Local anesthesia versus general anesthesia for evacuation of chronic subdural hematoma in elderly patients above 70 years old

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INTRODUCTION

The management of chronic subdural hematoma (CSDH) is completely dependent on the amount of blood, midline shift, and symptomatology.⁸⁻¹² CSDH is indicated when it causes symptoms such as disturbed consciousness and focal deficits or there is a significant amount of blood compressing the cerebral cortex.¹¹ The incidence of CSDH increases with age and patients tend to have multiple comorbidities which make the use of general anesthesia (GA) unfavorable.¹²⁻¹⁴ Hence, the selection of the proper anesthetic method may be better to be individualized accordingly.² The aim of our study is to assess CSDH evacuation by two burr-hole craniostomies under local versus general anesthesia (GA) in elderly patients over 70 years.
MATERIALS AND METHODS

After approval from the Institutional Review Board of our institute, we retrospectively reviewed all patients with CSDH who were surgically treated from March 2018 to April 2020. Inclusion criteria involved patients aged over 70 years with comorbidities, unilateral or bilateral hematomas, and evacuation by two burr-hole craniostomies with opening of membranes. We excluded patients with acute on top of chronic hematomas, concomitant intracranial lesions, previous neurological disability, transition from local to GA, and those who were treated by craniotomy or single burr-hole craniostomy. The study included 45 patients who were divided into two groups. Group (A) included 22 patients treated under local anesthesia (LA). LA is applied by both – blocking corresponding scalp nerve supply (supraorbital, supratrochlear, zygomaticotemporal, auriculotemporal, great auricular, and lesser and greater occipital) using 0.5% bupivacaine added to 1:200,000 epinephrine with maximum dose of bupivacaine 2 mg/kg each nerve was blocked by 2–5 cc. Local infiltration by lidocaine 2% added to 1:100,000 intradermally max dose 5 mg/kg. After sterilizing skin, 2–5 ml of bupivacaine/epinephrine was located around nerve to be blocked additional 5–10 cc lidocaine 2% at burr-hole site. Sedatives (midazolam 2–4 mg/h or propofol 1–3 mg/kg/h) were given selectively for irritable patients. The other group (B) included 23 patients treated under GA by giving fentanyl 0.5 mg/kg IV bolus followed by a continuous infusion dose at a rate of 0.25 mg/kg/min. Pain during the procedure was treated by a supplemental injection of fentanyl. A local infiltration of scalp with adrenaline and lignocaine 2% after skin preparation was applied. For frontoparietal and frontotemporoparietal CSDH, a 2 cm scalp incision was put and twist drill trephination was performed using hand drill at a point 1 cm anterior or posterior to the coronal suture along the superior temporal line. Dura mater and outer membrane of CSDH were gently pierced. Note that, 10 FG infant feeding tube was inserted perpendicularly at a depth of 1–2 cm from the inner table and fixed to the scalp with suture. The distal end of the infant feeding tube was connected to urinary drainage bag. The patient was positioned supine in neutral position. Continuous gravity-dependent drainage was kept. The drain was removed after 24 h and scalp stapled. Computed tomography scan was taken in the postoperative period [Figure 1].

Patients’ demographics and associated comorbidities were recorded. General health conditions were classified according to the American Society of Anesthesiology (ASA) grades. Complete neurological assessment including Glasgow Coma Score (GCS) and Markwalder grade [Table 1] was conducted preoperatively and 1 day postoperatively. Postoperative complications, operative time, and length of hospital stay were also evaluated. Data retrieved were processed using the Statistical Package for the Social Sciences’ program version 25. Data of numerical values were compared using Chi-square t-tests while the categorical comparisons were tested by Fisher’s exact test. P = 0.05 was considered as statistically significant.

RESULTS

Patients’ criteria are illustrated in [Table 2]. There was no statistically significant difference between the two groups regarding the age (P = 0.09). Male gender was found to be more prevalent in both groups. The anesthetic assessment of each group of patients is plotted in [Figure 2]. The most of group (A) patients were of high ASA grade while the main bulk of group (B) patients had Grades II and III (15 patients). The most of the cases had Grade II according to the Markwalder’s grading scale in each group preoperatively and Grade 0 postoperatively [Figure 3]. Decreased consciousness below 15/15 on GCS was the most common presentation in both groups (68.1%, 56.5%). GCS of Group A was statistically higher than Group B in postoperative day 1 (P = 0.01). Comparing preoperative and postoperative GCS of each group revealed a remarkable statistical difference.

Table 1: Markwalder’s neurological grading scale CSDH.

| Grade 0 | Patient neurologically normal |
|---------|------------------------------|
| Grade 1 | Patient alert and oriented mild symptoms, such as headache; absent or mild symptoms or neurological deficit, such as reflex asymmetry |
| Grade 2 | Patient drowsy or disoriented with variable neurological deficit, such as hemiparesis |
| Grade 3 | Patient stuporous but responding appropriately to noxious stimuli; severe focal |
| Grade 4 | Patient comatose with absent motor response to painful stimuli; decerebrate or decorticate posturing |

Figure 1: (a and b) Represent pre- and post-operative CT brain images for chronic subdural hematoma evacuation in Group A while (c and d) are those for Group B.
Operative time was statistically shorter in group (A) than (B) ($P < 0.0001$). The hospital stay was found to be longer in group (B) than (A) ($P = 0.0001$).

Postoperative complications are illustrated in Table 3. There was a statistically significant difference in the rate of complications with the favor of a higher complication rate in Group B ($P = 0.044$).

**DISCUSSION**

CSDH is a common neurosurgical disorder that usually affects elderly patients after minor head trauma. GA provides complete immobility and optimal surgical comfort but is a source of many complications, especially for elderly patients who have coexisting systemic diseases. The best practice for the treatment of CSDH is still a matter of debate; however, the least invasive surgical technique under local anesthesia should be encouraged.

Although local anesthesia was used during evacuations of CSDH by many authors, patients may become anxious and

| Table 2: Patients’ criteria. | Group A (n=22) | Group B (n=23) |
|-----------------------------|---------------|---------------|
| Age (Mean±SD)               | 74.3±2.5      | 73.2±1.7      |
| Sex (male %)                | 15 (68.1)     | 12 (52.1)     |
| Comorbidities*              |               |               |
| Cardiovascular              | 3 (13.6)      | 4 (17.3)      |
| Respiratory                 | 5 (22.7)      | 4 (17.3)      |
| Hepatic                     | 3 (13.6)      | 5 (21.7)      |
| Renal                       | 4 (18.18)     | 6 (26.08)     |
| DM                          | 6 (27.2)      | 14 (60.)      |
| HTN                         | 10 (45.45)    | 6 (26.08)     |
| Clinical presentation*      |               |               |
| Decrease consciousness      | 15 (68.1)     | 13 (56.5)     |
| Hemiparesis                 | 7 (31.8)      | 5 (21.73)     |
| Seizures                    | 3 (13.6)      | 4 (17.39)     |
| Headache                    | 12 (54.54)    | 9 (39.13)     |
| Markwalder’s neurological grading scale | | |
| Preoperative (mode)         | 2             | 2             |
| Postoperative (mode)        | 0             | 0             |
| GCS                         |               |               |
| Preoperative                | 12.96±1.48    | 12.55±0.7     |
| Postoperative               | 14.1±1.1      | 13.5±0.2      |
| Operative time in minutes (Mean±SD) | 37.5±5.1 | 76.3±4.4 |
| Hospital stay in days (Mean±SD) | 4.3±0.8 | 6.6±2.3 |

*Total number of comorbidities is not fit to total number of patients in each group

| Table 3: Complication rate. | Group A (n=22) (%) | Group B (n=23) (%) |
|-----------------------------|---------------------|---------------------|
| Tension pneumoencephalus    | 1 (4.54)            | 2 (8.69)            |
| Recollection                | 1 (4.54)            | 4 (17.3)            |
| Seizures                    | 1 (4.54)            | 2 (8.69)            |
| Uncontrolled HTN            | 1 (4.54)            | 1 (4.34)            |
| Diabetic coma               | 0                   | 1 (4.34)            |
| MI                          | 0                   | 2 (8.69)            |
| Surgical site infection     | 1 (4.54)            | 0                   |

Figure 2: ASA score among groups.

Figure 3: Pre- and post-operative Markwalder’s neurological grading scale in both groups.
experience discomfort during the procedure." Hence, conscious sedation using midazolam is beneficial.\[13\]

In our study, the most frequent presentation of patients was impairment of consciousness. The diagnosis of CSDH in elderly patients is usually delayed as neurological symptoms are usually related to vascular insufficiency or dementia. Conscious level improved more markedly in postoperative day 1 in the LA group. GA carries an additional risk of postoperative cognitive impairment and delirium hindering recovery in spite of the disappearance of the hematoma on serial postoperative images.\[14\]

We used to evacuate CSDH through two burr holes for better determination of hematoma boundary.\[13\] The mean operative time was markedly shorter in the LA group. This was achieved by many published series.\[14,11\] Shorter operative times were beneficial, decreasing the risks of thromboembolism, hypothermia, and intraoperative adverse events.\[4,12\]

The recurrence rate of hematomas was higher in the GA group. This can be explained by the occurrence of rebound hypertension during the awakening process.\[10,15\]

In the LA group, early mobilization of patients could be achieved. This decreased the incidence of postoperative deep venous thrombosis and lung atelectasis, abandoning the need for intensive care unit admission.\[11\]

Postoperative complications were found to be significantly more in the GA group. The majority of patients necessitated other departmental consultations which lengthened their hospital stays. The length of hospital stay was shorter in the LA group which proved to be economical and reduced hospital-acquired infections.\[5,7,9\]

This retrospective study has some limitations. The clinical and radiological data of the patients had to be obtained from the medical records. However, the results of our study suggested that surgical evacuation using local anesthesia should be the default treatment for CSDH, especially in high-risk elderly patients.

**CONCLUSION**

Evacuation of CSDH under local anesthesia in elderly patients above 70 years of age is effective and economical with fewer complications than the traditional technique with GA.

**Ethics approval and consent to participate**

An ethical approval from our institutional board was obtained before recruitment of the study.

**Availability of data and materials**

All the data retrieved in this article are already published previously and available at ease.

**Authors’ contributions**

Conceptualization: AHA. Data curation: AHA and AMS. Formal analysis: AHA and MG. Methodology: AHA, HA, and MG. Project administration: AHA and HA. Visualization: AHA, HA, and AMS. Writing – original draft: AHA, HA, and AMS. Writing – review and editing: HA.

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**Declaration of patient consent**

The authors certify that they have obtained all appropriate patient consent.

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**Conflicts of interest**

There are no conflicts of interest.

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