

Efficacy of Repeat Head CT-Scan in Patients with Traumatic Brain Injury and Subdural Hematomas

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ABSTRACT

Objective: To assess the radiographic and clinical features of isolated tentorial and falcine subdural hemorrhages. **Study Design:** A retrospective cross-sectional review. **Settings:** A single large tertiary care hospital. **Duration:** Two years from June 2017 to June 2019. **Methods:** A retrospective cross-sectional review was conducted where we included all the patients above 18 years of age whose initial presentations had evidence of falcine and tentorial SDH due to traumatic brain injury. Patients with other sites of hemorrhage at presentation, contusions, neoplasia and depressed skull fractures were excluded from our study population. Patients with other causes of injury other than TBI and patients who had not had a repeat CT scan done within 7 days of injury were also excluded from our study. **Results:** The final study population was n= 102 patients. The mean age of the patients was 34.5 +/- 15.45 years, where n= 68 (66.66%) patients were male and n= 34 (33.33%) patients were female. The mean GCS score in our study population was 14.2 and the mean GCS score at discharge was 15. None of the patients in our study population suffered from an expansion of the SDH having a p value of 0.17. In patients having mild TBI there were no significant differences (p value of 0.12). For those patients having a GCS score of less than 13 there was no statistically significant difference in SDH size at initial presentation as compared to the size at follow up CT scan. **Conclusion:** We found that patients having isolated falcine and tentorial SDH do not require a routine repeat CT scan in the absence of any signs and symptoms of deterioration.

Keywords: Glasgow Coma Scale, Subdural hematoma, Traumatic brain injury.

INTRODUCTION

Every year approximately 1.7 million people in the USA suffer from Traumatic Brain Injury (TBI), and 30% of these patients develop subdural hematoma (SDH). The incidence of SDH is more prevalent in patients suffering from severe TBI.¹⁻⁴ In a retro 73.9% of retrospective analysis with 646 patients 73.9% of the subdural hematoma cases were along the cerebral convexities, while 14% were falcine and 11% were tentorial in their position respectively. Subdural hematomas of the convexity have other concomitant injuries as well and

requires intervention.^{6,7} The literature is still naïve when it comes to the natural history of these convexity SDHs, studies have reported that these can be managed on their own and often with non-operative measures.^{5,8,9} Non-contrast computer tomography (CT) scan is the most efficient, cost effective and sensitive method of detecting intracranial hemorrhage. Most patients undergo an initial CT scan at the time of the presentation and then multiple CT scans are done to observe the progression of the hemorrhage. In our literature review we found that there is knowledge gap when it comes to the data on convexity SDH especially the falcine and tentorial SDH. The aim of

our study is to assess the radiographic and clinical features of isolated tentorial and falcine subdural hemorrhage at the initial presentation and follow up for patients presenting at our large tertiary care hospital in Karachi, Pakistan.

METHODS

This was retrospective cross-sectional review conducted at a single large tertiary care hospital from June 2017 to June 2019. The sample size of the study was one hundred and two patients by using non-probability convenience sampling

We included all the patients above 18 years of age whose initial presentations had evidence of falcine and tentorial SDH due to traumatic brain injury. Patients with other sites of hemorrhage at presentation, contusions, neoplasia and depressed skull fractures were excluded from our study population.

The study was approved by the hospital ethics committee and consent was waived as no identifying information was used and there is no harm to patients due to the conduct of this study. Patients with other causes of injury other than TBI and patients who had not had a repeat CT scan done within 7 days of injury were also excluded. Various other clinical and demographic variables were also noted for analysis such as the Glasgow coma scale (GCS) scores at different time intervals, complete blood count etcetera. A GCS score of 13-15 at presentation was labelled as having a mild injury. Two radiologists independently assessed the radiographic images. The widest dimension of SDH was evaluated in the axial, coronal and sagittal planes and it was measured perpendicular to the falx or tentorium. On repeat imaging we looked for a change in size and characteristics of the SDH. Frequency and percentages were used for qualitative variables while mean and standard deviation was used for continuous variables. Paired sample t tests were performed for comparison. We used IBM SPSS for Windows version 20 for our data analysis and kept p value at 0.05 or below to establish statistical significance.

RESULTS

The final study population included was n= 102 patients out of a total of 1598 cases of TBI that presented in the two-year period and had complete data available. The mean age of the patients was 34.5 +/- 15.45 years, where n= 68 (66.66%) patients were male and n= 34 (33.33%) patients were female. N=95 patients had a GCS score between 13 and 15 at the time of the presentation, while the rest of the patients had GCS score of less than 13. The mean GCS score in our study population was 14.2 and the mean GCS score at discharge was 15 respectively. N= 88 patients were shifted to the Neurosurgery ward and managed non operatively. The rest of the patients were

monitored and sent home directly from the emergency department. N=7 patients were on anticoagulants and n= 11 patients were taking antiplatelet medications. The mean INR for the anticoagulated patients had a mean and standard deviation of 2.9 +/- 1.1 respectively. The mean time period between the initial CT scan and the repeat CT scan was 10.5 hours, see table 1.

Table 1: Patient demographic and other variables of the study population of 102 patients

Variable	Frequency	Percentage	Mean	Standard Deviation
Gender				
Male	68	66.66%		
Female	34	33.33%		
Age in years			34.50	15.45
International normalized ratio				
All patients			1.18	0.95
Those who are anticoagulated			2.9	1.1
Platelet counts			234.1	86.66
GCS scores at presentation			14.2	1.6
13-15	95	93.13%		
<= 12	7	6.86%		
Anticoagulation medication	7	6.86%		
Rivaroxaban	2	1.96%		
Warfarin	5	4.90%		
Antiplatelet medication	11	10.78%		
Clopidogrel	4	3.92%		
Aspirin	7	6.86%		
Radiographic characteristics				
Location of SDH				
Falcotentorial	10	9.80%		
Falcine	58	56.86%		
Tentorial	34	33.33%		
Time interval from initial to repeat CT scan in hours			10.5	62.5
Expansion of the initial SDH				
Yes	0	0		
No	102	100%		
Size of SDH in mm				
Initial presentation			2.8	1.6
Follow up			2.7	1.6

None of the patients in our study population suffered from an expansion of the SDH on follow up imaging. When it comes to the size of the SDH there was no statistically significant difference found on initial presentation as compared to follow up having a p value of 0.17. In patients having mild TBI there was no significant differences as well having a p value of 0.12. For those patients having a GCS score of less than 13 there was no statistically significant difference in SDH size at initial presentation as compared to the size at follow up CT scan. One patient in our study population had suffered from clinical deterioration, she was a 70-year-old woman who suffered from a motor vehicular accident and presented to us with a GCS score of 15. The first CT scan showed an isolated falcine SDH of 4 mm in widest diameter. The patient suffered concomitant injuries to the thorax and became hypotensive. Later on, a diagnosis of hemothorax was made. We intubated the patient and placed a chest tube. The patient was managed conservatively for the SDH and was discharged on the 7th day of hospitalization. Figure 1 and 2 shows the initial and repeat CT scans of two elderly patients.

Figure 1: Isolated falcine SDH in a 65 year old male patient, presenting after a fall injury at baseline (picture on left) and at 6 hour post initial CT scan (picture on right).

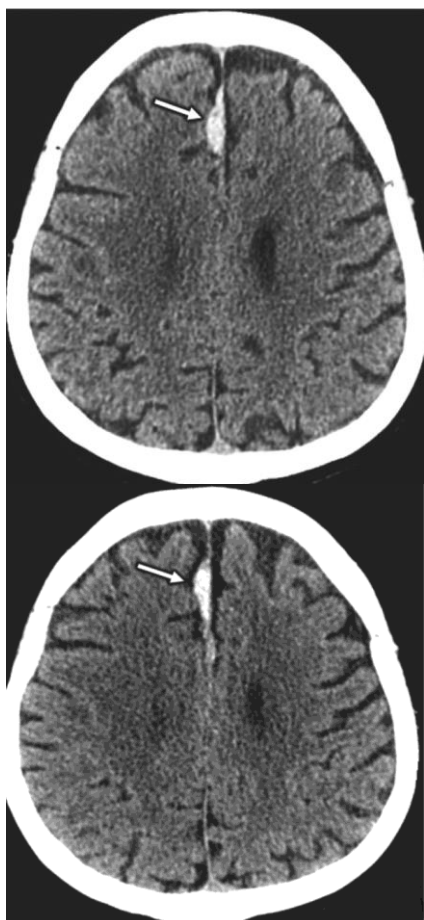
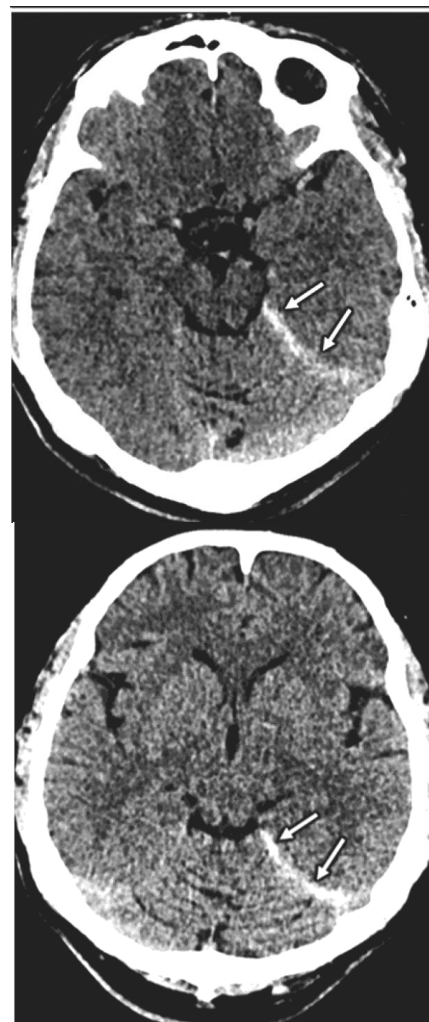


Figure 2: Isolated tentorial SDH in a 78 year old male patient, presenting after a fall injury at baseline (picture on left) and at 6 hour post initial CT scan (picture on right).



DISCUSSION

According to the results of our study the isolated falcine and tentorial subdural hematoma tend to have a smaller size and do not show increase in growth after the initial traumatic injury. Most of the published literature that explores this phenomenon were either case reports or case series.¹⁰⁻¹³ Very few large-scale studies are done on this topic and even fewer from Pakistan. Sweis et al reported their findings of 27 patients who all had favorable outcomes of their isolated falcine and tentorial SDH, none of the patients in their study required a surgical intervention. In a study by Howard et al who had 65 patients in their study, no change in size was observed in the SDH on follow up. The results of these studies combined with our own results indicate that repeat CT scans in patients with isolated falcine or tentorial SDH should be minimized and the patients should be evaluated clinically for signs of deterioration prior to the

repeat CT scan being performed. N= 18 patients in our study population received antiplatelet/anticoagulant medications. Howard et al in their study had 12 patients who had received antiplatelet/anticoagulant and showed no sign of increase in the size of SDH. ⁹ Sweis et al also reported similar findings in their three patients who received warfarin therapy.

CONCLUSION

We found that patients having isolated falcine and tentorial SDH do not require a routine repeat CT scan in the absence of any signs and symptoms of deterioration.

LIMITATIONS

There are some limitations to our study, first the retrospective approach might lead the way for observation bias. Secondly, we had very few patients who had a GSC score of less than 13 in our study population, which makes the results of our study challenging to generalize to the larger population.

SUGGESTIONS / RECOMMENDATIONS

We recommend that studies with a large patient population be conducted for patients who are receiving the anti-coagulant medication to conclusively determine the progression of SDH in these patients.

CONFLICT OF INTEREST / DISCLOSURE

None.

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