ORIGINAL ARTICLE

COMPARISON OF SIMULTANEOUS VERSUS DELAYED VENTRICULOPERITONEAL SHUNTING IN PATIENTS UNDERGOING MENINGOCOELE REPAIR IN TERMS OF INFECTION

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Background: Myelomeningocele is a congenital anomaly of Central Nervous System (CNS) leading to serious sequels related to various systems and organs of the affected patient. Hydrocephalus is a common condition associated with myelomeningocele. Hydrocephalus is seen in 11.8% of children with Myelomeningocele (MMC). This study was conducted to compare the simultaneous vs delayed ventriculoperitoneal shunting in children undergoing myelomeningocele in terms of infection. **Methods**: This Randomized Control Trial was conducted at department of Neurosurgery, Ayub Medical College, Abbottabad from 7th March to 7th June 2016. In this study a total of 98 patients with MMC and hydrocephalus were randomly divided into two equal groups. In group A simultaneous MMC repair and VP shunting was performed while in group B MMC repair was done in first and VP shunting was done two weeks postoperatively. **Results:** In this study mean age in Group A was 1 years with SD±2.77 while mean age in Group B was 1 years with SD±3.12. In Group A (12%) patients had infection and (88%) whereas in Group B (20%) patients had infection and (80%) patients didn't had infection. **Conclusion:** Simultaneous VP shunting was more effective than delayed VP shunting in children undergoing myelomeningocele in terms of infection.

Keywords: Myelomeningocoele; Spina bifida; Delayed ventriculoperitoneal shunting; Infection; Complication

Citation: Comparison of simultaneous versus delayed ventriculoperitoneal shunting in patients undergoing meningocoele repair in terms of infection. J Ayub Med Coll Abbottabad 2018;30(4):520–3.

INTRODUCTION

Myelomeningocele is a congenital anomaly of Central Nervous System (CNS) leading to serious sequelas related to various systems and organs of the affected patient. Hydrocephalus is a common condition associated with myelomeningocele. Hydrocephalus is seen in 11.8% of children with Myelomeningocele (MMC).[1] Since 1970, the Ventriculoperitoneal (VP) shunt has remained as the gold standard for MMC associated hydrocephalus with VP drainage being the method of choice. Prenatal repair of myelomeningocele, the most common form of spina bifida, may result in better neurologic function than repair deferred until after delivery.[2]

The timing of repair of neural tube defect is controversial, because of risk of shunt infection. Many authors have suggested the insertion of VP-shunt and repair of MMC in one session.[3] According to such authors this will provide a rapid healing of MMC, decrease tension on wound, avoid a second surgery, hence minimizing anaesthesia complications, protecting brain from harmful effects of increased Intracranial Pressure (ICP) due to delayed shunting and also decrease duration of hospital stay, while prolonging surgery time for only 30 minutes and additional blood loss of approximately 5 ml. However, according to some authors at ventricular shunting reverse the CSF flow from the lumber region to the ventricles, therefore increasing the risk of shunt infection which is a common complication in patients undergoing MMC repair and ventricular shunt insertion in the same session observing in between the rate of approximately 3.44%.[4]

Alternate approach is delayed repair, in this procedure first MMC repair done in standard three layers fashion then wait for two weeks. After this, VP shunting done in second surgery, so two surgeries performed in this type of repair. Studies have shown that this type of surgery has high risk of infection, i.e., approximately 15.4%[5,6], as compared to simultaneous repair. Both procedures are followed by different neurosurgeons.

The purpose of this study was to find out which procedure will get low infection rate, as this is very common procedure in neurosurgery ward and its one of biggest complications is infection, so as to help neurosurgeons follow that procedure (delayed vs early) in future. This study was conducted to compare the simultaneous vs delayed ventriculoperitoneal shunting in children undergoing myelomeningocele in terms of infection.

MATERIAL AND METHODS

This Randomized Control Trial was conducted at department of Neurosurgery, Ayub Medical College, Abbottabad from 7th March 2016 to 7th June 2016. Approval from hospital ethical review board was taken before starting the study. Patients of either gender with age of 15 days to 5 years with meningomyelocoele and hydrocephalus were included in this study in a consecutive manner. Patients with infected wound or infected CSF were excluded from the study. Infection was diagnosed on the basis of clinical signs of neck stiffness, fever, poor dietary intake and on the basis of CSF RE (total proteins >40 mg/dl, sugar <40 mg/dl, Neutrophils >10). Data was collected on a proforma (of selected patients as per inclusion criteria and sampling technique) after obtaining fully informed, understood and voluntary consent of the patients, explaining the risk of infection in both cases. After that patients were randomized into two groups by using blocked method of randomization. Permutted blocks of 6 were prepared. In the case of 1st patient a block was selected by random method and first 6 patients were allocated to different procedures accordingly. After 6 patients another block was randomly selected and so on. Blocked randomization was done to ensure equal representation in both groups. Group "A" was subjected to MMC repair with simultaneous VP shunting & group "B" was subjected to MMC repair followed by VP shunting after two weeks. Data was collected by trainee himself. After patients selection, their history, examination, investigations and surgery were carried out by the consultants of neurosurgery department.

Sample size was calculated using the WHO software for sample size calculation in health studies. The formula used is hypothesis test for two population proportions (one sided test) with the following assumptions, Significance level = 5%. Statistical Power =0%, Anticipated population proportion with procedure one=12.3%[4] (infection rate) With procedure two=33.3%[4] (infection rate), total sample size was 98 (49 in each group).

Data was analysed using SPSS version 17. Quantitative variables like age was described as mean±standard deviation. Categorical variables like gender, type of repair and presence of infection was described as frequencies and percentages. Data was stratified by age and gender and analysed. Chi-square test was used at 5% significant level to know the difference between the two procedures with respect to infection.

RESULTS

This study was conducted at Neurosurgery Department, Ayub Teaching Hospital, Abbottabad in which a total of 98 patients were observed to compare the simultaneous vs delayed ventriculoperitoneal shunting in children undergoing myelomeningocele in terms of infection and the results were analysed as:

Age distribution among two groups was analysed as in Group A 37 (75%) patients were in age range <1 year, 11 (22%) patients were in age range 1–3 years, 1 (3%) patients were in age range 4-5 years. Mean age was 1 years with SD±2.77. Where as in Group B 38 (77%) patients were in age range <1 year, 10 (20%) patients were in age range 1-3 years, 1(3%) patients were in age range 4–5 years. Mean age was 1 years with SD±3.12. (Table-1)

Gender distribution among two groups was analysed as in Group A 25 (52%) patients were male and 24(48%) patients were female. Where as in Group B 27 (55%) patients were male and 22 (45%) patients were female (Table-2) Status of infection among two groups was analysed as in Group A, 6 (12%) patients had infection whereas in Group B 10 (20%) patients had infection. (Table-3) Stratification of infection with age and gender is given in table-5

Table-1: Age distribution (n=98)

Age	Group A	Group B
< 1 year	37 (75%)	38 (77%)
1–3 years	11 (22%)	10 (20%)
4–5 years	1 (3%)	1 (3%)
Total	49 (100%)	49 (100%)
Mean and SD	1 year ± 2.77	1 year ± 3.12

Group A: Simultaneous VP shunting, **Group B:** delayed VP shunting. t-test was applied to compare mean age and the *p*-value was 1.0000

Table-2: Gender distribution (n=98)

Gender	Group A	Group A
Male	25 (52%)	27 (55%)
Female	24 (48%)	22 (45%)
Total	49 (100%)	49 (100%)

Group A: Simultaneous VP shunting, **Group B:** delayed VP shunting, Chi square test was applied in which *p*-value was 0.6856

Table-3: Status of infection (n=98)

Infection	Group A	Group A
Yes	6 (12%)	10 (20%)
No	43 (88%)	39 (80%)
Total	49 (100%)	49(100%)

Group A: Simultaneous VP shunting. **Group B:** Delayed VP shunting. Chi square test was applied in which *p*-value was 0.2742

Table-4: Frequency of infection among different age groups. (n=98)

Age	Infection	Group A	Group A	*p* value
<1 year	Yes	4	6	0.5259
	No	33	32	
Total		37	38	
1–3 years	Yes	2	4	0.2690
	No	9	6	
Total		11	10	
4–5 years	Yes	0	0	0.0000
	No	1	1	
Total		1	1	

Group A: Simultaneous VP shunting. **Group B:** delayed VP shunting.

Table-5: Frequency of infection among either gender (n=98)

Age	Infection	Group A	Group A	*p*-value
Male	Yes	3	6	0.3303
	No	22	21	
Total		25	27	
Female	Yes	3	4	0.5920
	No	21	18	
Total		24	22	

Group A: Simultaneous VP shunting. **Group B:** delayed VP shunting

DISCUSSION

Myelomeningocele is a congenital anomaly of Central Nervous System (CNS) leading to serious sequelas related to various systems and organs of the affected patient. Hydrocephalus is a common condition associated with myelomeningocele. Hydrocephalus is seen in 11.8% of children with Myelomeningocele (MMC).[1]

Neural tube defects like meningocoeles and meningomyelocoeles are associated with other anomalies. Most common being Chiari malformation type II (75 %) and hydrocephalus (85.4 %).

Since 1970, the Ventriculoperitoneal (VP) shunt has remained as the gold standard for MMC associated hydrocephalus with VP drainage being the method of choice. Prenatal repair of myelomeningocele, the most common form of spina bifida, may result in better neurologic function than repair deferred until after delivery.[2]

Our study shows that mean age in simultaneous VP shunting Group was 1 years with SD±2.77 while mean age in delayed VP shunting Group was 1 years with SD±3.12. In Simultaneous VP shunting Group (52%) patients were male and (48%) patients were female. Where as in delayed VP shunting Group (55%) patients were male and (45%) patients were female. In Simultaneous VP shunting Group (12%) patients had infection and (88%) patients didn't had infection. Where as in delayed VP shunting Group (20%) patients had infection and (80%) patients didn't had infection.

Comparable results were found in another study directed by Arslan M[4] in which VP (ventriculoperitoneal) shunt position was performed onto 65 new-born children inside the initial 48 hours of postnatal and 36 babies were worked 48 hours after birth. In independent sessions, repair of MM were performed onto 29 new-born children inside the initial 48 hours of postnatal and shunting was performed 7 days after sac repair. Fourteen new-born children were performed MM sac repair 48 hours after birth, then shunt was connected 7 days after conclusion of MM. Shunt disease rate in simultaneously worked gatherings was especially high (12.3% in early surgery, 33.3% in late surgery); in separately worked gatherings' shunt contamination rate was lower (3.44% in early surgery, 14.29% in late surgery).

Miller *et al*[8] observed twenty-one new-born children experienced synchronous myelomeningocele repair and shunting, and 48 experienced consecutive techniques. The choice to shunt simultaneously with myelomeningocele repair as opposed to in a deferred design was construct principally in light of specialist inclination instead of starting head outline, which did not vary fundamentally between the two gatherings. The recurrence and kind of hydrocephalus-related complexities (e.g., wound release, cerebrospinal liquid contamination, or shunt glitch) that happened amid the initial 6 months after myelomeningocele conclusion were thought about between the two gatherings. Neither the general recurrence of confusions nor the recurrence of cerebrospinal liquid disease, shunt glitch, or symptomatic Chiari distortion contrasted essentially between the two gatherings. Interestingly, there was an altogether higher rate of myelomeningocele twisted hole in the consecutive gathering versus the synchronous gathering (eight versus zero; p= .05). Mean clinic stay for the consecutive gathering was likewise fundamentally more than the synchronous gathering (22 days versus 13 days; p= .05). These outcomes recommend that synchronous myelomeningocele repair and ventriculoperitoneal shunt insertion diminishes healing centre stay and back injury grimness in those patients with proof of hydrocephalus during childbirth, without an unreasonable increment in shunt-related complexities.

Calderelli *et al*[9] reported the shunt contamination rate as 23% in the cases who were put shunt in same session with MM sac repair; and 7% in patients embedded shunt in partitioned sessions.

Recently there has been increased interest in fetal repair of neural tube defect. A few possible advantages of the intrauterine repair had been identified. The aim of neural tube defect repair during intrauterine life are two fold. First, it limits in utero damage to the exposed spinal cord and prevents the ongoing leakage of CSF hence it could potentially normalize the intercerebral gradient and leads to improved neurological outcomes. Moreover it has been observed that patients with milder forms of neural tube defects in which the abnormal neural elements remain covered with skin or a membrane have more normal neural development than those patients with MMC.

CONLCUSION

Our study concludes that simultaneous ventriculoperitoneal shunting was more effective than

delayed ventriculoperitoneal shunting in children undergoing myelomeningocele in terms of infection.

AUTHORS' CONTRIBUTION

HAK: Conceived the idea, data collection, write-up, literature search. NG, SAK: Data collection, write-up, data analysis.GM, IK: Data collection, literature search, write-up.

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Received: 20 May, 2018	*Revised: 5 September, 2018*	*Accepted: 16 September, 2018*

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