Association of vomiting with intracranial lesion in mild head injury patients

Adil Aziz, Faisal Mirza, Syed Ali Raza, Sadia Aziz, Hasan Aman, Atif Kazmi, Khaleeq uz Zaman

Abstract
Objective: “To determine the association of the frequency of intracranial pathology detected in mild head injury patients with post traumatic vomiting.”
Study design: It was a cross sectional descriptive study.
Place and duration: Patients received at the emergency department or OPD or referred to Pakistan institute of Medical Sciences, Islamabad were included in the study. Pakistan institute of Medical Sciences is a tertiary care hospital that recruits patients from Punjab and Northern areas. The data was collected over a period of six months from 1st August 2008 till 31st January 2009.
Methodology: Data were analyzed relating to a consecutive series of 206 patients who presented to the emergency department of Pakistan Institute of Medical Sciences, Islamabad. Data was collected through non-probability convenience sampling. Characteristics studied, were CT scan brain findings and the presence and severity of post-traumatic vomiting.
Result: Our study included 206 patients with mild head injury. 127 (61.7%) patients presented with vomiting after head injury and 79 (38.3%) patients did not vomit. 49 (23.8%) vomited once and 78 (37.9%) vomited on multiple occasions.
Vomiting was significantly more common among patients who were found to have an abnormal CT scan. 66.7% with abnormal CT scan vomited, as opposed to 51.5% of those with a normal CT scan. Conversely, among patients with post traumatic vomiting, 72.4% had abnormal CT scan as opposed to 58.2% abnormal CT scans, among patients without vomiting. The relation of vomiting with intracranial lesion on CT scan was statistically significant; p=0.035; OR=1.886, 95% CI= 1.042-3.411.
Conclusion: Patients with post traumatic vomiting have significantly higher frequency of an intracranial lesion on CT scan. These results support the incorporation of the enquiry, about vomiting, into the guidelines, for mild head injury management.

Keywords: mild head injuries, vomiting, CT scan brain
there is no clear evidence that it is an independent risk factor. Some studies do regard vomiting as evidence of possible intracranial injury and link it with headache as an indication for admission and extended observation. Others have concluded that vomiting confers no additional risk in patients presenting with normal consciousness.

The purpose of the present investigation was to determine whether the presence and severity of post-traumatic vomiting can predict the risk of an intracranial lesion in patients with mild head injury.

Methodology:
A cross-sectional study was carried out at the Pakistan institute of Medical Sciences, Islamabad. The data was collected over a period of six months from 1st August 2008 till 31st January 2009 with a total of 206 patients included in our study. Data was collected through non-probability convenience sampling. Patients of all ages and both genders, Patients with traumatic brain injury, those with GCS between 13-15, patients with and without vomiting were included. Patients whose guardian and attendants did not give consent to participate in the study, patients with moderate or severe head injury, and those with polytrauma were excluded.

After taking permission from the hospital ethical committee all the patients fulfilling the criteria were enrolled in the study. Written informed consent was taken from the relatives. All patients with a GCS between 13-15, during the first 24 hours of traumatic brain injury were referred for a CT scan to the department of radiology at Pakistan institute of Medical Sciences and were reported by the radiologist. All patients were admitted for indoor assessment and treatment. The relatives were asked questions regarding vomiting, its presence and frequency according to the proforma. Data was entered and analyzed using SPSS12. Descriptive statistics were used to calculate mean, standard deviation for age, number of vomiting and GCS score.

Categorical variables included presence and severity of vomiting, anatomical findings of intracranial lesion on CT scan, gender and age group. Chi square statistics were applied to this data. A p< 0.05 was considered statistically significant.

Results:
Our study included 206 patients with mild head injury. CT scan was done without contrast in all patients and were abnormal in most patients. (Figure 1) 127 (61.7%) patients presented with vomiting after head injury and 79 (38.3%) patients did not vomit. 49 (23.8%) vomited once and 78 (37.9%) vomited on multiple occasions.

Although patients with a lower GCS score had a tendency to recurrent vomiting, but this difference was not statistically significant; p=0.061. (Figure 2, Table 1, 2)

Vomiting was significantly more common among patients who were found to have an abnormal CT scan. The relation of posttraumatic vomiting with an intracranial lesion detected on CT scan was statistically significant; p=0.035. (Table 3)

Patients with abnormal CT scan had a tendency to vomit repeatedly. Out of 138 patients with abnormal CT scan 46 (33.3%) did not vomit, 38 (27.5%) vomited once and 54 (39.1%) had recurrent vomiting. Out of 68 patients with normal CT scan 33 (48.5%) did not vomit, 11 (16.2%) vomited once and 24 (35.3%) had recurrent vomiting. However, this difference did not reach statistical significance; p= 0.067. (Figure 3)

Patients with an abnormal CT scan had 1.886 times higher risk of vomiting as compared to those with a normal CT scan. (Table 3)

Discussion:
Head trauma is a common reason for medical evaluation in an emergency department (ED). Most patients with head injuries seen in the emergency departments have minor head trauma and recover without sequela. Because of the lack of clear predictors of intracranial hemorrhage, there is great variation in medical practice patterns for the examination and treatment...
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of these patients. Vomiting is a very common presenting complaint of patients after a head trauma, and many studies indicate that it may be a feature of possible intracranial injury.10 Controversy exists about the etiology of this symptom, and clear evidence that it is an independent predictor of intracranial lesion is still lacking.11

Table 1: GCS Score and number of vomiting episodes cross tabulation

<table>
<thead>
<tr>
<th>Severity of Vomiting</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>None</td>
</tr>
<tr>
<td>GCS 13</td>
<td>16</td>
</tr>
<tr>
<td>GCS 14</td>
<td>8</td>
</tr>
<tr>
<td>GCS 15</td>
<td>55</td>
</tr>
<tr>
<td>Total</td>
<td>79</td>
</tr>
</tbody>
</table>

Table 2: Chi-Square Tests

<table>
<thead>
<tr>
<th>Value</th>
<th>df</th>
<th>Asymp. Sig. (2 sided)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pearson Chi-square</td>
<td>8.996(a)</td>
<td>.061</td>
</tr>
<tr>
<td>Likelihood Ratio</td>
<td>12.311</td>
<td>.015</td>
</tr>
<tr>
<td>N of Valid Cases</td>
<td>206</td>
<td></td>
</tr>
</tbody>
</table>

A. 1 cells (11.1%) have expected count less than 5. The minimum expected count is 3.33.

Table 3: Association of post traumatic vomiting and CT scan findings (Vomiting / CT scan findings Crosstabulation)

<table>
<thead>
<tr>
<th>CT scan findings</th>
<th>Abnormal CT</th>
<th>Normal CT</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vomiting</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>92</td>
<td>35</td>
<td>127</td>
</tr>
<tr>
<td>No</td>
<td>46</td>
<td>33</td>
<td>79</td>
</tr>
<tr>
<td>Total</td>
<td>138</td>
<td>68</td>
<td>206</td>
</tr>
</tbody>
</table>

Chi-Square Tests

<table>
<thead>
<tr>
<th>Value</th>
<th>df</th>
<th>Asymp.Sig. (2-sided)</th>
<th>Exact Sig. (2-sided)</th>
<th>Exact Sig. (1-sided)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pearson Chi-Square</td>
<td>4.449(b)</td>
<td>.035</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Continuity Correction(a)</td>
<td>3.830</td>
<td>.050</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Likelihood Ratio</td>
<td>4.402</td>
<td>1</td>
<td>.036</td>
<td>.026</td>
</tr>
<tr>
<td>Fisher’s Exact Test</td>
<td></td>
<td></td>
<td>.047</td>
<td>.026</td>
</tr>
<tr>
<td>N of Valid Cases</td>
<td>206</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

A. Computed only for a 2x2 table
B. 0 cells (.0%) have expected count less than 5. The minimum expected count is 26.08.

Risk Estimate

<table>
<thead>
<tr>
<th>Value</th>
<th>95% Confidence Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>Odds Ratio for Vomiting (yes / no)</td>
<td>1.886</td>
</tr>
<tr>
<td>For cohort CT = Abnormal</td>
<td>1.244</td>
</tr>
<tr>
<td>For cohort CT = Normal</td>
<td>.660</td>
</tr>
<tr>
<td>N of Valid Cases</td>
<td>206</td>
</tr>
</tbody>
</table>

Figure 1: Pie graph showing post traumatic vomiting among the study group with head injury

Figure 2: Clustered bar graph showing severity of post traumatic vomiting and GCS score of the study group (n=206)

Figure 3: Stacked Bar graph showing association of severity of vomiting and CT findings

We conducted this study to evaluate vomiting as a predictor of intracranial lesion after mild head injury.

Among moderate and severe head injury a poor conscious level mandates imaging of the brain but in mild head injury cases we need other predictors that can help us in deciding about the CT scanning of brain.

In our study 61.7% patients presented with
vomiting after head injury and 38.3% patients did not vomit. 23.8% vomited once and 37.9% vomited on multiple occasions. Although patients with a lower GCS score had a tendency to recurrent vomiting, but this difference was not statistically significant. Vomiting was significantly more common among patients who were found to have an abnormal CT scan; 66.7% with abnormal CT scan vomited, as opposed to 51.5% of those with a normal CT scan; p=0.035; OR=1.295, 95% CI= 0.999-1.678.

Our results supplement previous observations that vomiting is a common symptom after head trauma, occurring in approximately 1 of every 6 patients. This symptom was more common in children with intracranial lesions, but the contrary was not true; most children who vomited (99%) had no demonstrable anatomic abnormalities. However, a more recent meta-analysis on the predictive effect of various clinical signs and symptoms concluded that vomiting is not an independent factor for predicting intracranial lesion. Despite these findings, a history of post-traumatic vomiting is often a basis for obtaining a computed tomography in patients admitted to the emergency department after head trauma.

The precise mechanism of post-traumatic vomiting is unknown, but it has been hypothesized that forces applied to the head as a consequence of trauma can cause shearing and compressive strain within the brain stem, causing stimulation of the vomiting center in the reticular formation of the lateral medulla and the adjacent chemoreceptor trigger zone of the area postrema.

In a recent paper, the absence of repetitive vomiting has been reported as sensitive criteria in excluding an intracranial lesion, but the specificity of this symptom in predicting an intracranial lesion was low, especially in children who are younger than 3 years.

Historically, the options for evaluation, have included skull radiography, CT scanning, and observation in the emergency department or hospital. Several studies have concluded that patients with normal findings on neurological examination and CT scanning can be safely discharged from the emergency department. CT is the preferred imaging study for patients with minor head injury, although magnetic resonance imaging (MRI) is more sensitive in detecting subtle lesions. As MRI becomes more widely available, it may have a greater role in the evaluation of patients with minor head injury. The question of which patients with head trauma should undergo scanning has remained controversial since the introduction of computed tomography (CT) in the early 1970s. Initially, CT was a scarce resource reserved for severely injured patients. As CT scanners became more widely available, numerous studies of CT have focused on patients with minor head injury who have intracranial lesions. In the early 1990s, several retrospective studies of patients with minor head injury reported substantial proportions with intracranial lesions on CT (17 to 20 percent). These studies included patients with scores of 13 to 15 on the Glasgow Coma Scale, indicating little or no impairment in consciousness. The authors concluded that CT was indicated in all patients with minor head injury. In subsequent prospective studies of patients with a score of 15 on the Glasgow Coma Scale, the rate of intracranial lesions on CT was much lower (6 to 9 percent).

Most data conclude that in patients with minor head trauma, vomiting alone is not a symptom of relevance in decisions about further investigations. Additional studies are needed to better understand the biological factors contributing to post-traumatic vomiting. The use of clinical findings as predictors of intracranial lesions in patients with minor head injury has been evaluated in several studies. In two studies, selective use of CT on the basis of clinical findings identified 96 percent and 98 percent of patients with abnormalities on CT scanning, and none of the patients with abnormalities who did not have the specified clinical findings required neurosurgery. However, some physicians are not willing to accept the risk of missing an abnormality. In a survey of emergency physicians, more than half insisted that a clinical decision rule for minor head injury must have a sensitiv-
ty of 100 percent. Thus, the use of CT to screen patients with minor head injury for intracranial lesions has become routine, but such screening is expensive. According to one estimate, even a 10 percent reduction in the number of CT scans in patients with minor head injury would save more than $20 million per year.

Further studies are required to formulate guidelines based on clinical features after mild head injury that would predict high probability of an intracranial lesion. More research is required to clearly define the role of vomiting in predicting the presence of intracranial lesion in mild head injury patients.

Conclusion:
Patients with posttraumatic vomiting have significantly higher frequency of an intracranial lesion on CT scan brain. These results support the incorporation of enquiry about vomiting into the guidelines for mild head injury management.

References: