, and closure of the defect without tension with sufficient cutaneous and subcutaneous tissue. In small defects, treatment is readily achieved by primary closing the defects and undermining of surrounding tissue. However, large defects require additional interventions. A number of methods have been described including skin graft, flap, skin graft and flap, and tissue expanders.

In this article, we present our patients repaired with bilateral fasciocutaneous flap which offers a shorter operation time, less bleeding, and no suture line over the area of dural repair, and is simple to learn and practice. It also does not prevent alternative techniques in case of insufficiency.

PATIENTS and METHODS

Demographic data, defect features, durations and methods of operations, and accompanying abnormalities of five newborns who were born with myelomeningocele and repaired by bilateral fasciocutaneous flaps in Afyonkarahisar Kocatepe University, Faculty of Medicine, Departments of Neurosurgery and Plastic and Reconstructive Surgery between the years 2004 and 2007 were reviewed.

Bilateral fasciocutaneous flaps were used for wide defects (the smallest one was 5x6 cm=30 cm²) that could not be closed primarily. Protruded neural tissue was replaced into the vertebral canal and dural repair was carried out by the Neurosurgery team. Thereafter, bilateral fasciocutaneous rotation flaps at both sides of the defect were elevated, rotated and transposed across the midline to close the skin defects (Figure 1 and 2). The flaps were planned in such a way that the direction of rotation of one flap was against the other flap; and the design



Figure 1: Photographs of a patient with a wide myelomeningocele defect preoperatively and after bilateral fasciocutaneous transposition flap operation.



Figure 2: Planning of the bilateral fasciocutaneous transposition flap, before and after the operation in another patient.

was oriented according to the skin reserve vector to accomplish closure with minimal tension. After elevating the flaps, they were sutured to each other. At the end, the suture lines were distant from the dural closure and all donor defects were closed primarily. Skin and subcutaneous tissue were closed by 5/0 prolene and 4/0 vicryl respectively. A drain was placed into the wound. Bleeding that could necessitate transfusion was not seen in any of the patients.

RESULTS

Operation duration was shorter than one hour in all cases. The defects of three patients were in the thoracolumbar and of two patients in the lumbosacral regions. All the defects were repaired with good quality tissue and without tension. No major surgical complication was noticed. Flap loss, flap necrosis, or wound dehiscence were not seen. Cerebrospinal fluid leakage did not occur.

Neurosurgeons placed ventriculo-peritoneal shunts for hydrocephalus in four of the patients with hydrocephalus.

In that time period, seven other myelomeningocele patients with smaller defects were repaired primarily by the Neurosurgery clinic. The size of the wider defects that were repaired by Plastic Surgery varied between 5x6 cm (30 cm²) and 8x10 cm (80 cm²).

Using the bilateral fasciocutaneous flap method, a good and durable skin coverage was achieved without tension, muscle function loss, and innervation or vascularization defect.

Information about the patients was summarized in (Table I).

DISCUSSION

In the majority of myelomeningoceles, the skin defects are not large and can be closed primarily by approximating the skin flaps. However, closure is more challenging and comprises some complications in wider defects. A number of methods including fasciocutaneous transposition flap, rotation flap, advancement flap, bipediced flap, double Z-plasty, Limberg flap, bilateral skin flap with relaxation incision, and musculocutaneous flaps of latissimus dorsi and gluteus maximus have been described to close wide defects (2). In this study, we presented the repair of five patients with the bilateral fasciocutaneous flap method, the preferred method for large myelomeningocele defects in our clinic.

Table I: The diagnoses, defect areas, repair timings, surgical interventions, and accompanying abnormalities of five patients that were repaired by bilteral fasciocutaneous flap method.

Patients	Gender	Diagnosis	Defect area (cm)	Timing of repair	Interventions	Accompanying abnormalities
1	M	Lumbar myelomeningocele	8x10	4th day	Bilateral fasciocutaneous transposition flap+VP shunt	Arnold-Chiari type 2, hydrocephalus, right pes equinovarus
2	F	Thoracolumbar myelomeningocele	7x7.5	7th day	Bilateral fasciocutaneous transposition flap+VP shunt	Arnold-Chiari type 2, hydrocephalus, bilateral pes equinovarus,talipes equinovarus
3	F	Lumbar myelomeningocele	5x6	4th day	Bilateral fasciocutaneous transposition flap+VP shunt	Arnold-Chiari type 2, hydrocephalus, symmetric encephalomalacia in frontal lobe
4	F	Thoracolumbar myelomeningocele	6x8	8th day	Bilateral fasciocutaneous transposition flap+VP shunt	Arnold-Chiari type 3, pes equinovarus
5	F	Thoracolumbar myelomeningocele	6x7-8	4th day	Bilateral fasciocutaneous transposition flap	Pes equinovarus

F: female, M: male, VP: Ventriculo-peritoneal

This technique was firstly described by Bajaj et al: two fasciocutaneous flaps neighboring the defect are elevated, one to superior and the other to inferior, and transposed to cover the dural repair line (1). Donor area is closed by split-thickness skin graft. The duration of surgery is relatively shorter and bleeding is little with this method. Besides, no suture line is placed over the dural repair region, the procedure is simple to learn and practice, and it does not prevent alternative interventions in case of any problem.

Özçelik et al used bilateral fasciocutaneous flaps to cover the defects of three patients with larger defects in their series of nine patients with myelomeningocele. The smallest defect of that three was 24 cm², and the authors suggested that defects equal to or less than 18 cm² can be closed primarily (8). In our patients, the smallest defect that had been repaired by bilateral fasciocutaneous flap technique was 30 cm². This difference may be due to the preference of referring to Neurosurgery clinics. In addition, we think that limited number of patients in both series (ours and Özçelik et al.) could make it difficult to propose a threshold for usage of the bilateral fasciocutaneous flap.

Welsh et al. used bilateral lumbar transposition flaps and split-thickness skin grafts in 10 newborns (11). Ohtsuka et al (7) modified the Limberg flap in three patients with lumbosacral myelomeningocele. Davies and Adendorff described the large lumbosacral rotation flap across the midline (4). The need of a skin graft to close the donor area seems to be the main disadvantage of the above methods. The double Z-rhomboid flaps of Cruz et al aim to minimize tension by using four equilateral Z-plasty flaps but the risk of ischemia in the inferiorly-based flap and tension over the dural repair area are shortcomings (3). Habal and Vries' bipediced flaps requires grafting of donor area and can cause midline tension because of limited mobility (5). McCraw et al. described bilateral latissimus dorsi musculocutaneous flap (10). The potential disadvantage of that method is the sacrificing of shoulder muscles that may be essential for paraplegic patients (6). As can be seen, previously described methods have various advantages and disadvantages.

Myelomeningoceles are seen mostly in the lumbar region. Rintoul et al. found the lumbar functional level (62% among 297 patients) to be the

most commonly affected site, followed by the thoracic (23%) and sacral (15%) levels (9). In our patient group, three of the defects were in thoracic and two in lumbar levels.

The survival and functional development of patients with myelomeningocele are negatively affected by complications such as meningitis and hydrocephalus. Immediate coverage of neural elements and early ventriculo-peritoneal shunting to prevent hydrocephalus are therefore needed. If a flap is used, the suture line should be far away from the dural repair area to prevent possible suture dehiscence. For this purpose, we achieved a coverage that did not overlap with dural repair area by using a bilateral fasciocutaneous flap. The bilateral preparation of flaps provided coverage without tension and primary closure of donor areas. By not using muscles, both shoulder functions were preserved and we had an option in case of flap failure. The shorter duration of surgical intervention diminished the morbidity of anesthesia.

In conclusion, bilateral fasciocutaneous flap method can be suggested for large myelomeningocele defects since it is quicker, causes minimal bleeding and no suture line over the dural repair area, is easy to learn and practice, and does not prevent alternative interventions in case of flap failure.

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