

## Emergency Management of Subdural Hematoma

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### ABSTRACT

**Background:** Subdural hematoma is extra-cerebral accumulation of blood between the dura matter and the subarachnoid layer. It is almost always caused by trauma or due to blood thinning therapies, and occurs due to rupture of bridging veins. Acute subdural hematoma is an emergency situation and requires prompt diagnosis using CT most of the time, and management requires surgery as well as reversal of anticoagulants.

**Materials and methods:** We conducted this review using a comprehensive search of MEDLINE, PubMed, and EMBASE, January 1985, through February 2017. The following search terms were used: subdural hematoma, emergency management of subdural hematoma, CT vs. MRI in diagnosis of subdural hematoma, treatment of subdural hematoma. **Aim:** In this review, we aim to study the etiology of subdural hematoma, explore how to diagnose and manage it in the emergency department **Conclusion:** Subdural hematoma is an important clinical presentation that needs proper and prompt surgical management and treatment. Treatment should be as less invasive as possible, with higher efficacy and lower recurrence rates. Non-surgical approaches are still being studied with no proven efficacy for them until now.

**Keywords:** subdural hematoma, diagnosis in emergency room for subdural hematoma, CT vs. MRI, management of subdural hematoma

### INTRODUCTION

Extra-cerebral accumulation of blood (whether liquid or clotted) between the dura matter and the subarachnoid layer is called subdural hematoma. This hematoma does not cause an expansion of the subarachnoid area. The cause of this hematoma is almost always trauma. Hematoma will cause an accumulation that will lead to compression of the brain and focal neurological manifestations.

Moreover, it causes an increase in intracranial pressure (with subsequent sequelae) and can affect consciousness <sup>[1]</sup>. The classification of subdural hematomas depends mainly on the time relapsing between the causing of the trauma and the onset of clinical signs and symptoms. Subdural hematomas can be classified as the following <sup>[2]</sup>:

- Acute subdural hematoma: onset of clinical signs and symptoms is within three days following trauma.
- Subacute subdural hematoma: onset of clinical signs and symptoms is within 4-21 days following trauma.
- Chronic subdural hematoma: onset of clinical signs and symptoms is after more than 21 days following trauma.

### METHODOLOGY

#### • Data Sources and Search terms

We conducted this review using a comprehensive search of MEDLINE, PubMed, and EMBASE, January 1985, through February 2017. The following search terms were used: subdural hematoma, emergency management of subdural hematoma, CT vs. MRI in diagnosis of subdural hematoma, treatment of subdural hematoma.

**The study was done after approval of ethical board of Majmaah university.**

#### • Data Extraction

Two reviewers have independently reviewed the studies, abstracted data, and disagreements were solved by consensus. Studies were evaluated for quality and a review protocol was followed throughout.

### Etiology

Subdural hematomas constitute up to 3% of cases presenting to neurosurgery clinics, and are most likely due to preceding trauma. Usually, trauma causing subdural hematoma is minor, anteroposterior, and is associated with emissary veins rupture. The long term

use of antiplatelets and anticoagulants has been linked to the occurrence of subdural hematomas, and has been shown to affect manifestations and complications, especially in chronic hematomas. Moreover, recent studies have found that antiplatelets and anticoagulants may be responsible for the occurrence of spontaneous (also known as non-traumatic) subdural hematoma. However, the use of these drugs is still considered a predisposing factor rather than a causing etiology <sup>[1]</sup>.

### Diagnosis

#### *Signs and Symptoms*

Chronic subdural hematoma can be quite challenging to diagnose, especially due to its high incidence among elderly, with the vague presentation of only decreased physical activity. Additionally, the causing trauma may be forgotten or neglected, causing many cases of misdiagnosis. This makes a thorough history that takes even minor trauma into consideration essential. This would not be only the responsibility of the patient, but also family members. Other than trauma, the presence of focal signs indicating brain damage (mainly motor), significantly decreased physical activity, and the fluctuation of symptoms, all must raise the suspicion of a diagnosis of a subdural hematoma. Other non-specific findings will include headache, elevated intracranial pressure with its associated signs, and/or drowsiness. The nature of signs and symptoms may help in the localization of the injury. However, confirmation is still needed <sup>[3]</sup>.

### Investigations

#### *CT vs. MRI*

CT and MRI are the main imaging modalities used to diagnose a subdural hematoma, with each one having its advantages and disadvantages. CT imaging is more rapid, more feasible, and less expensive than MRI. It can help reach a diagnosis within a relatively short time, and aid for proper early management. On the other hand, MRI provides valid more accurate results than CT and can show the injured bones more clearly.

It is also effective when diffuse axonal injuries are suspected, which cannot be detected in CT or other modalities. The term diffuse axonal injuries describes degeneration of the Wallerian axons causing axonal disintegration. Diffuse axonal injuries occur mainly in the white matter of the parasagittal cortex, the pontomesencephalic junction, and the corpus callosum <sup>[4]</sup>. In addition to this, MRI can provide clearer

imaging with exact location and dimensions of the hematoma. It can also show the relation of the hematoma with other near structures and the presence or absence of a mass effect by the hematoma. MRI also provides a more useful method in cases of bilateral and/or isodense hematomas. This more accurate and clear information provided by MRI allows the possibility of a better more effective surgical approach to correct the defect <sup>[5]</sup>.

### Treatment

#### *Surgery*

Surgery is most important intervention in managing subdural hematomas. Surgical techniques have developed a lot in the recent years causing better outcomes. Common surgical techniques in the treatment of subdural hematoma include <sup>[6-8]</sup>:

- Single burr hole technique (also known as minimal craniotomy), which uses a small hole which is smaller than 3 cm, with a closed vacuum drainage system. This technique has a variation where sodium chloride solution (physiologic serum) is used for irrigation.
- Twist drill trephination technique that also uses a closed system for drainage. This technique has a variant called the two-minimal craniotomy technique.
- Craniotomy with a diameter of more than 3 cm, using a vacuum closed system for drainage. This technique is mainly used in old cases characterized by the presence of a chronic septated hematoma.

#### **Patients on Anticoagulant Therapy**

Patients on anticoagulants therapy presenting with chronic subdural hematoma should be treated separately. This population is of special importance due to the continuous increase in chronic oral anticoagulants use. A recent research found that the risk of developing subdural hematoma can be up to 40 times more in individuals on anticoagulants than individuals who are not. Another Swiss study reported that up to 40% of patients with chronic subdural hematoma are on a daily anticoagulants regimen <sup>[9]</sup>.

Anticoagulants treatment does not only raises the risk of developing a subdural hematoma, but also makes its treatment more complicated, due to effects of coagulopathy.

Therefore, when patients with anticoagulants therapy present with a chronic subdural hematoma the following must be considered: their anticoagulants regimen must be adjusted to prevent the recurrence of hematoma and to make surgery more feasible. Even patients with specific indications of anticoagulants

(like severe cardiac pathology) should be treated in this case <sup>[8]</sup>.

Patients on antiplatelet therapy are also considered with a higher risk of developing hematoma and progressing to complications related to it, although their risk is still lower than patients on anticoagulants. When these patients present with a chronic subdural hematoma, the first step is to stop the antiplatelets therapy allowing for a proper neurosurgical management. After proper management is performed, the reintroduction of drugs can be considered with careful considerations <sup>[9]</sup>.

### Reversal of Coagulopathy

The reversal of coagulopathy can be essential in some cases but also has its risks. Any patient with a subdural hematoma carries a risk of developing an intracerebral hemorrhage, or a huge hematomal expansion when coagulopathy is significant. In subdural hematoma cases where acute exacerbation occurs on top of a chronic case, there is an excessive activation of coagulation and fibrinolytics, making clot formation unlikely, and thus the expansion very likely. Reversing anticoagulation must be considered regarding advantages and disadvantages of it. Data regarding this issue is still very limited in the literature. Moreover, the risk of bleeding may be high in some cases. When considering reversal, the INR target is usually 1.2-1.5.

In fact, some researchers suggest that reversing anticoagulation rapidly can significantly improve the prognosis of intracranial hemorrhage and lead to lower mortality rates. Anticoagulation reversal can be achieved using fresh frozen plasma, vitamin K, recombinant activated factor VII (rFVIIa), and prothrombin complex concentrates <sup>[8]</sup>.

#### Reversal of Antiplatelet Treatment

Varying data exists on the effect of antiplatelets therapy on the expansion of hematoma and the occurrence of further complications.

However, some suggest that being on these drugs can increase the risk of growth and expansion. Patients on these drugs who present with manifestations of hematoma are recommended to receive rFVIIa, platelets and desmopressin, which on the other hand are not used for the reversal of coagulopathy. Desmopressin actually showed benefits of antiplatelets reversal when was infused for 20 minutes before neurosurgery <sup>[10]</sup>.

### CONCLUSION

Subdural hematoma is an important clinical presentation that needs proper surgical management and treatment. Many techniques for surgery are present, however, relapse rates are still relatively high and studies on surgical techniques' efficacy are not conclusive. Generally, any treatment should be as less invasive as possible, with higher efficacy and lower recurrence rates. Non-surgical approaches are still being studied with no proven efficacy for them until now.

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