



Predictors of Ventriculoperitoneal Shunt Revision

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Introduction

- Idiopathic normal pressure hydrocephalus (NPH) is defined by the presence of enlarged ventricles, symptoms, but without elevated intracranial pressure.
- Classic triad of hydrocephalus symptoms include: gait imbalance, cognitive decline, and urinary incontinence.
- Ventriculoperitoneal (VP) shunt is one of the mainstay definitive treatments of NPH.
- Up to 35% of patients experience complications following shunt placement, including hemorrhage, seizures, infection, shunt malfunction, and over/underdrainage.
- 32-46% patients require a shunt revision within a year, and 70-80% require at least one shunt revision in their lifetime.
- Two studies suggest that male gender and young age (<19 years) are correlated with higher risk of shunt revision (Reddy GK 2012; Wu Y et al 2006).
- Few studies have focused on idiopathic NPH or looked at the correlation between baseline symptoms and the risk of future shunt revision.

Methods

- We retrospectively reviewed 423 patients diagnosed with idiopathic NPH and treated with VP shunting between 01/1993 and 12/2013.
- Patients missing info on shunt revisions were excluded.
- Demographic information (age, sex), baseline characteristics (co-morbidity index, symptoms), prior treatment, and causes of complications were recorded.
- Co-morbidity index was based Keifer et al. (2006).
- Prior treatments included VA shunt, LP shunt, VP shunt, ETV, and IVC.
- The primary outcome was number of revisions. Secondary outcome was time to first revision.
- Demographic and baseline information were compared with the need for revision and number of revisions.
- Chi squared test was used to compare categorical variables; Student's t test was used to compare continuous variables.
- Logistic regression analysis was used to study the association between the baseline symptoms and revision.

Results

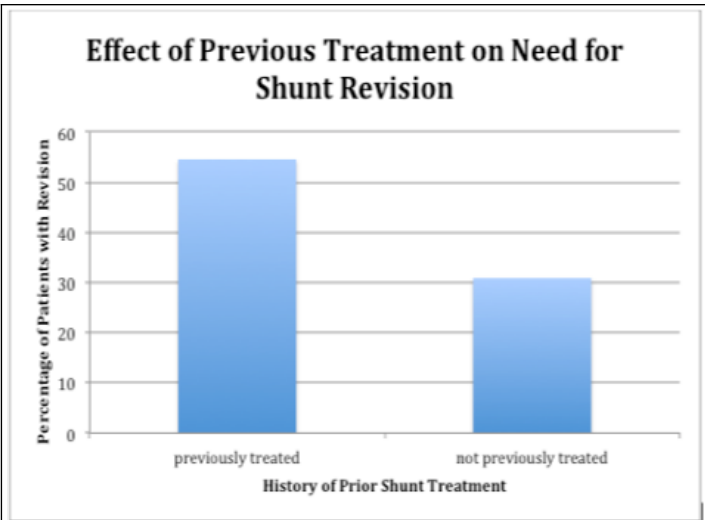


Figure 1: Patients who were previously treated prior to VP shunt placement at JHMI were significantly more likely to require a revision (OR = 2.15, p=0.018).

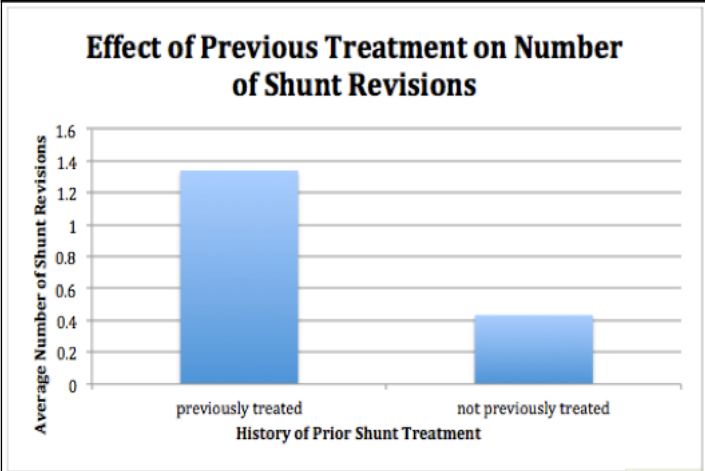


Figure 2: Patients treated prior to VP shunt placement at JHMI were significantly more likely to receive 1.12 more revisions than those without prior treatment (p<0.001).

- 401 patients with idiopathic NPH treated with VP shunting at JHMI were included, with 225 (56.1%) males, average age of 70.0 (± 14.6).
- Keifer's co-morbidity index was not associated with the need for shunt revision (p>0.05).
- Patients with presenting symptom of nausea were 3.8 times more likely to require shunt revision (p=0.004).
- Patients who were previously treated before VP shunt placement at JHMI were twice as likely to require a shunt revision (p=0.018), and received 1.12 more revisions (p<0.00005).

Limitations

- Retrospective study limited to one center.
- Need for revision is based on physician's clinical judgment without strict objective criteria.
- Prior treatment could not be stratified by type due to small sample size.

Conclusions

- Patients who received treatment prior to VP shunt placement were more likely to require shunt revision and undergo more shunt revisions than those who didn't.
- Prospective multi-centric studies are required to generalize these results.

Learning Objectives

By the conclusion of this session, participants should be able to 1) Identify an effective treatment for communicating hydrocephalus 2) Describe various factors associated with a higher risk of VP shunt revision and 3) Understand the results of the present study in the context of existing research on hydrocephalus management.

References

Reddy, GK. (2012). "Ventriculoperitoneal shunt surgery and the risk of shunt infection in patients with hydrocephalus: long-term single institution experience." *World Neurosurg* 78(1-2):155-63.
Wu Y. et al. (2007). "Ventriculoperitoneal shunt complications in California: 1990 to 2000." *Neurosurgery* 61(3):557-562.
Kiefer M. et al. (2006). "Outcome predictors for normal-pressure hydrocephalus." *Acta Neuro Suppl.* 96:364-367.