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The Timing of Ventriculo-peritoneal Shunt Application At The Late Stage Myelomeningocele Repair

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ABSTRACT

Objective: The insertion time of the shunt used for hydrocephalus treatment is controversial for the risk of infection in patients with myelomeningocele. Many authors have reported the risk of ventriculo-peritoneal shunt infection in early myelomeningocele repaired patients (the first 3 days after birth). The aim of this study is to evaluate the VP shunt insertion time with risk of shunt infection in cases who repaired myelomeningocele sac in late stage.

Materials and Methods: In this study, 50 patients who had undergone myelomeningocele repair after the 4th day of life in our institution during the period between 2000 and 2009, were analyzed. 31 of 50 cases underwent a simultaneous shunt procedure (Group A) and the remaining 19 cases underwent a shunt operation following myelomeningocele sac repair at a different session (Group B).

Results: For all cases, the shunt infection rate was 12% while infection ratio was 9.6% in Group A, and 15.7% in Group B. Shunt infection was 6,9% in cases with myelomeningocele repaired after 10 days, while this was 23.5% in cases with repair between the 4th and 10th days.

Conclusion: The risk of VP shunt infection for late period sac repair is higher between the four to ten days than after the ten days. There was no statistically difference between the risk of infection and the timing of shunt application at late stage myelomeningocele repair.

Key words: *Hydrocephalus, Myelomeningocele, Shunt infection, Ventriculo-peritoneal shunt.*

ÖZET

Geç Dönem Myelomeningosel Onarımında Ventrikülo-Peritoneal Şant Yerleştirilmesinin Zamanlaması

Amaç: Myelomeningoselli hastalarda hidrosefali tedavisi için şant takılmasının zamanı hala enfeksiyon riski açısından tartışmalıdır. Birçok yazar ventrikülo-peritoneal şant enfeksiyon riskini erken myelomeningosel onarımı (doğumdan sonra ilk 3 günde) yapılan hastalarda bildirmişlerdir. Bu çalışmanın amacı; geç dönemde myelomeningosel kese onarımı yapılan olgularda VP şant takılmasının zamanı ile şant enfeksiyon riskini değerlendirmektir.

Gereç ve Yöntem: Bu çalışmada 2000 ile 2009 yılları arasında kurumumuzda myelomeningosel onarımı hayatın 4. gününden sonra yapılan 50 hasta değerlendirildi. Bu 50 olgunun 31 inde eş zamanlı VP şant işlemi yapılırken (Group A), geriye kalan 19 olguya myelomeningosel kese onarımı sonrasında farklı seansta VP şant ameliyatı yapıldı (Group B).

Bulgular: Tüm olgular için şant enfeksiyon oranı %12 iken, bu oran Grup A daki hastalarda % 9.6 ve Grup B deki hastalarda % 15.7 idi. 10 günden sonra myelomeningosel tamiri yapılanlardan şant enfeksiyonu % 6.9, myelomeningosel onarımı 4. ve 10. günler arasında gerçekleştirilen hastalarda ise %23.5 idi.

Sonuç: Geç dönem kese onarımı için VP şant enfeksiyon riski 4. ile 10. günler arasında, 10. günden sonrasından daha yüksektir. Geç dönem myelomeningosel onarımında enfeksiyon riski ve şant yerleştiriliminin zamanlaması açısından istatistiksel olarak fark yoktu.

Anahtar Kelimeler: *Hidrosefali, Myelomeningosel, Şant enfeksiyonu, Ventrikülo-peritoneal şant.*

The majority of the patients with myelomeningocele (MMC) will need surgical treatment for associated pathologies, like hydrocephalus (HCP). The initial step in the treatment of these children should be closure of the defect at the back. The critical time for repairing the defect to prevent the infection risk is the first 72 hours (1). And also they will be treated with ventricular shunt. The insertion time of the shunt is still controversial for the risk of infection. Many authors have addressed concerns about simultaneous repair of MMC and shunt insertion. On the other hand, other authors did not observe any differences for the infection rate between patients with a shunt placed in the same operation of myelomeningocele repair or the patients with a shunt placed after the myelomeningocele repair operation (2). In general, these literatures reported the risk of ventriculo-peritoneal (VP) shunt infection according to the insertion time, which included the patients with early MMC repair.

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In this study, we discussed that associating shunt insertion time with risk of shunt infection in cases who were treated for MMC sac in late stage.

MATERIALS AND METHODS

We analyzed the patients who had undergone myelomeningocele repair after their the 4th day of life in our institution, during the period between 2000 and 2009. Most of these patients were born at home, due to the fact that the socio-economic status in our region is low, and they turned up for a medical control at a late period, or were referred to our clinic at a late period as a consequence of other health problems. Fifty cases underwent the VP shunt procedure secondary to HCP.

These 50 cases were grouped into two:

Group A: 31 cases underwent a simultaneous shunt procedure.

Group B: 19 cases underwent a shunt procedure following MMC sac repair at a different session (Table).

Patients with MMC and HCP admitted to our clinics before 4th day of life and also cases with preoperative infection findings were excluded from this study.

When deciding on the time of the shunt procedure, the existence of evident hydrocephaly findings on physical examination and computerized brain tomography were considered. While simultaneous VP shunt was performed with myelomeningocele sac repair in cases with evident hydrocephalus on admission, the remaining cases underwent VP shunt after evident hydrocephaly findings emerged. Both groups were evaluated for shunt infection.

All cases were evaluated for infection with clinical and laboratory investigations prior to surgery. In all cases, before MMC sac repair, the MMC sac was washed out with saline solution and closed by sterile dressings soaked with fucidic acid to keep the sac wet and soft. All cases received intravenous ceftriaxone at a dose of 100 mg/kg eight hours preoperatively and intraoperatively for prophylaxis. No cases were lost on follow-up and they were followed-up minimum for six months postoperatively (mean 17 months).

RESULTS

For Group A, the operation time was between the fourth and 48th day of birth (mean 8 days). In Group B, the first operation was performed between the fourth and 37th days (mean 10 days) and the VP shunt operation was performed 11 to 118 days after the first operation (29th day on average) (Table 1).

In general, the shunt infection rate was 12% and the shunt infection occurred in 6 cases. The shunt infection occurred in 3 of 31 (9.68%) patients in Group A and in 3 of 19 (15.79%) cases in Group B. The infection risk in same session group (Group A) was less than the different session group (Group B).

In 3 cases, there was leakage of CSF through the myelomeningocele sac. Two of these three cases were in Group A, and the other one was in Group B. No shunt infection occurred in any of these three cases. The remaining cases had no CSF leakage in the pre-postoperative period.

In 4 cases (23.5%) in whom shunt infection developed, we realized that MMC repair was performed between the 4th and 10th days. 2 of 4 cases were in Group A , and the other 2 cases were in Group B. There was no significiant relation about the infection risk of the timing of VP shunt application in MMC repair performed between 4th-10th days. In the remaining 2 cases, in which shunt infections were occured, myelomeningocele sac repair was performed after the 10th days. In 1 of these 2 cases, VP shunt application was in Group A and another case was in Group B. There was no significiant relation between the infection risk and the session of shunting.

Table 1. *The timing of MMC sac repair and VP shunt insertion of all cases. Of these, 31 underwent a simultaneous shunt procedure (Group A) and 19 underwent a shunt procedure following MMC sac repair (Group B).*

Operation days	Group A		Group B		
	Number of patients	Number of infected cases (Infection time/day)	Number of patients	V-P shunt application time/day	Number of infected cases (Infection time/day)
4-10	11	2 (13/66)	10	6/11/12/12/15/17/20/30/37/48	2 (10/30)
11-15	4	-	6	10/14/20/30/58/63	1 (13)
16-20	7	-	1	14	-
21-25	2	-	-	-	-
26-30	2	-	1	21	-
31-35	2	-	-	-	-
36-40	1	-	1	118	-
>41	2	1(32)	-	-	-

There was no significant difference between the risk of the shunt infection in Group A and Group B at early or late stage myelomeningocele repair ($p>0.05$).

The diagnosis of shunt infection was established after avarage 33 days (13-66 days) in Group A and avarage 17 days (10-30 days) in Group B and all of these cases underwent revision surgery.

Only 1 patient died due to pulmonary insufficiency. This case had undergone a simultaneous operation and shunt revision for shunt infection on the 32nd postoperative day.

DISCUSSION

It is recommended that myelomeningocele repair should be performed as soon as possible after birth to minimize the risk of infection, mortality, and possible spinal cord dysfunction. Contrary to the expectations, it is not strange to encounter suprising results (3). Moreover, the first 72 hours after birth are accepted as the safe period for MMC repair (1). After this period, the infection risk is reported to be significantly high (4,5). Regarding this issue, the ratio of ventriculitis (37%) at late stage repair has been reported by McLone (6) is remarkable. There have been reports stating that no significant differences were observed for the risk of infection in timing of MMC repair (7). When our study was compared with the literature, in spite of our late repair of sac (after 3 days), our infection risk didn't have high ratio (12%). The effectiveness of new generation antibiotics is thought to play a role in this concept (8). Another controversial issue related with infection risk is the timing of the shunt operation. Three different approaches may be performed; before, at the same session, and after sac repair. Shunting before sac repair significantly increases the risk of central nervous system infection (1). In addition to the possible effects of HCP on brain parenchyma, progression caused by Chiari and the negative effects on wound healing after sac repair resulted in the widespread preference to perform shunt and sac repair at the same session in the 1980s (2, 9, 10). In these studies, it was stated that simultaneous sac repair and shunt operations caused no risk for infection. Chadduck et al. (9) reported a low risk of infection as 5% in the long-term. In following years, these results were supported with larger series (11-13). On the other hand, some authors believe that this approach results in increased risk of infection by CSF backflow from the sac into the ventricles (11). In any case, MMC is generally believed to increase shunt infection risk. In the reports of Mirzai et al. (14), the rate of shunt infection was 24%. In this study, MMC repair was performed on 47% of cases on the first day of life and it was reported that delayed repair increased the rate of infection.

Oktem et al. (15) emphasized that VP shunt placement in the same session may be more advantageous for the patient, family, and physician and also from economic view, however they believed that VP shunt insertion should be performed in another session following MMC sac repair after excluding the presence of infection, especially in cases with a perforated MMC sac.

In the present study, the shunt infection ratio was 12% in 50 cases with late-period sac repair. The most important result of our study is that the ratio of infection in cases with sac repair performed after 10 days was about 6,9%. Despite the effectiveness of the surgical technique and prophylactic antibiotics on this decrease in infection ratio, it should not be forgotten that these cases are sensitive to infections in the physiological adaptation process between intrauterine and newborn periods (16). Higher infection rates have been reported in myelomeningocele cases undergoing shunt operation in the first week after birth, than others undergoing shunts at later stages (17). In 4 cases with shunt infection, MMC repairs were performed between the 4th and 10th days after birth. This was 19% of 21 cases with MMC repair between the fourth to tenth days. Shunt infection was observed in only two cases with myelomeningocele repair after 10 days (6,9%). When all these data were linked, we consider that sac repair in addition to shunting between the fourth and tenth days, is significant for the risk of shunt infection. These results support the reports of Amiratti et al (17). In contrast to the study by Amiratti et al, we want to especially emphasize that our study only included cases with late period MMC sac repair. Considering these 21 cases, simultaneous and consecutive shunting and sac repair were not significant for the risk of infection.

In conclusion, the risk of shunt infection for late period (after the third day of the birth) MMC sac repair is higher between the 4th and 10th days. There was no statistically difference between the risk of infection and the timing of shunt application (in same or different session) at late stage myelomeningocele repair.

KAYNAKLAR

1. Cohen AR, Robinson S. Early manegement of myelomeningocele. In: McLone DG (Editor). Pediatric Neurosurgery. ed 4, Philadelphia: W.B. Saunders, 2001: 241-259.

2. Epstein NE, Rosenthal AD, Zito J, Osipoff M. Placement and myelomeningocele repair: simultaneous vs sequential shunting. Review of 12 cases. Childs Nerv Syst 1985; 1: 145-147.

3. Heimburger RF. Early repair of myelomeningocele (spina bifida cystica). J Neurosurg 1972; 37: 594-600.

4. Charney E, Weller S, Sutton L, Bruce DA, Schut LB. Management of the newborn with myelomeningocele: Time for a decision – making process. Pediatrics 1985; 75: 58-64.

5. Gaskill SJ. Primary closure of open myelomeningocele. Neurosurg Focus 2004; 16: 2-15.

6. McLone D. Care of the neonate with a myelomeningocele. Neurosurg Clin North AM 1998; 9: 111-120.

7. Brau RH, Rodríguez R, Ramírez MV, Gonzalez R, Martinez V. Experience in the management of myelomeningocele in Puerto Rico. J Neurosurg 1990; 72: 726-731.

8. Akalan N. Spinal acık ve kapalı orta hat birlesim anomalileri. In: Aksoy K (Editor). Temel Norosirurji. 1. Baskı, Ankara: Turk Norosirurji Dernegi Yayınları, 2005: 1364-1373.

9. Chadduck WM, Reding DL. Experience with simultaneous ventriculo-peritoneal shunt placement and myelomeningocele repair. J Pediatr Surg 1988; 23: 913-916.

10. Hubballah MY, Hoffman HJ. Early repair of myelomeningocele and simultaneous insertion of ventriculoperitoneal shunt: technique and results. Neurosurgery 1987; 20: 21-23.

11. Machado HR, Oliveira RS. Simultaneous repair of myelomeningocele and shunt insertion. Childs Nerv Syst 2004; 20: 107-109.

12. Miller PD, Pollack IF, Pang D. Comparison of simultaneous versus delayed ventriculoperitoneal shunt insertion in children undergoing myelomeningocele repair. J Child Neurol 1996; 11: 370-372.

13. Parent AD, McMillan T. Contemporaneous shunting with repair of myelpmeningocele. Pediatr Neurosurg 1995; 22: 132-135.

14. Mirzai H, Ersahin Y, Mutluer S, Kayahan A. Outcme of patients with meningomyelocele. The Ege University experience. Childs Nerv Syst 1998; 14: 120-123.

15. Oktem IS, Menku A, Ozdemir A. When Should Ventriculoperitoneal Shunt Placement Be Performed in Cases with Myelomeningocele and Hydrocephalus? Turkish Neurosurgery 2008; 28: 387-391.

16. Tobias S, Peter R, Karen S. Neonatal immune responses to coagulase-negative staphylococci. Curr Opin Infect Dis 2007; 20: 370-375.

17. Ammirati M, Raimondi AJ. Cerebrospinal fluid shunt infections in children. A study on the relationship between the etiology of hydrocephalus, age at the time of shunt placement, and infection rate. Childs Nerv Syst 1987; 3: 106-109.

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