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OUTCOME OF SURGICAL RECONSTRUCTION OF MYELOMENINGOCELE DEFECTS – A STUDY OF 25 PATIENTS

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ABSTRACT

OBJECTIVE: *To evaluate the outcome of various reconstructive procedures performed for reconstruction of myelomeningocele defects.*
METHODOLOGY: *This prospective descriptive study was conducted at Departments of Neurosurgery and Plastic & Reconstructive Surgery, Liaquat University Hospital, Jamshoro between June 2008 and May 2009. A total of 25 newborns admitted with myelomeningocele during the study period and repaired with various local flaps and skin grafting were included in this study.*
RESULTS: *Out of Twenty five patients, 12 (48%) were males and 13 (52%) were females, age ranged from 1-48 months. Fifteen patients (60%) had defect in thoracolumbar region; ten patients (40%) had defects in lumbosacral region. ventriculoperitoneal shunts for hydrocephalus was placed in 8 patients (32%). Primary closure of defect was performed in 4 patients (16%), 3 patients (12%) were treated with rhomboid flap, Limberg flap was used to cover defects of 2 patients (8%), Lumber flap was used in 3 patients (12%), hatchet flap was used to close the defect of one patient (4%), double reverse flap was used to cover the defect in 5 patients (20%) and split thickness skin grafting was used in large defects of 7 patients (28%).*
CONCLUSION: *Skin grafting is a excellent choice for treatment of wounds where the defect size is huge because there is diminutive morbidity associated with this method, local flaps are fine option for coverage but care should be taken to keep the suture line away from dural repair line to avoid dehiscence.*

KEY WORDS: Myelomeningocele, local flaps, Reconstruction, skin grafting, VP Shunt

INTRODUCTION

Myelomeningocele is a congenital abnormality of central nervous system in which the backbone and spinal canal do not close. At birth there is a posterior pocket of the spinal canal, posterior fusion deficiency of the vertebral column, and associated skin defects. Frequency of myelomeningocele is varied in different parts of world. The frequency of myelomeningocele is reported as 1/1000 births.[1,2] The incidence has been widely decreased with timely management of folic acid deficiency. [3]

Treatment of myelomeningocele is instantaneous closure of the neural tube and dura, and closure of the defect with no tension (Reconstructive ladder) with adequate cutaneous and subcutaneous tissue.[4] Primary closure or primary closure with undermining of adjacent tissue can be done in small defects. Larger defects need tertiary closure like skin grafting, local flaps or combination of both. [5]

In this study, we evaluated the outcome of various reconstructive procedures done for the closure of myelomeningocele in our setup.

MATERIAL & METHOD:

This prospective descriptive study was conducted at Departments of Neurosurgery and Plastic & Reconstructive Surgery, Liaquat University Hospital, Jamshoro between June 2008 and May 2009. A total of 25 newborns admitted with myelomeningocele during the study period and repaired with various local flaps and skin grafting were included in this study after obtaining informed consent from their parents. Defect location, type of reconstructive procedure and complications were noted on a predesigned proforma. Projected neural tissue was placed into the vertebral canal and dural repair was done. Small defects were closed primarily, while medium size defects were closed with various

rotational and transposition local flaps and larger defects were covered with split thickness graft by Plastic Surgery team. 5/0 prolene was used to suture the flaps whereas skin stapler was used to secure the split thickness grafting. Redivac drain was placed in medium size defects and larger defects covered to collect possible seroma or CSF leaking. In cases of skin grafting, post graft dressings were performed every fourth day.

RESULTS

Out of 25 patients, 12 (48%) were males, while 13 (52%) were females, age ranged from 1-48 months. In 15 patients (60%) defect was present in thoracolumbar regions, while in 10 patients (40%) defect was present in lumbosacral region. ventriculoperitoneal shunts for hydrocephalus in 8patients (32%) with hydrocephalus.

Four patients (16%) were managed with primary closure of the defect, rhomboid flap was performed in 3 patients (12%), Limberg flap was used to cover defects of 2 patients (8%), Lumber flap was used in 3 patients (12%),hatchet flap was used to close the defect of one patient (4%), double reverse flap was used to cover the defect in 5 patients (20%) and split thickness skin grafting was used in large defects of 7 patients (28%).

CSF leakage was observed in 4 patients (16%) treated with split thickness grafting. a drain was placed under the graft to drain the cerebrospinal fluid. Wound infection was seen in 4 patients (16%). Wound dehiscence was observed in one patient only (4%) treated with primary closure of the defect. Tip necrosis was seen in one patient (4%) treated with rhomboid flap. One patient (4%) treated with double reverse flap had complete necrosis of flap, the resultant wound was later skin grafted. Partial loss of skin graft was found in 3 patients (12%), a repeat session of skin grafting was performed later for these patients. Complete loss of skin graft was observed in 2 patients (8%) due to infection.

Table I
LOCATION OF DEFECTS

LOCATION OF DEFECT	MALES	FEMALES	TOTAL
Thoracolumbar	7(28%)	8 (32%)	15 (60%)
Lumbosacral	5 (20%)	5 (20%)	10(40%)
Total	12 (48%)	13 (52%)	25 (100%)

Table II
TREATMENT MODALITIES USED FOR COVERAGE OF DEFECTS

PROCEDURE	NUMBER OF PATIENTS	%
Primary closure	4	16
Rhomboid flap	3	12
Limberg flap	2	8
Lumber flap	3	12
Hatchet flap	1	4
Double reverse flap	5	20
Split thickness skin grafting	7	28

Table III
Complications

Complications	Number of patients	%
CSF leakage	4	16
Wound infection	4	16
Wound dehiscence	1	4
Tip necrosis of flap	1	4
Complete necrosis of flap	1	4
Partial Loss of graft	3	12
Complete loss of graft	2	8

DISCUSSION

There are various causes identified for myelomeningocele including, genetic, deficiency of essential minerals like folate and zinc, use of teratogenic drugs, anti-epileptic drugs like carbamazepineor valproic acid, obesity and diabetes mellitus type I.[6] Infants with small myelomeningocele can be easily managed with primary closure however medium and large size defects may require local flap and skin grafting.[6]

A variety of options are available where local flaps are required for coverage of defects like rhomboid flap, limberg flap, lumber flap, bilateral reverse flap and skin grafting are defined to cover various size ranging from medium to large.[7]

The chief objective of myelomeningocele defect reconstruction is to secure the tissue, to avoid leakage of CSF and reduce the danger of infection by reconstructing the neural tube and its coverage with secure soft tissue coverage.

Primary closure in patients of meningocele and myelomeningocele has been described as safe in small defects by many authors. The urgent primary closure maximizes the neurological recovery by avoiding equally both infection and neural desiccation.[8] This primary wound healing can be achieved in small myelomeningocele defects with broad undermining of the wound edges and direct closure of the wound. In this study primary closure was performed in 4 patients (16%), out of which wound dehiscence was observed in one patient (4%).

The coverage of broad-based myelomeningocelesis is a challenging problem. Hence, the suitable technique and skill of the managing of the myelomeningocele defect have provoked substantial debate. A low morbidity and mortality has been reported in cases with use of split-thickness skin grafting for wound closure. [9]

In this study split thickness skin grafting was performed in 7 patients (28%). Partial loss of skin graft was observed in 3 patients (12%), whereas complete loss of skin graft was observed in only two patients (8%). A low morbidity and mortality and satisfactory outcome been reported by Luce Walsh in patients offered split thickness skin grafting for wound closure,19however same authors have reported an incidence of 23% skin ulceration on long term follow-up.

In this study, repair of wide defects of 5 patients (20%) was done with double reverse flap method, this method is also described as treatment of choice by many authors for closure of medium to wide myelomeningocele defects, and donor site is closed with partial thickness skin grafting. The period of surgery is comparatively smaller and blood loss is

little with this technique.

In addition, no stitch mark is positioned above the dural repair area, the technique is easy to study and practice, and in case of any delinquent, alternative interventions are also possible to carryout.

In a study of 9 patients of myelomeningocele, double reverse flap was used to reconstruct the defects of 3 cases, as stated by Ozcelik et al, in which the smallest was 24 cm^2.[10] In our study, the smallest defect was 28 cm^2 which was repaired with double reverse flap.

Welsh et al and Ozcelik et al have used double reverse transposition flaps and got good results. However split thickness skin graft use for closure of donor site is a shortcoming.[10,11] Cruz et al reported the use of 4 Z-plasty flaps, but again there is potential risk of flap necrosis due to compromised blood supply secondary to tension.[12] Bipedicle flaps have again an issue of midline tension due to strain across flaps. McCraw et al have described the use of bilateral latissimus dorsi flap for reconstruction of myelomeningocele defect, however In case of paraplegic patients; it is not wise to sacrifice latissimus dorsi muscle as they are essential for such patients. [13]

Myelomeningocele of lumbar region has been frequently reported. In a study of 297 patients, myelomeningocele has been reported in 62% of patients by Rintoul et al,[14] while it was 23% in thoracic area followed by 9% in sacral area. Whereas in our study 15 defects (60%) were in thoracolumbar region and 10 defects (40%) were in lumbosacral region.

Patients with complications like meningitis and hydrocephalus have compromised survival rate and their functional development is also affected, therefore such patients should be operated upon earlier and suitable and sufficient coverage should be given to their defects and ventriculo-peritoneal shunting should be done so as to avoid hydrocephalus.

Suture line should not be over the dural repair, this will avoid dehiscence of wound. In our study dehisces was observed in patients who's defects was closed primarily and having suture line placed over the dural repair. A same ratio of dehiscence is also reported in other studies where suture line was placed in local flaps over the dural line repair. [15]

In cases where skin grafting have been used a drain should be used to avoid possible collection of fluids like seroma formation or CSF collection.

CONCLUSION:

Skin grafting is a good option for coverage of wounds where the defect size is large because there is little morbidity associated with this procedure, local flaps are good choice for coverage but care should be taken to keep the suture line away from dural repair line to avoid dehiscence.

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