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

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Objective: Minor Head Injury (MHI) patients should not cause severe sequelae. In fact, many studies had reported that some MHI patients had abnormal scan, clinical deteoritation, and many of them have had neurosurgical intervention. This study analyzed correlations between clinical signs with abnormal scan, clinical deteoritation 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 deteoritation and surgery intervention using bivariate and logistic regresion multivariate analitycs with 95 % CI.

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

Conclusions: Clinical variables which had statistic significanly can be used as predictors of abnormal scan, clinical deteoritation, and surgical intervension. 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 deteoritation, surgical intervention, logistic regresion

INTRODUCTION

MHI is relatively common in Indonesia, especially in tourism city, Bali. MHI is the most common type of head trauma in emergency departments.[1] The low yield of CT scan findings among patients with MHI in developed countries suggests great potential for reducing the use of CT.[1] 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.[1,2]

The symptomps such as unconciousness, 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.[3] CT scan on MHI patients still controversial till now.[4] 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.[4] Clinical variables can be identified based on history and physical examination.[5]

The main objecive of this study was to identify clinical variables in MHI that could be used to predict significant intracranial injury, clinical deteoritate and the need of neurosurgical intervention

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PATIENTS AND METHOD

Beetween October 2011-Februari 2012, 364 patients with minor head injury who were older than 6 years treated in Sanglah General Hospital Bali. The exclusion criteria were patients with airway, breathing, circulation compromize; alkoholic state; unclear history of head trauma;the accident more than 24 hours, and head penetrating injury.

History and clinical data were collected on admission to the accident and emergency department. Head CT scan was obtained to all the patients using Shimadzu spiral single scan standard axial cuts from the basis to vertex. A consultant Radiologist blinded to the clinical findings,

reviewed the scan. The variables were recorded in bynary notation,data analysis was done by using bivariat chisquare and fisher exact and mulivariat logistic regresion to determine significant variables. Relative Risk with 95% of CI and corresponding *p* value were reported. Data analysis was carried out using SPSS.

Clinical parameters (dependent variables) including headache, amnesia, loss of conciousness, seizure, vomiting, cepalhematome, age more than 60 years, and skull fracture were recorded. Amnesia was defined episodic memory loss (antegrade or retrograde). Loss of concious was defined as the time taken to regain consciousness of self. The endpoints (independent varibles) of this study are abnormal scan, clinical deteoritation and neurosurgical intervention. Abnormal scan was defined all of acute lesion at scan except skull fracture. Clinical deteoritation was defined as neurological deficit or decreased GCS 2 or more points. Nerosurgical intervention was mean as all surgical intervention need based on indication such as craniotomi, 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 32.83±18.20 years (range 6-87 years). Fortyfour patients (12.1%) were older than 60 years. Trafic 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 indicates 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 deteoritation, 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 analitycs related clinical findings to the present of a relevant positve CT Scaning were LOC (RR: 8.74, 95% CI 2.77-27.57), Amnesia (RR: 5.904, 95% CI 3.52-10.72), cepalhematome > 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) ceopalhematome > 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 of Patients

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 %)
Cepalhematome	
> 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 deteorated	
(+)	12 (3.3%)
(-)	352 (96.7%)
Neurosurgical intervention	
(+)	14 (3.8%)
(-)	350 (96.2%)

In univariate analitycs there were four clinical variables that had significant association with the clinical deteoritation, LOC (RR: 0.948 95% CI, 0.92-0.97), amnesia (RR: 24.123, 95% CI 3.15-184.6), cepalhematome > **5** cm (RR: 33.989, 95% CI 4.45-259.6), skull fracture (RR: 34.655, 95% CI

(9.92-121.0). There were three variables that had significance association in multivariat analitics, cepalhematome > 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 analitycs 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), cepalhematome > 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), cepalhematome > 5 cm (RR: 0.068, CI 95%, 0.007-0.626), skull fracture (RR: 0.145, 95% CI 0.035-0.607) had statistic significancy.

DISCUSSION

MHI should not cause severe sequelae, without morbidity and mortality.[4] Many studies had reported that some MHI patients had abnormality on the scan, many of them had clinical deteoritation and neurosurgical intervention.[4]

Early detection of patients harboring intracranial lesions following minor head injury is the main objective of the proposed guidelines.[4] 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.[5,7] Performing routine cranial CT scans on every patients with MHI is ineffective due to the cost involved.[8] More than 80% MHI patients had a normal scan.[7] 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.[7] Another studies have recomended routine admision with or without scanning, given that a clinical policy to hospitalized patients without scanning.[8] Many studies have focused on identifying clinical variables that can predict positive scan findings and the need of neurosurgical intervention.[9,10] Many centers recommended the clinical guidelines to predicted abnormal scan, unfortunately, the majority of these recomendations lack of solid scientific basis.[10]

Retrospective study, more than 85% MHI patients were normal.[11] 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 cinical features because of 6-10% risk of sustaining an intracranial hemorhage.[9,11] Our study found a strong association between clinical features amnesia, cepalhematome more than five centimeter and skull fracure with abnormal scan, clinical deteoritation and neurosurgical 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 deteorated, all of these patients need surgical intervention as indication. Clinical features such as amnesia, cepalhematome more than five centimeter and skull fracture were significant variables both clinical deteorited and neurosurgical intervention. There were 3.8% patients who had neurosurgical intervention, majority of them are craniotomy cloth 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 scaned.[9,10] On the other hands, guidelines ussualy increase clinicians awarenes to the patients. The guidelines based on significan clinical parameters to identify patients with intracranial lesions, clinical deteorited and neurosurgical intervention[14]. 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.[9] The cost effectiveness of selecting patients based on significant clinicall data sometime can't be detected all patients with intracranial lession.[4,9] We propose that CT scaning should be indicated at MHI patients with risk factors: LOC, amnesia, cepalhematome > 5cm, skull fracture and age > 60 years. Patients with amnesia, cepalhematome > 5 cm and skull fracture are also higher risk and should got thight observation to prevent deteorated and neurosurgical intervention.

CONCLUSSION

Our study aimed to assess the association between clinicall 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 dont'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.

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