

Original Article

Comparison of Surgical Outcomes of ventriculoperitoneal (VP) Shunt at Choudhary's Point vs. Keen's Point

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ABSTRACT:

Objectives: The study compared the outcomes of VP shunt at Choudhary's vs Keen's point.

Material and Methods: A quasi-observational study was conducted on 50 patients who presented to NS-2, PINS, with the complaint of hydrocephalus. The study was conducted for 3 months from 1st November 2021 to 31th Jan 2022.

Results: Mean age was 40 years. In 25 (50%) patients, VP shunts were done through Choudhary's point while in 25 (50%) patients VP shunts were done through Keen's point. All patients were evaluated on day 3rd POD, 7th POD, 15th POD, and 90th POD. All patients were improved on 3rd POD. On the 7th POD, 15 (30%) patients deteriorated and showed signs of raised ICP. In these patients, the upper end of VP shunts is again revised due to blockage. On 15th POD, the upper end of VP shunts was blocked in 3 (6%) patients and their upper end was revised. On 90th POD, 2 (4%) patients were presented with upper-end blockage, and again shunt revision was done. VP shunts in all these patients were done through Keen's point approach. Blockage of the lower end of VP shunt occurred in 10% of patients in which 8% were operated through Keen's point approach while resting 2% of patients were operated through Choudhary's point approach. Slit like ventricle syndrome occurred in 2% of patients operated through Choudhary's point approach.

Conclusion: VP shunts through Choudhary's point approach yield good results as compared to Keen's point approach. This site is described by professor Muhammad Anwar Choudhary, as more convenient for insertion of VP shunt.

Keywords: Choudhary's point, Keen's Point, VP Shunt.

Abbreviations: VP: ventriculoperitoneal. POD: Post Operative Day. CSF: Cerebro Spinal Fluid. ETV: Endoscopic Third Ventriculostomy. EVD: External Ventricular Drain.

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INTRODUCTION

In hydrocephalus abnormal accumulation of CSF in ventricles occurs. In babies head size is increased while in older people, headache, diplopia, gait disturbance, and urinary incontinence occur. It can cause vomiting, sleepiness, seizure, etc.¹ Hydrocephalus can be due to aqueductal stenosis, meningitis, brain tumors, traumatic brain injuries, IVH, SAH, etc., hydrocephalus can be communicating, non-communicating, even under normal pressure.¹

Hydrocephalus can be treated by medical and surgical treatment. In surgical treatment, we can do a lumbar puncture, lumbar drainage, EVD, ETV, and shunt placement. There are many complications of VP shunts including over drainage, under drainage, mechanical failure, infection, or obstruction.¹

Hydrocephalus is present in 2 per 1000 newborn babies.² In developing countries, rates may be higher.³⁻⁶ For short-term relief, we use external ventricular drain (EVD). For long term relief, we use cerebral shunts. In this way, CSF is drained.⁷ For obstructive hydrocephalus, we use endoscopic third ventriculostomy (ETV).^{8,9}

Frazier's point is 6 cm above the inion and 3 cm lateral to the midline. It is a common site for insertion of the ventriculoperitoneal shunt (VP shunt).¹⁰⁻¹¹ Keen's point is located 3 cm posterior-superior to the helix of the ear.¹²⁻¹³ Choudhary's point is 6 cm above the inion and 4 cm lateral to the midline. This site is invented by professor Muhammad Anwar Choudhary.

Shunt infections commonly occur due to gram-positive cocci and fungus. Shunt infection can be treated with antibiotics, externalization of the shunt, and removal of the shunt with external ventricular drain (EVD) placement.¹⁵⁻¹⁸ The shunt can be blocked in the proximal or distal end. Extra protein and arachnoid granulations at the proximal end can block the shunt end. The shunt can be blocked by over drainage and slit ventricle syndrome. Overdrainage can lead to Chiari I

malformation.¹⁹⁻²⁰ Slit ventricle syndrome occurs several years after shunt implantation.

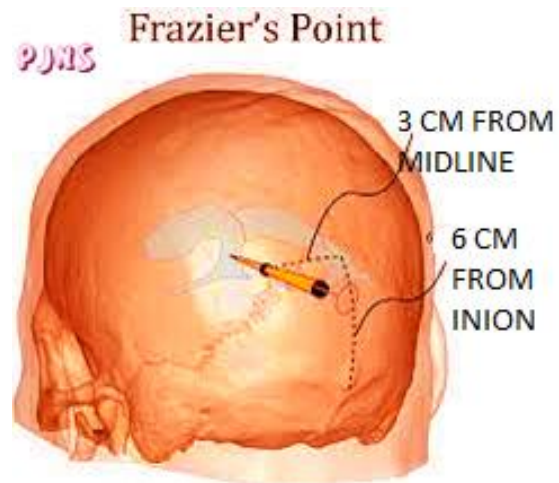


Figure 1: Illustration of Frazier's point.

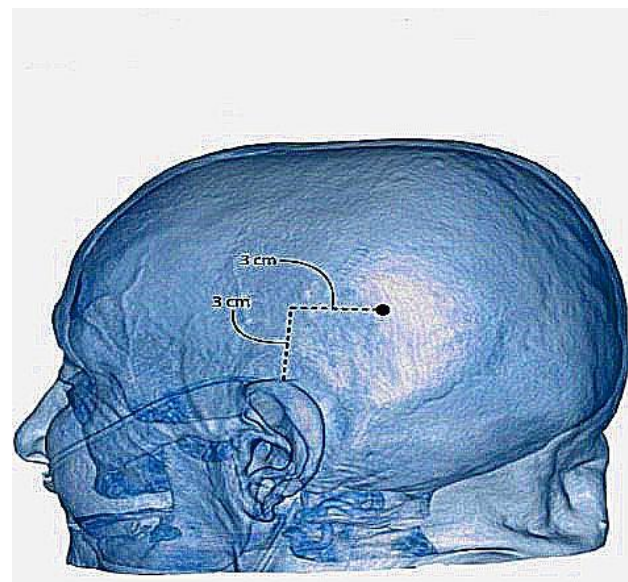


Figure 2: Illustration of Keen's point.

MATERIAL AND METHODS

Study Design & Setting

It is a quasi-observational study of 50 patients in 3 months from 1st November 2021 to 31th Jan 2022.

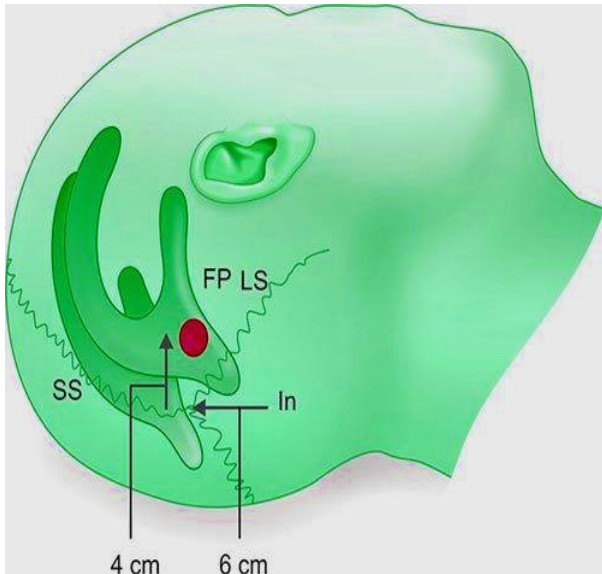


Figure 3: Illustration of Choudhary's point.

Inclusion Criteria

Patients having hydrocephalus, age range 10-70 years, GCS above 4/15, and patients having co-morbidities and poly-trauma were included in the study.

Exclusion Criteria

Patients having GCS below 4/15, active infection, and patients having ages less than 10 years and greater than 70 years were excluded from the study.

Group of Patients

Patients were divided into two groups. In group A, 25 patients were included and their VP shunts were done through Keen's point approach.

In group B, 25 patients were included and their VP shunts were done through Choudhary's point approach.

In the group, A 25 patients were included and their VP shunts were done through Keen's point approach. In group B 25 patients were included and their VP shunts were done through Choudhary's point approach.

Data Collection & Analysis

Patients' data were entered on preformed Performa for collection. SPSS version 22 was used for data analysis. A Chi-square test was applied to see the significant results. Cross tabulation for age, gender, and etiology distributions.

Surgical Management

For VP shunts we used two approaches; KEEN'S POINT approach (3 cm posterior-superior to the helix of the ear) and Choudhary's Point approach (6 cm above the Inion and 4 cm lateral to midline). This is the first ever article published for VP shunt at Choudhary's Point approach.

RESULTS

In the group, A 25 patients were included and their VP shunts were done through Keen's point approach. In group B 25 patients were included and their VP shunts were done through Choudhary's point approach.

Age Incidence

The age range was 10 – 70 years with a mean of 40 years. There were 15 patients in group A with ages between 10 – 40 years and 15 patients in group B with ages between 40 – 70 years. There were 15 patients in group A with ages between 10 – 40 years and 15 patients in group B with ages between 40 – 70 years. There were 10 patients in group A with ages between 40 – 70 years and 10 patients in group B with ages between 10 – 40 years.

Table 1: Age Incidence.

Age	Group A	Group B	Chi-square
10 – 40 Years	15	10	Chi-Sq: 2
40 – 70 Years	10	15	P value: 0.157 (insignificant result)

Gender Incidence

In our study, 40 patients were male while 10 patients were females. In the group, A 25 patients were included and their VP shunts were done through Keen's point approach. In group B 25 patients were included and their VP shunts were done through Choudhary's point approach.

Table 2: Gender Incidence.

Gender	Group A	Group B	Chi-square
Male	18	22	Chi-Sq: 0.08
Female	5	5	P value: 0.776 (insignificant result)

Table 3: Etiology.

Etiology	Group A	Group B	Chi-square
TBM	10	8	Chi-Sq: 1.53
Tumour	4	6	P value: 0.67
NPH	4	2	(insignificant result)
Post-Traumatic	7	9	

Table 4: Post-operative complications after VP shunt.

Complications	Keen's Point Approach	Choudhary's Point Approach
Infection	1 – 2%	1 – 2%
blockage of upper end	15 – 40%	0%
Blockage of lower end	4 – 8%	1 – 2%
Clot formation	2%	0%
Slit ventricle	0%	2%
Peritonitis	2%	0%
Hemiparesis	2 – 4%	0%

DISCUSSION

The age of our patients was in the range of 10 – 70 years and with a mean age of 40 years. In our study, 40 (80%) patients were male and 10 (20%) patients were female. All patients had hydrocephalus regardless of etiology.

VP shunt was done through Choudhary's point in 50% of patients while through Keen's point in 50% of patients. We used medium pressure VP shunts in all (98%) cases except in

one (2%) patient.

Our patients had the following co-morbidities diabetes mellitus, hypertension, chronic kidney disease, ischemic heart disease, and some had a history of trauma.

Our patients were presented with a history of altered state of consciousness, multiple episodes of vomiting, fits and headache, dementia, gait disturbance, and urinary incontinence. For all patients, we operated within 12 hours of admission. Neurosurgical facilities were not present in peripheral hospitals so patients always present with complications or are late.

In 50% of patients who were operated through Keen's point approach, 30% of patients were operated on again due to blockage of the upper end of the VP shunt on the 7th post-operative day. Four percent of patients were again operated on due to blockage of the upper end of the VP shunt on the 15th post-operative day. And 2 % of patients have operated again for revision of the VP shunt due to blockage of the upper end on the 90th post-operative day.

We performed all baseline, ECG, chest X-ray, and bleeding profiles were monitored. Their PT, APTT, INR, BT, and CT were performed before the operation. LP manometry was done to rule out NPH in 20% of patients. CSF complete examination and culture were done in 10% of patients to rule out infection.

In all cases, a CT brain plan was performed before surgery. Postoperatively, a CT brain plain was performed to see shunt placement, functioning, and hydrocephalus. BP was maintained in the range of 140 – 160 mmHg. In a CT scan brain, hydrocephalus, over drainage, intracranial hemorrhage, and slit-like ventricle syndrome were evaluated.

In our study, infection of the flap occurred in 4% of patients, 2% of patients were operated through Keen's point and 2% of patients were operated through Choudhary's point approach. Intracerebral hemorrhage occurred on 2% of patients operated through Keen's point approach.

Overdrainage after VP shunt occurred in 2% of patients all through Keen's point approach. In this patient, we placed a high-pressure VP shunt. Blockage of the upper end of VP shunt occurred in 36% of patients who were operated through the Keen's point approach. Blockage of the lower end of VP shunt occurred in 10% of patients. Eight percent of patients were operated through Keen's point approach while two percent of patients were operated through Choudhary's point approach. Peritonitis occurred in 4% of patients 3% were operated through Keen's point while 1% of patients were operated through Choudhary's point approach. Hematoma occurred immediately at the flap site in 2% of patients operated through Choudhary's point approach. Slit-like ventricle syndrome occurred in 2% of patients operated through Choudhary's point approach. Pseudocyst occurred in 10% of cases.

In our study, there was no improvement in 2 patients and they died. These patients have multiple comorbidities. According to Duong et al. shunt placement through Frazier point reduces the risk of malfunctioning. Junaid et al. advocated that shunting through Keen's point yields good results.²²⁻²³

The follow-up period was 3 months through OPD. Patients were given antibiotics, antiepileptics, pain killers, mannitol, acetazolamide, and anti-emetics for medical management. Patients were advised to get a medical check-up for co-morbidities too.

Recommendations

VP shunts through Choudhary's point yielding good results and there are fewer chances of obstruction and complications.

CONCLUSION

Patients who operated through Choudhary's point showed better outcomes and fewer complications. The following advantages were

observed: good outcome, less blockage rate, lesser hospital stay, easy to insert shunt as ventricles are in alignment, and less chance to damage the visual cortex.

Limitations

Patients come from remote areas in PINS. So, they present late and there is less compliance with treatment in the community.

REFERENCES

1. Stevenson DK, Benitz WE, Sunshine P, Hintz SR, Druzin ML, editors. Fetal and neonatal brain injury. Cambridge University Press; 2017 Dec. 21.
2. Kahle KT, Kulkarni AV, Limbrick Jr DD, Warf BC. Hydrocephalus in children. *The Lancet*. 2016 Feb. 20; 387 (10020): 788-99.
3. Abdulrauf SI, Ellenbogen RG, Sekhar LN. Principles of neurological surgery. Elsevier, 2012: 3-6.
4. Ferri FF. Ferri's clinical advisor 2018 E-Book: 5 Books in 1. Elsevier Health Sciences; 2017 May 25.
5. Melnick M. Dorland's Electronic Medical Dictionary, Philadelphia, PA 19106, WB Saunders Co., 2000. *Journal of Physical Therapy Education*, 2000 Oct. 1; 14 (2): 50-1.
6. Yadav YR, Parihar V, Sinha M. Lumbar peritoneal shunt. *Neurology India*, 2010; 58 (2): 179.
7. Burton A. Infant hydrocephalus in Africa: spreading some good news. *The Lancet Neurology*, 2015; 14 (8): 789-90.
8. Morone PJ, Dewan MC, Zuckerman SL, Tubbs RS, Singer RJ. Craniometrics and ventricular access: a review of Kocher's, Kaufman's, Paine's, Menovksy's, Tubbs', Keen's, Frazier's, Dandy's, and Sanchez's points. *Operative Neurosurgery*, 2020; 18 (5): 461-9.
9. Frazier CH. Operation for the radical cure of trigeminal neuralgia: analysis of five hundred cases. *Annals of Surgery*, 1928 Sep; 88 (3): 534.
10. Jandial R, Aizenberg MR, Chen M. 100 Case Reviews in Neurosurgery E-Book. Elsevier Health Sciences, 2016 Aug. 26.
11. Agarwal A, Borley N, McLatchie G, editors. Oxford handbook of operative surgery. Oxford University Press, 2017 Jun. 22.

12. Brook I. Meningitis and shunt infection caused by anaerobic bacteria in children. *Pediatric Neurology*, 2002; 26 (2): 99-105.
13. Shah SS, Smith MJ, Zaoutis TE. Device-related infections in children. *Pediatric Clinics*, 2005 Aug. 1; 52 (4): 1189-208.
14. James HE, Walsh JW, Wilson HD, Connor JD, Bean JR, Tibbs PA. Prospective randomized study of therapy in cerebrospinal fluid shunt infection. *Neurosurgery*, 1980; 7 (5): 459-63.
15. Steinbok P, Cochrane DD. Ventriculosubgaleal shunt in the management of recurrent ventriculoperitoneal shunt infection. *Child's Nervous System*, 1994; 10 (8): 536-8.
16. Morris A, Low DE. Nosocomial bacterial meningitis, including central nervous system shunt infections. *Infectious disease clinics of North America*, 1999; 13 (3): 735-50.
17. Martínez-Lage JF, Ruíz-Espejo AM, Almagro MJ, Alfaro R, Felipe-Murcia M, López López-Guerrero A. CSF overdrainage in shunted intracranial arachnoid cysts: a series and review. *Child's Nervous System*, 2009; 25 (9): 1061-9.
18. Mancarella C, Delfini R, Landi A. Chiari malformations. *New Trends in Craniovertebral Junction Surgery*, 2019: 89-95.
19. Gkolemis C, Zogopoulos P, Kokkalis P, Stamatopoulos G, Syrmos N, Paleologos TS. Management of multiple, late onset complications in a 33-year-old female, with a ventriculoperitoneal shunt and crohn's disease. *Pakistan Journal of Neurological Sciences (PJNS)*. 2014; 9 (3): 32-6.
20. Oushy S, Parker JJ, Campbell K, Palmer C, Wilkinson C, Stence NV, Handler MH, Mirsky DM. Frontal and occipital horn ratio is associated with multifocal intraparenchymal hemorrhages in neonatal shunted hydrocephalus. *Journal of Neurosurgery: Pediatrics*, 2017; 20 (5): 432-8.
21. Brownlee RD, Dold ON, Myles T. Intraventricular Hemorrhage Complicating Ventricular Catheter Revision: Incidence and Effect on Shunt Survival. *Pediatric Neurosurgery*, 1995; 22 (6): 315-20.
22. Duong J, Elia CJ, Miulli D, Dong F, Sumida A. An approach using the occipital parietal point for placement of ventriculoperitoneal catheters in adults. *Surgical Neurology International*, 2019; 10.
23. Junaid M, Ahmed M, Rashid MU. An experience with ventriculoperitoneal shunting at keen's point for hydrocephalus. *Pakistan Journal of Medical Sciences*, 2018; 34 (3): 691.

Additional Information

Disclosures: Authors report no conflict of interest.

Ethical Review Board Approval: The study was conformed to the ethical review board requirements.

Human Subjects: Consent was obtained by all patients/participants in this study.

Conflicts of Interest:

In compliance with the ICMJE uniform disclosure form, all authors declare the following:

Financial Relationships: All authors have declared that they have no financial relationships at present or within the previous three years with any organizations that might have an interest in the submitted work.

Other Relationships: All authors have declared that there are no other relationships or activities that could appear to have influenced the submitted work.

AUTHORS CONTRIBUTIONS

Sr.#	Author's Full Name	Intellectual Contribution to Paper in Terms of:
1.	Rana Zubair Mahmood	1. Study design, methodology and paper writing.
2.	Faheem Ahmed Usmani	3. Data collection and calculations.
3.	Mukhtiyar Ahmed Lakho	4. Analysis of data and interpretation of results.
4.	Talha Abbas, M Yasin Khan	5. Literature review and referencing.
5.	Touqeer Ahmed, Sarfraz Khan	6. Editing.