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Original Research Article

Prophylactic lumboperitoneal shunt in cases of cerebral venous sinus thrombosis with papilledema

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ABSTRACT

Background: Although the mainstay of cerebral venous sinus thrombosis treatment is medical, rarely surgical intervention is warranted. We aimed to determine the role of prophylactic lumbo-peritoneal (LP) shunt in cases of CVST with papilledema.
Methods: This is a retrospective review of 70 cases of CVST managed between November 2019 to April 2020. Indications for surgical management included poor response to medical management and severe vision impairment.
Results: The mean age of the patients included in the study was 39.44±4.76 years. The most common presenting complaint was headache (83%) and nausea/vomiting (69%). On examination, the common findings were papilledema (57%), blurred vision (31%), double vision (21%) and hemiparesis (11%). Two cases had sudden loss of vision, who underwent emergency LP shunt surgery. Of the 40 cases with papilledema, 8 had severe papilledema. Based on MRI venography, transverse sinus was involved in half of all patients, superior sagittal sinus was involved in 29% and 21% had both the sinuses involved, while 7% had cortical vein thrombosis. Anticoagulants was the first line of therapy for the patients. Papilledema was present in 40 cases, of which 10 showed complete resolution of symptoms, 15 cases had reduced severity of symptoms and symptoms persisted in rest of the 15 cases. The 10 cases who had complete resolution of symptoms included two patients who underwent LP shunt. There were no deaths.
Conclusions: We recommend that a LP shunt insertion in a patient with severe papilledema with superior sagittal sinus thrombosis can prevent disease progress, preserve vision and facilitate re-canalisation.

Keywords: Cerebral venous sinus thrombosis, Clinical outcome, Surgery

INTRODUCTION

Cerebral venous sinus thrombosis (CVST) is an obstruction to cerebral venous blood flow with estimated annual incidence 2-4 cases per million.[1] CVST accounts for 10-20% of stroke in young which in turn accounts for nearly 30% of all cases of strokes in India.[2] The first case of CVST was described in French literature in 1825 by Ribes.[3] Cerebral venous sinus thrombosis is a multifactorial condition with sex-related specific causes.[4] As in any thrombotic process, risk factors are associated with the classical Virchow triad of thrombogenesis: hypercoagulability, vessel wall damage and blood stasis.[5] Numerous acquired and congenital conditions can result in this. Earlier, cerebral venous sinus thrombosis was a condition which had high mortality and morbidity. But now with modern imaging and better understanding of pathophysiology the clinical outcomes have improved significantly. The mainstay of cerebral venous sinus thrombosis treatment is medical management, with surgical interventions required in cases with haemorrhagic infarcts causing midline shift and mass effect. Rarely, cerebral venous sinus thrombosis may progress to a severely raised intracranial pressure causing papilledema and visual disturbances. Neurosurgical intervention in the form of sequential drainage lumbar

punctures or then insertion of a lumbo-peritoneal shunt has to be performed to remedy this intractable raised intra-cranial pressure.[6] We performed a retrospective study of 70 cases of cerebral venous sinus thrombosis who were treated at our tertiary care centre. The objective of our study was to determine the role of prophylactic lumbo-peritoneal (LP) shunt in cases of cerebral venous sinus thrombosis with papilledema.

METHODS

The study was a retrospective analysis of patients assessed over a period of 6 months from November 2019 to April 2020. We included patients who were diagnosed with CVST based on the magnetic resonance imaging (MRI), and MR venography (MRV). The study comprised of 70 cases of CVST managed as inpatient at our institution. The sample size was calculated using the formulae:

$N=(Z_{\alpha/2})^2*(PQ)/E^2$,

where N=Sample size, $Z_{\alpha/2}$= Z value at 1% error (2.58), P=Taken as 73.3% (Chaturbedi et al reported that at the time of hospital discharge, 73.3% of the patients with CVST had good neurological outcome).[7] Q=1-P and E=Allowable error (taken as 15%). So, $N=[(1.96)^2x(0.35 \times 0.65)]/(0.035)^2$. The minimum sample calculated was 57.89.

Detailed history, clinical evaluation and pro-thrombotic work up was documented. Headache severity was assessed using the visual analogue scale. Ophthalmic assessment included visual acuity using Snellen's chart, fundoscopy, visual field with Goldmann kinetic automated perimetry. The severity of papilledema was graded using the Frisen's Grading as shown in the Figure 1.[8] All the patients were given medical management with anticoagulants and carbonic anhydrase inhibitor acetazolamide on initial presentation. The parameters for surgical management included poor response to medical management and severe vision impairment.

For the LP shunt, patient is placed in lateral decubitus position and a 2 cm linear midline incision is placed between L4/5 spinous process. A 14 G Tuohy needle is placed in the subarachnoid space with the bevelled edge pointed cephalad. Proximal end is advanced into the thecal sac for a distance of 8 cm. As soon as the CSF is seen to come out from its distal end, the Tuohy needle is withdrawn. A suture collar is used to prevent the displacement of shunt from the spine. A 2 cm incision is made in the right flank and a malleable shunt passer is employed to deliver the distal end of the shunt. A 2 cm incision is made in the right lower quadrant of the abdomen and the same passer delivered the tube. Access to peritoneum is achieved. Shunt tubing is inserted into the peritoneum. Wound closed in layers.

Outpatient follow up visits were performed for all patients at one month, 3 months and 6 months after discharge. The descriptive analysis of the patients and their outcomes is described and tabulated.

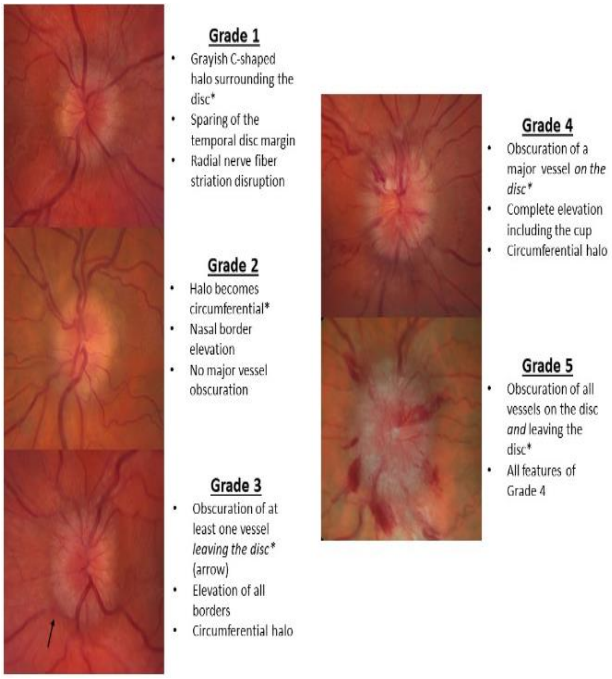

Figure 1: Frisen's grading of papilledema.

RESULTS

The mean age of the patients included in the study was 39.44±4.76 years and 60% of the patients were aged between 41 to 60 years (Table 1). Males comprised 44% of the study population. According to the time of presentation since symptom onset, 26% had an acute presentation, 59% had subacute presentation and 16% had chronic presentation. The most common presenting complaint was headache (83%) and nausea/vomiting (69%). On examination, the common findings were papilledema (57%), blurred vision (31%), double vision (21%) and hemiparesis (11%). Two cases had sudden loss of vision, who underwent emergency LP shunt surgery. Of the 40 cases with papilledema, 8 had severe papilledema. Based on MRI venography, transverse sinus was involved in half of all patients, superior sagittal sinus was involved in 29% and 21% had both the sinuses involved, while 7% had cortical vein thrombosis. Anticoagulants was the first line of therapy for the patients. We observed that half of all patients improved with medical management alone, which included anticoagulation and carbonic anhydrase inhibitors like acetazolamide. Papilledema was present in 40 cases, of which 10 complete resolution of symptoms, 15 cases had reduced severity of symptoms and symptoms persisted in rest of the 15 cases. The 10 cases who had complete resolution of symptoms included two patients who underwent LP shunt (Figure 2). There were no deaths.

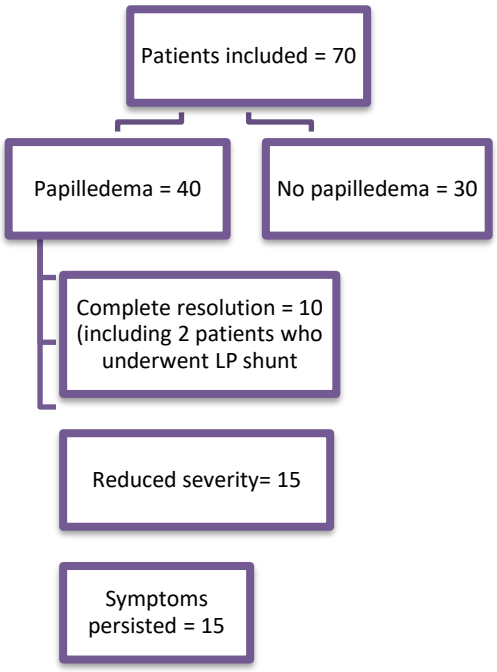

Figure 2: Distribution of patients according to their clinical outcomes.

Table 1: Baseline characteristics of the patients included in the study.

Patient characteristics	N	Percentage (%)
Age groups (years)		
Up to 40	13	19
41 to 60	42	60
More than 60	15	21
Gender		
Female	39	56
Male	31	44
Type of presentation		
Acute (less than 48 hours)	18	26
Subacute (48 hours to less than 30 days)	41	59
Chronic (more than 30 days)	11	16
Presenting symptoms		
Headache	58	83
Nausea/vomiting	48	69
Seizures	12	17
Loss of vision	2	3
Clinical examination findings		
Papilledema	40	57
Blurred vision	22	31
Double vision	15	21
Hemiparesis	8	11
Affected site		
Transverse sinus	30	43
Superior sagittal sinus	20	29
Both transverse and superior sagittal sinus	15	21
Cortical vein thrombosis	5	7

DISCUSSION

CVST is a rare subtype of stroke. Anticoagulation and, to a lesser degree, endovascular treatment methods in resistant cases constitute the current treatment regimens.[9] However, shunt procedures in CVST have very rarely been mentioned and utility of this method remains unclear.[10] The main mechanism of neurological dysfunction in CVST is thought to be impaired venous drainage resulting from a venous thrombus that leads to tissue congestion, which may cause brain parenchymal lesions.[11] These lesions are recognized as brain edema, venous infarction, or hemorrhagic infarction via neuroimaging, and can induce various focal neurological signs. Ferro et al reported that more than 60% of patients with CVST exhibited parenchymal lesions on CT/MRI.[12]

In the present study mean age of the patients was 39.44±4.76 years and 60% of the patients were aged between 41 to 60 years. The most common presenting complaint was headache, and on examination the most common finding was papilledema. Chaturbedi et al reported the findings of 45 patients with CVST, in which their mean age was 37.8 years and the most common presenting complaint were headache and vomiting, which is similar to our study.[7] We observed that based on MRI venography, transverse sinus was involved in half of all patients, superior sagittal sinus was involved in 29% and 21% had both the sinuses involved, while 7% had cortical vein thrombosis. In the study by Chaturbedi and colleagues, superior sagittal sinus (59.3%) and transverse sinuses (56.2%) were the most frequently involved sinuses. About 41% had involvement of two or more sinuses in combination. Only one patient (3.1%) had deep venous system involved in our study.

In our study, symptoms persisted in 37% of the patients with papilledema, while of the rest, 25% had complete resolution and remaining had reduced severity of papilledema. There were no deaths. In the study by Chaturbedi et al, at the time of hospital discharge, 73.3% had good neurological outcome and 26.7% had poor outcome. Among the poor outcome group, there were 6.6% in-house mortality. Out of these three deaths, two cases had raised ICP secondary to large haemorrhagic venous infarct and 1 case had septicaemia along with bacterial meningitis. From the international study on cerebral vein and dural sinus thrombosis (ISCVT) and other previously published five studies, Lobo et al performed a meta-analysis of 15 cases who underwent LP shunt for CVST.[13] The authors found that eight patients (53.37%) regained independence (mRS 0-2), 2 patients (13.3%) were left with severe dependence (mRS 4-5) and 4 (26.7%) died despite shunting. None died from the condition causing the CVST. Torikoshi and Akiyama reported a case of a patient with CVST which was resistant to anti-coagulants. Despite administering warfarin at a daily 3-mg dose, intravenous glycerine and oral acetazolamide (1000 mg/day), the symptoms remained and gradually deteriorated, and 55 days after

symptom onset, the lumbar puncture opening pressure increased further to 37 cm H_2O. Three days later, LP shunt was performed. Patient's headache and nausea improved immediately after the shunt and papilledema improved after 1 month. Over the next few weeks, patient's vision improved as well.

There are a few limitations of the study. First, long term follows up of the patients could not be done. Second, CVST is a multifactorial disease requiring intensive care. Therefore, the results of the present study might not be applicable other surgical centres.

CONCLUSION

In our study 57% of the patients had papilledema, out of which 20% had severe papilledema, of which 25% progressed to sudden vision loss which required surgical intervention on an emergency basis with LP shunt. Both the patients showed immediate recovery in vision. From our results, we recommend that a LP shunt insertion in a patient with severe papilledema with superior sagittal sinus thrombosis can prevent disease progress, preserve vision and facilitate re-canalisation. This avoids multiple lumbar punctures and decreases the possibility of serious visual complications in patients who do not follow up regularly.

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Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

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