

A Study of Early post-operative wound complications of spina bifida aperta repair “Incidence and Risk Factors”

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Abstract:

Background: Myelomeningocele is the single most common congenital anomaly that affects the CNS and vertebral column. The third world countries having a higher incidence. The management is usually surgical with relative high incidence of complications.

Objectives: to evaluate the possible risk factors that may predispose to early wound complications of myelomeningocele.

Methods: This prospective study was carried out in the Surgical Specialization Hospital in Medical City Complex - Baghdad from 2009-2012. 147 cases were included in the study. Requested data were gestational age, type of delivery, gender, age at operation, type of suturing of the wound, tension of suturing, duration of operation, site of the lesion, ruptured vs non ruptured myelomeningocele, associated shunting, peri-operative stay in hospital and associated jaundice.

Result: Forty four (44 %) of the total developed complications. All premature infants developed complications. Hydrocephalic cases was associated with higher rate of complication (86%). Type of delivery, age at operation, duration of operation, ruptured cases and site of the lesion were not associated with complications.

Conclusion: Myelomeningocele was predominantly affecting female. Most of the complications were wound infection with or without dehiscence, CSF leakage or seroma.

Keywords: Neural tube defect, Hydrocephalus, Cerebrospinal fluid, Myelomeningocele.

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Introduction:

Classification of Neural tube defect: Neurulation defect (developmental *disorder* caused by the incomplete closure of the embryonic neural tube) a. Craniorachischisis: total dysraphism usually die as spontaneous abortion. b. Anencephaly: failure of fusion of the anterior neuropore, neither cranial vault nor scalp covers partially destroyed brain. Uniformly fatal. (1) c. Spinal dysraphism: failure of fusion of the posterior neuropore which can be divided in to: Spina bifida occulta: a defect of the spinous process and or associated posterior neural arch, usually thoracic or lumbar at one level only, found in 5-30% of general population having few if any clinical significance (2). Meningocele: a cystic lesion consist of meninges only containing CSF that is in continuity with that of spinal canal with no neural tissue found within the cyst, it is 1:10 as frequent as myelomeningocele and rarely associated with HCP(3). Myelomeningocele (spina bifida aperta, spina bifida cystica): a rudimentary dura and leptomeninges have developed around and attached to a malformed neural tube, this abnormal tissue is covered by a reactive gliosis and axons and cell bodies. Rostrally the spinal cord can be traced as it exits from the spinal canal, caudally the placode may end within the meninges, extend out as a thickened filum or penetrate the spinal canal and continue on its course(2). Myeloschisis or rachischisis: characterized by a placode without any encasing meninges usually oblong with open central canal constituting a median furrow and crossing

the thoraco-lumbar area (4). Postneurulation defect (migration abnormalities): Microcephalyphaly, Porencephaly, Agenesis of the corpus callosum, Dandy walker syndrome, Macrocephaly, Split cord malformation (diastomatomyelia, diplomyelia). (5) Associated Abnormalities: Approximately 20-35 % of children with myelomeningocele are born with hydrocephalus and additional 60-70 % of patient with myelomeningocele develop hydrocephalus after closure of the back lesion. Hydrocephalus can cause expansion of the ventricles and atrophy of cerebral white matter, axonal degeneration, axonal demyelination with a considerable decline in intellectual function (6,7). In few cases Hydrocephalus arrest spontaneously but in most cases ventriculoperitoneal shunting is required, ventriculopleural and ventriculoatrial shunting can be used also. Shunting Hydrocephalus can be done during the same operation for closure of myelomeningocele which can reduce the future anesthetic risk and chance of CSF leakage through myelomeningocele (8,9). Patients with Arnold-Chiari type 2 malformations may present with signs and symptoms of acute or subacute brain stem and/or upper cervical cord compression that may necessitate occipital craniectomy and cervical laminectomy (10). Orthopedic surgical intervention may be indicated for a variety of musculoskeletal problems. Intermittent catheterization may be needed for patients with urologic symptoms in patient with high bladder pressure. (11) Perioperative complications: Wound infection, Delayed wound healing, CNS infection, CSF leakage, Additional neurologic damage to the cauda equine, Hydrocephalus, Tethered cord syndrome.

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Patients and methods:

This prospective study was carried out in the Surgical Specialization Hospital in Educational Medical City Complex - Baghdad from 2009-2012. A total of 147 cases of myelomeningocele was included in the study. The data requested were: Gestational age, Type of delivery, Gender, Age at operation, Type of Suturing of the wound, Tension of the suturing, Duration of the operation, Site of the lesion, Ruptured vs non ruptured lesion, Associated hydrocephalus, Shunted vs non shunted hydrocephalus, Preoperative stay in the hospital, associated jaundice. All patients were underwent surgical excision of the abnormal skin and membrane, reconstruction of the thecal sac and skin closure under general anesthesia in a prone position. The follow up period of the patients was 30 days. Chi square was used to study the association between complications and other factors, Student (t) test was applied to compare between means. P value of less than 0.05 was considered as significant.

Results:

Table 1: Data Collection Percentage

Sex	No.	Percentage		
Male	61	41.49		
Female	86	58.51%		
Mode of delivery	No.	Percentage		
Vaginal delivery	88	59.87%		
Cesarian section	59	40.13%		
Gestational age	No.	Percentage		
Full term	140	95.24%		
premature	7	4.76%		
Site of the lesion	No.	Percentage		
Lumbar	90	61.29%		
Dorsolumbar	37	25.11%		
Dorsal	18	12.29%		
Sacral	2	1.31%		
Type of the lesion	No.	Percentage		
Ruptured	3	2.05%		
Non ruptured	144	97.95%		
Suturing technique	No.	Percentage		
Simple interrupted	120	81.63%		
Vertical mattress	27	18.37%		
Suturing under tension	No.	Percentage		
Yes	45	30.62%		
No	102	69.38%		
Associated hydrocephalus	No.	Percentage		
preoperative	101	68.72%		
postoperative	27	18.36%		
Non	19	12.94%		
Shunted hydrocephalus	No.	Percentage		
Yes	18	14%		
No	110	86%		
Complications	No.	Percentage		
Non	82	55.79%		
Wound infection	33	22.44%		
Infection with dehiscence	15	10.26%		
Infection with CSF leakage	2	1.31%		
Seroma	2	1.31%		
Infection with seroma	3	2%		
CSF leakage	10	6.89%		
Gestational age	Complications			
	Yes		No	
	No.	Percentage	No.	Percentage
Full term	56	40%	84	60%
premature	7	100%	zero	0%

* P value = 0.017

Table 2: Gender Complication and Percentage

Gender	Complications			
	Yes		No	
	No.	Percentage	No.	Percentage
Male	16	26.22%	45	37.7%
Female	46	53.48%	40	46.51%
Total	62	42.18%	85	57.82%

* P value = 0.005

Table3: Suture Technique complication and percentage

Suturing technique	Complications			
	Yes		No	
	No.	Percentage	No.	Percentage
Simple interrupted	42	35%	78	65%
Vertical mattress	17	62.9%	10	37.1%

* P value = 0.003

Table4: Associated hydrocephalus complications and percentage

Suturing under tension	Complications			
	Yes		No	
	No.	Percentage	No.	Percentage
Yes	28	62.29%	17	37.71%
No	31	30.31%	71	69.69%

* P value = 0.04

Table 5: Associated hydrocephalus Complications and Percentage

Associated hydrocephalus	Complications			
	Yes		No	
	No.	Percentage	No.	Percentage
preoperative	35	34.65%	66	65.34%
postoperative	7	25.92%	20	74.07%
Non	13	68.5%	6	31.5%
Total	55	37.42%	92	62.58%

* P value = 0.019

Table 6: Shunted hydrocephalus Complications and Percentage

Shunted hydrocephalus	Complications			
	Yes		No	
	No.	Percentage	No.	Percentage
Yes	3	15%	15	85%
No	35	31.49%	75	68.5%
Total	38	29.25%	90	70.75%

* P value = 0.01

Table 7: Jaundice Complication and Percentage

Jaundice	Complications			
	Yes		No	
	No.	Percentage	No.	Percentage
Yes	48	51.6%	45	48.3%
No	14	25.93%	40	74.07%

* P value = 0.01

Discussion:

Myelomeningocele is a single most common congenital malformation that affect the central nervous system (12, 13). In this study 61.29 % of myelomeningocele were located at lumbar region, 25.1 % were located at dorsolumbar region and 12.29 % were located at dorsal region, the finding that the predominant site was lumbar is in agreement with Tulipan et al (13), Johnson et al (14), and Bruner et al (15). Female predominance in myelomeningocele was observed in this study which is similar to that reported by Shareef (16). Complications were significantly higher among premature infant than that

of full term infants ($P=0.017$). This finding is explained by the fact that premature infants have a higher rate of lung prematurity with subsequent tissue hypoxia and they need more intensive medical interventions, which in turn increase the probability of complications like infection (17). The study revealed that a significant higher complications were reported among female than that in male ($P=0.005$). No scientific explanation could be given for this finding. Vertical mattress suturing was associated with a significant higher rate of complications (62.9%) than that sutured by simple interrupted method (35%), ($P = 0.03$). This is due to the fact that vertical mattress suturing is more likely to cause ischemia than simple interrupted suturing (17). Suturing the wound under tension associated have higher complication rate (62.29%) than those sutured not under tension (30.31%) with a P value of 0.04. It is known that suturing under tension decrease blood supply and lead to wound failure (18). The study showed that the site of the lesion has not associated with a higher complication rate ($P = 0.3$). This finding is in agreement with that of Shareef (16). It was found that hydrocephalus (whether pre-existing or post-operatively) was significantly associated with higher rate of complications especially infection ($P = 0.019$). It might be attributed to a strong association between poor wound healing and ventriculitis. Different factors may play a role in this related infection e.g. age at shunt placement, local condition of the scalp, duration of shunt surgery, use of prophylactic antibiotics and general condition of the patient. Hospital acquired infection is highly prevalent in Iraq (19), however, pre-operative hospitalization was not significantly associated with the rate of infection ($P = 0.6$), this result is consistent with that of others (20). This result may reflect the efforts of preventing hospital acquired infection (nosocomial infection), It was logic to find that patient with complications had a longer hospitalization period than those without complication. There is a significant relationship between presence of jaundice and the rate of complication ($P=0.01$). This can be explained by reduction of the enzyme Prolylhydroxylase which is involved in collagen maturation, subsequently a reduction in wound strength and delayed appearance of fibroblast and formation of new blood vessels (21).

Conclusions:

Most of the complications were wound infection with or without dehiscence, CSF leakage or Seroma. Female infants had a higher complication rate. Vertical mattress suturing was associated with a higher rate of complications (62.9%). Prematurity is significantly associated with a higher complication rate. Hydrocephalus was associated with a higher rate of complications (86%). Infants with jaundice constituted 51.6 % of those with complications. Suturing under tension associated with a higher complication rate.

Authors' Contributions:

Ali K. AL-Shalchy supervisor

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