Neurosurgical intensive care

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ABSTRACT

INTRODUCTION: Neuro hospital is the only hospital in eastern Nepal that has an Intensive care unit (ICU) dedicated to neurological surgery. This is a 6-bed ICU with four ventilators, Arterial blood gas analyzer, central oxygen and suction supply which caters to neurosurgery along with few medical cases from not only eastern Nepal but also adjoining parts of India.

METHOD: To collect data from the only neurosurgical referral centre in Eastern Nepal and to create a registry with possible use in national trauma registry. Neurosurgery was started in December 2009 in this hospital and the aim of this study is to analyze the data and to look for the possible factors that will help in improving patient management in the future. This is a prospective-descriptive study including admissions to the ICU from December 2009 and November 2010. Descriptive statistics was used to analyze the data collected.

RESULTS: The total numbers of cases admitted were 251 with the majority being males (M:F::170:81). Neurosurgical cases amounted to 207 and medical 44. The most common age group was between 21-40 years (64 cases). Of the neurosurgical cases the majority were traumatic head injury (115 cases) followed by CVA (36), Aneurysm (13) and tumors in 8 cases. Postoperative cases comprised of 112 cases, the majority being intra-cerebral hematomas. The total number of ventilated cases was 73, the number of days of ventilation ranged from 1-18 with the majority weaned off within 1 day (28 cases). The total number of days of admission ranged from 1-28 days with the majority being transferred within 7 days. Of the medical cases the most common indication was for cardiac and respiratory problems (10 each) followed by liver diseases. The overall in ICU mortality was 25%.

CONCLUSION: ICU Service is available to Patient care in Biratnagar, Eastern Nepal.

KEYWORDS: data, intensive care, neurosurgery, trauma,

INTRODUCTION

Neurosurgical intensive care has evolved into a separate subspeciality all over the world. This concept although old is still at infancy in the developing world. There have been various studies from Nepal regarding neurosurgery in this country but none have addressed the issue of the neurosurgical ICU. Eastern Nepal with its large population and major roadways has the right conditions for neurosurgical cases-traumatic and atraumatic. Lack of neurosurgical facilities in this region necessitates the people to look for treatment either at Kathmandu or in neighboring India causing much time loss, increased costs, morbidity and mortality.

Neuro Hospital is the only neurosurgical referral centre in eastern Nepal which manages cases from Nepal along with adjoining states of India. The hospital is equipped with a 40 beds dedicated to neurosurgery along with a 6 bedded ICU having four ventilators. The ICU also had an ABG analyzer, portable X-Ray machine, defibrillator, Electrocardiogram machine, individual monitors and wall mount central suction and oxygen
supply. This is the only private centre in eastern Nepal to have a Computed tomogram (CT) and magnetic resonance imaging (MRI) services. Although the ICU caters to only neurosurgical problems due to the multispeciality nature of the hospital few admissions from the medical department are also included.

**METHOD**

This is a prospective analysis of the data collected from the neurosurgical ICU from December 2009 till November 2010. Sociodemographic and clinical factors like age, sex, cause for admissions, indication and duration of ventilation, duration of ICU admission and the overall morbidity and mortality were included. Data was obtained from the physical case notes and entered into the data collection sheet. There are many neurosurgical centres in Nepal but there is no data as to the type of admissions, outcome and mortality in these centres. The aim of this study was to look into the various parameters and compare the results with other centres to know the overall performance of the ICU in a developing world.

Only the neurosurgical cases admitted to the ICU were included with the other medical cases excluded from the study. Descriptive statistics was used on the data collected which were then analyzed using Microsoft excel (Microsoft corporation, Redmond, WA) using Epi Info Version3.5.1 (Atlanta, GA: Centers for disease control and prevention) statistical software.

**RESULTS**

A total of 207 cases were admitted within the study period out of which 207 were neurosurgical cases. Male patients accounted for 72 % of admissions. Age wise distribution showed the most frequent admissions was in the age group between 31 -50 years with 67 cases followed by 58 cases in 51-70 cases (Table 1). The majority of admissions were for traumatic brain injuries (TBI) with 115 cases. The breakup of TBI showed diffuse axonal injury in 33 cases, contusion in 24 cases, acute subdural in 25 cases and the rest including epidural hematoma and subarachnoid hemorrhage. Hypertensive non surgical intracerebral hematomas accounted for 36 cases and included lobar, pontine and ganglia bleeds. Postoperative cases were 112 cases which included surgery for traumatic hematomas, intracerebral bleeds, tumors and aneurysm. There were 13 cases each of aneurysm surgery and post operative intracerebral hematomas. Tracheostomy was done in 10 cases with severe TBI and prolonged ventilation as indication in nine and one case of severe craniofacial trauma. Postoperative tumors included 8 cases. Other cases included skull base fractures, cerebrospinal fluid leak and depressed fractures (Table 2). 31 % of cases needed ventilator support and the majority were weaned off within one day (26 cases) followed by within 5 days (22 cases) (Table 3). Considering the duration of ICU stay the majority were transferred out of the ICU within 7 days (176 cases), followed by within 14 days (23 cases) with only 6 cases needing admission more than three weeks (Table 4). The overall ICU mortality rate was 23% and the majority of deaths were within the 31 to 60 year group (33%) followed by the 51 – 70 age group (31%). Of the 48 ICU deaths, 32 cases were on ventilator and interestingly the deaths were maximum within the first 2-4 days of ventilation (21 cases), followed by within 1 day (8 cases) and then within seven days (6 cases). Of the 65 cases on ventilator the survival was 50 %.

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**Table 1. Figure showing the age, sex and the overall mortality according to age.**

**Table 2. The profile of admissions by pathology**

<table>
<thead>
<tr>
<th>Diagnosis</th>
<th>Number of cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>Traumatic Brain Injury</td>
<td>115 (55.5%)</td>
</tr>
<tr>
<td>Diffuse axonal injury</td>
<td>33</td>
</tr>
<tr>
<td>Acute subdural hematoma</td>
<td>25</td>
</tr>
<tr>
<td>Contusion</td>
<td>24</td>
</tr>
</tbody>
</table>
Subarachnoid hematoma 12
Epidural hematoma 11
Chronic subdural hematoma 10
Intracerebral hematoma 49 (23.6%)
Aneurysm 13 (6.2%)
Tumor (CSF leak, hydrocephalus, depressed fractures etc) 9 (4.3%)
Seizure disorder 3
Others 18

Table 3. Duration of ventilation and mortality in each group.

<table>
<thead>
<tr>
<th>Days of ventilation</th>
<th>Number (N=65)</th>
<th>Mortality (N=32)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>26</td>
<td>8</td>
</tr>
<tr>
<td>2-4</td>
<td>22</td>
<td>13</td>
</tr>
<tr>
<td>5-7</td>
<td>10</td>
<td>6</td>
</tr>
<tr>
<td>8-10</td>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td>11-13</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>&gt;14</td>
<td>1</td>
<td>-</td>
</tr>
</tbody>
</table>

Table 4. Length of stay in the ICU and its comparison with the study from Singapore

<table>
<thead>
<tr>
<th>Length of stay in days</th>
<th>Present study (1 year) (N=207)</th>
<th>Singapore study (5 years) (N=503)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-7</td>
<td>176 (85%)</td>
<td>391 (78%)</td>
</tr>
<tr>
<td>8-14</td>
<td>23 (11%)</td>
<td>80 (16%)</td>
</tr>
<tr>
<td>15-21</td>
<td>2 (1%)</td>
<td>21 (4%)</td>
</tr>
<tr>
<td>22-28</td>
<td>4 (2%)</td>
<td>4 (0.8%)</td>
</tr>
<tr>
<td>&gt;28</td>
<td>2 (1%)</td>
<td>7 (1.4%)</td>
</tr>
<tr>
<td>Overall results</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mortality</td>
<td>48 (23%)</td>
<td>132 (26%)</td>
</tr>
<tr>
<td>Survival</td>
<td>134 (65%)</td>
<td>371 (74%)</td>
</tr>
<tr>
<td>Unknown</td>
<td>25 (12%)</td>
<td>-</td>
</tr>
</tbody>
</table>

DISCUSSION

Neurosurgical intensive care has evolved into a separate subspeciality all over the world. This concept although old is still at infancy in the developing world. This subspeciality has evolved from neurosurgical units treating postoperative cases to units that provide comprehensive medical and specialized neurological support for patients with life-threatening neurological diseases. There are many studies of the neurosurgical ICU from other countries but none from Nepal though articles on neurosurgery have been published from this country. Lack of neurosurgical facilities in Nepal can be due to various reasons that include financial constraints, lack of government regulations, poor medical control over the private institutions and lack of proper training of the hospital management and staff. The pattern of admissions to the ICU varies in the developing and developed countries. Cerebrovascular diseases account for the majority in the western world and trauma and infections in the developing world. In a study of comparison between ICU patients from Tunisia (430 cases) and France (534 cases) the authors concluded that although the former patients were younger the mortality was lower in the French (17.2 vs 22.5%; p < 0.01) and economical constraints was one reason that could explain differences in ICU performances.

An ideal study should include the severity scores, organ system dysfunctions, patient age, previous health status, cost-efficiency, the quality of life in surviving patients and the main diagnosis. Joint ventures between neurology, neurosurgery and physician is a must to give the best management of these critical cases. The main aim of all these neurosurgical ICU should include the clinical physiology of intracranial pressure, cerebral blood flow, and brain electrical activity. Understanding of other systemic abnormalities, medical complications of nervous system diseases, traumatic brain injury, cardiac arrest, status epilepticus, cerebrovascular events, postoperative care and management of neuromuscular respiratory failure are also important in giving the best outcomes from the ICU. The treatment should also include the application of the multimodality neuromonitoring, which includes the use of, intracranial pressure, brain electrophysiology, brain metabolism and oxygenation, and cerebral blood flow. The increasing role of the neurointensivists in these neurocritical care units has been associated with reduced hospital mortality and resource utilization.

The present study was an epidemiological study and hence did not take into account the various injury severity scores which can help give a better evaluation of the ICU performance. In a comparison from a study from Singapore the results were comparable regarding the length of stay in the ICU and the overall mortality. This is also comparable to another study from Austria on severe head injury where the mortality was 31.7% which also showed that there was no significant correlations between mechanisms of injury and severity of trauma, nor between mechanisms and ICU outcome. Future studies with large sample cases
are warranted that will incorporate data from other centres in this country along with statistical analysis which can give the best results as to the outcome of neurosurgical care in Nepal.

CONCLUSION

This study shows that despite the limited resources and trained manpower the results are comparable with the developed countries and that although slow but neurosurgery is developing fast in Eastern Nepal. Further training in neurosurgery and improvement of resources can aid in further better management of the patients.

REFERENCES