

Surgical Management of Vesicovaginal Fistula, Single Center Experience at Urology Department Nishtar Medical University Hospital Multan

Mian Muhammad Asif Nawaz, Abdul Ghaffar, Umar Ghaffar and Zainab Javeed

ABSTRACT

Objective: To compare the efficacy of different approaches for repair of vesico-vagino fistula including transvaginal, transabdominal or the combined approach and to document the success rates and the complications of VVF repair.

Study Design: Prospective study.

Place and Duration of Study: The study was conducted at Urology Department Nishtar Medical University and Hospital Multan from October 2018 to April 2019 .

Materials and Methods: A total of 163 women diagnosed with vesico-vaginal fistula (VVF) on cystoscopy who met the inclusion criteria were selected. Transabdominal repair was performed in 111 patients when the fistula site could not be easily accessed per vagina, when VVF was above trigone or when the VVF was complex. Transvaginal repair was performed in 52 patients in cases of simple fistula. These patients were followed for 6 weeks at 2 week time interval. Rates of operative success, infection and recurrent fistula formation were compared. These outcomes were further stratified in respect to age of patient, size of fistula and type of fistula.

Results: Total 163 women having age range from 20 to 60 years with mean age of 38.18 ± 10.64 years. There were increased number of unsuccessful repair in transvaginal repair (17.31%) compared to transabdominal repair (4.5%) (p value 0.007). Stratification of outcomes with respect to age (Table IV) showed statistically significant increase in recurrent fistula formation in age groups 20-40 (p value 0.05) . Stratification with respect to size of fistula showed a significant decrease in infection rate with large fistulas compared to small and medium sized fistulas (p value 0.004). Stratification with respect to type of fistula showed no significant difference in infection rate, recurrent fistula formation or unsuccessful repair in simple or complicated type of fistulas.

Conclusion: This study concluded that the frequency of unsuccessful repair and recurrent fistula is more after vaginal repair compared to abdominal repair while infection rate was more after abdominal repair.

Key Words: Vesico-vaginal Fistula, Leakage of urine, trans-vaginal approach, trans-abdominal approach.

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INTRODUCTION

Vesico-vaginal fistula (VVF) is an abnormal communication between the bladder and the vagina that allows continuous involuntary urine leakage into the vaginal vault.¹ VVF is a condition having devastating consequences on the patient's physical and psychological health and continues to pose a significant challenge to the surgeon.

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Quick and accurate diagnosis followed by timely repair is essential to the successful management of these cases. A thorough understanding of the pathophysiology and anatomy of the fistula, potential factors that may compromise healing and experience in the fundamental principles of fistula repair are the vital tools towards proper management of the fistula.²

The etiology of VVF varies in different parts of the world. In the developing countries these result from obstetric complications, possibly due to inadequate medical care, early age of conception, vaginal lacerations from forceps rotations, cesarean sections hysterectomy and ruptured uterus while in developed countries, the main cause is iatrogenic injury during gynecologic surgery. Less frequent causes of VVF include various urological and gastrointestinal surgeries such as suburethral sling procedure, urethral and bladder neck surgery and surgery for pelvic carcinomas¹. Fistulas can be classified according to size and type as small (≤ 0.5 cm), medium (0.6 cm-2.4 cm),

large (≥ 2.5 cm), simple (small non-radiated, single) or complex (medium, large, radiated, multiple, recurrent) respectively.³

VVF repair can be approached transvaginally, transabdominally or in a combined approach if necessary. It can also be repaired laparoscopically or through robotic repair in limited cases.⁴ The transvaginal approach offers a lower complication rate and shorter postoperative recovery while transabdominal route is preferred when the fistula site cannot be visualized or easily accessed per vagina or when the VVF is complex.²

MATERIALS AND METHODS

A prospective analysis of 163 women was conducted after approval from ethical committee in the department of urology, Nishtar Medical University and Hospital Multan, Pakistan from 29th October 2018 to 27th April 2019. All the patients fulfilling inclusion criteria were enrolled from outpatient department (OPD) of Department of Urology, Nishtar Medical university and hospital Multan. The patients were explained about the objectives of this study and the fact that there is no risk involved to the patient while taking part in this study. Informed consent was taken from each patient.

Inclusion Criteria: Women diagnosed with vesico-vaginal fistula (VVF) on cystoscopy of either age.

Small (≤ 0.5 cm), Medium (0.6 cm-2.4 cm), Large (≥ 2.5 cm), fistula on cystoscopy.

Simple (small non-radiated, single) or complex (medium and large) fistula on cystoscopy.

Exclusion Criteria: Patients with the history of recurrence of fistula, multiple fistulae and radiation.

Patients with small bladder size, urethral destruction, circumferential involvement and severe vaginal scarring.

Patients having fistula at bladder neck and urethra and involving sphincter.

Patients who don't give consent of participation.

Preoperative Measures: Patients were admitted and complete history, detailed examination was done. Necessary laboratory investigations such as intravenous urogram and cystogram were obtained. Trans-vaginal or trans-abdominal approach were planned after diagnostic cystoscopy and EUA. Vesico-Vaginal fistulas were classified according to size as small (≤ 0.5 cm), medium (0.6 cm-2.4 cm), large (≥ 2.5 cm), and type such as, simple (single, small non-radiated) or complex (multiple, recurrent, medium, large, radiated).

Surgical Procedure: The trans-vaginal route was adopted in cases of simple infra-trigonal fistula having capacious vaginal cavity while VVF located at trigon or supra-trigonal area having less capacious vagina were approached by trans-abdominal route and also in cases of complex VVF.

Follow Up: These patients were followed for 6 weeks at 2 week time interval. All this data was noted on a predesigned form.

Statistical Analysis: Statistical analyses were performed using SPSS for Windows. Data was shown as mean \pm standard deviation (SD). T test were performed with a test level of $\alpha = 0.05$ the difference was considered to be statistically significant when the *P* value was less than 0.05.

RESULTS

Table No. 1: Percentage of patients according to Age distribution (n=163)

Age in (years)	No. of Patients	%age
20-30	44	26.99
31-40	59	36.20
41-50	33	20.25
51-60	27	16.56
Mean \pm SD	38.18 \pm 10.64	

Table No. 2: Outcome

Outcome	Frequency (%)	
	yes	No
Unsuccessful Repair	14 (8.59%)	149 (91.41%)
Infection	25 (15.34%)	138 (84.66%)
Recurrent Fistula formation	21 (12.88%)	142 (87.12%)

Table No. 3: Comparison of outcome between Abdominal versus Vaginal route.

Outcome		Abdominal (n=111)	Vaginal (n=52)	P-value
Unsuccessful Repair	Yes	05 (4.50%)	09 (17.31%)	0.007
	No	106(95.50%)	43 (82.69%)	
Infection	Yes	21 (18.92%)	04 (7.69%)	0.064
	No	90 (81.08%)	48 (92.31%)	
Recurrent Fistula formation	Yes	13 (11.71%)	08 (15.38%)	0.514
	No	98 (88.29%)	44 (84.62%)	

Table No. 4: Stratification of Outcome with respect to age

Outcome		20-40 years (n=103)	41-60 years (n=60)	P-value
Unsuccessful Repair	Yes	11(10.68%)	03 (5.0%)	0.212
	No	92(89.32%)	57 (95.0%)	
Infection	Yes	17(16.50%)	08(13.33%)	0.588
	No	86(83.49%)	52(86.67%)	
Recurrent Fistula formation	Yes	19(18.45%)	02 (3.33%)	0.005
	No	84 81.55%)	58(96.67%)	

Age range of the population of this study was between 20 to 60 years with mean age of 38.18 \pm 10.64 years. (Table I). Trans-abdominal repair was performed in 111 patients when the fistula site could not be easily accessed per vagina, when VVF was above trigon or

when the VVF was complex. Trans-vaginal repair was performed in 52 patients in cases of simple fistula. There were 47 patients with small (28.83%), 68 patients with medium (41.72%) and 48 patients with large.

Table No. 5: Stratification of Outcome with respect to size of fistula.

Outcome		Small (n=47)	Medium (n=68)	Large (n=48)	P-value
Unsuccessful Repair	Yes	04 (8.51%)	05 (7.35%)	05 (10.42%)	0.845
	No	43 (91.49%)	63 (92.65%)	43 (89.58%)	
Infection	Yes	09 (19.15%)	13 (19.12%)	03 (6.25%)	0.004
	No	38 (80.85%)	55 (80.88%)	45 (93.75%)	
Recurrent Fistula formation	Yes	04 (8.51%)	09 (13.24%)	08 (16.67%)	0.492
	No	43 (91.49%)	59 (86.76%)	40 (83.33%)	

Table No. 6: Stratification of Outcome with respect to Type of Fistula

Outcome		Simple (n=47)	Complicated (n=116)	P-value
Unsuccessful Repair	Yes	02 (4.26%)	12 (10.34%)	0.209
	No	45 (95.74%)	104(89.66%)	
Infection	Yes	10 (21.28%)	15 (12.93%)	0.180
	No	37 (78.72%)	101(87.07%)	
Recurrent Fistula formation	Yes	08 (17.02%)	13 (11.21%)	0.316
	No	39 (82.98%)	103(88.79%)	

DISCUSSION

We analysed a cohort of 163 women with Vesicovaginal fistula diagnosed on cystoscopy who met the inclusion criteria. Transabdominal repair was performed in 111 patients when the fistula site could not be easily accessed per vagina, when VVF was above trigone or when the VVF was complex. Transvaginal repair was performed in 52 patients in cases of simple fistula. Our study gives a comparative analysis on the procedures used for operating VVF including Transabdominal and transvaginal.

We found that there was a statistically significant increase in failure rate in transvaginal compared to transabdominal route to operate VVF. Infection rate despite having an increased rate in transabdominal was not statistically significant. Recurrence of fistula was greater in transvaginal method but again it was not statistically significant. Overall we preferred transabdominal as a superior procedure of choice to operate VVF in terms of success rate.

Our study went further to comment on various factors such as success rate, infection and recurrence when stratified in terms of age, size and type of fistula. We found statistically significant increase in recurrent fistula formation in age groups 20-40 compared with 41-60 age group. No significant difference was found in infection rate and unsuccessful repair when stratified by

age. We also found statistically significant decrease in infection rate with large fistulas compared to small and medium sized fistulas. No significant difference was observed in recurrent fistula formation or unsuccessful repair when stratified by size. Our study found no significant difference in infection, recurrent fistula formation or unsuccessful repair when stratified in terms of type of fistula ie simple or complicated type of fistulas.

Vesicovaginal fistula, (VVF), although reported in ancient Egyptian mummies of 2000 BC, is still a big problem in developing world. It is a devastating complication of obstetrics and gynecological surgery. Over 90% of fistulae in developing world are of obstetrical origin where as in the developed nations these are usually unfortunate complications of gynecological or other pelvic surgery. Abdominal hysterectomy remains the most common cause of VVF occurring in 1/800 hysterectomies. True incidence of VVF is not Known.⁵ Historically, the approach chosen by the surgeon has been dictated by the location of the fistula. The approaches include vaginal, abdominal, or combined abdominal and vaginal approaches. The abdominal approach has traditionally been used for supratrigonal fistulas, whereas the vaginal approach has been traditionally used for infratrigonal, bladder neck, and proximal urethral fistulas. Combined procedures are often reserved for complicated fistulas requiring the use of omentum or rectus muscle or for vesicovaginal fistulas with ureteral involvement. The advantages of transvaginal approaches include patient comfort and recovery time. The advantages of the abdominal approach include surgeon familiarity and the ability to perform simultaneous ureteral or bladder surgery. With the use of proper surgical technique and a well-vascularized buttress, even complex vesicovaginal fistulas can be repaired through a transvaginal approach.^{6,7}

Age of patients affected by VVF vary greatly between country to country and even in different regions of same country.^{8,9} Our study observed age range between 20 to 60 years with mean age of 38.18 ± 10.64 years. Majority of the patients 59 (36.20%) were between 31 to 40 years of age. Wall et al. found the leading cause of VVF to be obstetric trauma. They considered the age of the 'typical patient' to be 15.5 year⁸.

In another study from Ethiopia 40% of patients in the study cohort of 193 were teenagers, and 95.3% of the VVF resulted from obstetric trauma.¹⁰

In our study, we have done vaginal repair in 52 patients with simple fistula (small non-radiated, single), VVF located at trigone of bladder while transabdominal route was preferred in 111 patients when the fistula site could not be easily accessed per vagina, when VVF was above trigone or when the VVF was complex (medium and large). Unsuccessful repair was seen in 14 (8.59%), infection in 25 (15.34%) and recurrent fistula formation

in 21 (12.88%) patients. Different studies have reported different successful management rates. Rajamaheswari reported successful outcome for vaginal repair as 86.7% while 100% success rate for abdominal repair and recurrent fistula formation was observed in 12 % of these treated cases.¹¹ Kapoor R et al in his study on 52 VVF patients had a success rate of 94.2%. Thirty-two (61.5%) patients were managed by transvaginal route, of which 17 had supratrigoanal and 15 trigoanal fistulas. Twenty (38.5%) patients with complex fistulas were managed by abdominal route.

Another study from India reported 94.8 % success rate in vaginal repair while 100 % successful repair was achieved through abdominal repair.¹² Milicevic S et al¹³ has found successful primary repair of VVF in 75.00% of patients. The successfulness primary repairs with transvaginal and transabdominal approach with the use of omental flap was 100%, and with transvesical approach, it was 68.42%. Frajzyngier reported abdominal repair to be more successful (90% success rate) compared with that of vaginal repair (81% success rate).⁹ Gupta et al reported 91.7% success rate while among complication wound infection was 25%.¹ Some studies are also available at national level, in a study published from Islamabad reported 100 % success rate through transabdominal route while 80% success rate through transvaginal route.¹⁵ In a study conducted at Rawalpindi has reported overall 95 % success rate¹⁶, another study conducted at Lahore reported overall 87% success rate including 87% success rate through vaginal route while 88% success rate was reported through abdominal route.¹⁷ A study conducted at Jamshoro reported 93% overall successful rate.¹⁸ Many other studies have revealed higher success rates with abdominal approach. In our study, better results were obtained with transabdominal repair as compared to vaginal repair. On the other hand, there are surgeons who got excellent results with vaginal approach. The present study showed 83% success rate with transvaginal repair. Therefore, the success largely depends on a thorough evaluation followed by a prudent decision about the route of surgical repair. Success is also affected by many other factors, like general condition of the patient, size and site of the fistula, condition of the tissues, number of previous attempts at repair and operative facilities.

On the other hand, Atiq-ur-Rehman S et al¹⁹ has shown 91.67% success with transabdominal repair of VVF while 100% success with transvaginal repair.

In another series by Khawaja AR et al²⁰, majority of the patients (n=27) were repaired by trans abdominal route with a success in 26 patients (95.65%) and one failure. In literature, the success rate of repair by trans abdominal route is 94 - 98% and by trans vaginal 82%.²¹ It is concluded from our study that frequency of unsuccessful repair and recurrent fistula is more after

vaginal repair compared to abdominal repair while infection rate was more after abdominal repair.

Recurrence rate after VVF repair in our study is 12.88%²¹ and among these recurrence rate 11.71%¹³ in transabdominal repair but 15.38%⁸ in transvaginal repair with a p value 0.514. The result of our study are comparable to national and international studies: Ocrim LJ et al²², carried out a retrospective study which included 41 patients, out of whom 32 had a VVF and nine had a urethrovaginal fistula (UVF), the successfulness of the fistula closure was 92%, with 8% recurrence rate. These were managed by secondary and tertiary repair. Mubeen RM et al²³ showed successful surgical repair through transabdominal route in all 24 (100%) cases of VVF and in 4 (80%) out of 5 cases through trans-vaginal route with recurrence rate of 20 %. Sahito RA et al³⁷ wrote about the successfulness of the primary surgical repair with the abdominal approach in 30 patients with VVF in 86.67 % of cases with recurrence rate of 13.43%.

Infection was noticed in 25 case in our series with rate of 15.34%. Most of the studies have not highlighted the infection rates. Gupta et al reported 91.7% success rate while among complication wound infection was 25%.²⁴

CONCLUSION

VVFs are among the most distressing complications of gynecologic and obstetric procedures. As the best chance of a successful repair is at the first attempt so best decisions regarding technique and approach be adopted at the surgeons best satisfaction. We adopted the abdominal approach as a primary method of VVF repair with higher success rate as compared to vaginal route. Complications of adopted surgical procedure must be documented. Measures for prevention must include universal education, improvement in the status of women, and improved and accessible medical services.

Author's Contribution:

Concept & Design of Study:	Main Muhammad Asif Nawaz
Drafting:	Abdul Ghaffar
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Conflict of Interest: The study has no conflict of interest to declare by any author.

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Frequency and Associated Risk Factors for Complications of Ventriculo Peritoneal Shunts in Children

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ABSTRACT

Objective: The objective of this study was to determine the frequency and associated risk factors for complications of Ventriculo-Peritoneal (VP) Shunts in children.

Study Design: Retrospective cross sectional study.

Place and Duration of Study: This study was carried out at the Department of Neurosurgery, Khalifa Gul Nawaz Teaching Hospital, Bannu from January 2013 to December 2017.

Materials and Methods: A total of 148 below 12 years children with hydrocephalus, who were operated for ventriculo-peritoneal shunts placement. Demographic findings, follow-up period, shunt type, etiology of hydrocephalus, and timing of complications were recorded. Descriptive statistics were computed. Complications of VP shunt were compared among age groups, genders, and causes of hydrocephalus, shunt types and timing of complications, using chi-square test. $P \leq 0.05$ was considered significant.

Results: The mean age was 5.3 ± 3.12 years. Most of children were below 3 years $n=108$ (73%). Males were the predominant gender, $n=102$ (68.9%). Most common complication of shunt was malfunction, $n=17$ (11.5%), followed by infection, $n=12$ (8.1%). Overall complication rate was 19.6%. Of total, 93.3% complications were found in less than 6 months. In younger age, the complications were more frequent statistically ($P < 0.001$). The timing of complications was different statistically ($P < 0.001$). The effect of VP shunt type, cause of hydrocephalus and gender on complications was not statistically significant ($P > 0.05$).

Conclusion: Infection and malfunction are the common complications of VP shunt placement, in children with hydrocephalus. Clinicians should be most vigilant especially in the first 6 month, to manage these complications promptly.

Key Words: Ventriculo-peritoneal shunt, hydrocephalus, infection, malfunction, children, Bannu.

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INTRODUCTION

The abnormal accumulation of cerebro-spinal fluid within the brain is called hydrocephalus, which can occur at any age. The pathology of hydrocephalus is complex, can be the outcome of a variety of in-birth, and acquired diseases affecting nervous system.¹ The morphologic characteristics of Hydrocephalus are effortlessly recognizable, but the complete understanding of patho-physiology is still lacking.

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The contemporary treatment options are limited, and invasive in nature. Some of the treatment options are cerebrospinal fluid diversion, through a catheter or endoscopic third ventriculo-stomy.² Due to large capacity of peritoneal cavity of fluid absorption, ventriculo-peritoneal (VP) shunt is the most frequently used. First and subsequent placement of peritoneal catheter can be performed easily.³

In clinical practice of medicine, there are a lot of failures of cerebrospinal fluid (CSF) shunt surgery.⁴ VP shunt has been associated with many abdominal complications like fibrous encapsulation of the peritoneal tip, distal tube's kinking or blocking⁵, slippage of shunt via the surgical wound, or movement of the shunt into the various compartments of abdominal cavity.⁶ Infection, paralytic ileus, CSF fistula, the abdominal tube causing perforation of bowel, inability of peritoneum to absorb the diverted CSF, peritoneal cyst or hydrocele formation, and spontaneous extrusion of the tube through the umbilicus⁷ and anus are other complications.⁸

The literature reported that the overall rate of shunt infection ranges from 3 to 15%.^{9, 10} and 90% of infections occur within the first 6 months.⁴ According to

McGirt *et al*¹⁰ in the first year after implanting the shunt, 45% of shunt failed due to infection, and after 2 years there was 6% failures. Failure due to obstruction of VP shunt with cells or tissue was more than 50% in the children.¹¹

Due to genetic, ethnic and environmental variations, the risk factors and frequency of complications of VP shunt in children with hydrocephalus, is different in various populations. So this study was to know the burden of this problem and consequently to provide local data in this perspective, which is helping clinicians in better care of children. So the objective of this study was to determine the frequency and associated risk factors for complications of ventriculo-peritoneal shunts in children.

MATERIALS AND METHODS

retrospective cross sectional The study was carried out from 1st January 2013 to 31st December 2017 at the Department of Neurosurgery, Khalifa Gul Nawaz Teaching Hospital, Bannu. Total 148 patients with hydrocephalus were operated for ventriculoperitoneal shunts. These patients were admitted through the outpatient department and through referral from pediatric medical units. Verbal informed consent was obtained from children's parent after explaining aim and details of the research. Following data was collected from the retrospective review of patient records: demographic findings, age at operation, follow-up period, shunt type, etiology of hydrocephalus, and timing of complication. The recognition of a bacteria from the CSF reservoir (above 50 leukocytes per mm³) along with positive blood culture when a subjective have any of the following features: fever, abdominal symptoms, neurologic symptoms, or shunt malfunction.¹² was defined as the partial or complete blockage of the shunt that lead to function it intermittently or not at all. Blockage may be from blood cells, tissue or bacterial accumulation. Malfunction was assessed through history, examination, plain radio-graphs and CT brain. The inclusion criteria were all patients with hydrocephalus operated in the Department of Neurosurgery, Khalifa Gul Nawaz Teaching Hospital, Bannu, either gender, and age from one month to 12 years. Patients with ventriculo-peritoneal shunts complications operated elsewhere admitted through outpatient department were excluded.

RESULTS

The mean age was 5.3 ± 3.12 years. Most of children were below 3 years, n=108(73%). Only n=17 (11.5%) were above 6 years. Males were the predominant gender, n=102(68.9%). Most common cause of hydrocephalus was congenital, n=83(56.1%), followed by post meningitis, n=45(30.4%), and least was posterior fossa space occupying lesion, n=20(13.5%). In n=97(65.5%) cases, Chhabra type shunt was placed, while in n=51(34.5%) cases, the Medtronic was

placed. Most common complication of shunt was malfunction, n=17(11.5%), followed by infection, n=12(8.1%). Overall complication rate was 19.6%.

Table No. 1: Characteristics of age group, gender, cause of hydrocephalus, type of shunt, type of complication in VP shunt and timing of complications

Variable		Frequency	Percent	P-value
Age group	below 1 year	54	36.5	P<0.001
	1.1yr-3yrs	54	36.5	
	3.1yrs-6yrs	23	15.5	
	6.1yrs-12yrs	17	11.5	
	Total	148	100	
Gender	Male	102	68.9	P<0.001
	Female	46	31.1	
	Total	148	100	
Cause.of hydrocephalus	Congenital	83	56.1	P<0.001
	Post meningitis	45	30.4	
	Post fossa SOL	20	13.5	
	Total	148	100	
Type of shunt	Chhabra	97	65.5	P<0.001
	Medtronic	51	34.5	
	Total	148	100	
Type.of.compliation in VP shunt	no complication	119	80.4	P<0.001
	Infection	12	8.1	
	Malfunction	17	11.5	
	Total	148	100	
Timing of complications	Nil	119	80.4	P<0.001
	within 1 week	7	4.7	
	1-4 weeks	6	4.1	
	5-12 weeks	9	6.1	
	13-24 weeks	5	3.4	
	More than 24 weeks	2	1.4	
Total	148	100		

Of total, 93.3% complications were found in less than 6 months (upto 24 weeks). Only in 2 cases (1.4%), the complications in VP shunt had occurred after 6 months. All the difference for age group, gender, cause of hydrocephalus, type of shunt, type of complication in VP shunt and timing of complications were highly statistically significant. (Table 1)

In younger age, the complications were more frequent. Most of the complications were found in first year of life. These results were highly statistically significant (P<0.001). The type of complications in VP shunt was not statistically different among males and females (P=0.874). Most of the malfunction (blockage) of shunt was found within first week (29.4%). Most of the infection of VP shunt was in first week ((16.70%), and first month (16.70%). The timing of complications was different statistically (P<0.001). The effect of VP shunt type on complications was not statistically significant (P 0.682). Similarly, the cause of hydrocephalus was not statistically associated with complications (P=0.419). (Table 2)

Table No. 2: Comparison of VP shunt complications among age group, gender, cause of hydrocephalus, type of shunt, and timing of complications.

		Type of complication						P-value*
		Infection		Malfunction		no complication		
		N	%	n	%	n	%	
Age group	below 1 year	10	83.30	12	70.60	32	26.90	P<.001
	1.1yr-3yrs	1	8.30	2	11.80	51	42.90	
	3.1yrs-6yrs	1	8.30	2	11.80	20	16.80	
	6.1-12 years	0	0.00	1	5.90	16	13.40	
Gender	Male	9	75.00	12	70.60	81	68.10	.874
	Female	3	25.00	5	29.40	38	31.90	
Timing of complications	Nil	0	0.00	0	0.00	119	100.00	P<.001
	within one week	2	16.70	5	29.40	0	0.00	
	1-4 weeks	2	16.70	4	23.50	0	0.00	
	5-12 weeks	5	41.70	4	23.50	0	0.00	
	13-24 weeks	1	8.30	4	23.50	0	0.00	
	More than 24 weeks	2	16.70	0	0.00	0	0.00	
VP shunt type	Chhabra	7	58.30	10	58.80	80	67.20	.682
	Medtronic	5	41.70	7	41.20	39	32.80	
Cause of hydrocephalus	Congenital	6	50.00	6	35.30	71	59.70	.419
	Post meningitis	4	33.30	8	47.10	33	27.70	
	Post fossa SOL	2	16.70	3	17.60	15	12.60	

*chi-square test; P≤0,05 significant level; SOL, space occupying lesion

DISCUSSION

This study was done to find out the frequency of different complications and timing of Ventriculo-peritoneal shunt in children, so that we can overcome these problems in future.

Our results showed that overall complication rate was 19.6%. Of which, 93.3% complications were found in less than 6 months. Infection was found in 8.1% children. In younger age, the complications were more frequent (P<0.001). Most of the complications were in the first 6 months. The timing of complications was different statistically (P<0.001). The effect of VP shunt type, cause of hydrocephalus and gender on complications was not statistically significant (P>0.05). Although CSF shunt placement contributed to the significant improvement in the managing outcome of hydrocephalus, the shunt has several complications, including infection, which is a major threat to pediatric patients¹³. The current study found that infection was found in 8.1% children. Lee *et al*¹² analyzed shunt infection rate and identify risk factors in a retrospective cohort study on 333 consecutive VP shunt cases in Korea. They reported that overall infection rate was 10.5%. Their results are near to our findings. In literature, the rate of infection after shunt implantation in children with hydrocephalus ranges from 3% to 20%.¹⁴⁻¹⁶

Our results revealed that the malfunction of VP shunt in children with hydrocephalus was in 11.5% cases. This was the most common complication. An Indian study on 137 children's clinical outcome of shunt surgeries reported that the most common complication of VP was blockage that causes it to function intermittently or not at all. They found the malfunction of VP shunt was in

10.94%.¹⁷ These results are in consistent with current study. The reasons for shunt obstruction may be the presence of higher concentration of protein and cellular contents in the cerebro-spinal fluid.

Our study showed that most of the complications were in the first 6 months (P<0.05). This shows that success of shunt increased if survive in the first six months. Similar results were found in previous studies.^{17, 18} We used two types of VP shunts i.e Chhabra and Medtronic. We found no statistically difference in results. This shows that experience may be major reason responsible for success.

CONCLUSION

VP shunts placements are still associated with complications. Infection and malfunction are the common complications of VP shunt placement in children with hydrocephalus. Clinicians should be most vigilant especially in the first 6 month to manage these complications promptly..

Author's Contribution:

Concept & Design of Study: Anwar Shah
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 Revisiting Critically: Anwar Shah and Muhammad Ali Noman
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