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**ORIGINAL ARTICLE**

# Meningomyelocele and Surgical Outcome of Meningomyelocele: Single Center Study

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## ABSTRACT

**Objective:** To determine the clinical presentation, associate complication and surgical outcome of myelomeningocele repair.

**Study design**: Descriptive study.

**Place and Duration of Study**: The study was conducted at Neurospinal and Cancer care Institute, duration between 12 -03-2012 to 16-03-2019.

**Material and Methods:** Inclusion criterion was patient between age birth to 12 months having meningomyelocele with hydrocephalus or other neural tube defect. Exclusion criterion was previously operated, infected myelomeningocele (MMC). Factors such social status, folic acid intake during pregnancy, and associated anomalies were recorded on a structured proforma.

**Results**: A total 114 children were included; socio-economic status was low in 71% and poor intake of folic acid was present in 83% {p value ($p<0.05$)}. Based on position of defects, 64% was at the lumbosacral area, 20.14% were at lumbar spine area and 7.89% were thoracic. The Cerebrospinal fluid leak was observed in 3.5%, superficial wound infection in 0.87% and no mortality was observed post procedure.

**Conclusion:** Low socio-economic status and poor folic acid intake before and during pregnancy are significantly associated with MMC. Early surgical repair is associated with less post procedure complication.

**Key Words**: *Meningomyelocele, Surgical repair, Hydrocephalus, Prenatal repair*

## INTRODUCTION

Neural tube defects (NTD) is estimated to arise in 1/1000 pregnancies.[1] In Pakistan neural tube defects occurred in 3-5 per 1000 lives, births out of which 5% are meningocele, and 95% are myelomeningocele (MMC).[2] The pathophysiology is halt in the normal neural tube process resulting in neural tube defects during early weeks of life. In meningomyelocele, a fraction of the spinal cord, part of adjacent meningeal structures, protrudes externally via the defect of bony arches and skin as the covering of sac. This leads to complications related to paralysis of lower limb, bladder and bowel dysfunction, orthopedic disabilities like club foot or different leg size in proportion, structural abnormalities, postural issues, cosmetic issues.[3] Meningomyelocele etiology has multiple factors that include common genetic mutations, deficient diet, radiation, family history, maternal or paternal diabetic history, seizure history of mother and

many other.[4] With time, a strong relation of folic acid was established with MCC, if folic acid is taken at the time of conception, it can assist in prevention of such disorder in up-to 70% cases.[5] It is also observed that open NTD may have a remarkable effect on motor and cognitive impairment child grows.[6]

Management requires a multidisciplinary approach, needs proper counseling, proper diagnosis, family education and decision regarding surgical intervention.[7] Hydrocephalus is most commonly associated with MMC (83–93%). However, Hydrocephalus may develop prenatally and postnatally and it can be detected prenatally by ultrasound, post-delivery, may take many weeks or even months after the defect repair. Intrauterine repair can help to prevent Chiari malformation type II while commonly ventriculoperitoneal shunt is inserted for hydrocephalus during the same sitting or sometimes the hydrocephalus develops after few weeks post MMC repair, then surgery is planned accordingly.[8,9]

Related to operative issues postoperative cerebrospinal fluid leakage and electrolyte imbalance in meningomyelocele surgery are common obstacles in the healing process and may lead to wound dehiscence, operation by the experienced team member and good initial repair.[10]

MMC is one of the common preventable neurological diseases associated with disabilities. This can be prevented by use of folic acid before pregnancy, but it is still common in developing countries and mismanagement is common, so the aim of our study was to focus on increasing awareness regarding early intervention of MMC to improve outcome. The objective of our study was to determine the clinical presentation, associate complication and surgical outcome of myelomeningocele repair.

## MATERIAL AND METHODS

This was prospective descriptive study. The study was conducted at Neurospinal and Cancer care institute, duration between 12 -03-2012 and 16-03-2019. Inclusion criteria were patients between the ages of newborn to 12 months, having meningomyelocele may have an association with hydrocephalus or spinal disorder. Exclusion criteria were previously operated, age more than 1-year, infected meningomyelocele. Data was collected after taking consent and the ethical approval was taken from the institute. A presenting complaint and complete history, risk factors like socio-economic status and intake of folic acid during pregnancy. Neurological examination like OFC measurement, location of MMC, and size of myelomeningocele, associated limb weakness, urinary bladder and bowel problem and limb anomalies were recorded. Post-operative follow-up, up-to six months was done. MRI brain and dorsolumbar spine/lumbosacral spine were done preoperative. For data analysis SPSS version 23 was used and the mean ± Standard Deviation (SD) for quantitative data and percentage (%) for qualitative data were utilized to express the data appropriately.

**Surgical procedure:** Surgery was performed under general anesthesia, with the patient in right up position, the incision was marked in elliptical manner, after aseptic measures draping was done, local anesthesia was applied to minimize the bleed, incision was made elliptically, all non-viable skin was removed, nerve and theca were protected, under microscope while the tethered cord was checked, spina bifida was checked depending on MRI lumbosacral finding dura was closed with silk and muscle layer was closed, subcutaneous tissue was closed with vicyrl and skin was closed with skin. If patient needed shunt in same sitting, the position was supine with neck moved to right side, towel placed under shoulder, new draping was done, burr hole was made at Keen's point, while though passer lower-end was passed and then upper-end was placed in situ around 8 cm, both upper and lower-end were connected with the chamber, and lower-end was passed in abdomen with trocar and skin closed layer by layer with silk 1 or prolene 1 as shown in fig 2

## RESULTS

One hundred and fourteen children were included in our study, out of which 61 (53.5%) were male and 53 (46.4%) were female. Patients had poor socio-economic status in 82(71%), poor folic acid intake was found in 95 (83%) cases with significant p value ($p < 0.05$). The OFC over aged 38.5 cm (ranging from 31.8 cm to 49 cm), while

the location of the defect position-wise we had, 73 (64%) were at the lumbosacral area, 23 (20.14%) patients had specific lumbar area involvement and 9 (7.89%) were thoracolumbar. The meningomyelocele average size was 3.3 cm (ranging 1 cm x 2 cm to 8 cm x 7.3 cm). Considering the associated abnormalities, most prominent was hydrocephalus, found in 93 (81.5%), among 93 patients with hydrocephalus, sixty five (69.8%) presented with hydrocephalus pre-operatively and 28 (30.14%) developed hydrocephalus after post MMC repair surgery, while the other associated abnormalities were clubfoot 10 (8.8%) of MMC, 5 (4.3%) had diastematomyelia, and 8 (7.02%) had tethered cord which were treated accordingly. Cerebrospinal fluid leak was found in 04 (3.5%), superficial skin infection in 1 (0.87%) and no mortality was observed.

**Fig 1: showing huge preoperative Meningomyelocele**

**Fig 2: post-operative image Meningomyelocele**

## DISCUSSION

Although maternal folic acid intake and early diagnosis on ultrasound have reduced the rate of neural tube defect but in South Asia neural tube defect are still a common problem, required multidisciplinary approach for management includes neurosurgeon, urologist pediatrician, plastic surgeons and orthopedic and after surgical correction still multiple follow up are required and issues to be answered in such patients.

In our study 114 children were included in our study, out of which 61 (53.5%) were male and 53 (46.4%) were female associated hydrocephalus was found in 93 (81.5%). Out of 114, sixty five (69.8%) presented with hydrocephalus pre-operatively and 28 (30.14%) developed hydrocephalus after post-MMC repair. The OFC circumference was averaged 38.5 cm (ranging from 31.8 cm to 49 cm). Position-wise defects ranged from the lumbosacral area thoracolumbar area to lumbosacral. Average size of meningomyelocele was 3.3 cm (ranging 1 cm x 2 cm to 8 cm x 7.3 cm) and no mortality was observed in our study due to myelomeningocele.

In study conducted by Elbabaa et al,[11] they preferred endoscopic third ventriculostomy (ETV), which has shown better results in fetal meningomyelocele repair treatment and in patients who presented with hydrocephalus at early childhood and infancy. This resulted in lower shunting rate is in patients with successful ETV, while in contrast to our study in which we did VP shunt in our patients, 65 (69.8%) with hydrocephalus and 28 (30.14%) with post-MMC repair surgery developed hydrocephalus. Intra-uterine repair has its own risk and benefits and it is not done in most of developing countries yet.

In a study by Dupepe[12] where longer follow-up was done and revision of VP shunt cases was higher. In another study re-operation proportionately increased the rate of shunt infection[13] In comparison we did 6 months postoperative follow up and we did not observe any case of revision surgery in any infant. This difference is likely due to follow up which is longer in other studies as well as duration of surgery could lead to increased chances of infection. There are studies which have used vancomycin solution in 100ml saline to spray shunt before use to minimize the infection rate[14].

Closure of wound in larger defects is another important issue to deal with. A study by Anitha[15]

showed that there are many ways to close the wound such as musculocutaneous flaps and fasciocutaneous flaps. The differences are in reliability, operative time, and limited loss of blood. Every flap has its own pros and cons, however, author in this study preferred fasciocutaneous flaps compared to our study with larger flaps. We used modified incisions (S-shaped) while in a study by Gursoy[16] rotation/advancement fasciocutaneous flaps provided reliable single-stage reconstruction or defects related to MMC. They also stated that significant defects have chances of cerebrospinal fluid leak.

The research showed that early surgical repair of MMC decreased the complications rate. Though low-pressure VP shunts showed promising results in patients with myelodysplasia with marked dorsolumbar defects as compared to lumbo-peritoneal shunts in infants.[17] On the contrary, we used medium pressure, low profile shunt irrespective of the location to minimize the chances of complication like skin necrosis, subdural hematoma in our study.

McCarthy et al[18] analyzed that delayed hydrocephalus diagnosis during initial hospitalization resulted in an increased risk of in-patient shunt failure, in our study we did shunt simultaneously in 81.5% with MMC surgery, while seven patient developed delayed hydrocephalus, such cases were considered for ventriculoperitoneal shunt.

The study by Gurbuz[19] found no statistically significant difference among the shunt infection rates for meningomyelocele associated with hydrocephalus, if such patients underwent VP shunting simultaneously with meningomyelocele repair and those operated as early as first or second week. Further study into the possible beneficial impact of this delay with a more significant number of patients is required, while the study by Khattak et al[20] found that simultaneous VP shunting had minimal infection occurrence as compared to delayed VP shunt in infected myelomeningocele babies.

Khan et al[21] study showed that 23.7% had CSF leakage, while postoperative hydrocephalus was seen in 22.4% patients and 77.6% did not developed hydrocephalus postoperatively. In another study by Khan[22] showed that CSF leak was found in 15% and infection was found in 23% of cases compared to above both studies. Comparatively, we had CSF leak in 04 (3.5%), 1 case had a superficial skin infection (0.87%), no mortality was observed, and we had 65 (69.8%) patients presenting with hydrocephalus and 28 (30.14%) patients post-MMC repair hydrocephalus. This may be due to difference in number of patents, presentation and surgical practice which differ from hospital to hospital.

Recent surgical advances shown in many studies[23-25] have improved the surgical outcome, functional motor skill in children but such advances are still way to far from developing countries; the reason maybe the social stigma leading to lack of early diagnosis plus availability of tools.

## CONCLUSION

Low socio-economic status and poor folic acid intake before and during pregnancy are significantly associated with MMC. Early surgical repair was associated with less post-procedure complication.

**Conflicts of Interest**: No conflict of interest.

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