

Outcome of Repeated Distal Revision Versus New Ventriculo Atrial Shunt Replacement in Infants with Distal Ventriculo Peritoneal Shunt Complications

M.M.ELmaghrabi, W.A.Badawey, M.A.Elawady, M.E.Elhawary and A.A.Elnoury

Neurosurgery, Dept., Faculty of Medicine, Benha Univ., Benha, Egypt

E-mail: Elnoury@yahoo.com

Abstract

Background: hydrocephalus is defined as increased cerebrospinal fluid production or decreased CSF drainage. It could be managed by ventriculo peritoneal shunt but may be complicated by obstruction or infection, so management could be done through either repeated revision of the peritoneal end or through change it into ventriculo atrial shunt.⁽¹⁾ Purpose: This work aims to evaluate the efficacy of repeated distal end of ventriculo peritoneal shunt revision in comparison to replacement by ventriculo atrial shunt. Study design: it is a retrospective study. Patient and methods: this study is a retrospective that includes 60 hydrocephalic Patients with distal end malfunction operated with either repeated revision of distal end (group I) or changed into ventriculo atrial shunt (group II) at neurosurgery department at Benha university and Benha children hospital from January 2018 to January 2020. All patients were examined via detailed general, neurosurgical evaluation and radiological investigations. The patient were followed up with post operative from 12 to 18 months. Results: this study was done on 60 patients with mean age \pm SD is 37.22 ± 41.94 months. The outcome of surgery in group I, 14 patients (30.4%) were succeeded and 32 patients (69.6%) were failed. In group II, 9 patients (64.3%) were succeeded and 5 patients (35.7%) were failed which is statistically significant. Conclusion: success rate in ventriculoatrial shunt is higher than success rate in repeated ventriculoperitoneal distal revision in repeated distal shunt complication

Keywords: distal end malfunction, revision, shunt obstruction, shunt infection.

1. Introduction

Hydrocephalus is defined as an abnormal increase in the amount of cerebrospinal fluid within the cranial cavity (as from obstructed flow, excess production, or defective absorption) that is accompanied by expansion of the cerebral ventricles and often increased intracranial pressure, skull enlargement, and cognitive decline [1].

Surgical treatment of hydrocephalus includes either by shunting through insertion of ventricular system draining into one of the body cavities such as peritoneum, atrium of the heart, gall bladder or ureter or by endoscopic third ventriculostomy to allow drainage of cerebrospinal fluid out of the brain [2].

The most common complications of different shunting systems include infection, shunt obstruction, inadequate drainage, over drainage or even allergy against silicon material of shunt [3].

Distal end of ventriculo peritoneal shunt complications are such as infection, intestinal obstruction (volvulus or intussusception), intestinal perforation or abscess formation. So treatment of these complications may be by lysis of adhesions, antibiotics for infections, revision of the distal end or replacement by new ventriculo peritoneal or ventriculo atrial shunt [4].

Repeated revision of the peritoneal end may cause hazards as infections, adhesions, perforations or even hernias [5].

Also the ventriculo atrial shunt can cause complications such as bloodstream infection, intra atrial thrombus formation around the intra cardiac end of the shunt, perforation of the right atrium and cardiac tamponade [6].

2. Aim of the work

The aim of this work is to evaluate the efficacy of repeated distal end of ventriculo peritoneal shunt revision in comparison to replacement by ventriculoatrial shunt.

3. Patient and methods

This study is a retrospective study of all infants admitted to benha university and benha children hospitals with repeated distal shunt complications from January 2018 to January 2020 and operated by distal abdominal shunt revision or replacement by a new ventriculo peritoneal shunt versus ventriculo atrial shunt with follow up period from 12 to 18 months.

2.1. Inclusion criteria

- Age below 18 years old.
- Patients complaining from repeated distal shunt malfunction (2 or more times of revision).
- Distal shunt infection.

2.2. Exclusion criteria

- Proximal shunt mal function.
- Distal shunt mal function for the 1st time .
- Disconnected shunts.
- Discontinued shunts .

2.3. All patients are divided into 2 groups

- Group I : patients managed with revision of the peritoneal end.
- Group II : patients managed with ventriculo atrial shunt instead.

All patients were examined via detailed history, general evaluation, neurosurgical examination,

laboratory and radiological investigations (Pelvi abdominal ultrasound, CT brain, MRI and ECHO).

2.4. Surgical considerations

Shunt obstruction can be managed by releasing of adhesion around the peritoneal end or removing the blugging agent: In group I: the distal end is inserted in another site in the abdomen. In group II: the distal end is changed into ventriculo atrial shunt into ipsi lateral side of internal jugular vein under image of c-arm (to detect the length of the catheter in the right atrium) after confirmation of its patency by ECHO.

Shunt Infection can be managed by exteriorization of the shunt then removal of the shunt followed by frequent tapping then after 3 negative successive cultures of CSF samples without growth: In group I: a new ventriculo peritoneal shunt is inserted in another site away from the previous of infection. In group II: the new shunt is inserted as ventriculo atrial shunt on the contra lateral internal jugular vein.

2.5 Post operative considerations

After surgery early follow up of the patient was done: CT brain, pelvi abdominal (ultra sound +/- CT) and ECHO cardiography in case of ventriculo atrial shunt.

Patients then were followed up clinically and radiologically after 1 month, 3 months, 6 months then every 6 months.

2.6 Statistical analysis

The programme used was SPSS version 26. quantitative data were analysed using mean and standard deviation, while frequency and percentage were used with qualitative data. Chi square test and Fischer exact test to compare frequencies. P value was considered significant if it was ≤ 0.05 .

2.7. Ethical approval

The ethical approval was taken from ethical committee. Informed written consent were taken from parents of all cases.

4. Results: this is retrospective study that includes 60 patients with Distal Ventriculo Peritoneal Shunt Complications.

In table (1): the mean age is 37.22 months with standard deviation 41.94. Regarding gender, there is male predominance about 53.3% (32 of 60) are males and 46.7% (28 of 60) are females.

In our study 46 patients (76.7%) were included as group I and 14 patients (23.3%) were included as group II

In figure (1): the causes of shunt revision that was due to either shunt obstruction that occurred in 39 patients (65%) or shunt infection occurred in 21 cases (35%)

In table (2): the outcome of surgery in group I, 14 patients (30.4%) were succeeded and 32 patients (69.6%) were failed. In group II, 9 patients (64.3%) were succeeded and 5 patients (35.7%) were failed which is statistically significant.

In table (3): in group I: the surgical outcome due to shunt obstruction; 7 patients (12.2%) were succeeded and 26 patients (87.8%) were failed and the surgical outcome due to infection 7 patients (53.8%) were succeeded and 6 patients (46.2%) were failed which is statistically significant. In group II: the surgical outcome due to shunt obstruction; 4 patients (66.7%) were succeeded and 2 patients (33.3%) were failed and the surgical outcome due to infection; 5 patients (62.5%) were succeeded and 3 patients (37.5%) were failed which is statistically nonsignificant.

Table (1) Age and sex distribution of the studied group.

	Value (n=60)
Age /m	
Mean \pmSD	37.22 \pm 41.94
Range	2.5-192
Median (IQR)	22.0 (12.0-46.0)
Sex	
Male	32 (53.3)
Female	28 (46.7)

Table (2) Comparison between the studied groups according to outcome of surgery.

Outcome	Group I (46)		Group II (14)		Chi square test	P value
	No	%	No	%		
Succeed	14	30.4	9	64.3	5.20	0.023*
Failed	32	69.6	5	35.7		

Table (3) Comparison between surgical outcomes according to causes of revision among studied groups.

Outcome		Succeed		Failed		FET	P value
Causes of revision		No	%	No	%		
Group I (46)	Obstruction	7	12.2	26	87.8	3.28	0.041*
	Infection	7	53.8	6	46.2		
Group II (14)	Obstruction	4	66.7	2	33.3	0.0	1.0
	Infection	5	62.5	3	37.5		

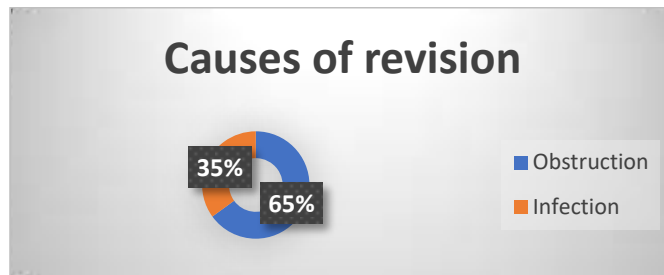


Fig. (1) Causes of revision of the studied group.

5. Discussion

In our study as regard the age of the patients: The age range was from 2.5 months to 192 months old., [8] found that the age is most commonly below 12 years old.

In our study as regard the gender incidence male patients were 32 (53.3%) and female patients were 28 (46.7%), [9] showed higher incidence of complications in males (70%) and 30 % complications were seen in females. [10] stated that among the study group, 28 were males and 22 females.

In our study as regard the causes of shunt revision that was due to either shunt obstruction that occurred in 39 patients (65%) or shunt infection occurred in 21 cases (35%) , as [11] showed The frequency of obstruction and infection was 25/65 (38.46%) and 8/65 (12.3%) respectively. [10] Also said that Infective complications of hydrocephalus are more likely to leave behind an adverse neurological outcome.

In our study): in group I: the surgical outcome due to shunt obstruction; 7 patients (12.2%) were succeeded and 26 patients (87.8%) were failed and the surgical outcome due to infection 7 patients (53.8%) were succeeded and 6 patients (46.2%) were failed which is statistically significant. In group II: the surgical outcome due to shunt obstruction; 4 patients (66.7%) were succeeded and 2 patients (33.3%) were failed and the surgical outcome due to infection; 5 patients (62.5 %) were succeeded and 3 patients (37.5 %) were failed which is statistically non significant, as [12] ventriculo atrial shunts are an effective second-line intervention for children with hydrocephalus in whom the peritoneum is no longer a suitable site for the distal catheter.

6. Conclusion

Success rate in ventriculoatrial shunt is higher than success rate in repeated ventriculoperitoneal distal revision in repeated distal shunt complication

Reference

- [1] M.Carbone, BH.Ly, RF.Dodson, I.Pagano, PT.Morris, UA.Dogan. Malignant mesothelioma: facts, myths, and hypotheses. Journal of cellular physiology.vol. 227 (1),pp. 44–58, 2012.
- [2] BW.Hanak, RH.Bonow, CA.Harris, & SR.Browd. Cerebrospinal fluid shunting complications in children. Pediatric neurosurgery.vol. 52(6),pp. 381-400,2017.
- [3] N.Nielsen, & A.Breedt. Hydrocephalus. In Nursing Care of the Pediatric Neurosurgery Patient.vol.8, pp. 39-89, 2017.
- [4] RM.Simeone. A pilot study using residual newborn dried blood spots to assess the potential role of cytomegalovirus and Toxoplasma gondii in the etiology of congenital hydrocephalus. Birth Defects Res A Clin Mol Teratol.vol. 97(7),pp.431–6,2013.
- [5] Tomer, S Gaurav. "Venous air embolism during ventriculoatrial shunt placement!." Journal of Neuroanaesthesiology and Critical Care.vol. 3.02,pp.153-154,2016.
- [6] Zawadiuk, RR.Luke, C.Aaron Van Slyke, and A.Sheina Macadam. Recurrent Breast Cerebrospinal Fluid Pseudocyst: A Complication of Ventriculoperitoneal Shunt Placement." Annals of plastic surgery.vol. 83.1,pp.108-111,2019.
- [7] G.S.Tomer, R.Mitra, S.Kumar, & S.K.Dube. Venouse air embolism during

- ventriculoatrial shunt placement! *Jornal of neuroanaesthesiology and critical care*.vol. 3(02),pp. 153-154 ,2016.
- [8] A.A.Ezzat, M.A.Soliman, A.A.Hasanain, M.A.Thabit, H.Elshitany, H.Kandel, E.El Refaee. Migration of the distal catheter of ventriculoperitoneal shunts in pediatric age group: case series. *World neurosurgery*.vol. 119,pp. e131-e137,2018.
- [9] M. A.Baig, S.Yaqoob, H.R.U.Haq. VP Shunt Placement and the Incidence of Associated Complications in Patients Presenting in Mayo Hospital Lahore. *Asian Journal of Multidisciplinary Studies*.vol. 7,pp. 7-9, 2019.
- [10] A.Ahmed, G.Sandlas, P.Kothari, D.Sarda, A.Gupta, P.Karkera, P.Joshi. Outcome analysis of shunt surgery in hydrocephalus. *Journal of Indian Association of Pediatric Surgeons*.vol.14(3),pp. 98,2019.
- [11] A.Almazroea. Epidemiology of ventriculoperitoneal shunt complications in pediatric age group in medina region: Observational study. *Clin Med Invest*.vol.4, pp.1-3,2019.
- [12] D.J.Clark, A.Chakraborty, D.J.Roebuck, D.N.Thompson. Ultrasound guided placement of the distal catheter in paediatric ventriculoatrial shunts—an appraisal of efficacy and complications. *Child's Nervous System*.vol. 32(7),pp. 1219-1225,2016.