Initial Clinical Findings as a Predictor of Abnormal Scan on Minor Head Injury Patients at Sanglah General Hospital, Bali-Indonesia

Ade-Chandra, Niryana, W., and Golden N.

Department of Surgery Sanglah General Hospital, Faculty of medicine Udayana University, Bali-Indonesia

Objective: Minor Head Injury (MHI) patients should not cause severe sequelaes. In fact, many studies had reported that some MHI patients had abnormal scan, clinical deterioritation, and many of them have had neurosurgical intervention. This study analyzed correlations between clinical signs with abnormal scan, clinical deterioritation and surgery intervention on minor head injury patients.

Methods: A series of 364 MHI patients were prospectively enrolled in this study. In all cases clinical data were collected and a CT Scan was obtained. The relationship between clinical findings (loss of conciousness, amnesia, seizure, vomiting, headache, cepalhameatome, skull fracture, age more than 60 years), were identified as independent risk factors in corelations to abnormal scan, clinical deterioritation and surgery intervention using bivariate and logistic regression multivariate analtycs with 95 % CI.

Results: the incidence of abnormal scan was 13.8% (48 patients), 3.3% (12 patients) with clinical deterioritation, and incidence of surgery intervention was 3.8% (14 patients). Lost of conciousness, amnesia, cepalhematoma, skull fracture, and age more than 60 years old are independent variables which had statistitcically significant with abnormal scan. Amnesia, cepalhameatome, skull fracture are independent variables which had statisitic significantly with clinical deteriorititation and surgical intervention.

Conclusions: Clinical variables which had statistic significanly can be used as predictors of abnormal scan, clinical deterioritation, and surgical intervention. Avoiding systematic CT Scan indication implies a rate of misdiagnosis, but liberal scan can be increasing the cost of patients.

Keywords: Minor Head Injury, clinical factors, head CT-Scan, clinical deterioritation, surgical intervention, logistic regression

INTRODUCTION

MHI is relatively common in Indonesia, especially in tourism city, Bali. MHI is the most common type of head trauma in emergency departments. The low yield of CT scan findings among patients with MHI in developed countries suggests great potential for reducing the use of CT. CT scan is an expensive modality in developing countries, selective MHI patients for using CT Scan could lead to a large reduction in health care costs.

The symptoms such as unconsciousness, vomiting, headache, amnesia, seizure, geriatric patients after a MHI have for many years been a sufficient basis for CT scan modality and admitting patients for observation, but this policy has led an excessive number of precautionery admissions. CT scan on MHI patients still controversial till now. There is a clear need for valid and reliable clinical guidelines to allow rural doctors to be more selective in the use of head CT scan without compromising the care of patients with MHI.
reviewed the scan. The variables were recorded in bivariant chisquare and Fisher exact and multivariat logistic regression to determine significant variables. Relative Risk with 95% CI and corresponding p value were reported. Data analysis was carried out using SPSS.

Clinical parameters (dependent variables) including headache, amnesia, loss of consciousness, seizure, vomiting, cephalhematome, age more than 60 years, and skull fracture were recorded. Amnesia was defined episodic memory loss (antegrade or retrograde). Loss of conscious was defined as the time taken to regain consciousness of self. The endpoints (independent variables) of this study are abnormal scan, clinical deterioriation and neurosurgical intervention. Abnormal scan was defined all of acute lesion at scan except skull fracture. Clinical deterioriation was defined as neurological deficit or decreased GCS 2 or more points. Neurosurgical intervention was mean as all surgical intervention need based on indication such as craniotomy, clot evacuation, VP Shunt, EVD, decompression.

RESULTS
A number of 364 patients were prospectively enrolled in this study. There were 237 (65.1%) male and 127 (34.9%) female (ratio 1.86:1) with a mean age of 32.8±18.20 years (range 6-87 years). Fortyfour patients (12.1%) were older than 60 years. Traffic accident were the main cause of minor head injury (80.2%), followed by falls (17.0%), and assault (2.7%).

The most frequent clinical parameters was headache (81.6%), followed by loss of conciousness (63.2%) and vomiting (40.9%) as indicated in Table 1. Insidence of abnormal scan was 44 patients (13.2%), the most frequent was EDH, followed by intraparenchimal lesion. Twelve patients (3.3%) had clinical deterioriation, and 14 patients (3.8%) got neurosurgical intervention as can be seen in the same table. No patients die in this study.

Analysis of Potential Clinical Risk Factors
Result of univariate analytcs related clinical findings to the present of a relevant positive CT Scanning were LOC (RR: 8.74, 95% CI 2.77-27.57), Amnesia (RR: 5.904, 95% CI 3.52-10.72), cephalhematome > 5cm (RR: 8.32, 95% CI 4.61-15.00), headache (RR: 10.603, 95% CI 1.48-75.49), skull fracture (RR: 8.99, 95% CI 5.86-13.75), age>60 years (RR: 3.306, 95% CI 2.77-27.57). In multivariate analysis (logistic regresion) LOC (RR: 4.841, 95% CI 1.29-18.13) Amnesia (RR: 4.45, 95% CI 1.86-10.67) cephalhematome > 5 cm (RR: 8.578, 95% CI 3.42-21.45), skull fracture (RR: 6.813, 95% CI 2.04-22.77), age>60 years (RR: 5.556, 95% CI (2.09-14.77) were significant variables.

Table 1
Characteristic | No. of patients
--- | ---
Sex | 
Male | 237 (65.1%)
Female | 127 (34.9%) | 
Age (year) | 
6-10 | 30 (8.2%)
10-20 | 74 (20.3%)
20-40 | 160 (44%)
40-60 | 55 (15.1%)
> 60 | 44 (12.1%) | 
Mode of injury | 
Traffic accident | 292 (80.2%)
Falls | 62 (17.0%)
Assault | 10 (2.7%) | 
Clinical predictor factors | 
LOC (+) | 230 (63.2%)
(-) | 134 (36.8%) | 
Amnesia (+) | 114 (31.3%)
(-) | 250 (68.7%) | 
Vomiting (+) | 149 (40.9%)
(-) | 215 (59.1%) | 
Seizure (+) | 4 (1.1%)
(-) | 360 (98.9%) | 
Cephalhematome > 5 cm | 89 (24.5%)
< 5 cm | 275 (75.5%) | 
Headache (+) | 297 (81.6%)
(-) | 67 (18.4%) | 
Skull fracture (+) | 29 (8.0%)
(-) | 335 (92.0%) | 
Age > 60 yo (+) | 44 (12.1%)
(-) | 320 (87.9%) | 
Head CT Scan | 
Normal | 316 (86.8%)
Abnormal | 48 (13.2%) | 
Intracranial lesions | 
EDH | 15 (4.1%)
SDH | 9 (2.5%)
IVH | 2 (0.5%)
SAH | 8 (2.2%)
Lesi Intraparenkim | 11 (3.0%)
Mixture | 3 (0.9%) | 
Clinical deteriorated (+) | 12 (3.3%)
(-) | 352 (96.7%) | 
Neurosurgical intervention (+) | 14 (3.8%)
(-) | 350 (96.2%) |
(9.92-121.0). There were three variables that had significance association in multivariate analytics, cephalhematome > 5 cm (RR=0.099, 95% CI 0.012-0.902), skull fracture (RR=0.114, 95% CI 0.023-0.558), amnesia (RR=0.103, 95% CI 0.012-0.902).

The other results of univariate analysis related clinical findings that had association with the need of neurosurgical intervention were as LOC (RR: 7.574, 95% CI 1.002-57.25), amnesia (RR: 28.509, 95% CI 3.77-215.3), cephalhematome > 5cm (RR: 40.169, 95% CI 5.32-307.76), Skull fracture (RR: 28.879, 95% CI 9.65-86.38). Multivariate shown that amnesia (RR= 0.076, 95% CI 0.009-0.647), cephalhematome > 5 cm (RR: 0.068, CI 95%, 0.007-0.626), skull fracture (RR: 0.145, 95% CI 0.035-0.607) had statistic significance.

**DISCUSSION**

MHI should not cause severe sequelae, without morbidity and mortality. Many studies had reported that some MHI patients had abnormality on the scan, many of them had clinical deteoriation and neurological intervention.

Early detection of patients harboring intracranial lesions following minor head injury is the main objective of the proposed guidelines. During the last decade, CT scanning has become more widely available, and scan mandatory use as a routine screening tool, with selective admission being based on CT findings. Performing routine cranial CT scans on every patients with MHI is ineffective due to the cost involved. More than 80% MHI patients had a normal scan. Cranial CT Scan is not always readily available in many rural hospitals so that is not also cost effective to transfer all patients with MHI to the refered hospitals. Another studies have recomended routine admission with or without scanning, given that a clinical policy to hospitalized patients without scanning. Many studies have focused on identifying clinical variables that can predict positive scan findings and the need of neurosurgical intervention. Many centers recommended the clinical guidelines to predicted abnormal scan, unfortunately, the majority of these recomendations lack of solid scientific basis.

Retrospective study, more than 85% MHI patients were normal. Our results are 13.2% normal. Age more than 60 years has been shown tend to have more significant intracranial injuries than younger. The European study mentioned that age more than 60 years regarded as high risk regardless of other clinical features because of 6-10% risk of sustaining an intracranial hemorrhage. Our study found a strong association between clinical features amnesia, cephalhematome more than five centimeter and skull fracture with abnormal scan, clinical deteoriation and neurological intervention. Therefore, CT scan was recomended for diagnosing intracranial injuries before these patients deteriorated and need neurosurgical intervention. In our study, seizure was not significant clinical features due to small sample of these group (1.1%). Skulls fracture was another clinical parameters with a strong association with CT findings, these results is appropriate with the previous studies. The presence of fractures indication of the need for CT and hospital admission. Our study shows that 8% patients had skull fractures and 72.4% developed abnormal CT findings. Our study revealed that vomited did not significant clinical features, its different with the other studies which showed that vomited was significant variable.

In our studies there was 3.2% patients were have clinical deteriorated, all of these patients need surgical intervention as indication. Clinical features such as amnesia, cephalhematome more than five centimeter and skull fracture were significant variables both clinical deteorited and neurological intervention. There were 3.8% patients who had neurosurgical intervention, majority of them are craniotomy clot evacuation.

Many doctors in emergency departments are inexperienced, and the use better defined guidelines for admission and CT Scan can reduce the number patients hospitalized or scanned. On the other hands, guidelines usually increase clinicians awareness to the patients. The guidelines based on significan clinical parameters to identify patients with intracranial lesions, clinical deteriorated and neurological intervention. Its difficult to provide a universal guidelines that suits in every country and region. In hospital with high quality medical resources shows zero tolerance for misdiagnosis, CT Scan is indication for all cases. The cost effectiveness of selecting patients based on significant clinical data sometime can’t be detected all patients with intracranial lesion. We propose that CT scanning should be indicated at MHI patients with risk factors: LOC, amnesia, cephalhematome > 5cm, skull fracture and age > 60 years. Patients with amnesia, cephalhematome > 5 cm and skull fracture are also higher risk and should got thight observation to prevent deteorated and neurological intervention.

**CONCLUSION**

Our study aimed to assess the association between clinical predictor variables and significant CT findings, deteorated and the need for neurosurgical intervention among patients with minor head injury. The aim of this study was not provide physicians with a universal methods of always staying on the safe side when clinically deciding to perform CT scan, but to inform them the level of risk that they are accepting when use these clinical guidelines. Avoiding Scan based on
only clinical signs can implies misdiagnosis, but when CT preform all of minor head injury patients can increasing the cost.

In rural hospital, minor head injury patient with significant clinically signs should be reffered to high level hospital for scanning. Thus a plain skull radiograph is needed in the district hospital to triage the patient. In referred hospital patients without significant clinical signs may not need scan and don’t need hospitalized.

In hospital with high quality medical resources shows zero tolerance for misdiagnosis, CT Scan is indication for all cases. The cost effectiveness of selecting patients based on significant clinical data sometime can’t be detected all patients with intracranial lession.

REFERENCES
14. Miller JD, Murray LS, Developent of a traumatic intrakranial heatome after a Minor Head Injury, neurosurgery 1990;27:669-72