



## Management and Complications of Arnold Chiari Hydrocephalus at Tertiary Health Care Center

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### Significance:

One of the most devastating and treatable type of neurological injury is hydrocephalus. It is also categorized as most common secondary neurological injury. Ventricular hydrocephalus or Arnold chiari malformation leads to the increased in intracranial pressure but in infants a natural body response adjusts this increase in ICP to the normal range. In this study, main outcome variables were use of VP shunt for the treatment of Arnold chiari malformation and its associated complication.

### ABSTRACT

**Objective:** to investigate the role of CT and MRI in diagnosis of Arnold chiari malformation of hydrocephalus and its treatment with VP shunt along with complications.

**Study Design:** Prospective study

**Place and duration:** Department of Neurosurgery, DG Khan Medical College from May 4, 2018 to May 4, 2019.

**Methodology:** Fifty patients of congenital hydrocephalus who were not treated previously were selected. Detailed history about disease and clinical examination of patients was performed. Follow ups were done at neurosurgery OPD. SPSS software for data analysis was used and mean  $\pm$  SD, frequency and percentages were calculated for variables. P value  $\leq 0.05$  was considered as significant.

**Results:** Treatment in case of congenital hydrocephalus as VP shunt, intra-aneurysmal coiling, excision of meningomyelocele with VP shunt and suboccipital craniectomy + upper cervical laminectomy (scucl) were observed as 10%, 6%, 8% and 8% respectively. Twelve percent of patients were not treated.

**Conclusion:** CT and MRI are the main diagnostic tools for diagnosis of Arnold chiari malformation and VP shunt is the treatment of choice. Among complications of VP shunt infection of shunt and shunt block are the main complications.

### Introduction

One of the most devastating and treatable type of neurological injury is hydrocephalus. It is also categorized as most common secondary neurological injury. (1) Unfortunately, in last four decades, treatment of hydrocephalus changed a little bit and remains complicated. From the middle of last century, valve regulated ventricular shunting is a treatment of choice for hydrocephalus. It is widely used treatment worldwide and continuous from last decades. (2, 3)

Hydrocephalus considered as congenital anomaly like intraventricular hemorrhage and spina bifida that's why it has been considered as case of pediatric neurosurgeon. (4) Hydrocephalus now considered as chronic disease of child age. (5) In recent years, advancement in technologies like modern neuroscopy, telemetric flow and pressure monitoring, improves the method of hydrocephalus treatment but VP shunt is a new advancement and treatment of choice for Arnold chiari syndrome in hydrocephalus children. (6)

In the previous literature, it was concluded that brain pathology will need to explore beyond the basic and cold management of previous century. (7, 8) First of all Rhazes describe the ventricular hydrocephalus and Vesalius describe a clear explanation of ventricular hydrocephalus in infants and concluded that enlarged heads could survive in older age. (9) Ventricular hydrocephalus or Arnold chiari malformation leads to the increased in intracranial pressure but in infants a natural body response adjusts this increase in ICP to the normal range. (10) In this study, main outcome variables were use of VP shunt for the treatment of Arnold chiari malformation and its associated complication.

### Materials and Methods

This prospective study was conducted in the Department of Neurosurgery at DG Khan Medical College, Dera Ghazi Khan, Pakistan from 4<sup>th</sup> May 2018 to 4<sup>th</sup> May 2019 under the supervision of senior neurosurgeon having 5 years experience in neurosurgery. Study was started after the ethical approval from the ethical board of hospital. Nonprobability consecutive sampling was used. Diagnosed cases of Arnold chiari malformation were included in the study and the patients who were treated

previously with any surgical intervention were excluded from the study. A detailed physical and neurological examination, clinical history and routine investigation like CT scan and MRI and CSF analysis was performed. Complications associated with VP shunt were noted on a predesigned proforma. Follow ups were done in neurosurgery outdoor department periodically for the assessment of shunts, any neurological shunts, new and persistent symptoms and visual and motor symptoms. In case of malfunction of shunt, causes behind it evaluated. Data analysis was done by using SPSS version 23. Mean and standard deviations were determined for numerical variables like age and weight. Frequency and percentages were calculated for qualitative variables like gender and complications of VP shunt.

**Results:**

Fifty patients were included in this study. Investigations in case of congenital hydrocephalus as X-ray skull, USG skull, CT brain, MRI brain and MR angiography were noted as n=3 (6%), n=4 (8%), n=19 (38%), n=6 (12%) and n=2 (4%), respectively. (Tab1)

Table 1: Investigations in case congenital hydrocephalus

Investigation	n , (%)
X-ray skull	n=3 (6%)
USG skull	n=4 (8%)
CT brain	n=19 (38%)
MRi brain	n=6 (12%)
MR angiography	n=2 (4%)

Treatment in case of congenital hydrocephalus as VP shunt, intra-aneurysmal coiling, excision of meningomyelocele with VP shunt and suboccipital craniectomy + upper cervical laminectomy (scucl) were observed as n=5 (10%), n=3 (6%), n=4 (8%) and n=4 (8%), respectively. While, n=6 (12%) patients were not treated. (Table 2)

Table 2: Treatment of congenital hydrocephalus

Treatment	n (%)
VP shunt	n=5 (10%)
Intra-aneurysmal coiling	n=3 (6%)
Excision of meningomyelocele with VP shunt	n=4 (8%)
Suboccipitalcraniectomy+upper cervical laminectomy (scucl)	n=4 (8%)
Non treated	n=6 (12%)

Complications of VP shunt as shunt infection, shunt block, transanal migration and intestinal perforation were noted as n=23 (46%), n=20 (40%), n=2 (4%) and n=3 (6%), respectively. (Table 3)

Table 3: Complications in VP shunt

Complications	n , (%)
Shunt infection	n=23 (46%)
Shunt block	n=20 (40%)
Transanal migration	n=02 (4%)
Intestinal perforation	n=03 (6%)
None	n=14 (28%)

**Discussion**

Prevalence rate of hydrocephalus vary region to region and this anomaly sometime left with persistent neurological deficit. Many operative procedures have been performed in previous years with VP shunt for its management. (11) Blackburn et al estimated in his study prevalence rate of hydrocephalus 0.48 and 0.81 per 1000 births. (12)

Bondurant et al reported that about 4000 surgical operations were performed in Ireland and United Kingdom. This number is increasing day by day; United States also have huge economic burden of 125,000 shunt surgeries every year. Estimated cost of this anomaly is 100 million dollars in America. (13)

Feng et al reported in his study that if hydrocephalus left untreated it may complicate with visual loss, loss of cognitive function and motor development of poor motor function. (14) Aschoff et al conducted a similar study on this topic and conducted that if hydrocephalus left untreated it may persist and complicated with other symptoms. (15)

In a study Kendre et al concluded that CT brain and MRI are the main diagnostic tools of hydrocephalus and VP shunt is the treatment of choice. Furthermore, VP shunts have some complication like infection of shunt and shunt block. This study is identical to the study findings in our report. (16)

Treatment of hydrocephalus varies according to the causes of hydrocephalus, but VP shunt is the treatment of choice. Sandberg et al conducted a similar study and reported similar finding that treatment of Arnold Chiari hydrocephalus varies with the causes of disease. (17) In a study Caldareli et al reported that Arnold Chiari hydrocephalus has only treatment of choice ventricular shunting. VP shunting resolves all kinds of symptoms. (18)

In another study by Milhorat et al reported that improvement in symptoms of Arnold Chiari hydrocephalus is possible only with VP shunting or revision which is a standard and recommended treatment. (19) Another study was conducted by Lam CH et al reported 15.2% failure rate of VP shunt in adult hydrocephalus. This rate of failure is much lower than previous ratio that was reported 18% to 29% in different studies. (20)

### Conclusion

CT and MRI are the main diagnostic tools for diagnosis of Arnold chiari malformation and VP shunt is the treatment of choice. Among complications of VP shunt infection of shunt and shunt block are the main complications.

**Conflict of interest:** Authors do not have any conflict of interest to declare.

**Disclosure:** None

**Human/Animal Rights:** No human or animal rights are violated during this study.

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