

Management and outcome of post traumatic hydrocephalus

Bhagwati Salgotra* and Kunal Kishore

Department of Neurosurgery, SBKS Medical College, Vadodara, India

*Correspondence Info:

Dr. Bhagwati Salgotra

Assistant Professor

Department of Neurosurgery,

SBKS Medical College, Vadodara, India

E-mail: drsalgotra@gmail.com

Abstract

Background: Post traumatic hydrocephalus (PTH) is frequent sequelae of moderate and severe traumatic brain injury. It is a frequent case of delayed deterioration and worsening of initial symptoms of head injury. We studied 31 cases of PTH diagnosed and treated at our institute from Aug 2013 to Aug 2015.

Material and methods: Retrospective study of clinico-radiological profile of these patients diagnosed with PTH was noted at the time of initial trauma and when PTH developed. These cases were treated by ventriculo-peritoneal shunting and outcome was analysed.

Results: Incidence of PTH in our study is 7.8%. out of 31 cases 26 were male (83.87%). RTA was the most common mode of injury (77.41%), contusion was the most common finding on C.T scan 19 cases (61.29%). PTH had very good outcome with v.p shunting in 93.54%.

Conclusion: Post traumatic hydrocephalus is sequelae of traumatic brain injury and can present in form of various neurological symptoms after variable days of initial trauma. C.T scan is the investigation of choice to quickly diagnose PTH. Outcome of v.p shunting in PTH is very good.

Keywords: Post traumatic hydrocephalus, post head injury hydrocephalus, v.p shunting.

1. Introduction

There is a wide spectrum of post-traumatic sequelae of traumatic brain injury. Patients developing post traumatic hydrocephalus present with neurological symptoms of varying severity. Post-traumatic hydrocephalus (PTH) as a clinicopathologic entity has been recognized since Dandy's report in 1914 [1]. It is common sequelae of traumatic brain injury. Few series in the world literature describe it with variable rates of incidence [2,3]. Recognition of PTH is very important to differentiate it from other causes of delayed deterioration like cerebral edema, hypoxia, ischaemia, electrolyte imbalance, seizures and infection. PTH is an active and progressive process of excessive cerebrospinal fluid (CSF) accumulation due to fluid-dynamic disturbances following cranio-cerebral injury [4].

Post traumatic hydrocephalus can be treated with V.P shunting procedure and can lead to dramatic improvement in patient's outcome.

1.1 Aims and Objectives

To study clinico radiological profile of patients diagnosed with Post traumatic hydrocephalus and to study the outcome of V.P shunting in cases of post traumatic hydrocephalus.

Study Design: Retrospective study.

2. Material and Method

Case records of all 31 patients of PTH managed in our centre between Aug 2013 and Aug 2015 were reviewed. The aim of the study was to evaluate the clinical and radiological features of each case, both at the time of initial injury and at the time of presentation with features of hydrocephalus. Cases were reviewed with demographic profile, mode of injury, GCS and CT findings at time of initial presentation. Line of management at time of initial injury – surgical or conservative – was noted. All clinical features at the time of presentation of PTH were included to complete the spectrum. Non-contrast CT scan brain showing ventriculomegaly with periventricular lucencies was taken as radiological criteria of hydrocephalus. This was to exclude ventriculomegaly due to loss of brain volume (hydrocephalus ex-vacuo). All patients were managed with medium pressure ventriculoperitoneal shunts. Postoperative results and complications were analyzed.

3. Results

We studied 31 cases of post traumatic hydrocephalus.

Table 1: Number of patients used

Sex	Number	Percentage (%)
Male	26	83.87%
Female	5	16.12%

Total 398 cases of head injury were admitted in our department and 31 were diagnosed as having post traumatic hydrocephalus Incidence 31/398 = 7.8%

Table 2: Age group of the patient were

Age	Numbers	Percentage
10-20	1	3.22%
21-30	7	22.58%
31-40	7	22.58%
41-50	11	35.48%
51-60	3	9.67%
61-70	2	6.45%

Youngest patient was 15 years and eldest was 68 years.

Table 3: Mode of injury

Mode of injury	Numbers	Percentage
RTA	24	77.41%
Fall	5	16.12%
Assault	2	6.45%

Table 4: Type of injury on C.T scan

CT scan finding	Number	Percentage
contusion	19	61.29%
Traumatic SAH	7	22.58%
Traumatic IVH	3	9.67%
Acute SDH	2	6.45%

Table 5: Type of head injury

Grade	GCS	Number	%
Mild head injury	14-15	0	
Moderate head injury	9-12	22	70.96%
Severe head injury	3-8	9	29.03%

In our study it was noted that Post traumatic hydrocephalus can develop as early 18 day and one patient presented as late as 48 days

Table 6: Symptoms of patients presenting with Post traumatic hydrocephalus

Symptoms	Number	percentage
Drowsy	21	67%
Confused	10	32%
Headache	9	29%
vomiting	12	38%
Urinary disturbance	11	35%
Seizure	2	6.4%
Speech disturbance	12	38%

Table 7: Management of post traumatic hydrocephalus

Treatment	Number	Percentage
Conservative	18	58.06%
Craniotomy	11	35.48%
EVD	2	6.45%

Table 8: Other findings

CT scan showing hydrocephalus	31	100%
Funduscopy showing papilledema	31	100%

Table 9: Mortality

Outcome	Number	Percentage
Good outcome	29	93.54%
Mortality	2	6.45%

Figure 1: CT scan images

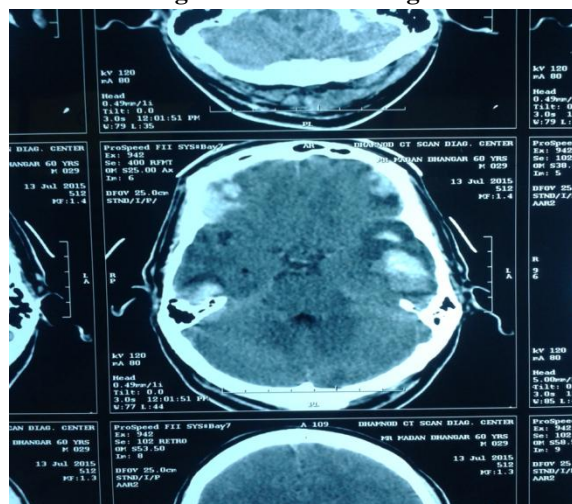


Figure 1a: Day 1 Trauma, bilateral temporal and basifrontal contusion

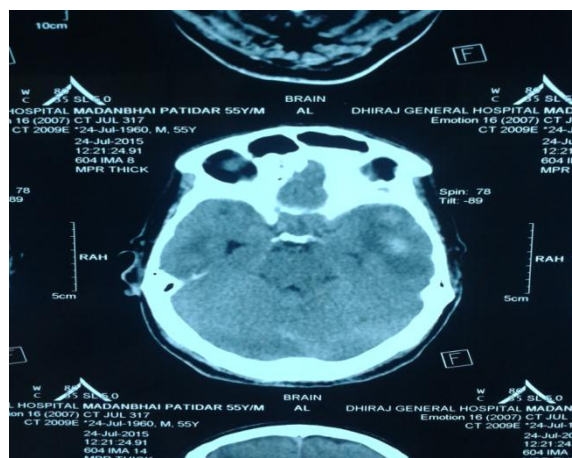


Figure 1b: Day 12 resolution of contusion

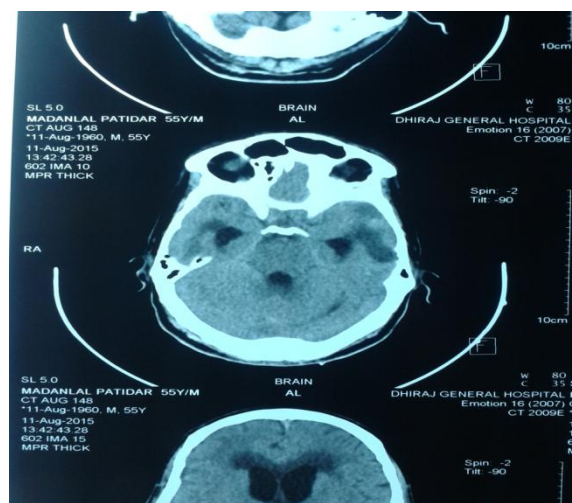


Figure 1c: Day 30: Patient developed PTH, ventricomegaly with periventricular lucency

4. Discussion

In the present study 31 cases out of 398 cases of severe head injury admitted at our center developed PTH. Thus the incidence was 7.8 % in severe head injuries. Incidence of PTH in world literature is quite variable, ranging from 0.7 to 29 % [2-7]. In our study when C.T scan was done during management of the patient ventriculomegaly and periventricular lucency was found in all the cases of post traumatic hydrocephalus. In many cases, initial brain damage leading to cerebral atrophy with secondary ventriculomegaly can give a false impression of PTH and if only CT finding of ventriculomegaly is taken into account, then the incidence rises to 30-88 % [8,9]. Kishore *et al* found that only 13.7% of patients with ventriculomegaly had PTH [7]. In our study it was noticed that post traumatic hydrocephalus can present with different symptoms like altered sensorium, drowsiness, headache, vomiting, seizures, etc. Cardoso *et al* suggested that, Post traumatic hydrocephalus may present with various clinical syndromes including altered sensorium, failure to improve, psychomotor retardation, memory loss, gait ataxia and incontinence [2,10]. Prolonged coma or arrest in clinical progress in conscious patients should arouse suspicion of hydrocephalus. In such patients funduscopy may reveal papilledema [2,20]. In our study we found that all patients diagnosed with PTH had papilledema.

PTH can present from variable days after initial trauma. Takagi *et al* suggested that PTH commonly occurs in first year post trauma and has been described as early as within 7 hours of injury [2,11,13]. In our series 1 patient was diagnosed on 18th post-trauma day and 1 as late as 48th day. CT scan findings at time of initial trauma have been described with variable rates of incidence of findings [2,8,12-16].

In our study initial C.T scan suggested various injuries. contusion was the most common finding in our study. Traumatic SAH was the second most common pathology in our study. In some studies Subarachnoid hemorrhage (SAH) has been cited as the most important pathology leading to development of PTH [2,10,15-18]. Obliteration of subarachnoid spaces with fibrous thickening of lepto-meninges particularly in sulci of the convexity and base of brain as a result of SAH has been suggested [19]. Sub-dural hematoma [17], intra-ventricular

Hemorrhage [13], diffuse edema and cerebral contusion [14] have been found as the most common CT findings in other studies.

In our study most of the patients were treated conservatively 58.06% and 35.48% patients had

undergone craniotomy for decompression and removal of contusion

Decompressive craniectomy (DC) has been found to be associated with development of PTH, [2,12,15,20,21] by altering CSF pressure dynamics, mechanical blockage around convexities [19] or inflammation of arachnoid granulations by post-surgical debris [21]. It leads to flattening of normally dirotic ICP waveforms due to transmission of pressure pulse through the open cranium [21]. Since arachnoid granulations function as pressure-dependent one-way valves from subarachnoid space to draining venous sinuses, the disruption of pulsatile ICP dynamics results in decreased CSF outflow. Higher incidence of PTH has been found with extended DC and re-operation [17].

In our study most of the patient of PTH underwent V.P shunting and had good out come in 93.54%

5. Conclusion

Post traumatic hydrocephalus is sequelae of traumatic brain injury and can present in form of various neurological symptoms after variable days of initial trauma. C.T scan is the investigation of choice to quickly diagnose PTH and rule out other possibilities of delayed deterioration in a recovering head injury patient. PTH has very good outcome after V.P shunting

References

- [1] Dandy W, Blackfan KD. Internal hydrocephalus. An experimental, clinical and pathological study. *Am J Dis Child* 1914; 8:406-82.
- [2] Cardoso ER, Galbraith S. Posttraumatic hydrocephalus — A retrospective review. *Surg Neurol* 1985; 23:261-4.
- [3] Hawkins TD, Lloyd AD, Fletcher GI, Hanka R. Ventricular size following head injury: A clinico-radiological study. *Clin Radiol* 1976; 27:279-89.
- [4] Loshakov VA, Iusef ES, Likhterman LB, Kravchuk AD, Shcherbakova E, Tissen TP, *et al*. [The diagnosis and surgical treatment of posttraumatic hydrocephalus]. *Zh Vopr Neurokhir Im NN Burdenko*. 1993:18-22.
- [5] Groswasser Z, Cohen M, Reider-Groswasser I, Stern MJ. Incidence, CT findings and rehabilitation outcome of patient with communicative hydrocephalus following severe head injury. *Brain Injury* 1988; 2:267-72.
- [6] Guyot LL, Micheal DD. Post traumatic hydrocephalus. *Neurol Res* 2000; 22:25-8
- [7] Kishore PR, Lipper MH, Miller JD, Giravendulis AK, Becker DP, Vines FS. Post traumatic

- hydrocephalus in patients with severe head injury. *Neuro Radiol* 1978; 16:261-5
- [8] Gudeman SK, Kishore PR, Becker DP, *et al.* Computed tomography in the evaluation of incidence and significance of post-traumatic hydrocephalus. *Radiology* 1981; 141:397-402.
- [9] Philippon J, George B, Visot A, Cophignon J. Post-operative hydrocephalus. *Neurochirurgie* 1976; 22:111-7.
- [10] Beyer B, Black PM: Post traumatic hydrocephalus. *Neurosurgery* 1984; 15:257-61.
- [11] Takagi H, Tamaki Y, Morii S, Ohwada T. Rapid enlargement of ventricles within seven hours after head injury. *Surg Neurol* 1981; 16:103-5.
- [12] Licata C, Cristofori L, Gambin R, Vivenza C, Turazzi S. Posttraumatic hydrocephalus. *J Neurosurg Sci* 2001; 45:141-9.
- [13] Rodrigues D, Sharma RR, Sousa J, Pawar SJ, Mahapatra AK, Lad SD. Post-traumatic hydrocephalus in severe head injury series of 22 cases. *Pan Arab J Neurosurg* 2000; 4:63-7.
- [14] Bhatoe HS, Batish VK. Post head injury hydrocephalus. *Ind J Neurotrauma* 2005; 2:131-3.
- [15] Jiao QF, Liu Z, Li S, Zhou LX, Li SZ, Tian W, You C. Influencing factors for post-traumatic hydrocephalus in patients suffering from severe traumatic brain injuries. *Chinese J Traumatology* 2007; 10:159-62.
- [16] Tian HL, Xu T, Hu J, Cui YH, Chen H, Zhou LF. Risk factors related to hydrocephalus after traumatic subarachnoid hemorrhage. *Surg Neurol* 2008; 69:241-6.
- [17] Choi I, Park H, Chang J, Cho S, Choi S, Byun B. Clinical factors for the development of posttraumatic hydrocephalus after decompressive craniectomy. *J Korean Neurosurg Soc* 2008; 43:227-31.
- [18] Butler AB, Maffeo CJ, Johnson RN, Bass NH. Alteration of CSF outflow in acute subarachnoid hemorrhage; effect of blood components on outflow resistance and vascular transport of CSF in arachnoid villus endothelium. In, Cervos-Navarro J, Fritschka E (eds). *Cerebral Microcirculation and Metabolism*. Raven Press, New York (1981):409-14.
- [19] Foroglou G, Zander E. Post-traumatic hydrocephalus and measurement of cerebrospinal fluid pressure. *Acta Radiol Diagn (Stockh)* 1972; 13:524-30.
- [20] Phuenpathom N, Ratanalert S, Saeheng S, Sripairojkul B. Posttraumatic hydrocephalus: experience in 17 consecutive cases. *J Med Assoc Thai* 1999; 82:46-53.
- [21] Waziri A, Fusco D, Mayer SA, McKhann GM 2nd, Connolly ES Jr: Postoperative hydrocephalus in patients undergoing decompressive hemicraniectomy for ischemic or hemorrhagic stroke. *Neurosurgery* 2007; 61:489-93.