



Ain Shams University
Faculty of Medicine

Postoperative Complications of Ventriculoperitoneal Shunt

Thesis

Submitted for partial fulfillment of master degree
In **Neurosurgery**

By

Ahmed Sabry Abdelkader
M.B.B.Ch

Under Supervision of

Prof.Dr./ Mohamed Ashraf Ghobashy

Professor of Neurosurgery
Faculty of Medicine -Ain Shams University

Dr. / Mohamed Alaa El-Din Habib

Assist. Professor of Neurosurgery
Faculty of Medicine -Ain Shams University

Dr. / Ahmed Faisal Toubar

Lecturer of Neurosurgery
Faculty of Medicine -Ain Shams University

2013



First of all, thanks to Allah, the most merciful, the most graceful for his great care, support and guidance every step of the way.

I would like to express my deep gratitude to, Prof. Dr. Mohamed Ashraf Ghobashy Professor of Neurosurgery, Ain Shams University, for his kindness, guidance and continuous encouragement. I consider myself fortunate to work under his supervision.

It is very difficult for me to express, in words, my gratitude to Dr. Mohamed Alaa El-Din Habib; Assistant professor of Neurosurgery, Ain Shams University, for his time, continuous help and encouragement, his concern will always be remembered.

I'm also very grateful to Dr. Ahmed Faisal Toubar; Lecturer of Neurosurgery, Ain Shams University, for his support and help to have this work fulfilled.



Ahmed Sabry

Dedication

First of all I'd like to dedicate this work to my wife & my family for their continuous help & support.

And to my all professors, senior staff, and colleagues in the department of neurosurgery, Nasr City Hospital for Health Insurance, for their sympathetic help.

Last, but not least, to professor Dr. Mohamed Ashraf Ghobashy for giving me the honour of working under his supervision, for his valuable criticism & kind guidance.

Ahmed Sabry
2013



CONTENTS

	Page
Acknowledgement	--
List of abbreviations	I
List of figures.....	II
List of Tables.	III
Introduction.....	1
Aim of the work.....	5
Review of literature:	
Functional anatomy of the CSF.....	6
Pathology of Hydrocephalus.....	22
Management.	39
Ventriculoperitoneal shunt.....	40
Post operative complications of V- P Shunt. ..	51
Patients & Methods.....	77
Illustrative Cases	92
Results and Analysis	100
Discussion	110
Conclusion and Summary	119
References.....	129
Arabic Summary	141

List of Abbreviations

CHW	: <i>Cerebral hemisphere width</i>
CNS	: <i>Central nervous system</i>
CSF	: <i>Cerebrospinal fluid</i>
CT	: <i>Computed tomography</i>
ICP	: <i>Intracranial pressure</i>
INPH	: <i>Idiopathic normal pressure hydrocephalus</i>
ISF	: <i>Interstitial fluid</i>
LVW	: <i>Lateral ventricles width</i>
MRI	: <i>Magnetic resonant imaging</i>
NPH	: <i>Normal pressure hydrocephalus</i>
SNPH	: <i>Secondary normal pressure hydrocephalus</i>
TCD	: <i>Transcranial Doppler</i>
TST	: <i>Transsystolic time</i>
VA	: <i>Ventriculoatrial</i>
VP	: <i>Ventriculoperitoneal</i>

List of Figures

Fig.	Title	Page
1a	Relations of the lateral ventricle (lateral, superior & anterior view).	9
1b	Relations of the lateral ventricle (lateral, inferior & anterior view).	10
2	Neural relationships of the different parts of the lateral ventricle	11
3	Foramen of Monro	11
4	Venous landmarks for identification of the interventricular foramen of Monro	12
5	Relations of the third ventricle. Anterior wall, posterior wall, roof & floor	13
6	The floor of the fourth ventricle	15
7	Lateral (A) and dorsal (B) views of the ventricles and the choroid plexus	16
8	Arachnoid granulations	18
9	Secretion of CSF by choroid plexus	20
10	CSF circulation	21
11	Pressure of CSF on the brain tissue	22
12	MRI brain (normal and dilated ventricles)	23
13	Normal ventricles & Hydrocephalic ventricles	25
14	CT brain: Normal ventricles and acute hydrocephalus.	30
15	Plain skull radiograph showed multiple erosive change of skull vault.	33
16	Ultrasound scan of premature neonate, showing marked hydrocephalus.	34
17	CT. brain with hydrocephalus	35
18	MRI Brain (T1) axial view show dilated lateral ventricles	36
19	MRI Brain (T2) axial view show dilated lateral ventricels.	37
20	Normal optic nerve (central pinkish disk).	38

List of Figures (Cont.)

Fig.	Title	Page
21	Grade IV papilledema.	38
22	Components of the shunt system.	41
23	Fixed pressure valves.	42
24	Delta valves with siphon control.	43
25	Adjustable strata valves.	43
26	Structures of the programmable valve .	44
27	Site of incision & The pathway of the shunt.	45
28	Insertion of the proximal catheter.	47
29	Insertion of the distal catheter into the abdomen	48
30	Tunneling of the distal catheter	49
31	Outside view of insertion of the distal catheter into the abdomen.	50
32	The final view after V-P shunt fixation.	50
35	CT brain, dilated ventricle & tip of V-P shunt.	54
33	CT brain, intracerebral hemorrhage.	53
34	CT brain , lt high parietal subdural hematoma.	53
36	AB view of x-ray skull (showing total intracranial migration of V-p shunt	56
37	Lateral view of x-ray skull (showing total intracranial migration of V-P shunt	56
38	Migrated VP shunt into the anterior abdominal wall	63
39	GIT endoscopy showing perforation of the stomach with VP shunt	63
40	Migrated VP shunt into the anus	64
41	Migrated VP shunt into the oral cavity	65
42	Migrated VP shunt into the scrotum	66
43	Chest radiograph with Rt. Pleural effusion due to migrated VP shunt	67
44	Migrated VP shunt into the anterior abdominal wall	68

List of Figures (Cont.)

Fig.	Title	Page
45	Shuntogram with VP shunt migration into the colon	69
46	Pneumocephalus after colonic perforation due to VP shunt	70
47	Child with huge abdominal pseudocyst after VP shunt	72
48	CSF pseudocyst.	73
49	Abdominal sonography showing large cystic mass.	73
50	Liver abscess due to VP shunt, arrow.	75
51	Progressive increase of head circumference.	81
52	Sloughing of skin around reservoir and proximal tube.	82
53	Facial & scalp swelling and sloughing around the reservoir.	83
54	Mal position of the ventricular catheter.	86
55	Mal position of the ventricular catheter.	86
56	Swelling at the neck in the course of the distal tube.	92
57	CT brain showing hydrocephalic changes.	92
58	CT brain showing improvement of hydrocephalic changes.	93
59	CT brain showing bilateral chronic SDH.	94
60	MRI brain showing bilateral CSDH.	94
61	CT brain showing disappearance of CSDH.	95
62	CT brain showing hydrocephalic changes.	96
63	CT brain post op showing no hydrocephalic changes.	97
64	Sloughing of the skin on the distal tube.	98
65	CT brain after extraction of the Rt v-p shunt.	99

List of Tables

Table	Title	Page
1	Sex distribution	100
2	Age distribution	101
3	Symptoms /signs	101
4	Examination of shunt device	102
5	Fundus examination	103
6	Examination of anterior fontanelle	104
7	Associated pathological condition	105
8	Investigations performed in the cases studied	106
9	CT findings in the cases studied	107
10	Operative management in the cases studied	107
11	Proximal revision in the cases studied	108

Introduction

The term hydrocephalus is derived from the Greek words "hydro" meaning water and "cephalus" meaning head. As the name implies, it is a condition in which the primary characteristic is excessive accumulation of fluid in the brain. Although hydrocephalus was once known as "water on the ventricles," the "water" is actually cerebrospinal fluid (CSF) — a crystal clear fluid that surrounds the brain and spinal cord. The excessive accumulation of CSF results in an abnormal widening of the cerebral ventricles. This widening creates potentially harmful pressure on the tissues of the brain (*Aschoff et al., 1999*).

Hydrocephalus may be congenital or acquired. Congenital hydrocephalus is present at birth and may be caused by either events or influences that occur during fetal development, or genetic abnormalities. Acquired hydrocephalus develops at the time of birth or at some point afterward (*Rekate and Cherney, 1996*).

Hydrocephalus may also be communicating or non-communicating. Communicating hydrocephalus occurs when the flow of CSF is blocked after it exits the ventricles while Non-communicating hydrocephalus "obstructive" hydrocephalus occurs when the flow of CSF is blocked along one or more of the narrow passages connecting the ventricles (*David and Nalin, 2006*).

Symptoms of hydrocephalus vary with age, disease progression, and individual differences in tolerance to the condition. (*David and Nalin, 2006*).

In infancy, the most obvious symptom of hydrocephalus is often a rapid increase in head circumference.

Other symptoms may include vomiting, sleepiness, irritability, downward deviation of the eyes and seizures.

Older children and adults may experience different symptoms because their skulls cannot expand to accommodate the buildup of CSF. Symptoms may include headache followed by vomiting, nausea, papilledema, blurred or double vision, disturbed conscious level, problems with balance, poor coordination, gait disturbance, urinary incontinence, slowing or loss of developmental progress, lethargy, drowsiness, irritability, or other changes in personality or cognition including memory loss(***Rekate and Cherney, 1996***).

Hydrocephalus is diagnosed through clinical neurological evaluation and by using cranial imaging techniques such as ultrasonography, computed tomography (CT), magnetic resonance imaging (MRI), or pressure-monitoring techniques.

Hydrocephalus is almost always treated successfully with surgical diversion of CSF pathway (either by third ventriculostomy or placement of a shunt system) or treatment of the cause as excision of underlying tumours (***Rush et al., 1985; Chris et al., 2003***).

Ventriculoperitoneal shunt is one of the most commonly performed neurosurgical procedures for the management of hydrocephalus. A wide range of complications, neurological as well as nonneurological, has been reported following this procedure.

Complications can be encountered either in the immediate perioperative or in postoperative follow-up period. VP shunt-related complications may occur anywhere along its course from the ventricle cranially to the peritoneal cavity caudally.

Commonly encountered complications include: mechanical obstruction of distal peritoneal catheter by omentum or other structures leading to shunt malfunction, formation of abdominal pseudo cyst, spontaneous bowel perforation, intestinal obstruction, inguinal hernia and development of liver abscess. Rare complications consist of migration of the peritoneal catheter into the stomach, gallbladder, urinary bladder, vagina, liver, bowel, colon, scrotum and diaphragm. However, extrusion of components of shunt apparatus is very unusual (*Metin et al., 2007*).

Shunt systems are not always perfect devices. Complications may include infections, obstructions, and the need to lengthen or replace the catheter. Generally, shunt systems require monitoring and regular medical follow up. When complications occur, the shunt system usually requires some type of revision.

Although the early symptoms of shunt malfunction or infection in children: fever, irritability are similar to many childhood illnesses; we must determine the symptoms associated with shunt failure in a particular individual. If we suspect there is a problem with the shunt, it is wise to have it checked rather than ignore it. It is better to have a false alarm checked than to leave it unattended.

Remember, although shunt complications can be very serious and become life threatening, they can almost always be treated successfully when they are discovered early.

The prognosis for individuals diagnosed with hydrocephalus is difficult to predict, although there is some correlation between the specific cause of the hydrocephalus and the outcome. Prognosis is further complicated by the presence of associated disorders, the timeliness of diagnosis, and the success of treatment. The degree to which relief of CSF pressure following shunt surgery can minimize or reverse

damage to the brain is not well understood (*Tamburrini G; et al., 2008*)

Affected individuals and their families should be aware that hydrocephalus poses risks to both cognitive and physical development. However, many children diagnosed with the disorder benefit from rehabilitation therapies and educational interventions and go on to lead normal lives with few limitations. Treatment by a multidisciplinary team of medical professionals, rehabilitation specialists, and educational experts is critical to a positive outcome. Left untreated, progressive hydrocephalus may be fatal.

Ventriculoperitoneal shunt operation should be done just for patients can not be treated either by medical or surgical methods as before, due to its frequent and variable serious complications.

Neurosurgeons hope that future has solutions for treatment of hydrocephalus other than ventriculoperitoneal shunt.

Aim of The Work

The aim of this work is to document and study the complications in individuals with hydrocephalus and managed by surgical insertion of a V-P shunt in the period from October 2011 to September 2012.