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The accuracy and precision of CT scan diagnosis in comparison with surgical findings in distinguishing epidertal hematoma from subdural hematoma

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Abstract

Introduction and objective: Epidertal hematoma and subdural hematoma ae two common complications occurring after head injury. There are several ways and methods to anticipate what will happen to patients with brain damage and the differentiation of these two hematomas is of great importance to both patients and physicians; Computer tomography (CT scan) is a very useful way to distinguish between these two hematomas. The present study was conducted to determine the precision of CT scan apparatus in differentiating between two types of epidertal hematoma and subdural hematoma compared with surgical findings in patients with traumatic brain injury.

Methodology: The present descriptive-analytic study was carried out on patients with intracranial hemorrhage following a head trauma referring to Khatam-ol-Anbia Hospital in Zahedan in 2016-2017. In order to diagnose possible hemorrhage, all patients were examined with CT scan and resulting images were evaluated and compared with surgical findings. Patients who did not go under surgery were excluded from the study.

Findings: A total number of 116 patients were examined in the present study and it turned out that 69 subjects (48.59%) suffered from subdural hematoma and 47 patients (54.40%) had epidertal hematoma. The mean age of the patients turned out to be 37.58±18.6. Based on the results of the present study, CT scan diagnostic power had a high sensitivity in differentiating between these two types of hematoma and there was no significant difference between CT results and surgical findings. Additionally, CT scan is of paramount precision and accuracy in terms of hematoma size index (higher than suture rupture in subdural hematoma and limited to suture rupture in the epidertal hematoma) and the shape of the lesion (contraction for subdomain hematoma and convexity for epidertal); however, because of low sensitivity, it is not an appropriate criterion for the diagnosis of presence or absence of fracture.

Conclusion: CT scan has a high diagnostic power in differentiating these two hematomas and is a very suitable way to examine and predict how things will work out for patients with traumatic brain injury. Indexes such as the extent of the hematoma and the shape of the lesion, also, are highly sensitive in the diagnosis and prediction of the fate of patients with head injury.

Keywords: Epithelial hematoma, Subdural hematoma, Surgery, Zahedan

Introduction

Traumatic brain injury is a broad and comprehensive term for determining the wide range of cranial and underlying pathology in the brain caused by an external force (1). The traumatic brain injury can lead to several pathological lesions, the most important of which are skull fractures, brain cantosis, as well as hemorrhages and various hematomas (epidertal, subdural, subareconoid, interparanchymal and intronterícular) (2). The two common complications that occur following head injury are hepatoma, epidertal, and subdural hematoma. Epidural hematoma occurs as a result of hemorrhage in the space between the dorsa and the skull and usually occurs as a result of a rupture of one of the cerebellar vessels and almost always with a fracture of the skull. Subdural hematoma is caused by bleeding in the space between Dora and arachnoid, and is usually caused by rupture of mediastinal veins that transmits Dora's blood to the venous sinus (3). There are several ways and methods to anticipate what will happen to patients with brain damage and Computer tomography (CT scan) is a very promising method for prognosis. The results of imaging studies play an important role in the diagnosis and treatment of acute traumatic brain injury (TBI). The essential findings on computed tomography (CT) are fractures, hemorrhages, or other attenuation changes. In the treatment of TBI, the role of imaging is to reveal any potential need for urgent neurosurgical intervention, and to assess the severity of the injury. CT findings often influence the decision whether the patient is admitted to the hospital or discharged (4,5).

In the early postoperative period, noncontract head CT is most commonly used to evaluate for potential Complications.CT is widely available, fast, relatively inexpensive, and accurate at identifying most postoperativeComplications.Intracranial air in the early postoperative period can cause artifact on MRI.CT is sensitive for the identification of new intracranial hemorrhage, new mass effect and herniation,Tension pneumocephalus, and calvarial fractures (6).

Ct scan uses several symptoms to differentiate epitural hematoma from subdural hematoma, one of which is the shape of the lesion that is convex in the hematoma of the epidertal, but crescent shaped slipping towards the brain in subdural hematoma (3). Although epithelial hematoma is usually associated with fracture of the skull, fracture is considerably rare in subdural hematoma (6). The present study was conducted to determine the precision of CT scan apparatus in differentiating between two types of epidertal hematoma and subdural hematoma compared with surgical findings in patients with traumatic brain injury.

Methodology

The present descriptive-analytic study was carried out on patients with intracranial hemorrhage following a head trauma referring to Khatam-ol-Anbia Hospital in Zahedan in 2016-2017. In order to diagnose possible hemorrhage, all patients were examined with CT scan and resulting images were evaluated and compared with surgical findings. Patients who did not go under surgery were excluded from the study.Initially, CT scan of patients was evaluated by expert radiologist without any knowledge so as to the course of the research and cases of subdural hematoma and epithelial hematoma were separated; other complications, such as tumor and fracture, were specified and these findings were compared to post-surgery results. Using the obtained results, the sensitivity of the CT scan in general and the sensitivity of each of the parameters mentioned were determined. McNemar statistical test was used compare CT scan and surgical findings; collected data was analyzed using SPSS18.

Findings

A total number of 116 patients were examined in the present study and it turned out that 69 subjects (48.59%) suffered from subdural hematoma and 47 patients (54.40%) had epidertal hematoma. The mean age of the patients turned out to be 37.58±18.6. The age distribution of patients is shown in Table 1.

Table1. Age distribution of patients

Percent	Frequency	Age group
4/3	4	0-10
9/18	22	11-20
34/4	40	21-30
16/3	19	31-40
11/2	13	41-50
10/3	12	51-60
5/1	6	61-70

Table 2. Frequency distribution of the comparison of CT scan results with post-surgical findings in detecting SDH and EDH

Total	EDH	SDH	Surgery / CT
68	**2**	**66**	SDH
48	**45**	**3**	SDH
116	**47**	**69**	Total

Table 2. The results of CT scan were used to detect epidertal hematoma and subdural hematoma scan and compare them with post-surgery outcomes. The calculated sensitivity turned out to be 95.7% for epithelial hematoma and 95.6% for subdural hematoma. Using McNemar's test, it was shown that the results of the two tests did not show significant differences (x2 = 0/00) and CT scan showed a high sensitivity in detecting these two.

Table 3. Frequency distribution of the comparison of CT scan results with post-surgical findings in detecting SDH and EDH in terms of the shape of the lesion

Total	EDH	SDH	Surgery / CT
67	2	65	circumference
49	45	4	Convexity
116	47	69	Total

Table3. The results of CT scan, and comparing them with post-surgery outcomes, in detecting epidertal hematoma and subdural hematoma in terms of the shape of the lesion. The calculated sensitivity turned out to be 95.7% for epithelial hematoma and 94.2% for subdural hematoma. With the data obtained, this criterion turns out to be highly efficient and sensitivity in detecting the direction and differentiation of these two hematomas. LAO, McNemar's test, it was shown that the results of the two tests did not show significant differences (x2 = 0/00).

Table 4. Frequency distribution of the comparison of CT scan results with post-surgical findings in detecting SDH and EDH in terms of the occurrence of fracture

Total	EDH	SDH	Type / fracture of hematoma
66	**21**	**45**	No fracture
50	**26**	**24**	Fracture
116	**47**	**69**	Total

Table4. The results of CT scan, and comparing them with post-surgery outcomes, in detecting epidertal hematoma and subdural hematoma in terms of occurrence of fracture. The calculated sensitivity turned out to be 55.3% for epithelial hematoma and 65.2% for subdural hematoma. The data obtained show that this criterion has a low sensitivity and therefore cannot be used to differentiate these two hematomas. Also, using McNamr's test, it is shown that the results of the two tests are significantly different. (X2 = 8/06 p <0/05).

Table 5. Frequency distribution of the comparison of CT scan results with post-surgical findings in detecting SDH and EDH in terms of the extent of hematoma

Total	EDH	SDH	Type of hematoma / Extent of hematoma
61	**2**	**59**	Above the suture
55	**45**	**10**	Limited to suture
116	**47**	**69**	Total

Table5. The results of CT scan, and comparing them with post-surgery outcomes, in detecting epidertal hematoma and subdural hematoma in terms of the extent of hematoma. The calculated sensitivity turned out to be 95.7% for epithelial hematoma and 85.5% for subdural hematoma. The obtained data indicated that this criterion had a higher sensitivity to epidertal hematoma rather than subdural hematoma. Also, using McNamr's test, it is shown that the results of the two tests are significantly different. (X2 = 3 and p <0/05). Thus, it is a good measure for the diagnosis and differentiation of these two hematomas.

Discussion

Epithelial hematoma and subdural hematoma are two major complications of brain damage and injuries and one of the most important issues in traumatic brain injury is the diagnosis and differentiation of these two types of hematoma. Computer tomography (CT scan) is a very useful way to prognosis and differentiate these two hematomas. The aim of this study was to determine the CT scan diagnostic accuracy in differentiating between the two types of epidertal hematoma and subdural hematoma in comparison with the surgical findings of traumatic patients. Patients aged between 21 to 30 years (the young subjects) formed 34.4% of the total population of this study and the largest age group included in this study. According to similar studied conducted by Arhami Dowlat Abadi, Asadian, and Fakhr, the largest age group of injuries and brain damage aged between 20 to 30 years old and was formed by young subjects (7, 8, and 9). The results show that the diagnostic power of CT scan was highly sensitive in distinguishing epithelial hematomas from subdural hematoma and there was no significant difference between surgical results and CT scan results in this case and CT scan error was low. CT scan was 95.7% sensitive for epithelial hematoma and 95.6% for subdural hematoma. According to Jose De Chari et al study, which was conducted in the field of brain trauma management, the prediction precision of CT scan compared with surgical findings was 52.8% for intracranial hematomas; this difference can be due to the effect of spatial and temporal differences and the design and sample size of the study (10). Another criterion used to diagnose and differentiate heptate dopamine hematoma from subdural hematoma is the shape of the lesion, the analysis of the results of which shows higher efficiency of Ct scan findings in differentiating these two types of hematomas. According to Chi Wuong et al study, which was conducted to provide appropriate criterion for 30-day prediction of mortality for intracranial hemorrhage, the accuracy rate of prediction turned out to be 70%; they stated that the shape of the lesion does not function as a sufficiently effective criterion in predicting the patient's fate and intracranial hemorrhage (14). Another criterion used for CT scan images to detect and distinguish between these two hematomas is the presence or absence of fractures. Using the results obtained, it is concluded that the fracture criterion is not very sensitive and is not an acceptable criterion for differentiating these two hematomas. Based on the results of Ghafouri et al study, the occurrence or non-occurrence of fracture cannot be used to predict brain hemorrhage (3). The extent of hematoma was one of the most important criteria for predicting subdural hematoma and epithelial hematoma used in the present study. The extent of the hematoma has been used as a strong predictor of moderate and severe traumatic brain injury (11) and is one of the important symptoms in CT scan images used to predict the fate of patients (12). The calculated sensitivity turned out to be 95.7% for epithelial hematoma and 85.5% for subdural hematoma. The obtained data indicated that this criterion had a higher sensitivity to epidertal hematoma rather than subdural hematoma. In a similar study conducted by Ghafouri et al, it was stated that the calculated sensitivity of CT scan, in terms of the extent of hematoma, was 95.7% for epitural hematoma and 80% for subdural hematoma (3). Based on the findings of Chi Wang et al study, which used CAVA and ABC/2 methods in order to determine CT scan sensitivity in the measurement of hematoma size as predictors of the fate of patients with traumatic brain injury, CAVA turned out to have a sensitivity rate of 71.5% and ABC/2 a sensitivity rate of 73.8% (14). CT scan has a high diagnostic power to differentiate these two hematomas and is a very suitable way to examine and predict the fate of patients with traumatic brain injury(1). The extent of the hematoma and the shape of the lesion, also, function as efficient and highly sensitive criteria in predicting how things will work out for brain damage patients(2).

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