

Intraabdominal Pressure: Is it a Cause of Shunt Dysfunction? A Pediatric Case Report

İntraabdominal Basınç Shunt Disfonksiyonu Sebebi midir? Pediatrik Olgu Sunumu

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ABSTRACT

Ventriculoperitoneal shunting is the most common and most effective method to resolve hydrocephalus. A dysfunctioning shunt is a cold fact and beginning of cascades of various problems for every neurosurgeon. In this article we discussed probable mechanisms of shunt dysfunction due to an abdominopelvic problem which is treated by a basic indwelling urinary catheter in a 14 year old boy.

Key Words: Hydrocephalus, intraabdominal pressure, ventriculoperitoneal shunt, pediatric.

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ÖZET

Ventriküloperitoneal shuntlama hidrocefali çözümlemesinde en yaygın ve en etkili metottur. Fonksiyon bozukluğu olan bir şant (shunt) somut bir gerçekliktir ve her nöroşirurji uzmanı için bir dizi problemin başlamasını temsil eder. Bu makalede 14 yaşında bir çocukta üriner kateterle tedavi edilen abdomino-pelvik problem sebebiyle fonksiyon bozukluğu olan bir şantın muhtemel mekanizmalarını ele aldık.

Anahtar Sözcükler: Hidrocefali, intraabdominal basınç, ventriküloperitoneal shunt, pediatrik

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INTRODUCTION

Since its first utilization in 1898 by Ferguson, usage of ventriculoperitoneal shunts are the most common and most effective method to resolve hydrocephalus (28). These devices work on the basis of Pascal's law and challenge against the laws of entropy. Every man made device is destined to deterioration and breakdown and shunts are not an exception. A dysfunctioning shunt is a cold fact and beginning of cascades of various problems for every neurosurgeon.

In this article we discussed probable mechanisms of shunt dysfunction due to an abdominopelvic problem which is treated by a basic indwelling urinary catheter.

CASE REPORT

A 14 year old boy who had, cerebral palsy, urinary retention and a previous history of V-P shunt operation was admitted to our institute's emergency department with abdominal pain, abdominal sensitivity including and decrease in level of consciousness. In his physical examination he had a severe sensitivity in abdomen. He underwent an immediate abdominopelvic ultrasonography scan (USG) and cranial computed tomography scan. (CT). It was seen he had a globe vesicale. Additionally ventricles were severely dilated compared to his last follow up visits (Figure 1). Immediate urinary catheter was administered for providing outflow of urine. Two days after on his control abdominopelvic USG bladder size was normal and there was no sign of globe vesicale. Also control cranial CT scan showed significant decrease in ventricular size (Figure 2). 2 days later patient discharged with intermittent urinary catheterization.

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Figure 1: Dilated ventricles on first CT scan with globe vesicale.



Figure 2: Normal ventricles was observed on the following 2nd day on CT scan.

DISCUSSION

Since its first usage by Ferguson in 1898, peritoneal cavity is the most common site for cerebrospinal fluid (CSF) absorption. After its popularization and advent of silicon elastomer, lumboperitoneal shunt systems became widely used (8, 16).

When literature was investigated, abdominal complications are; distal catheter migration and visceral perforation and/or extrusion (1,3,5,6, 11, 12, 14, 15, 17-21, 23, 24, 29-31), ascitis (2,13), and peritoneal pseudocysts (10, 26). However when this literature was analyzed in detail nearly all of them are related with "non-functional" abdominal complications.

We hypothesized two probable cause of abdomen related dysfunctioning of shunt system. Barker et al mentioned, augmentation of bladder, especially in meningocele (MMC) patients would cause distal shunt obstruction due to bladder perforation (9). When all patients investigated in their series this dysfunction is not due to infection since culture of the tip was negative in all. They concluded free urine in the abdominal cavity decreased absorptive ability of the peritoneum due to inflammation and as a result of this process a pseudocyst-type problem develops (7, 9).

From this point of view our first hypothesis is absorptive ability of peritoneum is one of the main variables of a "functional shunt system". But is it enough to explain pathophysiology of our case?

Our patient had no free-fluid in USG scans and had no signs, symptoms or findings of a perforation. He experienced a process causing an increase in intraabdominal pressure. In 2011 Al-Hwiesh et al studied on 13 men and 12 women end-stage renal disease patient, for calculating if there is any statistical difference between intraperitoneal pressure (IPP) and intraabdominal pressure (IAP). Their findings indicated there is no statistical difference between IPP and IAP (1). Additionally in 2008 Sahuquillo and Arkan determined a strong relationship between IAP and body mass index (BMI). They found BMI has a positive relationship with IAP (25). Also there are examples of case reports about shunt dysfunction secondary to pregnancy with no signs of shunt obstruction. (22,27, 32). In their case report Murakami et al solved the intraabdominal pressure problem by replacing the shunt as ventriculoatrial shunt (22). As a result our more probable hypothesis is that globe vesicale caused an increase in IAP and IPP respectively. So increasing IPP and IAP decreased absorptive ability of the peritoneum. In addition, increased IAP act like a mechanical barrier and following, increased IAP probably caused an increase in proximal pressure, due to Pascal's law and dilated ventricles.

Controversial issue on this case is we did not perform any radioisotope technique because globe vesicale is an emergent situation and urinary catheter should be applied as soon as possible.

CONCLUSION

Intraabdominal pressure is a neglected element of shunting. While evaluating a shunt dysfunction case not only shunt dependent problems but also abdomen related problems must have considered. This situation is especially important for cases with impaired neurological control of bladder such as myelomeningoceles.

Conflict of interest

No conflict of interest was declared by the authors.

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