Original Article

A Retrospective Study on the Association Between the Timing of Shunt Placement and Shunt Infection in Hydrocephalus Associated with Myelomeningocele

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ABSTRACT

Objective: The present study aimed to investigate the association of the shunt infection in hydrocephalus associated with myelomeningocele and timing of the shunt placement.
Study Design: A retrospective study.
Place and Duration of Study: This study was conducted at the Department of Neurosurgery, Jinnah Teaching Hospital Peshawar from June 2022 to May 2023.
Materials and Methods: Simultaneous shunting, early shunting, and delayed shunting were used for the comparison of shunt infection.
Results: Of the total 34 patients, the frequency of patients underwent three different methodologies simultaneous shunting, early shunting, and delayed shunting were 12 (33.3%), 10 (27.8%), and 14 (38.9%) respectively. The incidence of shunt infection in simultaneous shunting, early shunting was 4 (33.3%) and 3 (30%) patients respectively. Patients underwent delayed shunting developed no shunt infection.
Conclusion: The present study found no significant association among the rates of shunt infection in hydrocephalus associated MMC patients underwent simultaneously and early shunting.

Key Words: Hydrocephalus associated shunting, myelomeningocele, shunt infection

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INTRODUCTION

Myelomeningocele is the most serious condition affecting the vertebral arches. The incidence rate of MMC was 0.2-2 per 1000 live births causing various clinical catastrophic symptoms such as sensory and motor abnormalities, Chiari II malformation, hydrocephalus, and genitourinary dysfunction.[1] The reported incidence of MMC-related hydrocephalus varies from 57% to 86%.[2-5] The MMC-associated hydrocephalus etiology suggested the abnormal outflow of CSF through MMC defects leads to normal CSF drainage underdeveloped.[6]

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Several studies have been reported on shunt issue associated with shunt implantations in MMC associated hydrocephalus. Due to increased probability of shunt failure and infection risk, several authors have advocated for delayed shunting following MMC repair.[7,8] These authors also emphasized that in individuals with moderate and non-progressive hydrocephalus, shunt placement may not be essential, and that superfluous shunting may be avoided.[9-11] They claim that this method allows for faster healing of the MMC wound, prevents additional brain injury that might occur with delayed shunting, and has a decreased chance of cerebrospinal fluid leakage.

Previous studies reported two techniques: a) MMC repair for concurrent shunting and b) delayed shunting. Till now, the infection rate of shunting might delay varying length has not been studied by any research. Therefore, the present study aimed to investigate the association of timing of shunt placement and myelomeningocele associated hydrocephalus shunt infection.

MATERIALS AND METHODS

This retrospective study was conducted on 36 consecutive patients underwent shunt replacement placement in the Department of Neurosurgery, Jinnah Teaching Hospital Peshawar from June 2022 to May

2023. Simultaneous shunting, early shunting, and delayed shunting were used for the comparison of shunt infection. Based on the technique utilized, we divided the participants into three groups for this study: 1) the "simultaneous shunting" (n=12) group had the VP shunt inserted at the same session as MMC repair; 2) the "early shunting" (n=10) group had the shunt installed in the first week after MMC repair; and 3) the "delayed shunting" (n=14) group had the shunt placed in the second week following MMC repair.

RESULTS

Of the total 34 patients, the number of patients underwent three different approaches: simultaneous shunting, early shunting, and delayed shunting were 12 (33.3%), 10 (27.8%), and 14 (38.9%) respectively. The incidence of shunt infection in simultaneous shunting, early shunting was 4 (33.3%) and 3 (30%) patients respectively. Patients underwent delayed shunting developed no shunt infection. There were 20 (%) male and 16 (%) females. Patient's demographics are shown in Figure-1. Table-1 represents the rates of shunt infection in all three approaches.

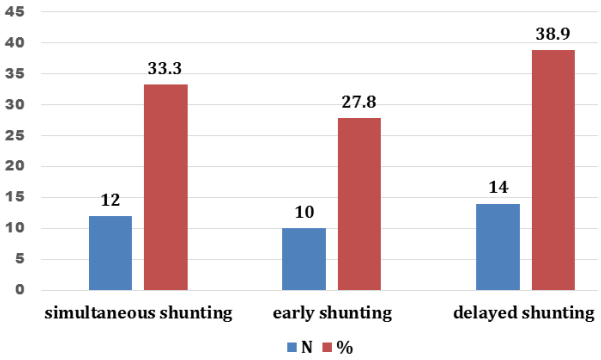

Figure No. 1: Patient's demographics (N=34)

Table No. 1: compare the rates of shunt infection in all three approaches

Infections	Simultaneous Shunting N (%)	Early shunting N (%)	Delayed shunting N (%)	P-value
Yes	4 (33.3)	3 (30)	0 (0)	0.183
No	8 (66.7)	7 (70)	14 (100)	X^2= 3.426

DISCUSSION

Hydrocephalus is one of the most prevalent and devastating consequences related to MMCs. Risk for shunt failure increases with hydrocephalus delay treatment during initial hospitalization. A long-term follow-up however reported that there were no significant difference in infection rates and shunt failure in patients with simultaneous and delay treatment. Many studies have now been conducted to assess the MMC-related hydrocephalus surgical intervention in following postnatal closure. They found 56% to 87% prevalence of VPS rates among MMC associated hydrocephalus.[12,13]

MMS significantly reduced the rates of postnatal hydrocephalus with repair VPS rate varied from 40% to 82%. At 30 months after delivery, there were less motor deficits (p = 0.007). However, these individuals had greater incidence of premature birth and uterine dehiscence.[14] Given that MMC associated with hydrocephalus was found in 5% to 25% children, it is uncertain whether VP shunting should be performed concurrently with MMC repair.[15,16]. According to the literature, there is still debate on when to place a shunt for these individuals. There is no clear guidance on whether shunting should be performed concurrently with MMC repair or as a separate procedure.

In the pediatric age group, reported incidences of VP shunt infection vary from 2% to 39%.[17] However, regardless of the technique chosen, this percentage varies from 10% to 25% in situations when hydrocephalus is accompanied with MMC.

Concurrent shunting and MMC repair increase the risk for shunt infection.[18] Oktem et al[19] found that the risk of shunt infection was 6% among patients underwent simultaneous operations. Numerous studies suggested that the CSF flow to ventricles from the lumbar area by direction reversing is known infection risk factor.[20,21]

Akalan et al[22] found that nearly 9% of 170 pediatric patients with hydrocephalus and MMC, and 13% of 166 in the Arslan et al[23] group, did not require shunt implantation. For asymptomatic individuals with moderate and stable hydrocephalus, these authors recommended diligent monitoring rather than shunting. Notably, Yilmaz et al[24] remarked that tolerating moderate ventriculomegaly and modest advancement following MMC repair would allow them to avoid excessive shunting. Our study only included kids who needed a VP shunt during the first two weeks of life following MMC repair.

Another study by AbdelFatah et al[25] reported that meningitis acquired by concurrent operations was found in 19.3% cases whereas separation session for shunt insertion was found in 9.5% cases. Coleman et al[26] reported that prior to hydrocephalus shunting, a fivefold risk for infection exist following the MMC repair as compared to delayed for 5 to 10 days. In newborns with hydrocephalus and MMC, poor skin health, weak immune system, and higher bacterial density of skin have been considered as infection related risk factors[27]. Furthermore, lower age at the time of the first shunt installation is associated with a greater risk of recurring shunt failure[28,29] In addition, MMC patients had a greater overall risk of shunt infection.[30]

CONCLUSION

The present study found no significant association among the rates of shunt infection in hydrocephalus associated MMC patients underwent simultaneously and early shunting.

Author's Contribution:

Concept & Design of Study:	Waheed Alam
Drafting:	Farooq Azam, Naeem Ul Haq
Data Analysis:	Naeem Ul Haq
Revisiting Critically:	Waheed Alam, Farooq Azam
Final Approval of version:	Waheed Alam

Conflict of Interest: The study has no conflict of interest to declare by any author.

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