Scrotal Migration of a Ventriculoperitoneal Shunt in Child with Hydrocephalus - A Case Report


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Abstract

Ventriculoperitoneal shunt implantation is commonly used in the treatment of hydrocephalus and there have been many reports on the migration of the distal catheter since this phenomenon was recognized 50 years ago. However, scrotal migration of the peritoneal end of ventriculoperitoneal (VP) shunt into the Patent Processus Vaginalis (PPV) is a rare complication. We present a rare case of an 18-month-old child presenting with a right-sided scrotal swelling with the distal end of the shunt migrating through the external inguinal ring into the scrotal sac following a VP shunt placement for congenital hydrocephalus. Its exact incidence is not mentioned in the literature to date. The appropriate management of our case included exploration of the inguinal canal and repositioning of the distal catheter back into the peritoneal cavity followed by Gross – Ferguson's herniotomy.

Keywords: Scrotal Migration; Hydrocephalus; Case Report; Herniotomy; shunt

Introduction

Hydrocephalus is an active distension of the ventricular system of the brain resulting from the inadequate passage of the cerebrospinal fluid from within the ventricles where it is produced to its point of absorption into the systemic circulation [1]. On the basis of contributing factors, it is further divided into congenital and acquired forms. Congenital is caused by birth defect or genetic disorder. Examples include aqueductal stenosis, Dandy-Walker malformation, myelomeningocele, Chiari malformations, and X-linked hydrocephalus [2].

This neurosurgical condition which if left untreated, leads to the progressive cognitive deficit and early death [3]. There are two common approaches to the treatment of hydrocephalus shunt placement and endoscopic third ventriculostomy [4]. The most common treatment is the placement of a shunt. This procedure has been in use ever since the 1950s and has been considered as the best treatment option for most cases of hydrocephalus [5].

Shunts are generally positioned in the lateral ventricle and can have one of three different drainage points. The principal drainage site for the shunt from the ventricles is the peritoneum, hence known as the ventriculoperitoneal (VP) shunt. Ventriculopleural, Ventriculooatrial, and lumboperitoneal shunt are the other types of shunts terminating in the pleural space, internal jugular vein and the lumbar intradural space, respectively [2,5]. Ventriculoperitoneal shunt (VP) accounts for the most part of the frequently performed neurosurgical procedures to treat most forms of hydrocephalus [6].

With existing standards and infection control, the postoperative mortality rate for shunt placement is less than 5% [7]. Even though shunt placement is considered as a paramount for treating hydrocephalus, it does have a number of drawbacks. Taking into consideration the most commonly used VP shunt the observed success rate was in the range of 60% and failure rate close to 40% [8]. The infection rate was close to 20% while complication rates of about 25.8% in developing countries [9].

One rare complication of VP shunt is distal catheter migration into various abdominal contents including the scrotum [11]. A few cases of scrotal migration of distal catheter have been reported in pediatric patients [12]. Here we report a case of an 18-month-old child who presented to our hospital with a right-sided scrotal swelling with the distal end of the VP shunt in the right scrotum four months subsequent to a VP Shunt placement for congenital hydrocephalus.

Case Report

An 18-month-old male child presented to our hospital (Niloufer Hospital for Women and Children) with a chief complaint of right-sided scrotal swelling for the last two months. The case was then...
referred to the department of pediatric surgery for the presenting complaints. The Child had undergone a VP shunt drainage procedure 4 months back for congenital hydrocephalus at the age of 13 months. At present, there were no signs of raised intracranial pressure. Scars over the abdomen signified evidence of VP shunting. On examination, abnormal findings were noted in the inguinal region. The inspection revealed a right-sided scrotal swelling which was brilliantly transilluminant and slowly compressible (Figure 1).

A cord-like coiled structure was palpable in the right hemiscrotum. Opposite side was normal. Due to the history of shunt being placed by a neurosurgeon in Osmania General Hospital, Osmania Medical College, the suspicion of shunt migration was kept in mind. An abdominal X-ray revealed a radio-opaque catheter coiled tube extending into the right inguinal-scrotal region (Figure 2). Ultrasound examination further confirmed the migration of distal catheter through the inguinal canal.

The patient was prepared for surgery. With general anesthesia, exploration of the inguinal canal and the distal catheter which had entered the scrotum was repositioned back into the peritoneal cavity (Figure 3,4). The hernia sac was then ligated, Gross – Ferguson’s herniotomy was performed without exposing the shunt. The fascia of the external oblique muscle and the external ring were incised to explore the high ligation of the hernia sac (process vaginalis) at the inner ring. The postoperative course in the hospital was eventful and the patient was discharged home three days after the operation in a stable condition.

**Discussion**

Congenital hydrocephalus is the accumulation of cerebrospinal fluid within the ventricles of the brain. The incidence of congenital hydrocephalus is about 0.2–0.5/1000 live births [13].
Ventriculoperitoneal (VP) shunt implantation is most frequently employed for treatment of hydrocephalus because of the competence of the peritoneum to resorb fluids [14]. There are three main components of a shunt; a proximal catheter, a valve, and a distal catheter. Ventricular catheter diverts the cerebrospinal fluid into the body cavity, valves control the rate of drainage and distal catheter terminates into the peritoneal cavity as in case of a VP shunts [2].

Shunt malfunction due to migration is an uncommon complication of ventriculoperitoneal shunts. It can occur anywhere, from hours to years after the placement of the shunt system [14]. Migration occurs in the mediastinum, chest, gastrointestinal tract, abdominal wall, bladder, and vagina [15]. One of the rare sites of distal catheter migration is the scrotum. We found less than 10 documented cases of scrotal migration of the distal VP shunt when a search was conducted on PubMed. In our case, the distal end of the catheter showed migration to the right scrotum thus confirming a rarity of complication. The prevalence of scrotal migration of the distal edge of the shunt is between 3.8% and 16.8% [16].

The most common time for a malfunction is within the first 6 months after placement or revision [17]. In our case, the fairly accurate time duration for the complication to occur was four months. Merely three cases reported with such a late onset of complications and only two of them have occurred in a pediatric patient and the other one was a 46-year-old male [11]. The present case reported with a right-sided scrotal swelling and this can be explained by the fact that the right testicles descend later than the left testicles. About 60% of the distal catheter migration of the VP shunt happens to the right side [16]. This shunt migration to the right side was also found to be consistent with the incidence of hernias in children (right-side, left-30%, bilateral-10%) [18].

Children with a VP shunt implantation are more liable to develop a hernia and hydrocele [19]. An inguinal hernia and/or hydrocele could follow the insertion of a ventriculoperitoneal shunt with a frequency ranging from a minimum of 3.8% to a maximum of 16.8% [20]. However, the incidence of scrotal migration of peritoneal end of the shunt into the hernia sac as observed in our case has been reported by very few reports [21,22]. This might possibly be because of the rarity of the complication as noticed in our case.

Various pathophysiologic mechanisms account for the migration of the peritoneal catheter. Intraabdominal pressure increase after VP shunt implantation can occur for two possible reasons: Firstly CSF drainage and localization of the shunt catheter in abdomen causes migration of shunt to other anatomical localizations. Furthermore, past hydrocephalus operation increases intra abdominal pressure and acts as a probable likelihood factor for peritoneal catheter migration [16,23]. Inguinal hernias arise secondary to this raised intra abdominal pressure. Normally, processus vaginalis is patent at 60%-70% of infants in the first three months of life. It could be established as a patent at 50–60% of 1-year-olds and 40% for children between ages 2–16 years [24]. The raised intraabdominal pressure prevents the natural closure of processus vaginalis (PV) and may convert a patent PV (PPV) to a clinical hernia [12].

The second possible reason is the correlation of peritoneal volume to the body surface area (80 ml/m²). Consequently, young children with small peritoneal cavity and PPV are more prone to scrotal migration. Furthermore, at this young age, the inguinal canal is vertical and combined with a “tough effect” formed by the PPV and raised intra-abdominal pressure leads to easier migration of shunt tube in the scrotum [22].

In our case, patent processus vaginalis and raised intraabdominal pressure can be attributed to the possible causes of this complication.

Hence the appropriate management included an open surgical procedure for the exploration of the inguinal canal followed by repositioning of the distal catheter back into the peritoneal cavity. Among the wide variety of methods reported for inguinal repair, two techniques are commonly performed by surgeons. One of these is the method described by Gross and Ferguson and the other one is the Mitchell-Bank technique. In the present case, a Gross and Ferguson herniotomy were performed. This technique allows the surgeon to properly explore for high ligation of the sac in the inner ring [25].

This condition though benign, the complication ought to be prevented, which can yet again be difficult. Modifiable factors such as the use of lengthy catheters to circumvent frequent shunt change and use of low-pressure shunts in every hydrocephalus cases can lead to increased drainage thus preventing this complication. Avoiding placement of extra tight sutures at the connections and employing laparoscopy to place distal catheters are some of the other possible intervention strategies [12].

Conclusion

This case report illustrates a rare complication of scrotal migration of peritoneal end of the shunt into the hernia sac three years four months following a surgical procedure of VP shunt implantation for congenital hydrocephalus. Very few cases have been reported in literature possibly because of the rarity of the complication. Furthermore, it is a unique case as most reported cases had an early onset, and there are only three other cases of such late onset. Prompt surgical management of this case comprised of an open surgical procedure for inguinal canal exploration and catheter repositioning followed by Gross – Ferguson’s herniotomy for the ligation of the hernia sac.

Conflict of Interest

All the authors declared that they have no conflict of interest.

References


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