



The Role of Sedation and Local Anesthesia in Acute Subdural Hematoma Surgery in the Elderly Population

Yaşlı Populasyonda Akut Subdural Hematom Cerrahisinde Sedasyon Lokal Anestezinin Yeri

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ABSTRACT

Objective: In the elderly population, subdural hematoma represents a significant cause of morbidity and mortality. The surgical and anesthesia techniques for managing this condition have progressively evolved. Unlike numerous studies that compare chronic cases managed under general anesthesia and sedation, our study uniquely focuses on acute subdural hematoma cases.

Material and Method: From 2020 to 2024, a retrospective study reviewed 54 patients aged 65 and older who underwent surgery for acute subdural hematoma. The patients were categorized into two groups: sedation (n=26) and general anesthesia (n=28). Data on surgical duration, hospital and intensive care unit stays, and mortality rates were collected from hospital archives. The general anesthesia group received midazolam, fentanyl, propofol, and rocuronium, while the sedation group received midazolam, fentanyl, and propofol. Subdural drains were universally placed and removed after postoperative brain computed tomography.

Results: The mortality rate was significantly lower in the sedation group compared to the general anesthesia group ($p=0.024$). Surgical duration was shorter in the sedation group ($p<0.001$), and the intensive care unit stay was also significantly reduced ($p<0.001$). There was no significant difference in regular ward stay between the groups ($p=0.212$). The time from surgery to discharge was significantly shorter in the sedation group ($p<0.001$). Sedation facilitated lower bleeding and medication doses, enabled early mobilization, and potentially increased the benefit-to-risk ratio of surgery.

Conclusion: While many studies compare general anesthesia and sedation in chronic subdural hematoma surgery, our study is the first to compare these approaches in elderly patients with acute subdural hematoma. We found shorter surgical times and lower complication rates with sedation.

Keywords: General anesthesia, sedation, subdural hematoma surgery.

ÖZET

Amaç: Yaşlı popülasyonda sık görülen subdural hematom, önemli bir morbidite ve mortalite nedenidir. Bu patolojinin cerrahisi ve anestezi uygulama teknikleri zamanla evrimleşmiştir. Genel anestezi ve sedasyon altında yapılan kronik subdural hematom cerrahilerinin karşılaştırılması literatürde çokça yer alırken, bu çalışmamızda farklı olarak benzer perspektiften akut subdural hematom vakaları tartışılacaktır.

Gereç ve Yöntem: 2020 - 2024 yıllarında akut subdural hematom nedeniyle opere edilen 65 yaş üzeri 54 hasta sedasyon (n=26) ve genel anestezi grubu (n=28) olarak iki gruba ayrılarak cerrahi süreleri, servis ve yoğun bakım ünitesi kalış süreleri ve mortalite oranları retrospektif olarak hastane arşivinden taranmıştır. Genel anestezi grubuna uygun dozda midazolam, fentanyl, propofol, rokuronyum; sedasyon grubuna ise midazolam, fentanyl, propofol uygulanmıştır. Tüm hastalara subdural dren yerleştirilmiş ve postoperatif beyin tomografileri çekildikten sonra drenleri çekilmiştir.

Bulgular: Mortalite oranı, sedasyon grubunda genel anestezi grubuna kıyasla daha düşük olarak saptanmıştır ($p=0.024$). Cerrahi sürenin sedasyon grubunda daha kısa olduğu görülmüştür ($p<0.001$). Yoğun bakım ünitesinde kalış süresinin sedasyon grubunda anlamlı şekilde daha kısa olduğu belirlenmiştir ($p<0.001$). Gruplar arasında hastanede kalma süresi açısından bir fark saptanmamıştır ($p=0.212$). Ameliyat ile taburculuk arasında geçen sürenin sedasyon grubunda belirgin şekilde daha kısa olduğu görülmüştür ($p<0.001$). Sedasyon grubunda kanamanın az olması ve alınan ilaç dozunun düşük olması, hastaya erken mobilizasyon olanağı sağlamıştır. Bu durum, erken mobilizasyonu ve cerrahiden sağlanan fayda oranını artırmıştır.

Sonuç: Kronik subdural hematom cerrahisinde genel anestezi ve sedasyonu karşılaştıran birçok çalışma mevcutken, çalışmamız ileri yaş akut subdural hematom vakalarında genel anestezi ve sedasyonun karşılaştırıldığı ilk çalışmadır. Sedasyonla yapılan akut subdural hematom olgularında ameliyat süresi ve komplikasyon oranı daha düşük saptanmıştır.

Anahtar Sözcükler: Genel anestezi, sedasyon, subdural hematom cerrahisi.

Introduction

Chronic subdural hematomas (CSH) are typically drained by neurosurgeons via craniotomy under general anesthesia, using either double burr holes or a single burr hole. With advancements in endoscopic surgery, experienced surgeons can now successfully perform endoscopic subdural hematoma drainage (1). In recent years, for older adults where complications from general anesthesia are a concern, drainage of a subdural hematoma via a single burr hole under sedation has become increasingly widespread (2). As the use of high-speed drills and surgeon experience increase, the evacuation of subdural hematomas under sedation can be accomplished more efficiently. Consequently, the duration of postoperative admission to the critical care unit is minimized, surgical infection rates are reduced, and early mobilization becomes feasible, thereby enhancing overall surgical success rates (3). In extraordinary situations, such as pandemics, finding a place in intensive care units for neurosurgery cases can become challenging. This has prompted neurosurgeons to become faster and more practical. Advanced age patients with comorbidities often require general anesthesia and intensive care monitoring. However, selected cases performed under sedation can be monitored in the general ward (4). In the literature, the use and comparison of general anesthesia and sedation for CSH cases have been evaluated in many studies (5,6). Unlike other studies, this study evaluated acute subdural hematoma (ASH) cases in patients over the age of 65 who underwent surgery under both sedation and general anesthesia.

Material and Methods

ASH cases operated on by a single surgeon at a single center between 2020 and 2024 were retrospectively analyzed. The study included a total of 54 patients: 28 underwent surgery under general anesthesia (general anesthesia group) and 26 under sedation (sedation group). Patient data were obtained from the hospital database and included discharge reports, age, gender, length of stay in the ward and intensive care unit, duration of surgery, and mortality rates. Exclusion criteria included patients under 65 years of age, those with a history of cranial surgery, and those with bilateral subdural

hematoma. All cases were operated on within the first week after hospital admission. Patients with a midline shift greater than 1 cm or hemiparesis were operated on the day of arrival. Patients with a midline shift less than 1 cm and without hemiparesis were monitored, and those who developed hemiparesis during follow-up underwent emergency surgery on the same day.

Surgery was performed under sedation for patients who could not tolerate general anesthesia. The general anesthesia group received midazolam 0.01 mg/kg, fentanyl 1 mcg/kg, propofol 3 mg/kg, and rocuronium 0.6 mg/kg. The sedation group received midazolam 0.01 mg/kg, fentanyl 0.5 mcg/kg, and propofol 1.5 mg/kg. Postoperatively, patients were evaluated by an anesthesiologist. Those who did not require intensive care were monitored in the neurosurgery ward, while patients experiencing respiratory distress, arrhythmia, or loss of consciousness were transferred to the intensive care unit. A subdural drain was routinely placed in all patients during surgery, and they were discharged after a routine postoperative control brain tomography was performed and the drains were removed. The general anesthesia and sedation groups were compared in terms of surgery time, mortality rates, and intensive care follow-up periods. This retrospective investigation received approval from the Hitit University Non-Entrepreneurial Research Ethics Board (No: 2024-08; date: 03/04/2024).

Statistical analysis

Statistical evaluations were conducted using SPSS (version 22.0; IBM, Armonk, NY). The surgical duration, lengths of stay in the ward and intensive care unit, the interval between the day of surgery and discharge, and mortality rates were compared between the groups using the Mann–Whitney U test. Statistical significance was set at a *p-value threshold* of <0.05 .

Results

The study comprised 54 patients, including 29 males and 25 females. Midline shift was observed in 45 of these patients: 21 had a shift of 1.5 cm (± 1 mm), and 24 had a shift of 1 cm (± 1 mm). General anesthesia and craniotomy were preferred for patients with extensive midline shift. Most patients had a history

of trauma, although clear trauma information was not available for those with dementia. Of the 54 patients, 28 underwent general anesthesia and 26 received sedation. The average age of participants was 75.6 ± 6.3 years in the general anesthesia group and 84.2 ± 5.3 years in the sedation group (Table I). The general anesthesia group underwent craniotomy, while the sedation group underwent burr hole drainage, as illustrated in Figures I and II.

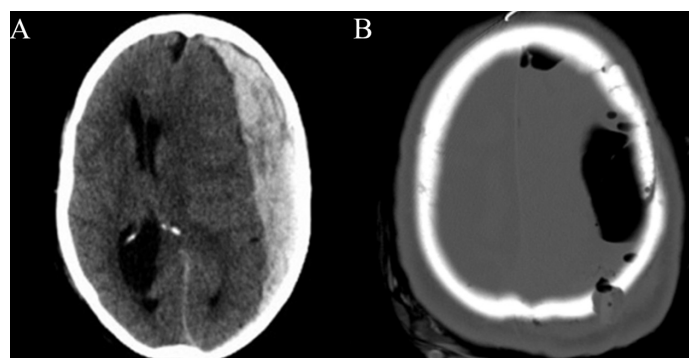


Figure 1 (A): Preoperative image of general anesthesia group, (B): Postoperative image of general anesthesia group with craniotomy defect

Table I Demographic characteristics of the participant population

	General Anesthesia Group	Sedation Group
Patients (n=54)	28	26
Sex		
• Female (n)	13	12
• Male (n)	15	14
Age (mean \pm standard deviation) (years)	75.6 ± 6.3	84.2 ± 5.3

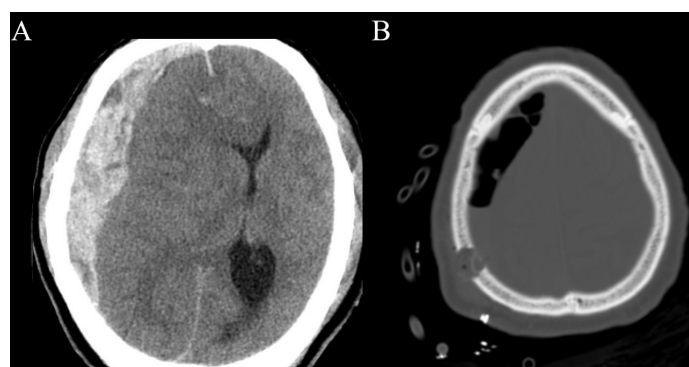


Figure 2 (A): Preoperative image of sedation group, (B): Postoperative image of sedation group with Burr Hole defect

All 26 patients in the sedation group were discharged, whereas five patients from the general anesthesia group passed away during their stay in the intensive care unit. Consequently, the mortality

rate was significantly lower in the sedation group compared to the general anesthesia group ($p=0.024$). A significant difference in surgical duration between the groups was also detected ($p<0.001$). The average surgical duration was shorter in the sedation group compared to the general anesthesia group (23.6 ± 5.3 minutes vs. 59.6 ± 8.8 minutes) (Table II).

Table II Showing comparing analysis between the groups of sedation and general anesthesia

	General Anesthesia Group (n=28)	Sedation Group (n=26)	
Mortality (n)	5	0	$p=0.024$
Surgery duration (min)	59.6 ± 8.8	23.6 ± 5.3	$p<0.001$
Intensive care unit stay (days)	4.5 ± 3.9	0.58 ± 0.5	$p<0.001$
Hospital ward stay (days)	4.3 ± 2.7	5.2 ± 0.8	$p=0.212$
Hospital discharge length (days)	8.1 ± 2.5	5.8 ± 1.1	$p<0.001$

min: minutes

A notable disparity in postoperative intensive care unit stay length was observed between the groups ($p<0.001$). The average stay duration in the intensive care unit was shorter in the sedation group than in the general anesthesia group (0.58 ± 0.5 days vs. 4.5 ± 3.9 days). Conversely, no significant difference was noted in hospital ward stay duration between the cohorts ($p=0.212$). The mean duration of hospital ward stay was 4.3 ± 2.7 days in the general anesthesia group and 5.2 ± 0.8 days in the sedation group. The interval between the surgery date and discharge date was notably shorter in the sedation group compared to the general anesthesia group (mean interval, 5.8 ± 1.1 days vs. 8.1 ± 2.5 days; $p<0.001$) (Table II).

Discussion

For chronic subdural hematomas, numerous factors such as the patient's age, comorbidities, size of the bleed, and presence of midline shift affect the indication, type, and urgency of surgery. A craniotomy may be preferred in cases of acute-on-chronic hematoma or when there is a midline shift and edema caused by the hematoma. General anesthesia is typically used for craniotomy. However, in recent years, hematoma evacuation via a single burr hole

has become more common in patients who are at higher risk for complications from general anesthesia. Patients who undergo surgery under sedation demonstrate cardiac and respiratory complications less frequently than those who undergo surgery under general anesthesia (7). Furthermore, patients with chronic subdural hematoma who undergo evacuation under local anesthesia and sedation experience fewer postoperative complications, shorter surgical times, and shorter hospital stays compared to those who undergo evacuation under general anesthesia (8). A study reported that surgeries performed under local anesthesia had shorter surgical times, lower mortality rates, and fewer postoperative complications compared to those performed under general anesthesia (9). Another study found that patients with chronic subdural hematoma who underwent surgery under local anesthesia and sedation had fewer postoperative complications and shorter hospital stays compared to those who underwent surgery under general anesthesia (10). Similarly, in our study, both the interval between surgery and discharge and the duration of stay in the intensive care unit were shorter for surgeries performed under local anesthesia and sedation compared to those performed under general anesthesia.

As an alternative, a mini craniotomy can be performed under sedation and local anesthesia. However, this procedure should be carried out only by experienced surgeons, as the use of high-speed drills during a sedation-assisted mini craniotomy can pose challenges due to the lack of head fixation (11). In experienced centers, surgeries for acute subdural hematomas have been successfully performed under sedation (12). The use of rigid or angled endoscopes in these procedures has been reported to increase the surgical success rate (13,14). In ASH surgery, procedures have traditionally been performed with general anesthesia and craniotomy. In contrast, for chronic subdural hematoma surgery, some surgeons prefer sedation and local anesthesia, particularly in older patients. There are no definitive criteria for determining the surgical method. Craniotomy may be preferred in cases with significant hemorrhage or when there is a risk of intraoperative loss of control. The surgeon's experience and speed also play a crucial role in the decision-making process.

In extraordinary situations, such as pandemics, finding a place in intensive care units may become challenging, compelling surgeons to seek effective and practical solutions while maintaining surgical ethics and standards (15). Most of the cases were performed during the pandemic, and using sedation and local anesthesia for ASH surgery greatly increased the comfort of both the anesthesiologist and the surgeon, as well as the patients. The avoidance of intubation is also significant in terms of reducing the risk of coronavirus transmission. Further studies on this topic could be beneficial. This study highlights that ASH cases can be effectively managed with sedation and local anesthesia (16). The increased use of endoscopic techniques in subdural hematoma surgery has significantly accelerated the pace of research conducted in recent years (17). Considering all this information, it is anticipated that the use of a single burr hole under sedation for the surgical treatment of ASH will become more widespread in the future.

In conclusion; for patients deemed to possess heightened vulnerability to the adverse effects of general anesthesia, executing surgical procedures under sedation and local anesthesia holds promise in mitigating mortality rates and diminishing the length of intensive care unit residency. Therefore, it is an appropriate strategy to perform surgery under sedation and local anesthesia in elderly patient groups presenting with ASH.

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