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Clinical study

Anterior subtemporal approach for severe upper pontine hematomas: A report of 28 surgically treated cases

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ABSTRACT

The efficacy and safety of surgery for patients with primary pontine hemorrhage (PPH) remain debatable. Twenty-eight consecutive patients with huge upper PPH were included in this study. They underwent surgical management through a subtemporal approach between January 2009 and October 2013. We analyzed clinical and radiological parameters to assess the patient outcomes. The near-complete (>90%) evacuation rate was 67.9%, and there was no surgery-related death. The overall survival rate at 3 months was 64.3% (17/28), including 28.6% (8/28) with good function, 10.7% (3/28) with disability and 25% (7/28) in a vegetative state. The mortality rate was 35.7% (10/28). Preoperative hemorrhage volume ($P = 0.019$), preoperative ($P = 0.017$) and postoperative ($P = 0.001$) Glasgow coma scale (GCS) score, coma on admission ($P = 0.001$), ventricular extension ($P = 0.001$), preoperative mechanical ventilation ($P = 0.001$) and hydrocephalus ($P = 0.007$) were found to be statistically significant predictors for mortality on univariate analysis. On multivariate regression analysis, only GCS on admission and coma were found to be significant prognostic predictors. The subtemporal approach was found to be a safe method to treat upper PPH. Microsurgery may be beneficial for the treatment of PPH, but these results need further validation in a more comprehensive and comparative study. GCS on admission and coma were found to be the only significant prognostic predictors for mortality with multivariate regression analysis.

1. Introduction

Primary pontine hemorrhage (PPH) is among the most devastating forms of intracranial hemorrhage. It accounts for about 5% to 10% of primary intracranial hemorrhages, and it is extremely rare in patients with hemorrhagic stroke [3,14]. PPH has an incidence of 2 to 4 per 100,000 of the population per annum, and the reported mortality rates vary widely from 50% to 90% [1]. Patients with PPH very often develop severe disturbances of consciousness, papillary abnormalities and respiratory and motor disturbances [9,10,15].

The optimal treatment and the efficacy of surgery in PPH patients remain debatable. Some authors have suggested that surgical management offers no benefit to patients with PPH [4,8], whereas others have advocated the efficacy of surgical treatment for PPH [5,6]. However, the number of operative PPH patients enrolled in previous studies has been relatively small, and most of the studies involved were only reports of surgery cases. Additionally, whether the surgical treatment can be performed safely is largely unknown. In this article, we conducted a retrospective study to analyze and compare the therapeutic effect of conservative and surgical therapy in the treatment of PPHs through an anterior subtemporal approach.

2. Materials and methods

Twenty-eight consecutive patients underwent surgical management through a subtemporal approach and thirty-four consecutive patients underwent conservative management with huge upper PPH (hematoma volume >5 mL) between January 2009 and October 2013 in the affiliated Bayi Brain Hospital, PLA General Hospital, Beijng, China were included in this study The records were retrospectively reviewed after obtaining approval for this study by the clinic ethics committee.

The clinical criteria for patient selection were the following: diagnosis of PHBH verified by computed tomography (CT) or magnetic resonance imaging; location of the PPH at the pons; interval between the onset of the hemorrhage and the operation within 60 h; clinical history of long-term or highly suspected hypertension;

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definite blood pressure higher than the upper limit of normal (>140/90 mmHg) on admission; decreased level of consciousness or a Glasgow Comma Scale (GCS) score ≤9; no clinical signs of herniation; follow-up for at least 3 months; and hematoma volumes between 5 and 20 cm^3. The informed consent for study participation was obtained from the patient's relatives. Additionally, patients who were initially treated at other hospitals but were transferred to our hospital were also included in the study.

The exclusion criteria of severe intracranial hemorrhage were as follows: disturbances of blood coagulation, such as thrombocytopenia or hepatitis; traumatic intracranial hemorrhage; complicated with serious heart, liver, renal, or lung disease or functional failure; previous stroke history with neurological deficits; intracranial aneurysm or arteriovenous malformation complicated with hemorrhage; and lack of consent form from the patient or their legal representative.

The patient was placed in supine position, and the ipsilateral shoulder was raised with a cushion to facilitate head rotation. The head was rotated 75° to the contralateral side; thereafter, the head was lateroflected by 15 to 20°. A horseshoe-shaped incision was performed from the zygoma to the mastoid according to the exact location of the PPH as displayed on the neuronavigation screen. After that, the subcutaneous tissue was carefully dissected while preserving the superficial temporal artery and auriculotemporal nerve. A temporal bone flap was fashioned with one burr hole on the superior temporal line, and the craniotomy was performed extending from the asterion to a point placed about 1 cm above the zygoma until reaching the floor of the middle fossa. The dura was then opened in an inverted U-shaped flap and reflected inferiorly.

After opening the dura mater, the first step was insertion of CSF drainage. The temporal lobe was gently retracted and the arachnoid membranes of the ambient cistern were opened. After a safe dissection and isolation from the underlying arachnoidal bands and trochlear nerve using a dissector, a small tentorial incision was made starting medially at the edge behind the entry point of the IV cranial nerve into the dura. The IV cranial nerve, superior cerebellar artery and vena petrosa were then extensively exposed in the ambient cistern. In 9 of the 28 cases the emergence hematomas could also be visually identified as a blue area on the lateral surface of the pontomesencephalic junction and were completely removed in a piecemeal fashion by means of bipolar forceps and delicate suction. When the PPH did not reach the brainstem surface, a millimetric incision was made vertically following the orientation of the pyramidal tract on the most superficial emergence site as indicated by the navigation, and the lesion was then found and removed. We excised the hematoma piece by piece with blunt, small diameter, curved enucleators. As often as possible, we avoided injuring the venous anomalies we encountered. Hemostasis was easily obtained with locally applied cotton and Surgicel®; we used electrocoagulation as little as possible (Fig. 1A–G).

The volume of remaining hematoma was obtained by CT scans at 24 h. The GCS score was assessed on the seventh postoperative day. Activities of daily living were assessed at 6 months postoperatively to evaluate the quality of life of the patients.

A chi-squared test was used for comparison of categorical variables and Mann–Whitney *U* test for continuous variables. The parameters proven to be significant with univariate comparison were analyzed again with multivariate regression analysis. The significance level accepted was of $P < 0.05$.

3. Results

Of the 28 patients underwent surgical management, 20 (71.4%) were male and 8 (28.6%) were female. Mean patient age was 62.4 ± 8.3 (range 31–76.3) years. The average systolic blood pressure was 192.20 ± 18.45 mmHg. The median hematoma volume of 28 patients was 9.3 (range, 7.8–18) mL at admission and was 1.4 (range, 0.5–9.5) mL at 24 h postoperatively. In this group, near-complete (>90%) evacuation was achieved in 19 cases (67.9%), 70% to 90% in 5 cases (17.9%) and less than <70% in 4 cases (14.2%) (Fig. 2). The mean operation time was 153.34 ± 38.1 min. On admission, the median GCS score was 5.9 ± 1.1 and the mean GCS score on the seventh postoperative day was 8.4 ± 2.7. There were no significant differences between GCS scores obtained on admission and 7 days postoperatively (Table 1).

The overall survival rate of surgical group at 3 months was 64.3% (17/28), including 28.6% (8/28) with good function (Glasgow Outcome Scale [GOS] score 4–5), 10.7% (3/28) with disability (GOS score, 3) and 25% (7/28) in a vegetative state (GOS score, 2). The mortality rate (GOS score, 1) was 35.7% (10/28). Three patients died because of severe pulmonary infection; all died during the hospitalization. Five patients died of multiple organ failure; two of whom died because of poor neurological status and the treatment was withdrawn, and three died of respiratory and circulatory failure during the follow-up stage after being discharged from the hospital. Two patients died because of rebleeding; both patients presented uncontrollable hypertension postoperatively, and the bleeding sites were located at sites other than the surgical site as shown in CT scans.

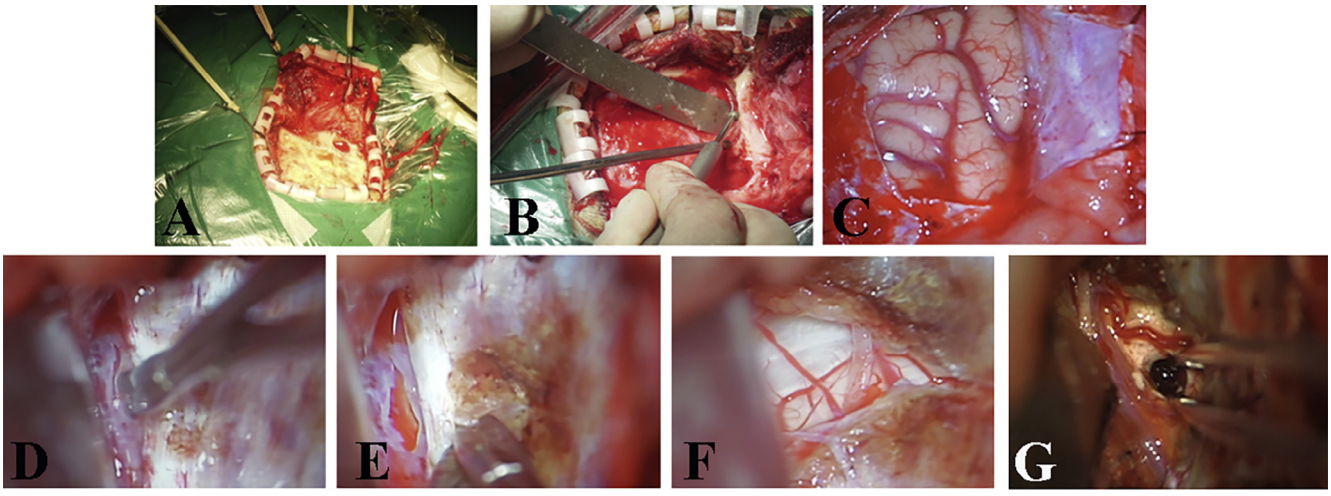

Fig. 1. Surgical procedure to exposure and remove the PPH through subtemporal approach (A–G).

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