

Original Research Article

Chronic subdural hematoma pressure measurement and its correlation with clinical characteristics and postoperative neurological outcome

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ABSTRACT

Background: The pressure of the chronic SDH (subdural haematoma), the age of the patient, preoperative GCS score and midline shift were considered prognostic dependent factors. The study aimed at the significance of the pressure of chronic SDH in the outcome of patients.

Methods: A correlation between subdural hematoma pressure and preoperative and postoperative clinical variables such as hematoma volume, midline shift, age, GCS score and postoperative modified ranking scale score as well as complications were assessed and analyzed.

Results: According to the pressure of chronic SDH, 56 patients were grouped into 4 groups. In the pressure group <15 cm/h20 group the mean age was 85 and postoperative ranking score was 3 and the recurrence was 21 % while in high pressure group (>25 cm/h20) the mortality was 14% and no recurrence.

Conclusions: The pressure of the chronic SDH has significant prognostic value in chronic SDH surgeries.

Keywords: Chronic SDH, Pressure gradient, Prognostic factors

INTRODUCTION

Chronic subdural hematoma is one of the commonest encountered disease conditions in daily neurosurgical practice. Although the diagnosis and treatment of this condition is mostly standardized universally, the treatment outcome vary in different persons. The factors related to postoperative neurological improvement, recurrence and other complications are still the focus of hundreds of studies all over the world.¹⁻³

The pressure within the chronic subdural hematoma cavity as a probable factor responsible for postoperative outcome has been studied very rarely.⁴⁻⁷ The objective of this study was to quantitatively measure the chronic subdural hematoma pressure using the very same technique used for central venous pressure measurement done very routinely and to correlate the pressure with the

clinical characteristics of the disease, neurological outcome and various postoperative complications.⁸⁻¹⁰ This will help in prognosticate neurological outcome and complications after surgery for chronic subdural hematoma.

Objective

The objective was to determine chronic subdural hematoma pressure and correlate with clinical characteristics including postoperative neurological outcome and complications.

METHODS

This study was conducted in the department of neurosurgery, Government medical college, Kottayam. Patients undergoing surgery in the department for chronic

subdural hematoma will be taken up for study. After selecting the patients according to inclusion and exclusion criteria, a well informed consent was taken.

A detailed proforma was used to collect the required data of the patient, which included clinical findings such as GCS score, detailed neurological examination, radiological findings such as volume of the hematoma, midline shift. Patient was taken up for surgery under general anesthesia after finishing all preoperative investigations. After putting a burr hole and before making the dural incision, a large bore needle was inserted into the subdural space, the length of which was tailored according to the thickness of chronic subdural hematoma as measured in preoperative CT scan of brain. A quantified measurement of subdural hematoma pressure was taken by using a simple manometric technique in which the needle was connected to a normal saline prefilled tubing set with a manometer, saline bag and a three-way stopcock. This technique was very similar to the one routinely used for measuring central venous pressure. This was followed by the standard surgical technique for CSDH evacuation.

Routine postoperative CT scan of brain was taken on the 3rd day after drain removal. The following parameters were noted: residual hematoma volume, pneumocephalus, midline shift, fresh bleeding. The following complications were also noted, CSF leak and infection.

Hematoma volume was calculated using the formula,

$$\text{hematoma volume} = \frac{ABC}{2}$$

$$= \frac{\text{depth} \times \text{maximum length} \times \text{maximum width}}{2},$$

values obtained from CT scan of brain.

Postoperative assessment of neurological outcome was done using modified ranking scale, utilizing a printed list of questions and an intelligent cross examination. Assessment was done at 3rd day and 2 weeks after surgery.

A correlation between subdural hematoma pressure and preoperative and postoperative clinical variables such as hematoma volume, midline shift, age, GCS score and postoperative modified ranking scale score as well as complications, was assessed.

Study tool

The study tools were modified ranking scale and structured proforma.

Inclusion criteria

Patients undergoing surgery for chronic subdural hematoma under general anaesthesia in department of neurosurgery, GMC, Kottayam were included in the study.

Exclusion criteria

Patients with bilateral chronic subdural hematomas; patients with unilateral chronic subdural hematoma with complex architecture requiring multiple burr holes or craniotomy for drainage; patients who were operated under local anaesthesia due to medical contraindications for general anaesthesia patients with other space occupying lesions like tumours, arachnoid cysts, infections; patients with ventriculo peritoneal/lumbo peritoneal shunts; patients less than 18 years of age; patients with re-surgery; and cases in which preop CT scan was not taken (if diagnosis based on MRI brain only) were excluded from the study.

Data management and statistical analysis

All quantitative data was analyzed in SPSS software. Frequency distributions was presented. Descriptive statistics was reported in mean and standard deviation or median and interquartile range for continuous variables and in absolute numbers and percentages for categorical variables. Group comparisons was done using student t test for normally distributed continuous variables. The correlations to determine the degree of linear relationship between two variables were analyzed and significance found out using Pearson correlation coefficient and Chi squared test.

Type of study

This was a prospective type of study.

Period of study

The period of study was for 6 months from IRB approval (1 December 2020 to 1 June 2021).

Study setting

The study was conducted in the department of neurosurgery, GMC, Kottayam.

Population under study

All patients coming to GMC Kottayam were the population under study.

Sample size

The sample size in the study was 56 cases.

RESULTS

This study included 56 patients of chronic SDH treated with surgical management with 35 males and 11 females. The mean age of this study was 75.8 years. The pressure of SDH was calculated intraoperatively and the mean value was 19 cm/h20. The mean postoperative ranking score was 2.14 in this study. In 8 cases recurrence was seen (14.2%) and in those cases re-surgery was done. The mortality in this study was 4 (7.1%).

The pressure of the SDH was grouped into 4; <15 cm/h20, 15-20, 20-25 and >25 and compared to another parameters, depicted in Table 1 and Figure 1.

The pressure of the chronic SDH was inversely proportional to the age of the patient, the less pressure group was having more mean age 85 years and also postoperative ranking score was more in this group. In the pressure group <15 cm/h20, the recurrence rate was 21% and mortality was 14%. While in high pressure group (>25 cm/h20) the mean age was 65 and mean postoperative ranking score was less with no recurrence and the mortality rate was 14%. Mortality had no significant difference in the pressure groups. The mean postoperative GCS was 12.4.

Table 1: Pressure of SDH.

Pressure group (cm/h20)	Mean age (years)	Male	Female	Preop gcs-mean	Post op ranking score- mean	Recurrence	Death
<15	85	11	3	11.5	3	3	2
15-20	76.1	18	3	13.1	2.1	3	1
20-25	72.2	11	3	12.5	1.1	2	0
>25	65.5	5	2	12.3	1.5	0	1

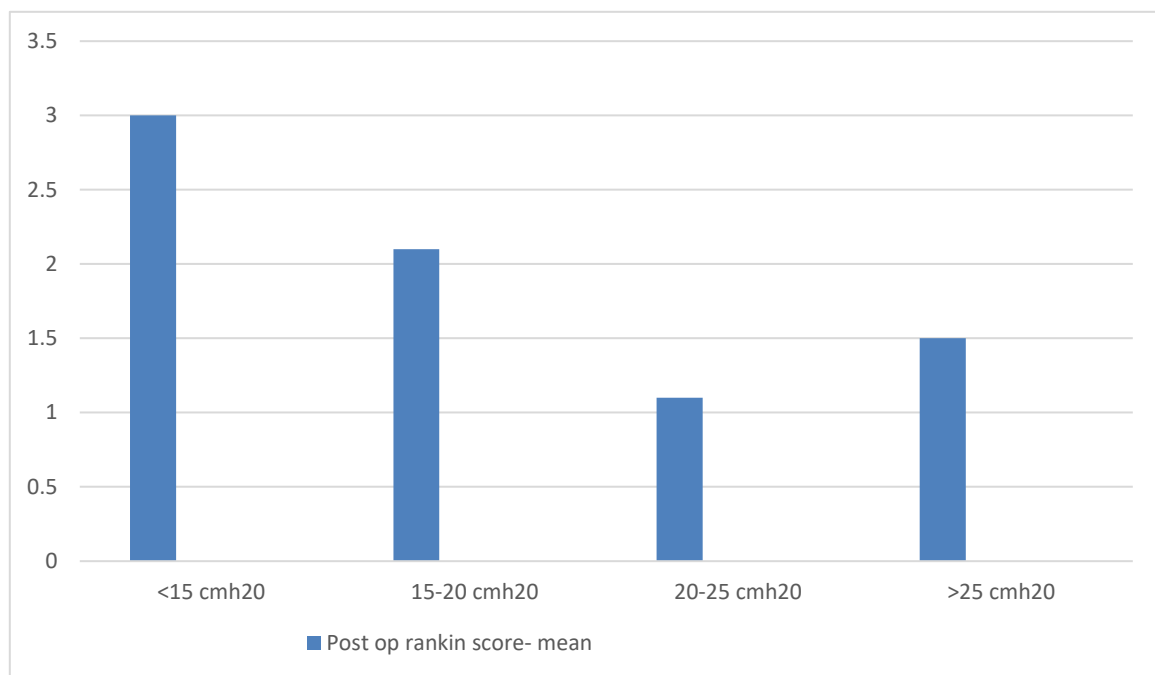


Figure 1: Pressure versus postoperative ranking score.

DISCUSSION

When the pressure of the chronic SDH patients were calculated according to the age, pressure <15 cm h20 group have more mean age 85 and mean postoperative ranking score was 3 with more recurrence and 2 deaths. In the more pressure groups the postop ranking score was less compared to low pressure groups.

Gender and preoperative GCS score have no significant role in the postop outcome. Recurrence and death were more in higher age group and low-pressure group. According to Choi et al the neurological condition of patients at the time of diagnosis and treatment were the only significant prognostic factors.¹¹ While in this study pressure of the chronic SDH and the age of the patient were significant factors in the prognosis of the patient.

ElKadi et al also studied the prognostic factors of chronic SDH and observed the SDH density and midline shift have more prognostic value.¹² While Miah et al studied 5566 patients and found the thickness of the chronic SDH, heterogeneity of SDH and midline shift had increased recurrence rate.¹³

In this study recurrence was more in low pressure group with more mean age. According to Kang et al layered type of hematoma density, location of catheter tip, presence of postoperative intracranial air, cranial base type of intracranial extension and greater hematoma width had more recurrence.¹⁴ Ramachandran et al observed age, GCS at presentation and associated illness like cardiac and renal failure have significant relation to the recurrence.¹⁵

Limitations

The sample size was not adequate to recommend the conclusions.

CONCLUSION

Patient with high preoperative SDH pressure having less recurrence and better postoperative ranking score compared to low pressure group.

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Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

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