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RESEARCH ARTICLE

Z-PLASTY TRANSPOSITION FLAPS A NEW TECHNIQUE IN CLOSURE OF SKIN DEFECTS AFTER LUMBOSACRAL MENINGOMYELOCELE RESECTION IN PEDIATRICS.

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Key words:-

Z-plasty, meningomyelocele (MMC), lumbosacral, rhomboid flap.

Abstract

Background: Different closure techniques are available after lumbosacral meningomyelocele resection (MMC) resection for large defects reconstruction, but wound healing and tension-free closure in the midline remain major considerations. In this study we use Z-plasty technique in closure of MMC defects > 5 cm. Twenty newborns with large lumbosacral MMC were enrolled in this study. The mean age was 57.45 ± 59.8 days. Complete healing of the skin occurred within two weeks in 14 patients (70%). Superficial wound infection was seen in four patients (20%). Necrosis of the edges of the flap was showed in two patients (10%). No mortality or complete wound dehiscence were observed in this study. Almost skin wounds healed without any major complications.

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Introduction:-

Meningomyelocele (MMC) is the most common significant birth defect involving the spine ranging from less than one case per 1000 live births in North America to 7.7% of live births born in United Arab Emirates. MMC is associated with several CNS anomalies including hydrocephalus, varying degrees of caudal displacement of hindbrain and cerebellar hypoplasia.⁽¹⁾ Because MMC defects vary in size, shape and location no single procedure applies to all. A large number of techniques have been described for closing the back defects occurring after excision of the MMC sac, but new studies focus more on simple, reliable and versatile alternative. The neurosurgical repair of this defect is performed immediately after birth for those lesions with rupture dural sac and external CSF leakage and can be delayed for several days without additional morbidity od mortality.⁽²⁾

The goal of surgical back closure is to seal the spinal cord with multiple tissue layers, to guard against ascending infection and to prevent CSF leakage with preserving the neurological function and untethering of the spinal cord.⁽³⁾

The plastic surgeon draws and designs the Z plasty flap to close the skin defects without tension.⁽⁴⁾

The aim of this study:-

The aim of this study is to assess the Z-plasty transposition flap in closure of skin defects after lumbosacral (MMC) resection in pediatrics.

Patients and methods:-

Twenty (20) newborns with large MMC were enrolled in this study, presented to the neurosurgical department Damanhour Teaching Hospital with the collaboration of surgical unit, during the period of 1 year from Dec 2009 to Nov 2010. After obtaining informed consent from their parents, our initial step was a careful physical examination conducted by a pediatrician, neurosurgeon and plastic surgeon to reveal any associated anomalies including cardiac, renal and other cranial defects. Preoperative anesthetic consultation was done with the request of blood grouping with cross matching of one unit of packed RBC for all patients; three newborns only needed intraoperative blood transfusion. Premature babies and newborns with low birth weight, anemia, and upper respiratory tract infection were excluded from this study. Over hydrocephalus was associated in four newborns and CSF diversion was done in the same sitting for those cases.

This study included only large-sized MMC with an average diameter more than 5 cm which was impossible to close these defects by using simple closure surgery without tension especially in the presence of kyphosis.

The mean age of the infants was 57.45 ± 59.8 days (approximately 2 months), 11 (55%) were males while 9 (45%) were females. The mean operative time for flap elevation and closure of skin was 40 minutes.

The following steps were done:-

1. A thorough history was taken and clinical examination conducted by pediatrician and neurosurgeon was done.
2. MRI lumbosacral spine was done for those cases with motor defects and CT brain was done for all newborn with large skull diameter.
3. Blood laboratory tests including CBC, bleeding time, clotting time, prothrombin activity, serum albumin were done for all patients.

Surgical technique:-

Under general anesthesia, the newborn was placed in prone position with rolls under the chest and pelvis to allow abdomen to hang free.

Measurement of the expected raw area (skin loss) and designing of the Z-plasty flap and its landmark on the skin was done (Fig. 1). Also, decompression of bladder was done prior to placement in this position. The neurosurgical repair started with transverse or longitudinal elliptical skin incision extending through the subcutaneous tissue. The dural sac is undermined and reflected medially on each side. It is closed in a water-tight fashion using 4/0 non-absorbable suture the posterior layer of thoracolumbar fascia is then closed in a separate layer to reinforce the dural tube. The plastic surgeon made the defect as a rhombus shape placed vertically over the midline, equilateral Z-plasty were elevated at the sides of the rhombus and transposed across the defect. The skin lines of closure were chosen to be away from the dural suture, approximated and secured without tension.

Meticulous hemostasis with bipolar cautery was done, so suction drainage was not used in any patient.

Postoperative care:-

Daily dressing was done for all newborns to guard against fecal and urine contamination and also to detect any early signs of surgical wound complications including infection, subcutaneous seroma, CSF leakage, edge necrosis and wound dehiscence. All patients were discharged after removing the surgical sutures to be followed every week in the 1st month postoperative to secure and document the sound healing of the wound.

Results:-

The closure of the skin defect was possible in all patients, as a tension-free and in one stage. Figure 2, showed a newborn's back two weeks postoperative, the wound has healed without any major complications. No mortality has occurred among newborn in this study. Sound healing has occurred in 14 patients (70%), while total post-operative complications occurred in (30%) of patients. CSF leakage was observed in three patients (15%). Superficial wound infection was seen in four patients (20%). As regard partial wound dehiscence it was detected in two patients (10%). Complete wound dehiscence didn't occur in any patient. Necrosis of the edges of the flap was showed in two patients (10%). Subcutaneous seroma was found in five patients (25%), and it was aspirated under local anesthesia without impact on the flap vascularity. Necrosis of the whole flap did not happen in any patients. Table 2, showed the results of the Z-plasty technique after 1 month follow up in 20 patients with lumbosacral MMC.

Table 1: - Postoperative results of the Z-plasty technique in 20 new born with lumbosacral MMC.

Factor	Number of patients	%
Sound healing	14	70
CSF leak	3	15
Superficial wound infection	4	20
Partial wound dehiscence	2	10
Necrosis of edges of the flap	2	10
Subcutaneous seroma	5	25
Complete necrosis of the flap	-	-
Complete wound dehiscence	-	-
Mortality	-	-

**Fig. (1)****Fig. (2)**

Fig. 1:- showed designing and drawing of the flap and Fig. 2 the sound healing of the flap with sound healing two weeks postoperative.

Discussion:-

Unfortunately, MMC repair by skin direct closure cannot accomplish in nearly 25% of the neonates with large defects.⁽⁵⁾ So, for those with large defects, definitive operative management should be performed by a combined neurosurgical and plastic surgical team as to provide reconstruction and protection of the exposed spinal cord, elimination of any CSF leakage and stable soft tissue coverage.⁽⁶⁾

The suitable technique and skill of the managing of MMC defect have provoked substantial debate.⁽⁷⁾ Myriad plastic surgical techniques have been developed to address these issues.⁽⁸⁾ The literature suggests a number of convincing, effective procedures such as skin, subcutaneous and most frequently muscle flaps, bilateral sliding muscle flaps, and split thickness skin grafts.^(9,10,11) The decision to use a specific technique is dependent on the size of the defect, vascular supply and to some extent to the surgeon experience.⁽¹²⁾

The goal of using Z-plasty technique was not to replace the other techniques but to offer an effective option in the treatment of MMC with large cutaneous defects. Among the different methods, Z-plasty proved in our study to be one of the good options to cover large MMC defects. No major complications were encountered. In a study done by Gumus et al.,⁽¹³⁾ they found that Z-plasty flap is a safe alternative, rapid easy dissection, and short operation time with minimal blood loss. Also as regard this technique a low morbidity and mortality and satisfactory outcome have reported by Ozcelik et al.⁽¹⁴⁾

Conclusion:-

Surgical repair of large myelomeningocele (> 5 cm diameter) may be a challenging problem. The advantages of our method are simplicity, reliability and coverage of the defect with well-vascularized flaps, almost nil major flap complications and no donor site morbidity. Primary closure was possible in all patients. This procedure also provides a thick heavy duty skin and subcutaneous tissues over the dural sac; the flap can be taken 1:3 in diameter without compromising the blood circulation of the flap. No suture lines overlie the cord closure and no contour deviation occurred. The result of this technique is satisfactory as regard blood loss and time elapsed.

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