

Letter to Editor: Post-Traumatic Hydrocephalus

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Dear Editor,

We read the recent article: "An Observation Study of Blood Glucose Levels during Admission and 24 Hours Post-Operation in a Sample of Patients with Traumatic Injury in a Hospital in Kuala Lumpur" published in the *Malaysian Journal of Medical Sciences*, Volume 18, Issue 4, 2011. We note the higher incidence of severe head injury in the publication (1). Therefore, we would like to add further comments on post-traumatic hydrocephalus.

We recently did a retrospective cohort study where in the respondents involved patients who were diagnosed and treated for post-traumatic hydrocephalus in Hospital Sultanah Aminah for the 4 years period 2008–2011. We initially looked into the differences between the duration of intensive care unit (ICU) stay, and development of hydrocephalus. We predicted that the initial head injury classification based on Marshall's computed tomography (CT) classification was the one causing longer stay in ICU. Based on previous studies done by different authors (2–6), we identified four main factors associated with post-traumatic hydrocephalus, which are intraventricular haemorrhage, subarachnoid haemorrhage, base of skull fracture, and interhemispheric subdural hygroma. We then predicted that it is safe to put shunt in patients with post-traumatic hydrocephalus without causing complications.

In our study, 15.9% of patients who developed post-traumatic hydrocephalus had stayed in ICU more than three weeks. Univariate analysis showed there is an association between duration of stay and development of hydrocephalus ($P < 0.001$). Of post-traumatic hydrocephalus patients in our study, 50% had severe brain injury. However, out of 22 cases diagnosed as post-traumatic hydrocephalus in our study, two patients had mild head injury. The first patient sustained base of skull fracture complicated by subdural empyema. The second patient, allegedly assaulted with machete, sustained multiple compound wounds that extended to brain parenchyma. This patient was complicated by meningitis and developed hydrocephalus. It indicates that the complication

of infection in head-injured patients could increase the morbidity.

The cause of trauma of 77.3% of patients in our study was alleged motor vehicle accident. Of the remaining causes, 13.6% were falls from height and 4.5% for each: industrial accidents and assault. Nearly, 63.3% of post traumatic hydrocephalus patients in our study underwent decompressive craniectomy. Fifteen patients (68.2%) had an onset of hydrocephalus of more than 21 days in our study. There were five patients (22.7%) who had an onset within 8-20 days. Only two patients developed hydrocephalus in less than seven days.

Areal Kaen et al. found that the presence of interhemispheric subdural hygroma was a predictive radiological sign of hydrocephalus development within the first six months of decompressive craniectomy in patients with severe head injury. A subset of 14 (31.8%) of patients who had interhemispheric subdural hygroma on repeated scan developed post-traumatic hydrocephalus; 17 (38.6%) of patients who had traumatic subarachnoid haemorrhage developed post-traumatic hydrocephalus, 18 (40.9%) of patients who developed post-traumatic hydrocephalus had intraventricular haemorrhage on initial CT brain, and 20 (45.5%) of patients developed post-traumatic hydrocephalus in our study had base of skull fracture. However, multivariate analysis showed subarachnoid haemorrhage, intraventricular hemorrhage, base of skull fracture, and subdural hygroma are not associated with post-traumatic hydrocephalus ($P > 0.05$).

Aetiology of hydrocephalus appears to play a major role in influencing the complication rate (8). In our study, eight patients had complications out of 14 cases who had internal shunts, i.e. ventriculoperitoneal shunts. However, there is no association between internal shunt insertion, and complications ($P > 0.110$) in post-traumatic hydrocephalus patients in our study. We concluded that, a traumatic head injury patient who stayed longer than 21 days in ICU should be monitored closely for symptoms and signs, of hydrocephalus

($P < 0.05$). There are no significant complications when shunt procedure is performed ($P > 0.05$).

There were some limitations of this study. The main limitation was the small sample size. It was found that only 44 patients were enrolled into this study due to incomplete data, missing case notes, or exclusion criteria. Since the data were mainly dependent on the case notes, some of the valuable data was not available. Incomplete documentation by the attending doctor, who reviewed the patients during admission and follow-up may have led to inaccurate interpretation by researcher. Secondly, we did not look into patients who present with chronic symptoms of post-traumatic hydrocephalus, particularly patients who were diagnosed with normal pressure hydrocephalus.

We recommend that the patients with head injury and evacuated mass, with CT brain showing traumatic subarachnoid haemorrhage, intraventricular haemorrhage, and base of skull fracture or interhemispheric subdural hygroma stay in ICU more than seven days and have a repeat CT brain within three weeks to six months after the injury. Additionally, the study suggests the necessity for further research a multi-centre study in Major Neurosurgery Centre in Malaysia with a larger sample over a longer period.

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