

Predictive Factors for Chronic Subdural Hematoma Recurrence

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Abstract

Background: Recurrence of chronic subdural hematoma is a major impact on the clinical course during management. Literatures define several factors during their study.

Aim of Study: We aimed to investigate the predictive factors that may be responsible for CSDH recurrence in patients who underwent surgical evacuation at our center.

Patients and Methods: This was a retrospective analysis of medical records for patients who underwent surgical evacuation of CSDH at Kasr Al-Ainy University Hospital from July 2018 to August 2020. The diagnosis of CSDH was established by Computed Tomography (CT). The ethical approval was gained prior to data retrieval. The main inclusion criteria is the presence of CSDH on CT scan with neurological sequelae. It has been found that 54 medical records. Eleven cases were excluded from the study sample due to missing data. Finally, 43 patients' file were reviewed for analysis. Routine imaging of post-operative evacuation is achieved in the 1st day, 1st and 3rd months.

Results: The mean and standard deviation of age was 64.71±12.65 years, age range 45-88 years. The male patients constituted 76.7% the interval between head trauma (found in 39.5%) and surgery was up to 60 days. Multivariate analysis identified mixed density as the sole predictive value for recurrence (OR=16.8, 95% CI=13.4-20.2, *p*-value=0.021).

Conclusion: Recurrence of an evacuated chronic subdural hematoma is not uncommon phenomena. Presence of acute blood on top of chronic fluid (mixed density) is regarded as a risk factor for recurrence in the first month post-operatively.

Key Words: CSDH – Recurrence – Subdural hematoma.

Introduction

THE definition of Chronic Subdural Hematoma (CSDH) is an abnormal collection of liquefied blood in subdural space that may lead to neurologically consequences [1,2]. The incidence is ranging from 1.72-20.6/100,000 per year [3-5]. The incidence in elderly age is more evident. The surgical

treatment is the corner stone of CSDH with mass effect [6]. There are multiple options to evacuate the hematoma [7]. The main problem that facing neurosurgeons when dealing with CSDH is recurrence [5,8-11]. The recurrence rate is ranging from 5% to 30% [7,12,13]. Prediction of recurrence was extensively investigated previously in many literature [3-5,7,8,10,14]. In our study, we aimed to investigate the predictive factors that may be responsible for CSDH recurrence in patients who underwent surgical evacuation at our center.

Material and Methods

Study design and recruitment:

This was a retrospective analysis of medical records for patients who underwent surgical evacuation of CSDH at Kasr Al-Ainy University Hospital from July 2018 to August 2020. The diagnosis of CSDH was established by Computed Tomography (CT). The ethical approval was gained prior to medical records recruitment. The main inclusion criteria is the presence of CSDH on CT scan with neurological sequelae that requires evacuation.

Study parameters and predictive factors:

The following parameters were collected; age, gender, symptomatology, duration, laterality, comorbidities (hypertension, DM or medications for coagulopathy), Markwalder's grading scale (Table 1), midline shifting (mm), cisternal compression, thickness of subdural hematoma (mm) and finally the density of hematoma according to Hounsfield Unit (HU) on Ct scan (Table 2).

Table (1): Markwalder grading scale.

Grade 0	• Neurologically intact
Grade 1	• Alert and oriented
Grade 2	• Drowsy and disoriented
Grade 3	• Stuporous or focal signs such as hemiplegia
Grade 4	• Comatose with no motor response, decerebrate or decorticate posturing

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Table (2): Density of CSDH on CT scan.

Low density	<25 HU*
Isodensity	25-35 HU
Hyper density	>35 HU
Mixed density	Mixed signals on CT scan

*HU: Hounsfield Unit.

Study selection:

From July 2018 to August 2020, it has been found that 54 medical records with diagnosis of CSDH. Eleven cases were excluded from the study sample due to missing data. At the end, 43 patients' file were reviewed for appropriate statistical analysis.

Follow-up:

Routine imaging of post-operative evacuation is achieved in the 1st day, 1st and 3rd months. Emergent imaging is a must in case of the presence

of symptoms suggestive of increased intracranial tension or development of focal deficit.

Definition of recurrence:

The definition of recurrence is increased volume of ipsilateral subdural hematoma on CT scan with signs of mass effect (increased intracranial tension or presence of neurological deficit).

Statistical analysis:

A univariate analysis was done with Pearson χ^2 test or Fisher test. A Mann-Whitney U-test was utilized for noncategorical variables. Multivariate regression analysis was done for prediction of independent factors responsible for recurrence. A *p*-value below 0.05 was regarded as significant. The relationship between probable predictive factor and recurrence was expressed in Odds Ratio (OR) and 95% Confidence Interval (CI).

Results

Table (3): Factors related to recurrence of CSDH: Univariate and multivariate regression analysis.

Factor	Number of patients (%)		<i>p</i> -value univariate regression analysis	<i>p</i> -value multivariate regression analysis	OR, 95% CI
	No recurrence	Recurrence			
Total	36	7			
Sex (male)	28 (77%)	5 (71.4%)			
Age (years)	64.18±14.2	65.25±11.1	0.88	0.3	0.97 (0.87-1.07)
Bilateral hematoma	10 (27.7%)	2 (28.5%)	0.27	0.9	0.81 (0.79-0.83)
Hypertension	8 (22.2%)	2 (28.5%)	1.0	0.48	2.54 (1.83-3.25)
Diabetes mellitus	10 (27.7%)	3 (42.8%)	1.0	0.99	4.22 (3.71-4.73)
Antiplatelet therapy	9 (25%)	2 (28.5%)	0.11	0.65	0.66 (0.15-1.17)
Anticoagulant therapy	9 (25%)	0 (0%)	1.0	0.99	0.56 (0.3-0.82)
Markwalder's grading scale:					
1	14 (38.8%)	5 (71.4%)			
2	11 (30.5%)	2 (28.5%)			
3	9 (25%)	0 (0%)			
4	2 (5.55%)	0 (0%)			
Midline shift (mm)	4.52±3.2	6.97±3.9	0.07	0.448	1.09 (0.81-1.4)
Cisterna ambience compression	24 (66%)	7 (100%)	0.001*	0.88	NA
Density:					
Isodensity	21 (58.3%)	1 (14.2%)	0.112	NA	NA
Low density	7 (19.4%)	0 (0%)	1.00	NA	NA
High density	4 (11.15%)	0 (0%)	1.00	NA	NA
Mixed density	4 (11.15%)	6 (85.7%)	0.01*	0.021	16.8 (13.4-20.2)
Thickness of hematoma	17.6±6.1	22.4±8.18	0.11	0.07	1.2 (0.4-2)
Organized hematoma	1 (2.77%)	0 (0%)	1.0	0.99	NA
Thickness of post-operative pneumocephalus (mm)	7.12±2.4	7.14±1.1	0.98	0.55	1.02 (0.72-1.32)
Thickness of post-operative liquid (mm)	4.98±4.2	5.12±3.3	0.43	0.31	0.81 (0.6-1.02)

The total number of patients' medical record were 43. Only 7 cases (16.27%) of patients had had recurrence that requires evacuation. Table (3) illustrate the demographic, clinical and radiological criteria of studied participants. The mean and

standard deviation of age was 64.71±12.65 years, age range 45-88 years. The male patients constituted 76.7% the interval between head trauma (found in 39.5%) and surgery was up to 60 days. Eleven patients received aspirin and 9 patients took war-

farin prior to presentation. All patients required evacuation either by burr hole craniostomy or craniotomy. Burr hole craniostomy was done in 33 patients in non-recurrence group while all patients did this procedure in the recurrent one. Mortality rate was seen in five patients (11.6%).

Two patients in recurrence group died between the 1st and 2nd week post-operatively due to myocardial infarction or respiratory failure. Univariate analysis showed mixed density and ambient cistern compression were associated with recurrence (0.01, 0.001) respectively.

Table (4): Recurrent CSDH cases in our retrospective analysis.

No.	Age	Sex	HTN/ DM*	Antiplatelet + Anticoag	Mark-walder's G. S.	Hemorrhage side	Midline shift (mm)	Cisterna Ambience compression	Destiny	Hematoma Thickness	Post-operative Gas (mm)	Post-operative liquid
1	64	M	No	No	1	Left	11	Yes	Mixed	27	4	9
2	63	M	Yes	No	1	Right	8	Yes	Mixed	14	9	5
3	80	F	No	Yes	2	Right	9	Yes	Iso-density	14	4	5
4	74	M	Yes	Yes	1	Left	4	Yes	Mixed	36	9	10
5	71	F	No	No	1	Left	9	Yes	Mixed	14	4	4
6	60	M	Yes	No	1	Right	14	Yes	Mixed	19	14	6
7	55	M	No	No	2	Right	6	Yes	Mixed	24	4	8

*HTN/DM: Hypertension or Diabetes Mellitus.

Multivariate analysis identified mixed density as the sole predictive value for recurrence (OR=

16.8, 95% CI=13.4-20.2, *p*-value=0.021). Further description of recurrent cases in (Table 4).

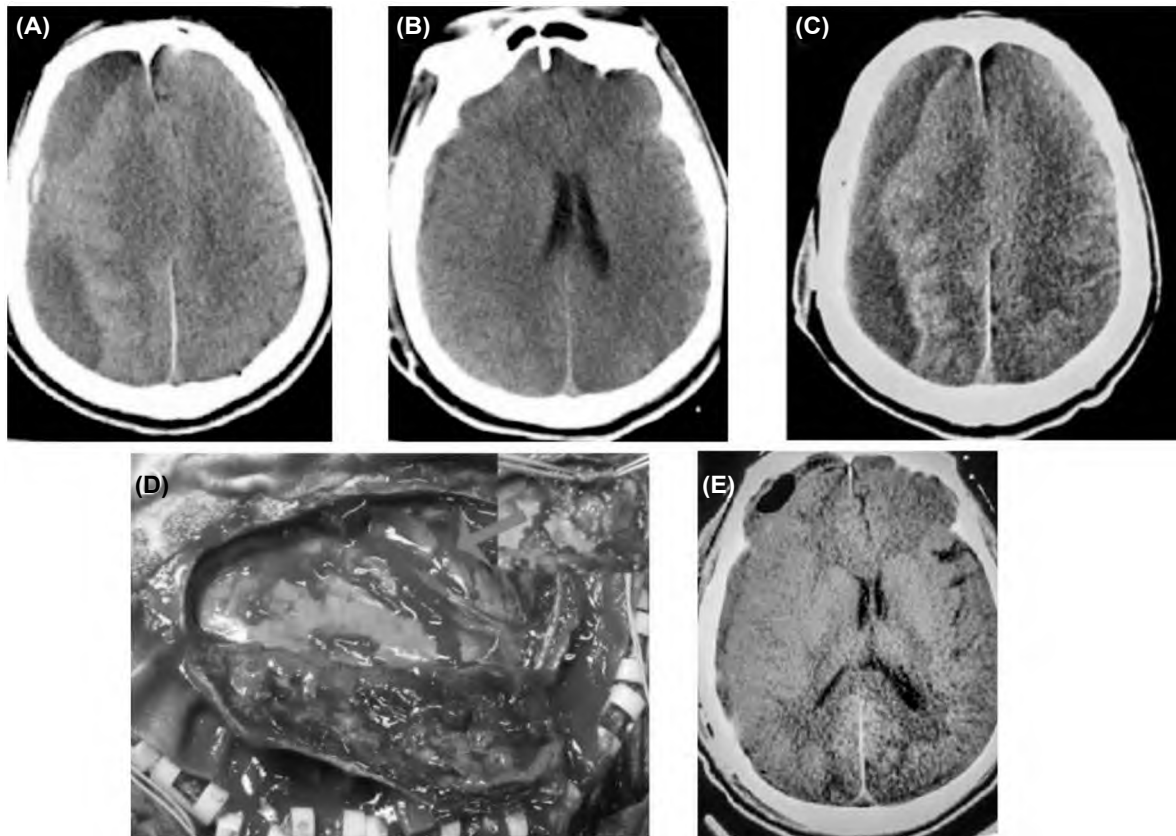


Fig. (1): A- Non contrast CT on first visit. B- CT scan after burr hole craniostomy. C- CT scan showed recollection. D- Intraoperative image showed thick neomembrane. E- CT after craniotomy.

Case presentation:

A 65-year-old male patient with history of ischemic heart disease and antiplatelet therapy (aspirin) developed left sided weakness grade 4/5 with decreased consciousness over 7 days. CT scan

showed right fronto-parietal chronic subdural hematoma with mixed density Fig. (1A). Reverse of antiplatelet therapy was achieved by giving platelet replacement prior to surgery. He underwent burr hole craniostomy. An immediate post-operative

CT scan showed no fluid or gas in the subdural space Fig. (1B). He was discharged 4 days thereafter with improvement in his conscious level and hemiplegia. Eleven days post-operatively, he presented in the Emergency Department with deterioration in consciousness and re-emergence of left sided weakness. An immediate CT scan showed subdural collection extending from frontal to parietal region with midline shift (>1cm) Fig. (1C). Craniotomy was done, we evacuate the collection and trimmed the thick inner neomembrane with hemostasis Fig. (1D). Patient was admitted to Intensive Care Unit for two days. His consciousness was improved dramatically as well as his weakness to be full motor power. Before discharge (on the 5th day), CT scan was done which showed no fluid with minimal gas collection Fig. (1E).

Discussion

The risk factors for CSDH recurrence were mentioned previously in literatures [1,2,11,12,15]. They are included advanced age, recent hemorrhage, intracranial hypotension, concomitant brain atrophy, bilateral hematoma, associated comorbidities like coagulopathy, post-operative subdural pneumocephalus and type of hematoma [8,10-12]. The mechanism of developing the subdural collection is being well understood. But what was a great question to neurosurgeons is the cause of recurrence apart from the technical faults. In this study as well as previous literature, the key players in successful CSDH evacuation are adequate drainage, return of neural tissue and prevention of recurrence [15-17]. In our logistic regression models, mixed density (i.e. acute on top of chronic hematoma) was found to be the sole factor responsible for recurrence. Certain literatures found similar finding [10,18]. All recurrent cases were operated at 1st with burr hole craniostomy with mixed density hematoma. Recurrence was diagnosed at the 1st fourteen days. Recurrence of subdural hematoma was not merely radiological but rather with clinical impact in the form of increased intracranial tension and positive neurological deficit. All recurrent cases were treated by craniotomy with strong evidence of thick inner neomembrane and organized hematoma. These two observations were found in all recurrent cases.

The thickened inner neomembrane is an important factor in CSDH recurrence in many published articles discussing this issue. Thin inner membrane can aid resolution of hematoma by facilitating neural tissue expansion and slow absorption of gas and liquid [10]. In contrast, the presence of thick one prevents neural tissue expansion. Previous

literatures suggest removing the neomembrane to decrease chances of recurrence [4,5,8,10]. However, Sahyouni and colleagues [19] found no superior outcomes from removing the neomembrane in comparison with traditional burrhole craniostomy as regard outcome and complications.

The recurrence rate is ranging from 5% to 33% in published articles. In our study, it was found to be 16.27%. We used burr hole craniostomy with closed draining system as a method for evacuation of chronic subdural hematoma in our center. We noted that presence of liquid and gas are not preventive finding against recurrence. Certain reports of gas presence in the subdural hematoma is regarded as risk factor for recurrence [2,20]. Neither gas nor liquid in the subdural space post-operatively are predictive for recurrence in our study. Anticoagulant and antiplatelet medications are acting in reversible and temporary [4,6,13,21,22]. Neurosurgeons as well as anesthesiologists were used to reverse their actions pre-operatively by giving counteracting medications (e.g. Vitamin K) or replacement therapy (fresh frozen plasma or platelets). In our study, presence of anticoagulant or antiplatelet therapy were found to be of no predictive value.

The major limitation in our study is in its small sample size. Different operators were found during data retrieval which makes judgment of fixed technical skill is not established during analysis of data.

Conclusion:

Recurrence of an evacuated chronic subdural hematoma is not uncommon phenomena. Presence of acute blood on top of chronic fluid (mixed density) is regarded as a risk factor for recurrence in the first month post-operatively.

Conflict of interest:

Non to declare.

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العوامل التنبؤية لتكرار الورم الدموي تحت الأم الجافية المزمن

من المعروف أن حدوث إرتجاج للنزيف المزمن الذى يحدث تحت الأم الجافية لهو من أصعب المشاكل التى تواجه الجراحين خلال معالجة هذا المرض ولهذا قمنا بهذا الدراسة لتحديد الأسباب التى قد تؤدى لحدوث هذا الإرتجاج فى المرضى الذين خضعوا لعمليات جراحية لافراغ هذا النزيف.

تمت هذه الدراسة المرجعية على المرضى الذين يعانون من النزيف المزمن ما تحت الأم الجافية والذين قد خضعوا لجراحة لافراغ هذا النزيف فى مستشفيات قصر العينى فى الفترة ما بين يوليو ٢٠١٨ وأغسطس ٢٠٢٠ بمراجعة الحالات، تم العثور على ٥٤ مريض ممن تنطبق عليهم شروط الدراسة من حيث وجود نزيف مزمن ما تحت الأم الجافية كافي للتأثير على الجهاز العصبى. تم إستبعاد ١١ حالة لعدم إكمال البيانات. وبالتالي تبقى ٤٣ حالة ممن تنطبق عليهم الشروط والذين خضعوا لعمليات جراحية كما أجرى ليهم إشعات مقطعية للمخ فى اليوم الأول ما بعد الجراحة ثم بعد شهر من الجراحة ثم بعد ٣ شهور من الجراحة.

تراوحت أعمار المرضى المشمولين فى الدراسة ما بين ٤٥ و ٨٨ سنة بمتوسط ٦٤ سنة. كان الذكور ٧٦.٧٪ من المرضى. كما كان متوسط الفترة ما بين حدوث ضربة بالرأس وإكتشاف النزيف ٦٠ يوماً.

لقد تبين بالتحليل الإحصائى المتعدد إن وجود كثافة متباينة لمكونات النزيف هو العامل الوحيد الذى يحقق دلالة إحصائية فى توقع إرتجاج هذا النوع من النزيف وبخاصة فى الشهر الأول فيما بعد إجراء الجراحة.