

A Decision Making for Wound Reconstruction in Large Neural Tube Defects: Role of One Sided or Double Sided Rhomboid Flaps

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Abstract

Background: Tension free closure of large neural tube defects after excision poses a significant challenge to the operating surgeon. We are studying the role of one sided or double sided rhomboid flap tailored according to the shape and size of the large defect.

Aim: A decision making for wound reconstruction in large neural tube defects: Role of one sided or double sided rhomboid flaps.

Materials and Methods: This was a retrospective study where the case records of all the cases of neural tube defects performed over 1 year from January 2021 to January 2022 in the department of paediatric surgery at a tertiary care hospital were reviewed after approval from the institutional ethics committee. We reviewed a total number of 20 infants admitted to the pediatric surgery department at our center. Their age ranged between 10 days and 4 months. We classified the defect into mild, moderate and major; mild defect was defined as defect less than 3cms in diameter, the moderate one is between 3-5cms in diameter while the major defect more than 5cms. Data is collected regarding location and type of lesion, ruptured or intact MMC, associated bony deformity, dimension of the defect (vertical and transverse) when one or double sided rhomboid flap was done. Dressing is opened in post operative day 5 and different complications like wound infection, flap necrosis and wound dehiscence in post operative period were noted. Data were tabulated and analysed statistically by calculating the mean and range of the data for different measures.

Result: A total of 20 patients were operated during this period. Mean age of surgery for NTDs excision and repair is 68 days (10 days - 4 months). Average dimension of the defect when one sided rhomboid flap used was 4.1cms x 3.9cms (average total surface area~16cm²) and average dimension of the defect when double sided rhomboid flap used was 6.3cms x 5.2cms (average total surface area~32.7cm²). Wound infection is the most common short term complication, total of 5 (25%) patients developed wound infection. Wound infection was mainly limited to redness and serous discharge but none of them had CSF leak. Three patients (15%) had flap necrosis while only single patient (5%) had wound dehiscence.

Conclusion: We concluded that the rhomboid flap is safe and a versatile option with less morbidity and flap related complications. It is a good aesthetic solution that permits tension free closure in large neural tube defects.

Keywords: Neural Tube defect (NTD); Meningomyelocele (MMC); Rhomboid flap; Tension free repair; fasciocutaneous flap.

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INTRODUCTION

Meningomyelocele (MMC) is the most common form of open spinal dysraphism and is a defect of the spinal cord, vertebrae, and the overlying skin. It is mandatory to close the defect as early as possible in early neonatal period to reduce the frequency of infection related complications of the central nervous system. Global prevalence of

MMCs ranges from 0.8 to 1.0 in 1000 live births.¹ Closure of the defect is challenging as the tissue available is less, with high chances of wound dehiscence. Therefore, it is important to provide a stable skin cover over the defect and avoid wound related complications. Several reconstructive methods using local cutaneous, fascio-cutaneous, myo cutaneous, and graft procedures have been described.² In our study we attempt to summarize the wound characteristics and the results of wound closure with local rhomboid flaps after excision of meningomyelocele.

AIM

A decision making for wound reconstruction in large neural tube defects: Role of one sided or double sided rhomboid flaps.

MATERIAL AND METHODS

This was a retrospective study performed over 1 year from January 2021 to January 2022 in the department of paediatric surgery at a tertiary care hospital after approval from the institutional ethics committee. All the cases of neural tube defects operated during this period were included after obtaining written informed consent from each patient's parent. In this retrospective study, we reviewed a total number of 20 infants admitted to the pediatric surgery department at our center. Their age ranged between 10 days and 4 months. We classified the defect into mild, moderate and

major; mild defect was defined as defect less than 3cms in diameter, the moderate one is between 3-5cms in diameter while the major defect more than 5cms. Five infants had hydrocephalous with frontal bossing. Their hydrocephalous was treated with shunt prior to surgical repair and reconstruction of the MMC.

Data is collected regarding location of the lesion, type of lesion, ruptured or intact MMC, associated bony deformity, dimension of the defect (vertical and transverse) when one sided rhomboid flap was done, dimension of the defect (vertical and transverse) when double sided rhomboid flap was done. Dressing is opened in post operative day 5 and different complications like wound infection, flap necrosis and wound dehiscence in post operative period were noted. Data were tabulated and analysed statistically by calculating the mean and range of the data for different measures.

Operative Technique

After excision of a lesion, our aim is to close the defect in tension free manner either by primary closure or by using local flap like one or double sided rhomboid flap. Hence, in all cases of large defects where tension is expected with primary closure, we choose the later to reduce the morbidity of the patient. While raising a rhomboid flap, popularized by Limberg³, incision is given perpendicular to the long axis of rhomboidal defect which is equal in length to one of the sides of the rhomboid and a second equal incision from the end of this segment but parallel to the long axis of the rhomboid. (Fig. 1)

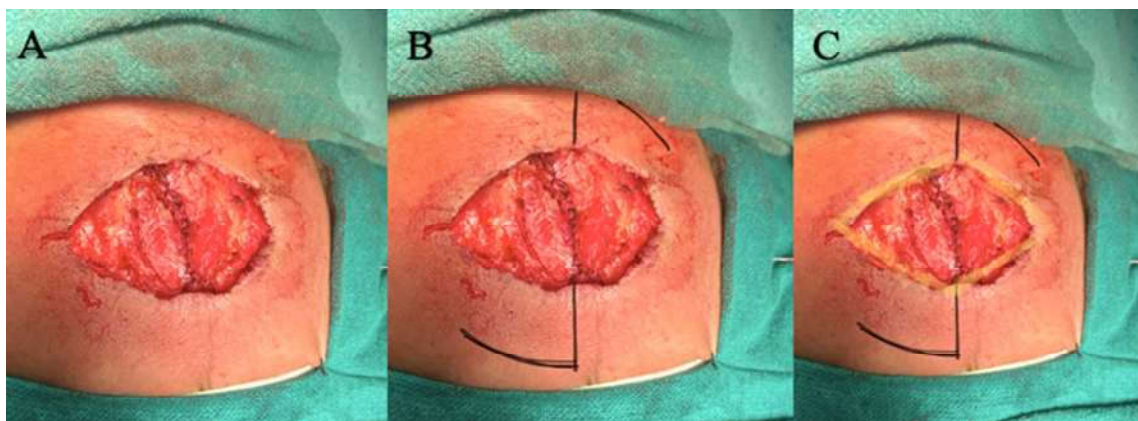


Fig. 1: Rhomboid flap Incision characteristics.

This fasciocutaneous flap is then raised and rearrangement is done so that tension free closure of the defect is achieved. (Fig. 2, Fig. 3) Rhomboid flap can be raised either on the one side or both the sides depending upon the size of defect. The

direction toward which rhomboid flap is raised depends on the location of the defect and also the availability of skin on that side. Dressing is opened on post-operative day five and different complications were noted.



Fig. 2: Final Closure after one sided rhomboid flap.

RESULTS

Patient and lesion characteristics. Table1 describes the patient and lesion characteristics.

Table 1: Patient and lesion characteristics.

Total Number of Patients Operated using rhomboid flaps	20
Males : Females	16 : 4
Mean age at surgery	68 days (10 days – 4 months)
Type of Neural tube defect	MMC (n=15, 75%), Meningocele (n=4, 20%), Rachischisis (n=1, 5%)
Location	Lumbo-sacral (n=14, 70%), Thoracic (n=5, 25%), Sacral (n=1, 5%)
Ruptured MMC	N=3, 15%
Bony deformity	kypho-scoliosis (n=1, 5%)

Wound characteristics for one sided or double sided rhomboid flaps: Table 2 summarizes the wound characteristics when one sided or double sided rhomboid flaps were used.

Table 2: Wound characteristics for one sided or double sided rhomboid flaps.

Mean dimension of the defect (vertical and transverse) when one sided rhomboid flap was used	n= 9 (4.1cms x 3.9cms) Average total surface area~16cm ² Category – Moderate defect (3-5cms)
Mean dimension of the defect (vertical and transverse) when both sided rhomboid flap was used	n=11 (6.3cms x 5.2cms) Average total surface area~32.7cm ² Category – Major defect (>5cms)

Wound complications for one sided or double sided rhomboid flaps: Table 3 summarizes wound complications when one sided or double sided rhomboid flaps were used.

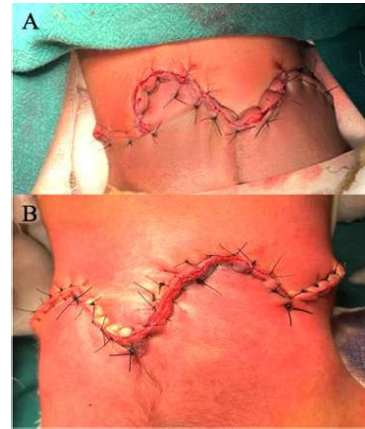


Fig. 3: Final Closure after double sided rhomboid flap.

Table 3: Wound complications for one sided or double sided rhomboid flaps (Fig. 4)

Wound Complications	One sided rhomboid flap (n=2, 22.2%)	Double sided rhomboid flaps (n=3, 27.2%)
Wound Infection	2	3
Wound dehiscence	0	1
Flap Necrosis	1	2
Mean stay in hospital (without wound complications)	7.1 days	8.6 days
Mean stay in hospital (with wound complications)	18.4 days	21.6 days



Fig. 4: Different wound complications after rhomboid flap.

Relationship of wound dimension and type of flap used (one or both sided rhomboid flap): Fig. 5 shows relationship of wound dimension and type of flap used.

<3cms	3 – 5 cms	>5cms
Mild defect primary repair	Moderate defect one sided rhomboid flap	Major defect double sided rhomboid flap

Fig. 5: Relationship of wound dimension and type of flap used.

DISCUSSION

Regardless of the variety of techniques available for the closure of MMC defects, the main aim is to achieve tension free soft tissue coverage to provide stable and durable wound healing. Different local flaps and grafts have been described with variable

results in literature.^{4,5,6} Proper preoperative planning is critical to reconstruction and will assist to shorten the operating time. Rhomboid flaps are often popularly known as Limberg flap. The main advantage of these fasciocutaneous flaps are that these flaps can be rapidly dissected, can be raised with relative ease, can cover a round defect, have lower complication rates and preserve the back muscles.^{4,7} we reviewed 20 patients with neural tube defects of different wound dimensions, out of which 9 needed one sided rhomboid flap and 11 needed double sided rhomboid flap. We have seen that in our study average dimension of the defect when one sided rhomboid flap used was 4.1cms x 3.9cms (average total surface area~16cm²) and average dimension of the defect when double sided rhomboid flap used was 6.3cms x 5.2cms (average total surface area~32.7cm²). We can see we used single or double sided rhomboid flaps when the average total surface area ranges between 16cm²-32.7cm². One sided rhomboid flap was used when one of the dimension exceeded 3cms and double sided flap was used when it exceeded 5cms. Studies like Mohammed M.A et al⁸ shows additional rotational flap is required to achieve tension free closure when wound dimension ranges average surface area of 18-80 cm² and one of the diameters exceeded 4cm. A few studies have classified the defect according to the size of one axis, thereby defining large defects as those exceeding 5cm in diameter and considering the need for additional procedures and prolonged admission after surgery.[9,10] In a recent study, Kemaloglu et al.¹¹ emphasized the importance of ratio of the dimensions of the wound in decision-making for wound closure. In our study wound infection is the most common short term complication, total of 5 patients developed wound infection. Wound infection was mainly limited to redness and serous discharge but none of them had CSF leak. Three patients (15%) had flap necrosis while only single patient (5%) had wound dehiscence. The wound healed with conservative management. Other investigators have also reported similar complication rates.^{4,11} The simplicity in the technique with low complications rate make the rhomboid flap safe and a versatile option to be used universally where adequate skin is available.¹²

LIMITATIONS

Although rhomboid flap is safe, easy and versatile with less number of complications but due to wide variability in technical aspects of surgery and complexity for individual cases, additional

large sample size, well-designed studies need to be conducted.

CONCLUSION

We concluded that the rhomboid flap is safe and a versatile option to be used universally where adequate skin is available with less morbidity and flap related complications. It is a good aesthetic solution that permits tension free closure in large neural tube defects.

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