**Commentary**

Hydrocephalus has been observed as one of the most common pediatric neurosurgical conditions [1]. Due to progressive nature, if not treated in time, hydrocephalus can lead to significant disability and mortality [2]. Globally hydrocephalus is most commonly and traditionally treated with cerebrospinal fluid diversion with ventriculoperitoneal (VP) shunt insertion [3]. Despite its effectiveness VP shunt placement has significant shunt device as well as disease related complications. Most commonly observed complications include shunt obstruction, infection, dislocation, breakage and functional failure such as overdrainage [4,5].

Endoscopic third ventriculostomy (ETV) is another method of treatment with the advantage of cost-effectiveness and also devoid of shunt device complications [6,7]. But due to its limitations of questionable effectiveness in certain etiologies, unavailability of expertise and requisite of advanced imaging make this modality less preferred choice of surgery [8,9].

Contrary to preexisting traditional shunt related studies, this study not only analyzed etiologies (Table 1) shunt complications and contributing factors but also observed shunt survival as well (Figure 2).

This study reports a retrospective data of 6 years from 2006 to 2011 (Figure 1). Experience with hydrocephalus and its management with VP shunt surgery of a single center in a developing country was observed. Special effort was made to retrieve a detailed data pertaining to initial patient encounter before shunt surgery to the last outpatient follow-up or inpatient activity. All of the patients included in the study underwent VP shunting only, the primary modality of treatment available at this center.

### Table 1: Etiologies of hydrocephalus with shunt malfunction (*Other than bacterial or tuberculous meningitis*).

| Etiology                        | Patients (n=113) | Patients with shunt malfunction (n=26) | p-value |
|---------------------------------|------------------|---------------------------------------|---------|
| Congenital hydrocephalus        | 22 (19.5%)       | 6 (23.1%)                             | 0.596   |
| Brain tumor                     | 16 (14.2%)       | 1 (3.8%)                              | 0.084   |
| Post-cranial surgery            | 15 (13.3%)       | 3 (11.5%)                             | 0.766   |
| Spinal dysraphism               | 15 (13.3%)       | 3 (11.5%)                             | 0.766   |
| Bacterial meningitis            | 11 (9.7%)        | 5 (19.2%)                             | 0.063   |
| Tuberculous meningitis          | 9 (8.0%)         | 2 (7.7%)                              | 0.953   |
| Idiopathic                      | 6 (5.3%)         | 2 (7.7%)                              | 0.537   |
| Post-meningitis*                | 4 (3.5%)         | 0 (0%)                                | 0.266   |
| Intraventricular hemorrhage     | 3 (2.7%)         | 1 (3.8%)                              | 0.867   |
| Traumatic brain injury          | 2 (1.8%)         | 0 (0%)                                | 0.435   |
| Aqueductal stenosis             | 2 (1.8%)         | 1 (3.8%)                              | 0.36    |
| Arnold-Chiari malformation      | 2 (1.8%)         | 0 (0%)                                | 0.435   |
| Vascular malformation           | 1 (0.9%)         | 0 (0%)                                | 0.583   |
| Intracerebral hemorrhage        | 1 (0.9%)         | 0 (0%)                                | 0.583   |
| Dandy-Walker malformation       | 1 (0.9%)         | 0 (0%)                                | 0.583   |
| Arachnoid cyst                  | 1 (0.9%)         | 1 (3.8%)                              | 0.066   |
| Encephalocele                   | 1 (0.9%)         | 1 (3.8%)                              | 0.066   |
| Congenital hygroma              | 1 (0.9%)         | 0 (0%)                                | 0.583   |

Figure 1: A flow diagram depicting the selection of patients for inclusion in the final analysis along with a summary of the etiologies and types of hydrocephalus and subsequent initial and revision ventriculoperitoneal shunt insertion.
Emphasis to VP shunt survival was given to find median time to first shunt failure and various factors contributing to early shunt failure. This type of approach makes our study one of the uplifting reports newly added to the literature of pediatric hydrocephalus.

Elaborate use of Kaplan–Meier survival curves showed shunt failure rates of 18.58% and 20.35% at 1 year and 500 days, respectively. Miscellaneous factors contributing to early shunt failure such as certain etiologies of hydrocephalus, presence of meningitis, congenital anomalies (Figure 3), past history of mass lesion and mass excision, contributed to low rate of shunt complications in our study. This same observation was reported by Oktem et al. [10]. It should pave the way for neurosurgical centers to adopt this strategy in practice after carefully evaluating cost and feasibility. Interestingly, we also observed that strict aseptic surgical techniques and availability of expertise played a huge role in reducing the incidence of shunt malfunction.

Through being conducted in a developing country setting and owning certain shortcomings such as missing data and patients lost to follow up, is one of the few from the South Asian countries that comprehensively assessed numerous determinants of VP shunt survival in pediatric patients.

Based on our experience we encourage readers to establish rigorous periodic evaluation of post-shunt surgery status of patients and shunt function in outpatient setting, especially those at high risk for shunt failure. This will help in documentation of clinical progress and timely intervention. We hope that hydrocephalus and shunt research in future will avidly consider the impact of prematurity and congenital abnormalities on shunt survival.

References

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