Letter To The Editor

Intraoperative Cerebrospinal Fluid Sample from First Ventriculoperitoneal Shunt Operation: Is it Indicated?

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Dear Editor,

We read with interest two articles on neurosurgical infections in Hospital Kuala Lumpur in the *Malaysian Journal of Medical Sciences* published in 2010 with the title "The Risk Factors of External Ventricular Drainage-Related Infection at Hospital Kuala Lumpur: An Observational Study" by Omar and Mohd Haspani (1) as well as another article in the January 2011 issue of the same journal titled "A randomised control trial on the use of topical methicillin in reducing post-operative ventriculoperitoneal shunt infection" written by Theophilus and Adnan. Therefore, we would like to add further comments on a brief study of ventriculoperitoneal (VP) infections done in a tertiary university hospital during the same period (2).

Cerebrospinal fluid (CSF) sample is routinely performed in neurosurgical patients, generally to confirm any evidence of intracranial central nervous system (CNS) infection and for follow-up on patients who already on treatment. Commonly performed tests on CSF fluid analysis include protein and glucose levels, cell counts and differential, microscopic examination and culture (3). In the institution where this study was done, intraoperative CSF sampling is a routine procedure following ISO 9001 standards.

We reviewed retrospectively all the first VP shunt procedure performed by multiple surgeons from April 2005 until July 2011 in Hospital Universiti Sains Malaysia of whom 101 patients were included in the study. The study subjects had no history of previous neither intracranial operation nor CNS infection, and they were all followed- up within a one-year period. The male-to-female ratios of the patients were 47:54 and 56 of them were less than 16 year-old (55.6%). Right sided VP shunt was the preferred site (86, 85%). Congenital hydrocephalus became the most common indication for the procedure (48, 47.5%). From 101 CSF samples included in the study, there was significant difference between the age at insertion of first VP shunt and indications for the procedure ($P = 0.009$). 90.1% (91) had white cells count (WCC) less than 6 (not significant), 3.0% (3) had a significant sample, and 6.9% (7) had no sample taken ($P < 0.001$).

When analysing the second CSF samples, eighteen samples were collected; 12.9% (13) had negative samples, and 5% (5) became significant. 82% (83) did not have a repeat CSF samples. Comparing these two samples, they were also statistically significant ($P < 0.001$). Three patients who had significant results from the first sample, two of them did not have to repeat CSF samples. From 91 patients who had negative first CSF sample, 81% (74) did not have repeat sample, 13.2% (12) who had repeat sample came back negative and only 5.5% (5) came back significant. These CSF sampling indications were based on clinical evidence of surgical site infection (9, 53%); fever (7, 47%); seizure (4, 23.5%); sepsis (3, 17.6%) and one patient had a query of shunt malfunctioning from a post-operative CT finding. Five samples came back significant; all of them were commenced with antibiotics and 4 of them required shunt revisions. Futhermore, we noticed in these samples were positive for microorganisms on CSF culture and sensitivity. Six of them were gram-positive cocci (*Staphylococcus* sp.) and one was gram-negative bacilli (*Chryseobacterium meningosepticum*). Three of them had a normal WCC. All were treated with antibiotics and 6 of them had revision of shunts.

Intracranial CNS infection is defined as a positive CSF culture on the day that the sample was obtained (4). The term contamination was used when a patient had only one positive CSF culture for a common skin pathogen, the results of the consecutive samples were negative, and no treatment had been started (5). All of our patients who had intraoperative CSF samples taken had no organism seen on culture. Only three of them showed positive CSF sample, but no treatment had been started. Therefore, assumed this might have to be due to sampling contamination.

Normal CSF WCC contains between 0–4/μL (6) and up to 5/mm^3 in adults (3) and

20/mm^3 in newborns (7). Tulipan and Cleves (8) used the value of CSF WCC greater than 40/mm^3 as the significant finding and correlated with shunt infection. This was quite high in comparison to our value (> 6/ mm^3 was significant). If we used the same value as in the above study, only two significant results were noted on each CSF sample. This might have led to misdiagnosis and delayed in patient's management and treatment.

There are no established published criteria for intraoperative CSF sample taken from patients who underwent first VP shunt, especially when there was no history of previous intracranial CNS infection. A further prospective study should be done to further evaluate the criteria for intraoperative CSF sampling as the diagnosis of any infection can only be established by either a positive culture or when clinical signs are found and therapy is started and increased WCC, elevated protein and/or decreased glucose in CSF are found, as defined by the Centers for Disease Control and Prevention (9). Future study protocols must take heed that ventricular CSF may show lower WCC than lumbar CSF, and the WCC can be different with various microorganisms.

Conflict of Interest

None.

Fund(s)

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