

Conservative Versus Surgical Management for Non-Traumatic Subarachnoid Hemorrhage: A Mini Review



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Abstract

Subarachnoid hemorrhage diagnosis is always a challenge for patients and physicians because it has different presentations. There are two main causes of subarachnoid hemorrhage: traumatic and non-traumatic subarachnoid hemorrhage. Both groups share clinical characteristics, but not treatment. Therefore, it is essential to recognize the signs, symptoms, and types of presentation for proper management. The objective of this article is to inform our audience about the significant difference between conservative and surgical treatment for non-traumatic subarachnoid hemorrhage because it carries a high risk of morbidity and mortality, requiring emergency management and well-trained physicians to evaluate patients suspicious for the diagnosis. This article is a compilation of several articles that have been selected from different databases, International Journal of Emergency Medicine, and Journal of Neurosurgery. Traumatic subarachnoid-related articles were excluded from our search. There is no consensus yet about the approach of patients with non-traumatic Subarachnoid Hemorrhage (ntSAH) among experts worldwide, so SAH diagnosis is often overlooked due to the clinical manifestations and inconsistencies in individual findings, especially atypical presentation arrives at the ER. The most significant limitations of timely and aggressive management of SAH are the lack of clinical suspicion and the delay from the CT scan order until the CT scan report is ready. The most repeated cause of subarachnoid hemorrhage is aneurysm rupture. A timely aneurysm repair is considered the most critical strategy to reduce the risk of aneurysm re-rupture. Therefore, detection of the cause of bleeding and prompt management can make the difference between life and death.

Keywords: Subarachnoid hemorrhage; Surgical Management of SAH; Conservative Management of SAH; Medical management of SAH; Nontraumatic Subarachnoid hemorrhage

Abbreviations: SAH: Subarachnoid Hemorrhage; NtSAH: Non-Traumatic Subarachnoid Hemorrhage; GCS: Glasgow Coma Scale; DCI: Delayed Cerebral Ischemia

Introduction

The most common cause of patients going to the emergency room is headache [1]. As physicians, we must be able to recognize headaches that could be life-threatening. The medical history and the physical findings will allow us to differentiate a simple headache from those that can be deadly. "The worst headache of my life," this is the way how medical students and physicians can start thinking about subarachnoid hemorrhage, but not all the patients can recognize the worst headache in their life; some of them die before they arrive at the emergency room. There are many tools and strategies to approach and treat patients with

severe headaches, and we must understand the strengths and limitations of each strategy.

The clinical presentation should be considered before proceeding with the different diagnostic modalities for subarachnoid hemorrhage. Once a subarachnoid hemorrhage is suspected, a CT scan must be requested. Subarachnoid hemorrhage diagnosis is always a challenge for the physician. Every second and minute will determine a poor or great outcome in each patient. There are multiple causes of subarachnoid hemorrhage (SAH), but we can differentiate two big groups: Traumatic and non-traumatic

subarachnoid hemorrhage. Both groups share some similar clinical characteristics, but not the treatment.

There are several scales to categorize SAH. The systems used to predict the patient outcome are the Hunt and Hess score and World Federation of Neurological Surgeons grading, and the Fisher grade helps predict vasospasm. In terms of patient-centered results and prognosis, specific scores were not performed better than the Glasgow Coma Scale (GCS). As we search into the diagnosis of SAH, it is essential to note that some patients with SAH, for example, Hunt and Hess lower grades are more commonly failed to see because the clinical presentation is mild, and they may have smaller aneurysms with scant subarachnoid blood. These patients do not necessarily recover or have less morbidity with rupture or re-rupture [1].

Accurate data is not available about the management of subarachnoid hemorrhage, but some of the Egyptian, Greek, and Arabic literature report some clues of earliest management in 1800. Unfortunately, the management is still controversial, especially when the discussion is between surgical and medical management of SAH. That is why reviewing many studies worldwide will allow colleagues to understand how to face this particular situation.

The most crucial strategy to reduce the risk of aneurysm re-rupture is timely aneurysm repair is generally considered. However, evidence for the ideal timing of treatment is limited, and it is undefined if ultra-timely treatment (within 24 hours) is superior to timely aneurysm repair (within 72 hours) [2]. A recently published retrospective data analysis that compares ultra-early treatment with repair performed within 24-72 hours after hemorrhage suggests that aneurysm occlusion can be performed safely within 72 hours after aneurysm rupture [2]. The American Heart Association/American Stroke Association suggests as a Class IB guidance that surgical clipping or endovascular coiling of the ruptured aneurysm should be implemented as early as achievable in most patients to decrease the risk of re-bleeding after SAH [2]. The treatment modality option between surgical clipping and endovascular coiling is a complex endeavor that requires an interdisciplinary team's expertise, including neuro-intensivists, interventional neuroradiologists, and neurovascular surgeons. The endovascular approach is superior for aneurysms to be considered equally treatable by both modalities, associated with better long-term outcomes.

Retrospective data on clipping and coiling in poor-grade patients suggests that surgical clipping and endovascular are equally effective. An early and short course of an antifibrinolytic drug, including tranexamic acid, started as soon as the radiological diagnosis of SAH is made and stopped within 24-72 hours, has been associated with a decreased rate of ultra-early re-bleeding and a non-significant improvement in long-term functional outcome. This approach remains controversial, and short-term administration of tranexamic acid to prevent re-bleeding is being

studied in a multicenter randomized trial (Dutch Trial Registry number NTR3272) [3]. The avoidance of extreme levels of blood pressure is another medical intervention applied to prevent aneurysm re-rupture. The American Heart Association/American Stroke Association and the Neurocritical Care guidelines advise keeping the mean arterial blood pressure below 110mm Hg or systolic blood pressure below 160mm Hg (or both) in the presence of a ruptured unsecured aneurysm.

Serum biomarkers to detect the risk of delayed cerebral ischemia (DCI) are showing promising results [3]. Changes in serum protein S100B levels interacted with DCI status (presence vs. absence): $F=3.84, p=0.016$. Patients with DCI had higher S100B concentration level on day 3 than those without DCI ($3.54\pm 0.50\text{ng/ml}$ vs. $0.58\pm 0.43\text{ng/ml}$, $p=0.001$). S100B concentration on day 3 following a SAH predicted DCI ($p=0.006$). The multivariate logistic regression analysis has shown that impaired cerebral autoregulation and elevated S100B concentration on day three increase the likelihood of DCI [3]. Subarachnoid hemorrhage (SAH) is a medical emergency that requires urgent management. Around Eighty-five percent of cases of atraumatic SAH result from a ruptured aneurysm. Other factors such as arteriovenous malformation, Ehlers-Danlos disease can also be the cause [4].

The diagnosis of SAH ought to be considered in any patient with a severe and sudden onset or rapidly escalating headache. With many such patients presenting to the ED with a chief complaint of headache, differentiating those with a benign cause from an emergent etiology such as SAH can be difficult. Establishing the diagnosis of SAH, the most critical time-sensitive goals include confirmation of airway security and stabilization of hemodynamics. In the setting of a low Glasgow Coma Scale Score or the lack of ability to protect the airway, intubation should be undertaken, but care should be taken to mitigate increases in mean arterial pressure during the intubation process [5]. These therapeutic modalities should be addressed with the admitting neuro-intensivist or neurosurgery team. In addition, continuous electroencephalogram monitoring may be started in the intensive care unit.

It is essential to determine adequate management in every case, as this can be the difference between life and death. According to preoperative neurologic function, location, size of the aneurysm, the timing of the operation, severe initial bleeding, re-bleeding (usually within two weeks), and delayed ischemia were the major preoperative problems; ten percent died, and 13 percent deteriorated before surgery. Operative mortality was 5 percent, ranging from 1.6 percent of patients with normal preoperative neurologic function to 35 percent of severely disabled patients. Intraoperative complications (5 percent of cases) related primarily to the size and location of the aneurysm, postoperative delayed ischemia (minor and reversible in 10 percent and severe in 5 percent) related to operation timing and occurred primarily in patients afflicted within the previous ten days [4]. The outcomes

of surgical treatment, including preoperative deaths, were better than the natural history of the illness. The difference became apparent after one month of observation.

Once a bleeding aneurysm is identified, the ultimate therapeutic goal is to secure it surgically by coiling or clipping. While coiling is the preferred method since it is less invasive than open surgical clipping, data is indeterminate as to whether long-term outcomes are better with either procedure, but protocols propose that coiling should be performed if both are possible [6]. In some cases, tortuous vascular anatomy or other contraindications to coiling make open surgery necessary. Timely treatment and securing the aneurysm are associated with a lower risk of re-bleeding. If surgical treatment is delayed, antifibrinolytics such as aminocaproic acid may be used for a short time to mitigate the risk of re-rupture [6].

Nine articles have been selected from Pubmed, Google Scholar, International Journal of Emergency Medicine, Journal of Neurosurgery, International Journal of Emergency Medicine, and other Databases. The articles were published within the previous ten years and written in the English language. The studies reviewed include review articles, clinical articles, systematic reviews, single-center, retrospective studies, prospective, multicenter cohort studies, cross-sectional studies, observational studies, and clinical trials. Traumatic subarachnoid-related articles were excluded from our search. The objective of this article is to inform our audience about the significant difference between conservative and surgical treatment for non-traumatic subarachnoid hemorrhage.

Discussion

There is no consensus about treating patients with hemorrhage (no traumatic Subarachnoid Hemorrhage) among expert clinicians within the United States and worldwide. Many concerns arise from an attempt to establish a protocol for the individual patient. However, at least in some areas, the wide variety of management practice testifies to a lack of agreement in the medical community. Therefore, we sought to design a survey that would highlight areas of controversy in the modern management of ntSAH and identify specific areas of interest for further research. Additionally, we performed a comprehensive review of the existing literature on several of these controversial subtopics in the management of ntSAH [7].

Although the timing of surgical intervention after SAH is controversial, it should be based on the clinical-grade, site of the aneurysm, and patient's medical condition. There are many factors to consider when treating patients with SAH, such as patient neurological condition and aneurysm location (Ex. Basilar aneurysms) aneurysms, unusually large or irregular aneurysms [8]. Patients with a non-peri mesencephalic SAH have an increased risk of a worse neurological outcome. Therefore, these patients should be monitored attentively. When an aneurysm breaks down, patients require a calcium channel blocker to reduce vasospasm

risk due to ischemia. For example, The Mayo Clinic experience of 1,947 patients who underwent surgical treatment because of aneurysmal SAH or aneurysmal repair for about 20 years shows the results after a follow-up that 1,445 had an excellent outcome, 231 had an acceptable outcome, 171 had a poor outcome, and 100 died. Aggressive management can benefit many patients with severe neurologic injury after SAH by preventing rupture of the aneurysm, attenuating the severity and sequelae of vasospasm, and decreasing the surgical complications [8].

Clinically, subarachnoid hemorrhage diagnosis is often missed due to the various clinical manifestations and inconsistencies in individual findings, especially when atypical presentation arrives at the ER. In addition, there are several etiologies of non-traumatic SAH, such as perimesencephalic SAH, intracranial arterial dissection, pituitary apoplexy, mycotic aneurysms, reversible cerebral vasoconstriction syndrome, cerebral venous sinus thrombosis, moyamoya, vasculitis, and even cocaine use [9]. When SAH is suspected, the best initial step would be a CT scan of the head or LP. Once the diagnosis of SAH hemorrhage has been made, it is essential to classify and grade the patient's risk to lead to the urgency of further management and prevent neurological consequences [9].

Subarachnoid hemorrhage carries a high risk of morbidity and mortality, requiring emergency medicine physicians to evaluate patients suspicious for the diagnosis cautiously. It is crucial to consider the restrictions of diagnostic modalities and early implementation of grading/scoring systems even in a nontraditional presentation. Giving the SAH complications, making a timely diagnosis, initiating management in the ED, and employing suitable consultations or admission for possible early intervention is crucial for care [9].

The two most significant limitations of timely and aggressive management of SAH are the lack of clinical suspicion from physicians and the delay from the CT scan order until the CT scan report is ready [8]. We suggest starting a SAH standardized protocol that includes the high priority of imaging studies (CT scan) to reduce the time from diagnosis and management. Performing a prospective cohort study using the protocol could lead us to better conclude aggressive and early management in non-traumatic SAH.

Limitation

This systematic review uses data collected in nine articles that included cohort studies, a cross-sectional study, and several observational studies and clinical trials. Given the nature of this investigation (secondary data review), the main limitation of this study is the lack of control over the desired study population, variables of interest, and the study design. Problems with secondary data could be that bias may have crept meanwhile obtaining the data; this bias will go unnoticed and may inadvertently affect the results.

Furthermore, the primary data may not include certain demographic information (e.g., respondent zip codes, race, ethnicity, and specific age) relevant to the study. For example, in the specific case of this investigation, age, availability of conditions to perform endovascular procedures, the severity of the SAH, and other variables could be ignored. In such cases, the data would create an aggregate pooled effect that may be misleading if there are important reasons to explain variable treatment effects across different types of patients.

In addition, secondary data analysis research cannot establish causality. This kind of investigation is limited to descriptive, exploratory, and correlational designs and nonparametric statistical tests. By their nature, they are retrospective, and the investigator cannot examine causal relationships (by a randomized, controlled design).

These significant limitations were addressed and minimized by:

1. Assuring that the correct type of studies was eligible for the review and guaranteeing that identifying all relevant information was comprehensive.
2. Considering publication bias.
3. Confirming that the methods used in each study were appraised and had an appropriate data abstraction.

Conclusion

Non-traumatic subarachnoid hemorrhage is a medical emergency. Early diagnosis and adequate management are crucial for a patient's survival. Therefore, conservative or surgical management should be promptly established. Intense headache is one of the most common alarm symptoms of non-traumatic subarachnoid hemorrhage that bring a patient to the emergency room; frequently described as "the worst headache of my life". There are many tools and strategies to approach and treat our patients with severe headaches, and we must understand the strengths and limitations of each strategy.

One of the most frequent causes of subarachnoid hemorrhage is aneurysm rupture. This can be caused by certain conditions such as arteriovenous malformation, Ehlers-Danlos disease, collagen deficiencies, uncontrolled high blood pressure, uncontrolled

Diabetes Mellitus. A timely aneurysm repair is considered the most vital strategy to reduce the risk of aneurysm re-rupture. However, evidence for optimum timing of management is insubstantial, and it is unclear whether ultra-early actions to resolve the subarachnoid hemorrhage (less than 24 hours) are superior to early aneurysm repair (within 72 hours) [2].

Retrospective data on clipping and coiling in low-grade patients suggests that surgical clipping and endovascular are equally effective. Early detection of the cause of bleeding and prompt determination of management can make the difference between life and death, as it requires prompt and adequate management.

References

1. Meyer FB, Morita A, Puumala MR, Nichols DA (1995) Medical and surgical management of intracranial aneurysms. *Mayo Clin Proc* 70(2): 153-172.
2. Konczalla J, Platz J, Schuss P, Vatter H, Seifert V, et al. (2014) Non-aneurysmal non-traumatic subarachnoid hemorrhage: patient characteristics, clinical outcome and prognostic factors based on a single-center experience in 125 patients. *BMC Neurol* 14: 140.
3. Uryga A, Czyz M, Adamik B, Tabakow P, Kasprócz M, et al. (2021) Serum biomarkers and cerebral autoregulation as early warnings of delayed cerebral ischemia risk in patients after aneurysmal subarachnoid hemorrhage. *J Clin Neurosci* 87: 35-43.
4. Evie Marcolini, Jason Hine (2019) Approach to the Diagnosis and Management of Subarachnoid Hemorrhage. *West J Emerg Med* 20(2): 203-211.
5. Bryan Boling, Tasha R Groves (2019) Management of Subarachnoid Hemorrhage. *Crit Care Nurse* 39(5): 58-67.
6. Jianhe Y, Yuan X, Xiaolin Z, Yongxiang J, Weifu C, et al. (2020) The safety and outcomes of acutely ruptured intracranial aneurysms with incomplete occlusion after coiling: a case-control study. *BMC Neurology* 20: 412.
7. Tomycz L, Shekhawat N, Forbes J, Ghiassi M, Ghiassi Mahan, et al. (2011) The spectrum of management practices in nontraumatic subarachnoid hemorrhage: A survey of high-volume centers in the United States. *Surg Neurol Int* 2: 90.
8. Zheng K, Zhao B, Tan X-X, Li Z-Q, Xiong Y, et al. (2018) Comparison of aggressive surgical treatment and palliative treatment in elderly patients with poor-grade intracranial aneurysmal subarachnoid hemorrhage. *Biomed Res Int* 2018: 5818937.
9. Patel S, Parikh A, Okorie ON (2021) Subarachnoid hemorrhage in the emergency department. *Int J Emerg Med* 14(1): 31.



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