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Evaluation of traumatic head injury with hemorrhagic contusion in Al-hussien teaching hospital in Al- Muthanna governorate

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Abstract:

Background: Traumatic brain injury is one of the most common causes of mortality and moribity worldwide and may cause a various of secondary injuries including brain contusions. Those injuries may be overlooked because it's often associated with other larger and more obvious lesions and because they have a tendency to further progress and increase in size later on. All that rises the requirement for early detection of contusions to provide necessary management in order to prevent further progression.

Objective: The aim of this study was to manifest the most useful evidences for an early detection of hemorrhagic contusion following head injuries and also the signs of a hemorrhagic progression occurs later on.

Patients and methods: This study was done in Al-Hussein teaching hospital in AlMuthanna governorate during a five months period from November 2022 until March 2023. The data was collected initially from fifty patients of all age groups with a history of head trauma admitted to the emergency room . Their clinical condition from admission until discharge or death and the investigations results (especially imaging modalities) were carefully studied and analyzed.

Results: Of the total fifty patients admitted only fifteen person of them met the inclusion criteria. CT scan was the basic imaging modality used to evaluate their condition and it showed abnormal changes depending on the pathological stage of contusion. The results of our study also showed that low GCS, older age, male gender and associated lesions as hemorrhage were more common to be found in patients with contusion.

Conclusion: Hemorrhagic contusions after head injury is a common incidence that require careful investigations to search for. It usually appears in CT scan as hyperdense area with hypodense lesion within it (heterogenous) initially, and then becomes reduced in density to eventually sometimes and after months appear as a cystic area. Progression of lesion occurs usually during first 24 hours and therefore serial CT scans may be required.

Key words: Hemorrhagic, Traumatic brain injury.

Introduction:

Traumatic brain injury (TBI) represents a significant health problem around the world and it is the most disabling types of traumatic injuries as it often lead to physical, cognitive, emotional or behavioral abnormalities [1].

A classic example of TBI is cerebral contusion (softened, necrotic and hemorrhagic tissue resulting from the disruption of neurons and blood vessels.)

This type of injury is fairly common and accounts for 8% of all TBI cases and 13-35% of severe injuries [2]. Previously in the pre-CT era, cerebral contusion could be diagnosed only during craniotomy in the operating room or during autopsy, therefore it was thought to be pathognomonic for severe injuries. Nowadays after the invention of CT and specially the high resolution CT, contusion became visible even in mild or moderate TBI.

The significance of hemorrhagic contusion is that it is one of the most severe types of secondary injury encountered following TBI due to the reason that blood is a very toxic substance to the brain tissue as it is associated with necrosis of the intermixed CNS tissue [3]. Initially the contusion produces secondary focal cerebral dysfunction at the site of hemorrhage and rapid swelling which may produce a mass effect that compromises brain tissue not injured in the original trauma. A possible consequence is also brain herniation. As an eventually change it either causes personality changes, seizures, focal neurological deficits, anosmia (if lower frontal lobe is involved) or permanent neurological deficit [4].

A troublesome complication regarding the contusion is it's probability for progression gradually with time which can proceed to an irrevocable loss of brain tissue that was intact immediately after the injury. In a study done by Alahmadi, H. and his associates they concluded that about half of contusions managed conservatively would progress radiologically over time in hospital which is similar to rates reported by other authors : 51% by Oertel et al.,[5] 44% by Stein et al.,[6]. This enlargement of contusion usually occur during the first week [7] and especially during the first 24 hours post injury [8]. This hemorrhagic progression of contusion even if not fatal it still increase the likelihood for morbidity [9], which makes it an important responsibility for health care providers to detect an early progression since it usually occurs during the hospital stay of the patient. This progression is more likely if the contusion is in large size or if it is associated with subdural hematoma [10]. A possible explanation is that an underlying large contusion can lead to burse lobe which ends by subdural hematoma.

An awareness of this progression is necessary to avoid insufficient monitoring or premature discharge of a patient with small hemorrhagic contusion especially because not all patients with progression shows clinical deterioration or require surgical intervention [10]. Despite the recognition of this fact for many years, the extent and consequences of hemorrhagic expansion in the TBI patient are still being characterized.

So after recognition of the harmful effect of blood in the contusions on the surrounding brain tissue and after knowing that it may further progress and the lesion have a tendency to increase in size in the proximal future, it became obvious that evidence and signs of the presence of any hemorrhagic contusion is very important and need to be clarified.

Therefore our study aimed to study the clinical condition and the investigations done to those patients and analyze their results to get to know how a cerebral contusion appears in CT imaging and if it produce specific clinical signs.

Patients and Method

During the 5-month period from November 2022 to March 2023 data were collected for this study from Al-Hussein teaching hospital in Al Muthanna Governorate. The data was taken from 50 patients admitted to the emergency room as a consequence of head injury. All personal characteristics was taken as age, gender, occupation and the Glasgow Coma Score GCS. We recorded if the patient had associated injuries as abdominal or cervical injuries, if any fractures were present and the type of management that was required whether it was conservative or surgical.

Patient's health condition were followed until discharge from the hospital or death and all head CT scans available for each patient were reviewed. We recorded number of contusions for each patient, it's size, location, if there was a counter cup contusion and if any associated CT finding as epidural or subdural hematoma or other types of intracranial hemorrhage as subarachnoid hemorrhage.

Inclusion criteria included (1) a history of head injury (2) all age groups and genders (3) patients who had a CT scan within 24 hours post-injury and who developed radiological signs of contusion either initially at the admission or later on.

We excluded from this study patients with penetrating head injury

Results

Fifty cases patients (36 males, 14 female) were considered 19 of them had a normal CT and a rapid subsequent improvement and was rolled out from the study. From the remaining patients 16 didn't have hemorrhagic contusion neither in their first scan nor subsequently, they demonstrated injuries as hemorrhages. Only 15 patient from our sample met the inclusion criteria at the end and was included in this study.

Table 1 : CT changes in patients admitted due to head injury

The incidence of hemorrhagic contusion was 30% in our study. Of those patients 10 of them showed associated findings in their CT scan (66.6%) and those findings were subdural hematoma, epidural hematoma, and intracranial hemorrhage at incidence of 40%, 13.3% and 13.3% respectively.

CT changes	Number	Percent
Normal	19	**38%**
Contusion	15	**30%**
Brain hemorrhage	10	**20%**
Compound	6	**12%**

CT scan changes in addition to the contusion	Number	Percent
No associated finding	5	**33.3%**
Subdural hematoma	6	**40%**
Intracranial hemorrhage	2	**13.3%**
Epidural hematoma	2	**13.3%**

Table 2: The associated findings in CT scan

The patients were categorized according to Glasgow coma score into three groups: mild cases (53.3%), moderate (13.3%) and severe (40%). This score rates a patient's level of consciousness from 3 (worst) to 15 (no impairment) based on a patient's ability to open his or her eyes, talk or move.

Table 3 describes the level of consciousness of patients according to GCS

GCS	Number	Percent
14-15	7	**46.6%**
9-13	2	**13.3%**
<9	6	**40%**

Regarding the age group, only 6% was the incidence of patients below 15 years and the most common cause of the injury was road traffic accident (40%). It is also worthy to mention that all our cases were male.

We studied the distribution of hemorrhagic contusion and noticed that the most common site among the cases was in the temporal and parietal area in an incidence of

30% followed by parietal lobe alone in 20%. Frequently the contusions were multiple and its percent was 40%.

The number of cases that required surgical intervention was 4 in a percentage of 26.6%.

Discussion

In our study we found that hemorrhagic contusion was the single most common (30%) abnormality found in the CT scan of patients with closed head injury that arrived to Al-Hussein teaching hospital during a period of five months.

Ten patients out of fifteen (66.6%) showed associated hemorrhagic areas (one or more) in addition to the contusion. Since the distinction between contusions and intracerebral hematoma may be somewhat ill-defined [2] it will add another challenge in the diagnosis of contusions, because they already have a tendency to be overlooked due to the often presence of larger and multiple hematoma which may be life threatening and consider more attention [4].

As a consequence of those challenges that faces the diagnosis of contusions, it became of a special importance to study the evidence and signs of hemorrhagic contusions following head injuries which is the aim of this study.

What is the importance of diagnosis of the contusions?

Because large contusions with severe mass effect can be life threatening to the patient and if not causing death they still are reasons for increasing morbidity. Patients with contusions may have altered vital signs that may lasts for prolonged period of time or have hemiplegia or partial paralysis. Progressive swelling may further compromise brain tissue not injured in the original trauma [11]. Another dangerous outcome is the tendency of the contusions for further progression during the first week post injury and especially the first 24 hours [tong]. However this is not the end result in all contusions as the tiny punctuate contusions in mild head injury have no clinical significance and carry the same prognosis as normal CT findings [12].

What is the best way for diagnosis of contusions?

Both MRI and CT scan are useful in the diagnosis, however MRI is more sensitive than CT in the detection of small focal hemorrhagic lesions and chronic or subacute cases [imaging]. CT is generally considered the most rapid and accurate imaging tool.

The appearance of contusions in CT depends on it's size, location and length of time following injury. The CT picture shows an excellent correlation with the time course of stages described by neuropathologist. The first stage is during the first day and involves the progression of hemorrhagic tissue into necrosis [13] that is shown in a CT picture as a superficial hemorrhagic lesion. It appears initially as a heterogeneous area of an increased density with scattered areas of decreased density within it. During this stage mass effect can also be visible and depends on the size of contusion which becomes even bigger if there is an associated focal lesion as an extracerebral collection.

The second pathological stage is between the fourth and seventh day post trauma [12], during this stage there is a decreased density due to edema which also produces a considerable mass effect. Usually the hemorrhagic area is not seen during this stage [4].

The third stage is seen during CT imaging when it is done 12-18 days post trauma [12]. It is during this stage that diagnostic error is possible and the hemorrhagic contusion can be mistaken for tumor if the presence of patient is late or if there isn't any clear history of trauma or if a previous CT scan is not available. It is isodense contusion during this period and a decrease in the mass effect due to decrease edema. If enhancement is given during this period we can notice an enhancement pattern similar to that seen in intracerebral hematoma or cerebral infarction [4].

The fourth becomes visible on CT after the first month and involves formation of cystic cavities.

During our study we focused on which area the contusion was distributed at , because an increased attention of the physicians to notice any contusions in this region will help in detection of them. The results of our study showed that temporal and parietal area were the most common sites of contusions involvement, while in study done by Martin RM [14], and his associates they noticed that anterior and posterior temporal lobes, and the inferior frontal lobes were the most common sites of involvement. Lesions tend to occur in the both frontal and temporal lobes because of the irregular surface of the cranial base, and the anatomical contiguity of the crista galli and the petrous bone to the cortex. [15]

Results showed that only 6% of patients were below 15 years, the exact cause is not known but thought to be due to an increased pliability of the pediatric skull and brain [old].

By observation of the patients GCS the results showed a high incidence (40%) of contusions in patient considered with severe injury. Unfavorable factor for a bad outcome or higher risk of progression was a low score (<8) [16]. Alahmadi, H. and his associates considered that an older age and a poor GCS were inversely related to the chance of going home from hospital.[17]

Conclusion

Hemorrhagic contusions are common and a serious secondary injuries that can occur after traumatic head injury. It may progress later on and especially during the first week post injury and therefore increase incidence of mortality and morbidity of those patients. Early detection by a careful interpretation of the CT scan imaging is necessary. Early it appears as a hyperdense heterogeneous area with hypodense lesions . In addition to that a mass effect can be seen due edematous brain, those findings will change with time as the lesion progress or heal. The progression in contusion size can be predicted if it is large sized or if it is associated with subdural hematoma. It is important to look carefully for this type of lesion post traumatic and also a serial CT scans may be required later on to make sure no progression have occurred.

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