Ventriculoperitoneal Shunt Placement Complications and Shunt Displacement

VENTRİKÜLOPERİTONEAL ŞANT UYGULAMA KOMPLİKASYONLARI VE ŞANT REVİZYONU

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Summary

Eventhough hydrocephalus is known for a long time neurosurgeons have still faced to various problems in the treatment and follow up. Ventriculoperitoneal shunting has been the most used technic. But problems such as overdrainage, inadequate drainage, infection, and obstruction causes a high incidence of revision.

In this article we studied the factors causing increased revision rate in the patiens admitted to the Neurosurgery Clinic of Yüzüncü Yıl University.

Thirty-two patients were operated on with the diagnosis of hydrocephalus, and 10 patients had 12 revisions. It was concluded that; shunting a neonate, presence of additional neurological congenital abnormalities such as meningomyelitis, presence of infection in the preshunting period eventhough it has been treated, increases the risk of shunt revision.

Key Words: Hydrocephalus, Shunt revision, Ventriculoperitoneal shunt

T Klin J Med Sci 2000, 20:11-13

Özet

Hidrosefali uzun yıllardır bilinmesine rağmen hala tedavi ve takibinde pek çok sorunla karşılaşılmaktadır. Ventriküloperitoneal şant uygulaması en sık kullanılan tedavi şeklidir. Fakat, aşırı drenaj ve tıkanma gibi nedenlerden dolayı revizyon insidansı fazladır. Bu çalışmada Yüzüncü Yıl Üniversitesi Tıp Fakültesi Nöroşirürji Anabilim Dalında hidrosefali tanısı ile tedavi ve takibi yapılan 32 hasta değerlendirildi. 12 revizyon ameliyatı gerektiren 10 hastada revizyon sebebi tartışıldı. Sonuçta, hastaların yenidoğan döneminde olmaları, şant takılmadan önceki dönemde santral sinir sistemi enfeksiyonu nedeni ile tedavi görmüş olmaları, hidrosefali ile beraber ek santral sinir sistemi anomalilerinin varlığı revizyon insidansını arttırıcı etkenler olarak görüldü.

Anahtar Kelimeler: Hidrosefali, Şant revizyonu, Ventriküloperitoneal şant

T Klin Tıp Bilimleri 2000, 20:11-13

Hydrocephalus is now the most commonly treated problem in pediatric neurosurgery and the cerebrospinal fluid (CSF) shunt is the neurosurgical procedure with the highest incidence of complications. Complications in CSF shunting have received considerable attention and many articles have been written about them, yet controlled clinical trials are lacking in many areas of management. Consequently many management decisions are reached on the basis of empiric observation or past experience. The purpose of this article is to highlight our experience in complications and revision rate of CSF shunting (1,2).

Geliş Tarihi: 07.10.1998

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Materials and Methods

Data obtained from the files of the patients were summarized in Table 1. All of the patients were operated on by the same surgeon and as a first case in the operating room. 10 patients underwent ventriculoperitoneal shunting with, the diagnosis of hydrocephalus. During two years' follow up period 12 revisions have been performed because of shunt malfunction. Half of the patients were female. 4 patients were in the neonatal period when they were

Table 1. Clinical data of the patients

	age-sex	additional pathology	previous infection	postop. infection	Revision #	outcome	follow up
1	NB-M	Operated MM	absent	Absent	1	good	7 m. ex.
2	14y-M	absent	absent	Absent	1	good	2 y
3	4 m-F	Operated MM	absent	Absent	1	good	1 m
4	NB-M	Operated MM	absent	Absent	1	good	3 m
5	NB-F	Operated MM	absent	Absent	1	good	8 m
6	5y-M	absent	TbcMen	TbcMen	2	good	5 m
7	8y-F	absent	absent	Absent	2	good	13 m
8	14y-M	absent	infect. Liver abscess	shunt infect.	1	Exitus	1 m
9	7y-F	Post fossaTm.	absent	Absent	1	good	2 y
10	NB-F	Operated MM	absent	Absent	1	good	6 m

M: Male, F: Female, MM: meningomyelosel, NB: Newborn (<1 m), y.: year, Tm: tumor, Men:meningitis, Tbc: tuberculous, infect.: Infection

operated on. One of the patients had been shunted in another neurosurgery center. This patient have been sent to our clinic with the diagnosis of subdural effusion, liver abscess and sepsis secondary to ventriculoperitoneal shunting. He died during the follow up in our clinic. Three patients died because of the reasons other than hydrocephalus after their treatment were completed and they were discharged. Half of the hydrocephalic patients in our series had also spinal dysraphism and operated on for meningomyelocele or meningocele. All but two of our patients were operated on once in their follow up period for shunt malfunction. The two patients were operated on twice for shunt malfunction and one of the had hydrocephalus secondary to tuberculosis meningitis.

Discussion

Hydrocephalus has been the focus of more dedicated study and investigation than perhaps any other condition afflicting the human nervous system. For many centuries patients with hydrocephalus had limited expectations for survival. With modern cerebrospinal fluid (CSF) shunts, normal learning and intelligence is now possible and patients are able to enjoy full participation in all facets of life (1,3). Diversion of CSF to extracranial absorption reservoirs was first attempted in the last century. After usage of many kind of diversion techniques in the first half of this century early ventriculoatrial shunts were successful, but diversion to the peritoneal cavity has evolved as the treatment of choice for hydrocephalus (2,4). Even though diagnosis and follow up of patients with hydrocephalus have been facilitated by the imaging revolutions of the past two decades: the availibility of high resolution ultrasound, computed tomography, and magnetic resonance imaging. The development of effective shunts represents a landmark achievement in neurosurgery. The natural history of untreated hydrocephalus is disabling disfigurement and retardation that heralded a bleak future for a great majority of infants with hydrocephalus before the development of effective shunts. However, this success has been tempered by a high incidence of serious complications that accompany the diversion of CSF. Many of these complications results in the shunt displacement and renewal (5-7). Some of the complications which result in shunt revision are proximal obstruction, valve related obstructions, distal or peritoneal cathater obstructions, internal and external obstructions, overdrainage, pneumocephalus, and rarely metastases.

Obstruction

Eventhough shunt obstruction is frequently cited as the most common source of shunt failure, there are relatively few reports that focus on shunt obstruction. Shunt obstruction can be considered in 3 categories (5).

1) proximal obstruction (ventricular catheter): It is the most common site of obstruction. It almost accounts half of the ventriculoperitoneal shunt revisions. Choroid plexus, brain debris, fibrin and clotted blood are most frequent causes for ventricular catheter obstruction. Disconnection can serve as a cause of ventricular catheter dysfunction. As with any other portion of occluded shunt, the treatment of an occluded ventricular catheter involves removal and replacement with a functional catheter.

2) distal obstruction (peritoneal catheter): With modern ventriculoperitoneal shunts, distal obstruction is seen principally in the settings such as; improper placement at the time of initial shunt placement, low-grade infection with intraabdominal loculation or pseudocyst formation and disconnection, migration, or withdrawal of the catheter from the peritoneum.

3) valve obstruction. The greatest propensity for valve occlusion ought to involve those cases where CSF protein is elevated. Yet there appear to be few reported data to support this commonly held belief that high CSF protein is predictive of valve failure.

Infection of CSF shunts is a common complication that often has devastating consequences. The incidence ranges from 3% to 29% and the mortality from shunt related ventriculitis is 30% to 40%. Success in the treatment is often difficult, requires extended treatment. Furthermore, seizures, cognitive deficiences, and psychomotor retardation have been noted in patients who are succesfully treated. Overdrainage which is another complication in ventriculoperitoneal shunting, is seen in 10% to 12% of all shunted patients. It may cause subdural hematoma, premature suture closure, silvian aquaduct stenosis and slit ventricle syndrome (8-12).

REFERENCES

1. Lyons AE. Hydrocephalus first illustrated. Neurosurgery 1995; 37:511-2.

2. Aronyk KE. The history and classification of hydrocephalus. Neurosurg Clin Am 1993; 4:599-610.

3. Shinnar S, Gammon K, Bergman EW, et al. Management of Hydrocephalus in infancy: Use of acetazolamide and furosemide to avoid cerebrospinal fluid shunts. J Pediatr 1985; 107:31-7.

4. Jones RFC, Currie BG, Kwok BCT. Ventriculopleural shunts for hydrocephalus: A useful alternative. Neurosurgery 1988; 23:753-5.

5. Faulhauer K, Schmitz P. Overdrainage phenomena in shunt treated hydrocephalus. Acta Neurochir 1978; 45:89-101.

6. Hakim S, Adams RD. The special clinical problem of symptomatic hydrocephalus with normal CSF pressure. J Neurol Sci 1965; 2:307-27.

7. LeMay M, Hochberg FH. Ventricular differences between hydrostatic hydrocephalus and hydrocephalus ex vacuo by CT. Neuroradiol 1979; 17:191-5.

8. Sato O, Bering EA. Extraventricular formation of cerebrospinal fluid. Brain Nerv 1967; 19:883-5.

9. Lorenzo AV, Page LK, Wlaters GV. Relationship between cerebrospinal fluid formation, absorbtion, and pressure in human hydrocephalus. Brain 1970; 93:679-92.

10. Stein SC, Schut L. Hydrocephalus in myelomeningocele. Child's Brain 1979; 5:413-9.

11. Epstein NE, Rosenthal RD, Zito J, et al. Shunt placement and myelomeningocele repair: simultaneous vs. sequential shunting. Child's Nerv Syst 1985; 1:145-7.

12. Winn HR, Mayberg RM. Hydrocephalus. Neurosurg Clin North Am 1993; 4(4):599-734.