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Spontaneous and Rapid Resolution of Acute Sub Dural Hematomas: A Retrospective Study for Evaluation of Predicting Factors

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Abstract

Objective: Acute sub dural hematomas (ASDH) are one of the most common sequel following traumatic brain injury. Most of the ASDH constitutes neurosurgical emergency requiring urgent evacuation of the hematoma. There are very few and rare instances of Spontaneous and rapid resolution of ASDH. We share our experiences of Patients having spontaneous resolution of ASDH in a view to establish the pathophysiology & predicting factors and to improve the management of ASDH. *Patients & Methods:* We retrospectively analyzed Clinical & radiological findings as well as outcomes of 8 patients having ASDH who had spontaneous and rapid resolution. *Result:* Certain predicting factors such as, presence of cerebrospinal fluid (CSF) band or sub duralhygro-hematoma, large CSF spaces in computed tomography (CT) brain were consistent with these patients. *Conclusion:* Spontaneous & rapid resolution of ASDH though rare, is a possibility even in a patient with thick ASDH with significant midline shift. A repeat CT before surgery should be done especially in neurologically improving patients. Presence of the CSF band or sub duralhygro- hematoma/large CSF spaces in CT brain maybe a guide in identifying such patients and to avoid high risk surgery.

Keywords: Acute Sub dural hematoma; Spontaneous Resolution; Head Injury; CSF Band.

Introduction

Acute sub dural hematomas (ASDH) are one of the most common sequel following traumatic brain injury. Most of the ASDH constitutes neurosurgical emergency requiring urgent evacuation of the hematoma. Generally an ASDH with a thickness greater than 10 mm or a midline shift greater than 5 mm on computed tomographic (CT) scan should be surgically evacuated, regardless of the patient's Glasgow Coma Scale (GCS) score [1]. Patients with good GCS and thickness < 10 mm and midline shift less than 5mm and patients with very poor GCS and poor general condition can be managed by conservative means. However there are very few and rare instances of Spontaneous and rapid resolution of acute SDH.

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Patients and Methods

Hospital records of neurosurgery emergency admission over last 2 years were retrospectively analyzed in terms of clinical profile, radiological findings and treatment outcomes for the cases of ASDH, in which rapid and spontaneous resolution occurred during the traumatic brain injury management. Total 8 patients were qualified as case of spontaneous & rapid resolution of ASDH.

In brief the 8 cases of spontaneous resolution of ASDH, their demographic data, the time, mode and condition at presentation, CT head features before and after resolution, associated features if any and the time required for their resolution are depicted in **Table 1.**

Table. 1: Clinical summary of patients having acute sub dural hematoma (ASDH) with spontaneous & rapid resolution

No	Age/Sex	Mode of Injury	Time of Presentation	Initial NCCT Head	Clinical Condition at Presentation	Repeat NCCT Head	Associated Injuries	Clinical Condition at Discharge	Time for Spontaneous Resolution	CSF band	Thickness of ASDH in initial NCCT (in mm)	Thickness of ASDH in repeat NCCT (in mm)
1	45/M*	RTA*	4 HRS*	done after 4 hrs of injury showed contusions in bilateral temporal lobe with thick acute SDH in left hemisphere with mid line shift towards right side with large cisterna magna	GCS of E2V2M5	done 12 hrs post injury, done prior to planned surgery, demonstrated complete resolution of acute SDH	NIL	Patient was discharged on day 6 with GCS of E4V4M6	12 HRS	+	11	0
2	15/M	FFH*	2 HRS	showed left frontal acute SDH with thickness of 14 mm and midline shift of 7.4 mm	GCS was E2V2M5 and vitals were stable	done after 19 hours post injury showed complete resolution of the acute SDH	NIL	GCS improved to E4V5M6 and was successively discharged after 4 days	15 HRS	-	14	0
3	50/F*	RTA	8 HRS	showed ASDH with thickness of 10mm in left hemisphere with left temporal contusion & midline shift of 5mm	GCS of E4V5M6 her vital parameters were stable	showed resolved ASDH with absent midline shift	NIL	E4V5M6	2 DAYS	+	10	0
4	22/M	RTA	4 HRS	showed left temporal contusion with ASDH of 7.4mm thickness in left parietal region, with fracture right temporal bone with midline shift of 9.1 mm towards right side.	GCS of E2V2M5	done after 16 hours of trauma showed, dramatic resolution of ASDH and resolving contusion.	NIL	E4V4M5	16 HRS	-	7.4	0
5	45/F	RTA	3 HRS	done 3 hours after trauma revealed left sided hemispheric acute SDH of 9.6mm thickness with left temporal contusion and midline shift of about 8.5mm	GCS of E2V3M5	showed rapid and drastic resolution of acute SDH reducing the thickness to 2.5 mm and midline shift to 5.6 mm	NIL	GCS also improved to E4V4M5	4 DAYS	+	9.6	2.5
6	45/M	FFH	8 HRS	showed acute SDH of about 11mm thickness with midline shift of 6.7 mm	GCS was E4V5M6	done after 39 hours post trauma showed resolution of ASDH to 5 mm and a absent midline shift	NIL	E4V5M6	39 HRS	+	11	5
7	50/M	RTA	3 HRS	showed ASDH of 11.4 mm thickness with midline shift of 10.8 mm	GCS of E1V2M5	before surgery showed rapid resolution of ASDH to 5 mm thickness and reduced midline shift to 2.5mm	NIL	GCS of E4V4M6	4 DAYS	+	11.4	5
8	8/M	RTA	10 HRS	revealed right hemispheric ASDH of 10 mm thickness with midline shift of 6.5 mm	initial GCS of E3V2M5	done just before surgery revealed drastic spontaneous resolution of ASDH to 2 mm thickness and absent midline shift	NIL	GCS of E4V5M6	4 DAYS	+	10	2

Results

We had 2 female and 6 male patients. The age of patients varied from 8-50 years. The time of presentation from trauma varied from 3- 8 hours with an average of 4.56 hours. The thickness of ASDH at initial CT head varied from 7.4 mm to 14 mm. The midline shift on CT brain ranged between 5 mm to 9.2 mm.

The initial Glasgow coma scale (GCS) of our patients ranged from 8-15. Associated underlying parenchymal contusion was seen in 4 of 8 patients (Case no. 1, 3, 4, & 5). The CSF band (hypo density between the hematoma and inner surface of skull) was noted on initial CT head in 6 out of 8 patients (**Fig. 1, Fig. 3, Fig. 5, Fig. 6, Fig. 7 and Fig. 8**) except case no. 2 & 4 (**Fig. 2 & Fig. 4**).

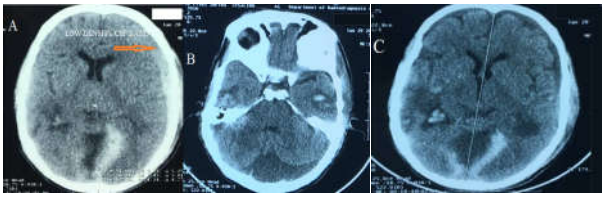

Fig. 1: Case no.1 showing **(A)** initial CT head having acute SDH with midline shift and CSF band (arrow), **(B)** associated left temporal contusion & enlarged cisterna magna, **(C)** Repeat CT head after 12hours showing complete resolution of SDH

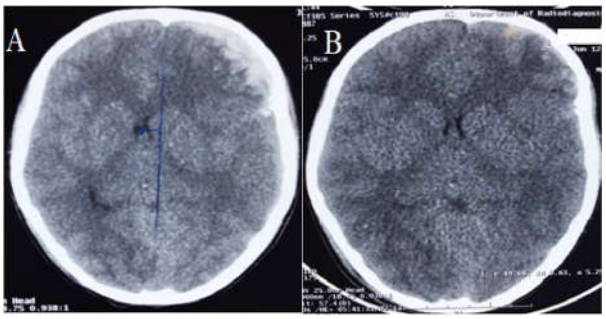

Fig. 2: Case no.2 **(A)** initial CT head showing left side acute SDH, **(B)** repeat CT head after 19 hours having spontaneous resolution of SDH

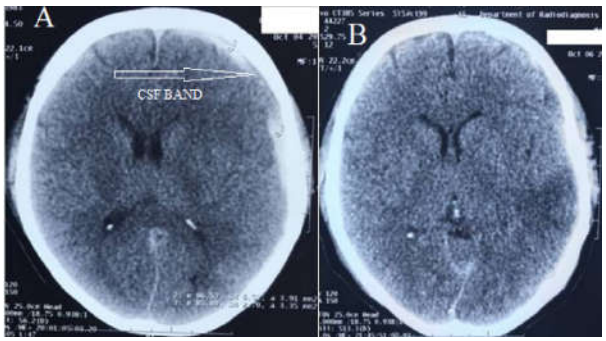

Fig. 3: Case no.3 **(A)** initial CT head showing left side acute SDH and CSF band (arrow), **(B)** Repeat CT head of same patient having spontaneous resolution of SDH

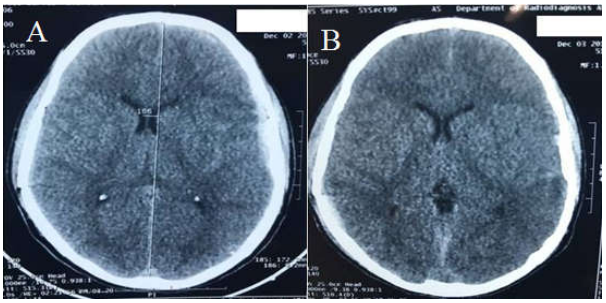

Fig. 4: Case no. 4 **(A)** initial CT head showing left acute SDH and associated left temporal contusion & right temporal bone fracture, **(B)** repeat CT head having spontaneous resolution of SDH

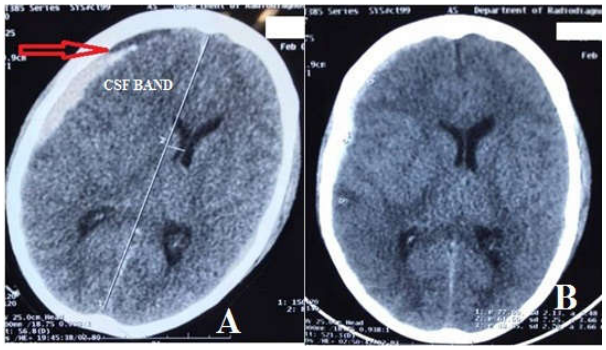

Fig. 5: Case no.5 **(A)** initial CT head showing right side acute SDH and associated CSF band, right temporal contusion, **(B)** Repeat CT head showing rapid spontaneous resolutionof SDH

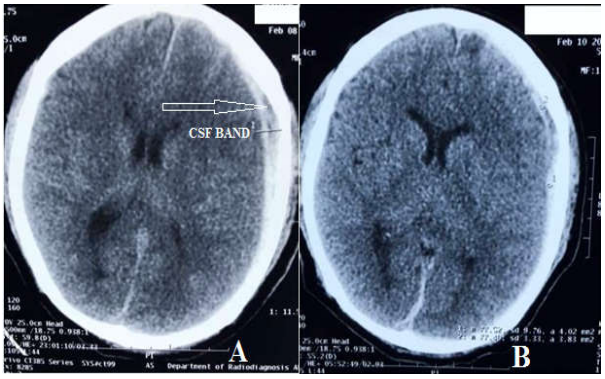

Fig. 6: Case no 6. **(A)** Initial CT head showing left side acute SDH and CSF band (arrow), **(B)** Repeat CT head of same patient having rapid spontaneous resolution of SDH

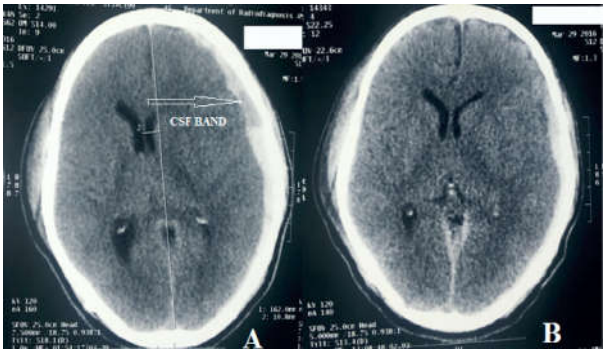

Fig. 7: Case no 7. **(A)** Initial CT head having left side acute SDH and CSF band (arrow), **(B)** Repeat CT head of showing rapid spontaneous resolution of SDH

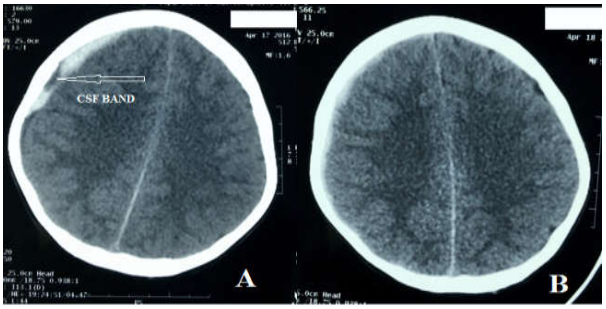

Fig. 8: Case no 8. **(A)** Initial CT head having right side acute SDH and CSF band (arrow), **(B)** Repeat CT head of having rapid spontaneous resolution of SDH

Discussion

Acute SDH usually is a neurosurgical emergency. However patients with good GCS score and small size hematomas can be managed by a conservative approach. Spontaneous resolution of acute SDH is a rare entity, however it can occur and hence, obviating the need of a surgical intervention. Such cases of spontaneous resolution have been reported in literature (2-18, 24). We shared experiences of 8 patients who had spontaneous and rapid resolution of ASDH within a span of 48 hours. Out of 8 patients, 4 patients had spontaneous and complete resolution of ASDH. In rest 4 patients, significant reduction in the thickness of ASDH was observed.

The thickness of ASDH at initial CT varied from 7.4 mm to 14 mm. The midline shift on NCCT brain ranged between 5 mm to 9.2 mm. We had 2 female patients and 6 male patients.

The age of patients varied from 8-50 years. The time of presentation from trauma varied from 3- 8 hours with an average of 4.56 hours. The initial GCS of our patients ranged from 8-15. Associated underlying parenchymal contusion was seen in 4 of 8 patients. The CSF band (hypo density between the hematoma and inner surface of skull) was noted in 6 of 8 patients.

Various possible theories have been postulated previously to explain spontaneous resolution of ASDH. One theory suggests that effusion of CSF into the subdural space due to tearing of the arachnoid membrane resulting in dilution and redistribution of the hematoma (15-17). The low density band between the hematoma and the inner wall of the skull bone, or the sub duralhygro-hematoma (CSF band) results from acute admixture of blood and CSF, which might involve the above mentioned process (19-21). As mentioned earlier, we had noticed CSF band or sub duralhygro-hematoma in 6 out of 8 patients

Cohen ET al. [5] postulated that increased CSF volume in the subarachnoid space due to brain atrophy might have facilitated the redistribution and washout of the ASDH in a patient of HIV related cerebral atrophy with ASDH. One of our patients had large cistern magna further supporting this theory of increased CSF volume facilitating the wash out and redistribution of ASDH.

Another theory suggests that acute brain edema after a severe head injury compresses and redistributes the hematoma [13, 22, 23]. The cause of acute brain swelling is considered to be an increase in cerebral blood volume and brain edema. Kapsalaket al [22] had documented raised intracranial pressure in a case of spontaneous resolution of ASDH supporting the theory of acutely increased ICP as a driving force responsible for this phenomenon.

Polman et al [23] reported a case of spontaneous resolution of an acute traumatic subdural hematoma within 6 hours. Magnetic resonance imaging demonstrated no real disappearance, but rather a redistribution of the frontoparietotemporal ASDH over both cerebral convexities and the tentorium after rapid spontaneous resolution. Kuroiwa et al [13] reported that the size of the frontoparietotemporal ASDH decreased, as the size of the interhemispheric subdural hematoma increased, suggesting the redistribution of ASDH due to brain swelling. Bortolotti et al [4] reported a single case exhibiting a subacute spinal SDH after rapid spontaneous resolution of cranial SDH suggesting redistribution of ASDH to spinal subdural space.

Lou and Yang reported [25] two of three cases of acute SDH with rapid spontaneousresolution had linear skull fractures and scalp hematomas upon their admission and it was noted that, after the SDH resolution the associated scalp hematomas increased in size, suggesting that part of the SDH moved to the scalp hematomas through a meningeal tear and a skull fracture. Similarly, Kundra and Kundra(12) reported a case in which an acute SDH was spontaneously resolved by moving to extradural spaces through a dural tear and a coronal diastatic fracture, which lead to a corresponding increase in size of the overlying scalp hematoma. Only One our patient (case no. 4) had temporal fracture but on the opposite side of the ASDH and didn't have scalp hematoma.

Bin Liu et al [26] proposed new hypothesis called the ''Piston theory'' where it was proposed that the fluctuation of intra-parenchymal cerebral pressure, (which results from alterations inintra-thoracic and intra-abdominal pressure after the trauma) similar to a piston moving back and forth, drives the rapid spontaneous resolution of ASDH.

Fujimoto K et al.[18] analyseda total of 366 consecutive patients with ASDH and concluded that, use of antiplatelet agents before head injury and a low-density band between the hematoma and inner skull bone on CT images (indicative of cerebrospinal fluid infusion into the subdural space) increase the probability of rapid spontaneous resolution. There were no patients with the history of taking antiplatelet drugs in our study.

Wen et al reviewed previously described cases of spontaneous resolution of acute SDH and suggested the following characteristics which were common in these patients; Transitory coma lasting no longer than 12 h, absence of cerebral contusion, band of low density between the skull and the hematoma in (CT) imaging, thin width which is widely distributed, Glasgow Coma Scale >8 on admission. In our series to contrary we had 4 of 8 patients had underlying contusions. Most of our patients had GCS of 9 and above.

Conclusion

To conclude although ASDH is neurosurgical emergency, certain cases can be managed by conservative means. Spontaneous resolution of ASDH though rare, is a possibility even in a patient with thick ASDH with significant midline shift. A repeat NCCT before surgery should be done especially in neurologically improving patients. Presence of CSF band or sub duralhygro-hematoma/large CSF spaces in NCCT brain maybe a guide in identifying such patients, in whom high risk surgery can be avoided.

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