Original Article

Prognostic Indicators in Patients with Primary Intraventricular Haemorrhage

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Abstract

Objectives: Primary intraventricular haemorrhage (PIVH) is a rare clinical entity. We sought to evaluate risk factors, clinical and radiological features, and outcome of patients with PIVH.

Materials and Methods: Cases of PIVH were identified from cohort of patients with non traumatic intracerebral haemorrhage (ICH) by reviewing the radiological data. Their charts were reviewed and demographic, clinical, radiological and laboratory data was recorded and analyzed. Chi square and t test were used to determine predictors of poor outcome.

Results: Fifteen of 677 (2%) patients with ICH had PIVH. Nine (60%) were men. Median age was 56 years. Predisposing factors included hypertension in twelve (80%), coagulopathy in five (33%) and vascular malformations in two (13%) patients. Eleven (73%) patients developed hydrocephalus. Two patients died. Univariate analysis identified diabetes mellitus, blood in all ventricles and coagulopathy as predictors of death during initial hospital stay and hydrocephalus as predictor of poor outcome (death and disability combined) ($p<0.05$).

Conclusion: Hypertension is most common associated risk factor for primary intraventricular haemorrhage followed by coagulopathy. Hydrocephalus is a common complication, associated with poor outcome. Diabetes mellitus, coagulopathy and panventricular blood predict early mortality (JPMA 55:315;2005).

Introduction

Primary intraventricular haemorrhage (PIVH) is non-traumatic intracerebral haemorrhage, confined to the ventricular system. It occurs relatively infrequently and comprises roughly about 3% of spontaneous intracerebral hemorrhage (ICH).[1] Multiple and diverse factors associated with PIVH have been reported, hypertension being the most common factor. This study focuses on identifying risk factors, clinical and radiological features and outcome in 15 adult patients with PIVH.

Methods

Patients with non traumatic intracerebral haemorrhage (ICH), admitted at our institution from 1988 to 2001 were identified through ICD-9 coding system. The brain imaging reviewed by two persons, trained in reading brain imaging, and patients with pure intraventricular haemorrhage were identified. Their medical records were retrospectively reviewed and demographic, clinical, laboratory, and radiological data were recorded and analyzed. Modified Rankin score at admission, discharge and latest follow up visit was used to assess the outcome. PIVH was defined as presence of blood confined strictly to ventricular system. Poor outcome was defined as either death during hospital stay and/or modified Rankin score of more than 2 at the time of discharge. Statistical analysis employed descriptive and univariate (chi-square and t test) methods.

Results

Six hundred and seventy seven patients with ICH were identified and 15 (2%) of these had PIVH. Nine (60%) were men and 6 (40%) were women. Median age was 56 (range: 14-76) years.

Nausea and vomiting was noted in 12 (80%) patients, headache in 11 (73%), drowsiness in 8 (53%), cranial nerve palsies in 7 (47%; two had papilledema, two had supranuclear 7th nerve palsy, one each had partial 3rd and 6th nerve palsy and one had both 6th nerve and supranuclear 7th nerve palsy), signs of meningeal irritation in 5 (33%), extensor planters in 6 (40%), hemiparesis in 5 (33%) and asymmetric deep tendon reflexes in 4 (27%) patients. Three (20%) patients were comatosed and three (20%) were restless and agitated. Only one patient had seizures, who had past history of stroke.

Two (13%) patients were on Warfarin and their international normalization ratio (INR) was 3.74 and 2.3. One (7%) each had polycythemia vera, hemophilia C, mild thrombocytopenia (platelet 135,000), dural AVF and cerebral AV malformations.

Ten patients had computed tomography (CT) of head, 2 had magnetic resonance imaging (MRI) and 3 had both. Lateral ventricles were involved in all (7 had bilateral involvement), 3rd ventricle in 10 (66%) and 4th ventricle in 7 (47%) patients (Figures 1 and 2).

Eleven (73%) patients developed hydrocephalus, evident on 1st image. Seven of these patients were managed conservatively as their neurologic status remained stable, not requiring CSF diversion.

Four patients deteriorated. Two of these underwent surgical intervention i.e. ventriculoperitoneal shunt insertion in one and external ventricular drain placement in

Table 1. Factors associated with mortality during hospital stay.

S.No.	Variable	Survived	Expired	RR (95%CI)	P value
1	Diabetes mellitus	2/13	2/2	4.3 (1.6 -11.6)	0.025
2	Coagulopathy	3/13	2/2	4.3 (1.6 -11.6)	0.025
3	Blood in all ventricles	2/13	2/2	4.3 (1.6 -11.6)	0.025

the other, one was transferred to another hospital because of unavailability of ICU bed and in fourth patient surgical intervention was not performed on account of extremely poor neurological status at presentation and his code status was decided to be 'Do Not Resuscitate'.

Conventional angiography was done in 3 (21%) patients and was abnormal in 2 (one had AVM and other had dural AVF). Magnetic resonance angiography (MRA) was performed in one (7%) patient and was normal. Because of the retrospective nature of the study it was difficult to ascertain as to why angiography was not done in other patients. Patient with AVM underwent resection and patient with dural AVF underwent embolization.

Figure 1. T_1 weighted (TR;345, TE;9, FA;90) axial image of MRI brain showing hyperintense signals in frontal horn of left lateral ventricle and third ventricle, consistent with subacute intraventricular haemorrhage.

Twelve patients (80%) had hypertension. Six of them were being treated appropriately, five were noncompliant with medications while no information was available in one patient regarding treatment of hypertension. Five (33%) had diabetes mellitus.

Median length of hospital stay was 4 (1-18) days. Two (13%) patients died, eight (53%) patients improved and 5 (34%) patients remained unchanged.

Figure 2. CT scan of head showing intraventricular haemorrhage in both lateral ventricles.

More than one month of follow up was available in six patients, ranging from three months to twelve years. Three of them were doing well, one had been unchanged, one had been considerably sick because of metastatic breast carcinoma and one died for other medical problems. Less than one month of follow up was available in two patients who had been doing well. No follow up was available in five patients.

On univariate analysis diabetes mellitus, coagulopathy, and presence of blood in all ventricles were found to be predictors of death during hospital stay (table 1). Hydrocephalus was also found to be a predictor of poor outcome i.e. death and disability combined (5/11 with hydrocephalus had poor outcome while all the 4 patients who did not have hydrocephalus had favorable outcome; p value 0.047).

Discussion

PIVH is a rare clinical entity, first described by Sanders in 1881.[2] The reported incidence of PIVH in patients with ICH is 3-7%.[1,3] In our series, it accounted for 2% cases

of spontaneous ICH. This discrepancy is probably because of different criteria used for the diagnosis of PIVH. It has been defined as haemorrhage in ventricle and 15 mm around the ventricle[4], however, we included only those patients who had blood confined strictly to ventricular system.

PIVH has classically been described as a condition presenting with sudden onset of headache, vomiting and altered mentation with minimum focal neurologic deficits.[4-6] The main presenting features in our cohort were also headache, nausea, vomiting (>70% of the patients) and altered level of consciousness with fewer than half of the patients having focal neurologic deficits i.e. hemiparesis and cranial nerve palsies.

A variety of risk factors have been linked to PIVH, hypertension being the most common.[4-8] Twelve of our 15 (80%) patients had hypertension. Other etiologic factors include cerebral vascular anomalies like AVM and aneurysms, coagulopathies, choroid plexus tumours and cysts, moyamoya disease and arteritis.[4] Four of our patients had definite coagulopathy and one had mild thrombocytopenia, one had AVM and another had dural AVF. These results underscore the need of cerebral angiography and workup for coagulopathies in patients with PIVH. No definite cause was identified in seven (47%) patients and PIVH was assumed to be secondary to hypertension in 6 of these.

Mortality reportedly ranges from 20-47%.[2] Two (13%) patients of our cohort expired. Overall mortality of the ICH cohort, from which our PIVH patients were identified, was 25%.[9] Patients who have no demonstrable cause, even after angiography, seem to have better prognosis than those with a documented mechanism of haemorrhage.[10] We also found that coagulopathy is a poor prognostic factor (table 1).

We noted diabetes mellitus to be associated with early mortality. This is not reported before, however, blood sugar at time of admission in patients with ischemic stroke has been reported to be associated with poor outcome.[11]

Presence of blood in all ventricles was found to be a poor prognostic factor in our series. This is contrary to previously reported series of same size.[4] This difference may be a result of difference in volume of intraventricular blood. Though we did not measure the volume of blood in our patients but the prognostic significance of this factor has been found to be controversial.[5,7,12,13]

Hydrocephalus has been reported as a poor prognostic factor.[4,6,7,12] We did find that hydrocephalus was associated with poor outcome (death and disability combined).

We conclude that hypertension is the most common associated risk factor for PIVH followed by coagulopathies. Our study also highlights the importance of angiography and work up for coagulopathy in patients with PIVH. Hydrocephalus is a common complication and associated with poor outcome. History of diabetes mellitus, coagulopathy as an underlying etiologic factor and presence of blood in all ventricles predict early mortality. However, our study is limited by its small sample size and retrospective nature. A large scale study is required to confirm these findings.

Conclusion

Hypertension is most common associated risk factor for primary intraventricular haemorrhage followed by coagulopathy. Hydrocephalus is a common complication, associated with poor outcome. Diabetes mellitus, coagulopathy and panventricular blood predict early mortality.

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