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Research Article

FREQUENCY OF POST OPERATIVE COMPLICATIONS IN REPAIR OF MENINGOMYELOCELE, A DESCRIPTIVE CASE STUDY

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Abstract:

Neural tube defects are one of the most common congenital birth defects resulting in a significant number of physical, mental and social disabilities in the earlier years of life. Amongst the central nervous system anomalies which are reported in 31% of newborns with anomalies, meningocele (MMC) is the most common of the central nervous system defects with upto 71% occurrence.

Objectives: *Determine frequency of post-operative complications in the repair of meningocele.*

Methods: *This descriptive case series was conducted in Pakistan Ordnance Factories Hospital, Wah Cantt from January 2017 till December 2018. Total of 156 patients were included in the study who presented in neurosurgical department of POF Hospital, Wah Cantt who were suffering from meningocele were included in the study.*

Results: *Mean Age of presentation of patients was 58.58 days + 26.01 Std. deviation. 88 patients (56.4%) were males and 68 (43.6%) were females. 79 patients had size of defect < 5 cm, 68 patients had size of defect ranging from 5-10 cm and 9 patients had defect size > 10 cm in size. 21 patients (13.5%) wound showed signs of surgical site infection while 135 patients (86.5%) wounds healed satisfactorily. 37 patients (23.7%) had CSF leakage while 119 patients (76.3%) recovered completely. Post operative pyrexia was noted in 141 patients (90.4%) while 15 patients (9.6%) remained afebrile. Post operative Hydrocephalus was seen in 35 patients (22.4%) as compared to 121 patients (77.6%) with no hydrocephalus post operatively.*

Conclusion: *Early diagnosis and prompt management is key to recovery of child. Early operation without subsequent complications is the backbone of treatment.*

Key Words: *Meningocele (MMC), Post operative Pyrexia, Wound infection, Hydrocephalus, Cerebrospinal fluid (CSF) Leak.*

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INTRODUCTION:

Human disabilities are one of the leading burdens of disease upon our society. According to the 'World Report on Disability', there are more than one billion persons with a variety of disabilities which amounts to above 15% of the world population.¹ Neural tube defects are one of the most common congenital birth defects resulting in a significant number of physical, mental and social disabilities in the earlier years of life. The incidence of these anomalies is very high in the developing world, while in the western countries it has reached a steady state where no decrease is noted despite significant research into its prevention.²⁻⁴

These anomalies are the most debilitating amongst all the structural malformations and have a grave impact upon the functioning of individuals, families and communities as a consequence.^{5, 6} Amongst the affected are the families from lower socio-economic status and especially those with poor food quality and hygiene.⁷ Amongst the central nervous system anomalies which are reported in 31% of newborns with anomalies, meningocele (MMC) is the most common of the central nervous system defects with upto 71% occurrence.⁸ The incidence is reported to range from 3 to 6 per 1000 live births.^{8,9}

The current surgical guidelines advise for early repair of the meningocele defect, within 48 hours, and to shunt the hydrocephalus at right time if present concomitantly. Typically the meningocele defect is repaired within 24 to 48 hours of birth and the infant is followed closely for development of signs of hydrocephalus. In more than 70% of infants however, hydrocephalus develops early post-operatively and ultimately require shunting of CSF. Among the remaining patients, hydrocephalus may develop later at any time in life.¹⁰

A study into short term outcome of surgical management of patients with spina bifida by Khan et al reported various complications. Almost all patients experienced postoperative pyrexia, wound infection was estimated at 9%, 30% cases of cerebrospinal fluid (CSF) leakage through the wound and 21.2% of patients developed hydrocephalus. The rationale of this study is therefore to further investigate the outcome and frequencies of various complications as they occur in the early post-operative period and to determine their incidence from our population. It will provide an insight and stimulate further improvement in management of meningocele as well as management of the specific complications which arise post-operatively in these patients.

MATERIAL AND METHODS:

This descriptive case series was conducted in Pakistan Ordnance Factories Hospital, Wah Cantt from January 2017 till December 2018. Total of 156 patients were included in the study who presented in neurosurgical department of POF Hospital, Wah Cantt who were suffering from meningocele were included in the study. Patients with both genders, birth (24 hours after) and six months of age, with the diagnosis of meningocele, with a defect size of 10 cm in diameter or less were included in study. Patients with spina bifida such as encephalocele and variants of spina bifida occulta, with operated meningocele, with advanced hydrocephalous concomitant with meningocele and moribund patients who are not fit for general anaesthesia or surgery were excluded from study.

DATA COLLECTION PROCEDURE:

All patients with meningocele admitted in Neurosurgery department of Pakistan Ordnance Factories ces selected randomly through Outpatient Department (OPD). Only those patients who fulfilled the inclusion criteria were included in the study. Data was collected on a predesigned proforma (Annexure I). This proforma included information about the identity of patient like name, age, gender, address, admission number, mode of admission, location of the meningocele, size of meningocele, time of presentation and associated anomalies were recorded.

Diagnosis of meningocele was made on clinical examination. Decision regarding operative/conservative treatment was made by a Neurosurgeon. Operations were done under general anaesthesia by Neurosurgeon with above mentioned qualifications. Patient were followed post-operatively till discharge from the hospital and up to one month thereafter. The patient were assessed by a Neurosurgeon with a minimum five year experience for development of any complications like hydrocephalous, fever, wound infection and CSF leak within one month post operatively and were treated accordingly. Observation and examination were also be done by a trainee medical officer and data was recorded on a predesigned proforma. To control confounders and bias in the study results, exclusion criteria were followed strictly.

DATA ANALYSIS PROCEDURE:

Statistical Package for Social Sciences (SPSS version 20) was used to enter and analyse the data. Descriptive statistics like mean and standard deviations was calculated for quantitative variables like age. Frequency/percentage were calculated for categorical

variables like gender, defect size and postoperative complications (fever, wound infection, CSF leak, and hydrocephalous). Postoperative complications were stratified among age, defect size and gender to control effects modifiers. Post stratification chi square test was applied keeping p-value less than or equal to 0.05 was considered significant. All results were presented in the form of charts and graphs.

RESULTS:

Total of 156 patients were included in the study who presented in neurosurgical department of Pakistan Ordnance Factories Hospital, Wah Cantt suffering from meningomyelocele.

Mean Age of presentation of patients was 58.58 days \pm 26.01 Std. deviation. Minimum age at presentation was 2 day and maximum age of presentation was 134 days. (Table No. 01) Out of 156 patients 88 patients (56.4%) were males and 68 (43.6%) were females. (Table No. 02) Patients were categorized according to size of defect. 79 patients had size of defect < 5 cm, 68 patients had size of defect ranging from 5-10 cm and 9 patients had defect size > 10 cm in size. (Chart No. 01)

Rate of complications was noted among the patients. Frequency of wound infection was calculated. 21 patients (13.5%) wound showed signs of surgical site infection while 135 patients (86.5%) wounds healed satisfactorily. (Table No. 03) Post operative pyrexia was noted in 141 patients (90.4%) while 15 patients (9.6%) remained afebrile. (Table No. 04)

Frequency of Post operative CSF was also noted. Results showed 37 patients (23.7%) had CSF leakage while 119 patients (76.3%) recovered completely.

(Table No. 05) Post operative Hydrocephalus was seen in 35 patients (22.4%) as compared to 121 patients (77.6%) with no hydrocephalus post operatively. (Table No. 06)

Post-stratification results were analyzed according to age of patients, gender and size of defect. According to age of patients post stratification results showed post operative pyrexia was seen in 25 patients at age of 01-30 days, 48 patients at age of 31-60 days, 55 patients at age of 61-90 days, 11 patients at age of 91-120 days and 2 patients of age 121-150 days . Chi square test results had p value 0.991 which was insignificant. (Table No 07) Post operative CSF leak (Table No. 08), Hydrocephalus (Table No. 09) and wound infection (Table No. 10) results stratified on basis of age showed low frequencies and chi square test results were not significant.

Results were stratified on basis of gender also. Post operative pyrexia was seen in 76 patients out of 88 males and 65 females out of 68 females. Chi square test results showed p value of 0.045 which was considered significant. (Table No. 11) Similarly 27 males out of 88 had CSF leak while 10 females out of 68 had CSF leak. Chi square p value was 0.015 which was significant. (Table No. 12) Post operative Hydrocephalus (Table No. 13) and Post operative wound infection (Table No. 14) results had p value >0.05 which was not significant.

Post stratification results on basis of size of defect on post operative pyrexia; p value 0.182 (Table No. 15), CSF leak; p value 0.351 (Table No. 16), Hydrocephalus; p value 0.906 (Table No. 17) and wound infection; p value 0.427 (Table No. 18) were all not significant.

Table No. 01: Descriptive Statistics of Age of patients

	Minimum	Maximum	Mean	Std. Deviation
Age of patients (days)	2.00	134.00	58.5833	26.01711

Table No. 02: Gender Distribution of Patients N = 156

	Frequency	
Male	88	56.4
Female	68	43.6

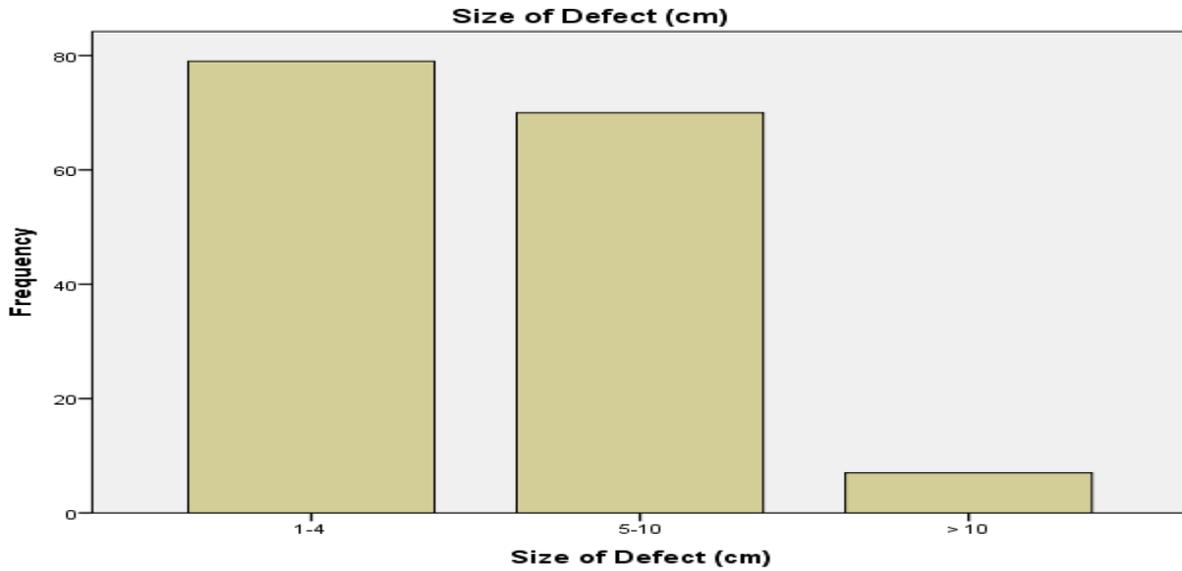


Chart No. 01: Distribution of Patients according to Size of Defect

Table No. 03: Frequency of Wound Infection among Patients

	Frequency	Percent
Yes	21	13.5
No	135	86.5

Table No. 04: Frequency of Post-operative Pyrexia among Patients

	Frequency	Percent
Yes	141	90.4
No	15	9.6

Table No. 05: Frequency of Post-operative CSF leak among Patients

	Frequency	Percent
Yes	37	23.7
No	119	76.3

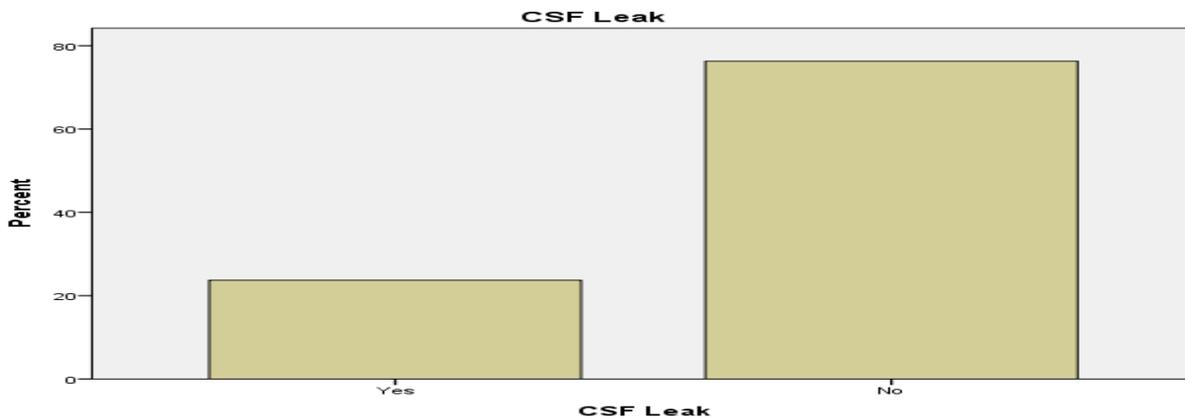


Chart No. 03: Frequency Of Csf Leak In Study Population

Table No. 06: Frequency of Post-operative Hydrocephalus among Patients

Valid	Frequency		Percent
	Yes	35	22.4
No	121	77.6	
Total	156	100.0	

Table No. 07: Post Stratification Post-Operative Pyrexia according to Age with Chi square Test

		Age of Patients (months)					P-Value
		1-30 days	31-60 days	61-90 days	91-120 days	121-150 days	
PostOp Pyrexia	Yes	25	48	55	11	2	0.991
	No	3	5	6	1	0	

Table No. 08: Post Stratification Post-Operative CSF Leak according to Age with Chi square Test N = 156

		Age of Patients (months)					P-Value
		1-30 days	31-60 days	61-90 days	91-120 days	121-150 days	
CSF Leak	Yes	6	13	13	5	0	0.549
	No	22	40	48	7	2	

Table No. 09: Post Stratification Post-Operative Hydrocephalus according to Age with Chi square Test N = 156

		Age of Patients (months)					P-Value
		1-30 days	31-60 days	61-90 days	91-120 days	121-150 days	
Presence of Hydrocephalus	Yes	6	14	13	2	0	0.853
	No	22	39	48	10	2	

Table No. 10: Post Stratification Post-Operative Wound Infection according to Age with Chi square Test N = 156

		Age of Patients (months)					P-Value
		1-30 days	31-60 days	61-90 days	91-120 days	121-150 days	
Wound Infection	Yes	4	5	8	2	2	0.008
	No	24	48	53	10	0	

Table No. 11: Post Stratification Post-Operative Pyrexia according to Gender with Chi square Test N = 156

		Post Op. Pyrexia		P-Value
		Yes	No	
Gender of patients	Male	76	12	0.053
	Female	65	3	
Total		141	15	

Table No. 12: Post Stratification Post-Operative CSF Leak according to Gender with Chi square Test N = 156

		CSF Leak		P-Value
		Yes	No	
Gender of patients	Male	27	61	0.020
	Female	10	58	
Total		37	119	

Table No. 13: Post Stratification Post-Operative Hydrocephalus according to Gender with Chi square Test N = 156

		Presence of Hydrocephalus		P-Value
		Yes	No	
Gender of patients	Male	22	66	0.382
	Female	13	55	
Total		35	121	

Table No. 14: Post Stratification Post-Operative Wound Infection according to Gender with Chi square Test N = 156

		Wound Infection		P-Value
		Yes	No	
Gender of patients	Male	13	75	0.585
	Female	8	60	
Total		21	135	

Table No. 15: Post Stratification Post-Operative Pyrexia according to Size of Defect with Chi square Test N=156

		Post Op. Pyrexia		P-Value
		Yes	No	
Size of Defect (cm)	1-4	71	8	0.182
	5-10	65	5	
	> 10	5	2	
Total		141	15	

Table No. 16: Post Stratification Post-Operative CSF Leak according to Size of Defect with Chi square Test N=156

		CSF Leak		P-Value
		Yes	No	
Size of Defect (cm)	1-4	16	63	0.351
	5-10	18	52	
	> 10	3	4	
Total		37	119	

Table No. 17: Post Stratification Post-Operative Hydrocephalus according to Size of Defect with Chi square Test N=156

		Presence of Hydrocephalus		P-Value
		Yes	No	
Size of Defect (cm)	1-4	17	62	0.906
	5-10	16	54	
	> 10	2	5	
Total		35	121	

Table No. 18: Post Stratification Post-Operative Wound Infection according to Size of Defect with Chi square Test N = 156

		Wound Infection		P-Value
		yes	No	
Size of Defect (cm)	1-4	9	70	0.427
	5-10	10	60	
	> 10	2	5	
Total		21	135	

DISCUSSION:

meningomyelocele (MMC) is one of the most common types of open neural tube defect, leading to exposure of the spinal cord to the external environment. Individuals affected by this disease may have varying degrees of motor deficit, fecal and urinary incontinence, and central nervous system changes due to the herniation of the elements of the posterior fossa into the spinal canal. This group of central nervous system malformations known as Arnold-Chiari type II malformation can lead to progressive dilation of cerebral ventricles, requiring ventriculo-peritoneal shunting (VPS) for the treatment of hydrocephalus.

Our study included 156 patients who were operated for meningomyelocele, post operatively patients were followed up for complications like pyrexia, wound infection, hydrocephalus and CSF leak. 21 patients (13.5%) wound showed signs of surgical site infection while 135 patients (86.5%) wounds healed satisfactorily. Post operative pyrexia was noted in 141 patients (90.4%) while 15 patients (9.6%) remained afebrile. 37 patients (23.7%) had CSF leakage while 119 patients (76.3%) recovered completely. Hydrocephalus was seen in 35 patients (22.4%) as compared to 121 patients (77.6%) with no hydrocephalus post operatively.

A study done in 2012, data of sixty consecutive patients with a meningomyelocele was recorded between January 2002 and December 2005. Out of total 60 patients, seven patients (11.7%) developed wound infections after meningomyelocele repair and two (3.3%) presented with sepsis unrelated to the neurosurgical procedures. Forty-six patients (76.7%) received a VP shunt and nine of them (19.6%) had VP shunt infection.⁸⁹

Closure of a meningomyelocele is a simple operation; however, meticulous technique significantly reduces operative complications. Efforts should be directed toward preserving neurological function and optimizing the subsequent repair of a tethered spine if required later on. The timely management of associated hydrocephalus will help to avoid cerebrospinal fluid leakage and wound infection/dehiscence.⁹⁰

In a study among 190 patients with meningomyelocele operated upon between 1979 and 1993 were reviewed. There were 82 boys (43.2%) and 108 girls (56.8%). The lumbar region was the commonest site of meningomyelocele in 113 patients (59.5%). Patients with cervical and sacral meningomyelocele had a

higher rate of almost normal motor function than those with meningomyelocele at other levels ($P=0.000$). Only 36 (21.7%) of 166 patients did not have hydrocephalus.⁹¹

The Nationwide Inpatient Sample (NIS) database with 7.45 million patient admissions for 2000 was retrospectively studied. Patient demographic data, length of stay, immediate disposition at the time of discharge, hospital information and total cost for the hospitalization were determined. It was surprising to note that only 35% also required VP shunt placement during the same hospitalization for developing hydrocephalus post operatively.⁹²

The Nationwide Inpatient Sample database from 1988-2010 for meningomyelocele repair was analyzed. There were 4034 hospitalizations for surgical repair of meningomyelocele. Overall, 56.6% of patients required shunt placement during the same hospital stay as for surgical repair; 95.0% of patients were routinely discharged; and the in-hospital mortality rate was 1.4%.⁹³

In a study done in 2015, following MMC closure, out of the 91 neonates, 18 (16.4%) developed meningitis/shunt infection and 12 (11%) developed surgical wound infection. Deep surgical wound infection was not correlated with the operation time or wound surface area. However, there was an intermediate but very significant positive correlation between meningitis and cerebrospinal fluid (CSF) leakage, length of hospitalization, and flap transposition ($r=0.377, 0.420, 0.357,$ and 0.503 , respectively; for all values, $p < 0.001$).⁹⁴

In a study done in 1995. both early and late complications of meningomyelocele closure were discussed with respect to predisposing factors, diagnosis, treatment, and prevention. These complications include worsened neurological level, wound dehiscence, wound infection, cerebrospinal fluid leak, postoperative ileus, symptomatic Chiari malformation, shunt infection, necrotizing enterocolitis and problems related to kyphectomy.⁹⁵

CONCLUSION:

Meningomyelocele is a congenital disorder which results in drastic morbidities, complications and even mortality in newborns. Early diagnosis and prompt management is key to recovery of child. Early operation without subsequent complications has remained the backbone of treatment. Even in developing countries with more and more resources

being introduced in health sector, good management of such children is now possible. More studies should be done throughout Pakistan reporting the complication rates, different methods of surgery and long-term outcome of patients suffering from meningomyelocele.

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