**Summary**

Even though 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 patients 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 even though it has been treated, increases the risk of shunt revision.

**Key Words:** Hydrocephalus, Shunt revision, Ventriculoperitoneal shunt

**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 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).
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 ven-triculoatrial 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 availability 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 catheter 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 re-
visions. Choroid plexus, brain debris, fibrin and
clotted blood are most frequent causes for ventric-
ular catheter obstruction. Disconnection can serve
as a cause of ventricular catheter dysfunction. As
with any other portion of occluded shunt, the treat-
ment of an occluded ventricular catheter involves
removal and replacement with a functional catheter.

2) distal obstruction (peritoneal catheter): With
modern ventriculoperitoneal shunts, distal obstruc-
tion is seen principally in the settings such as; im-
proper placement at the time of initial shunt place-
ment, low-grade infection with intraabdominal loc-
ulation 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 complica-
tion that often has devastating consequences. The
incidence ranges from 3% to 29% and the mortal-
ity from shunt related ventriculitis is 30% to 40%.
Success in the treatment is often difficult, requires
extended treatment. Furthermore, seizures, cogni-
tive 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
aqueduct stenosis and slit ventricle syndrome (8-
12).

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