



## Case Report

### Extremely Rare Cause of Ventriculo-Peritoneal (V-P) Shunt Dysfunction: Spontaneous Peritoneal Catheter Knotting

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## Summary

Shunt application is one of the most common treatment method for hydrocephalus. Many complications have been reported in literature for ventricular and peritoneal catheters and shunt valve. Spontaneous knotting of peritoneal catheter is an extremely rare condition. Mechanism of knotting is still unclear and peristalsis, elasticity of shunt materials, intraabdominal density, length of the peritoneal catheter and surgical technique may be responsible factors. In this paper, we presented a peritoneal catheter knotting resulted in shunt dysfunction in an 8-year-old girl. During surgery, we removed the peritoneal catheter, untied the knot and placed in the peritoneum again.

**Key words:** Hydrocephalus, Spontaneous knotting, Ventriculo-peritoneal shunt, Shunt dysfunction, Surgical technique

### Ventrikülo-Peritoneal(V-P) Şant disfonksiyonun Nadir Sebebi: Spontan Peritoneal Katater Döğümlenmesi

## Özet

Şant uygulaması hidrosefali tedavisinde kullanılan en yaygın tedavi yöntemlerinden biridir. Ventrikül, peritoneal kateter ve şant pompası için literatürde birçok komplikasyon bildirilmiştir. Peritoneal kateterin spontan döğümlenmesi son derece nadir bir durumdur. Bu olguda, 8 yaşındaki kız hastada peritoneal katater ucunun döğümlenmesi sonucu gelişen şant disfonksiyonu sunuldu. Biz cerrahi yöntem ile periton kateteri bulundu döğüm çözüldü ve tekrar periton yerleştirilir.

**Anahtar Kelimeler:** Hidrasefali, döğümlenme, ventrikülo-peritoneal şant, şant disfonksiyon, cerrahi teknik

## INTRODUCTION

Ventriculo-peritoneal (V-P) shunt surgery is one of the most common treatment method used for hydrocephalus<sup>(1,13)</sup>. Many complications have been reported in literature for ventricular and peritoneal

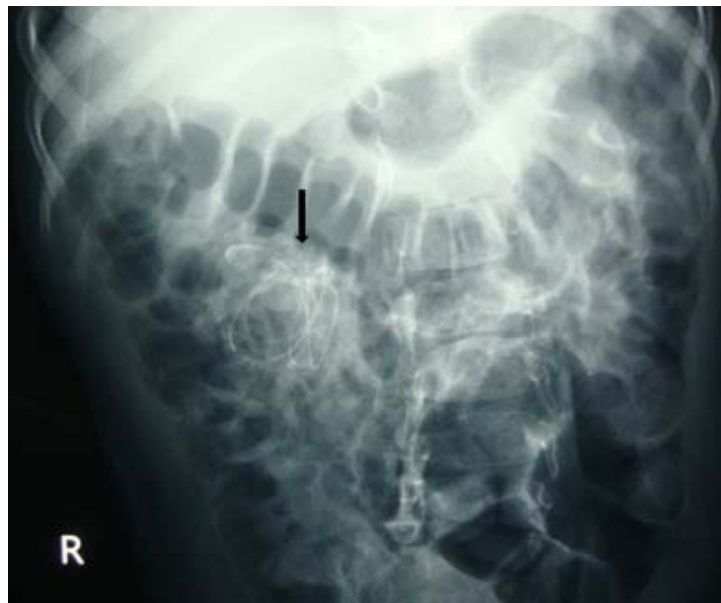
catheters and valve<sup>(13)</sup>. Complications for peritoneal part of the V-P shunt such as intra-abdominal ascites accumulation, regional cyst formation, hydrocele, intestinal injury, coming out of catheter from skin, ureter or anus or migration to internal organs have been reported<sup>(1,2,8,13)</sup>.

Spontaneous knotting of peritoneal catheter is an unusual condition<sup>(1,2,3,5,8,13,3)</sup>. Here, we presented a peritoneal catheter knotting resulted with shunt dysfunction in an 8-year-old girl. We removed the peritoneal catheter, untied the knot and placed in the peritoneum again.

### CASE PRESENTATION

An 8-year-old girl was admitted to emergency department with headache and sleeping. Complaints were started 2 days ago. On her physical examination, she had somnolence, limited cooperation and orientation. Her vital functions were normal. She had no fever. Routine laboratory test were normal. In her history, she had been operated for meningomyelocele in the newborn period. Ventriculo-peritoneal shunt was applied for hydrocephalus when she was 3 months-

old age. Fifteen days ago, shunt revision was done due to shunt dysfunction. Cerebral computed tomography (CT) revealed ventricular enlargement and sulcus effacement compared to the prior images. Shunt series did not determine problem at catheter connections. However the peritoneal catheter was observed to have been knotted in the abdomen (Figure-1). The patient underwent urgent operation. Peritoneal part was explored and the knotted peritoneal catheter was seen (Figure-2). We did not determine cerebrospinal fluid (CSF) flow from the tip of the knotted catheter. The knot had been untied, CSF flow was seen and the catheter was placed in the peritoneum again. The conscious of the patient improved in postoperative period. No problems were encountered on postoperative 1<sup>th</sup> and 3<sup>th</sup> month.



**Figure 1:** Black arrow is showing peritoneal catheter knotting on shunt series.



**Figure 2:** Intraoperative photography is showing peritoneal catheter knotting.

## DISCUSSION

Shunt applications have been widely used for treatment of hydrocephalus. Distal catheter of the shunt usually placed in peritoneum and less commonly in atrial, pleural, ureteral region<sup>(1)</sup>. Complications of the valve, ventricular or distal catheters of the shunt system may occur<sup>(13)</sup>. In a study with 112 patients, Murtagh et al.<sup>(9)</sup> reported complication rates as 79% and 47% in ventriculo-atrial (V-A) shunts and in V-P shunts respectively. Shunt dysfunction is usually originates from distal catheter problems<sup>(1,9)</sup>. Local complications such as hydrocele, localized peritoneal cyst, intra-abdominal ascites, shunt migration, catheter obstruction due to omentum adhesions, intestinal perforation and the coming out of catheter from skin, ureter or anus or migration to internal organs have been reported in 5-47% in literature<sup>(1,13)</sup>.

Spontaneous knotting of peritoneal catheter is a very rare condition which results in shunt dysfunction<sup>(1,2,3,5,13)</sup>. Chopra et al.<sup>(2)</sup> treated a pregnant woman (25 weeks of gestation) who had undergone V-P shunt due to bilateral

thalamic glioma related hydrocephalus. On 2<sup>nd</sup> month shunt dysfunction developed. Authors detected knotting in peritoneal tip and untied the knot, placed the catheter in the abdomen. Authors reported that enlarged uterus facilitated catheter knotting. Woerdeman et al.<sup>(3)</sup> applied V-P shunt to a 7 day-old boy who had Chiari malformation and meningomyelocele. On postoperative 2<sup>nd</sup> day, they detected a problem on shunt series. During surgery authors noted double knotting on peritoneal catheter which one was tight and another was loose. They untied the knot and placed the catheter in the peritoneum again and they concluded that intestinal peristalsis was the underlying cause for knotting. Eftekhari et al.<sup>(5)</sup> detected double knotting of which one was tight and another was loose. on distal 10 cm of the peritoneal catheter in a 3 years and 6 months old boy. Mohammed et al.<sup>(10)</sup> reported shunt dysfunction due to knotting between two catheters in a 14-year-old girl who had undergone V-P shunt due to congenital hydrocephalus. Borcek et al.<sup>(1)</sup> treated a 3-year-old boy with V-P shunt whom had hydrocephaly after head trauma. They reported shunt dysfunction due to

peritoneal catheter knotting after 34 weeks of surgery. They indicated that, intestinal peristaltis is the cause for shunt knotting and they emphasized the importance of shunt series. Ul-haq et al.<sup>(13)</sup> reported that peritoneal catheter was coiled on shunt series in a 8-year-old boy whom was treated with V-P shunt 2 years ago. They applied external ventricular drainage and removed the ventricular part. They could not remove peritoneal catheter. Thereafter authors removed the knotted distal catheter laparoscopically. They considered that, peritoneal catheter knotting was developed due to the adhesions in omentum. Fekete G. et al.<sup>(6)</sup> determined distal catheter knotting in a premature baby after 2 months of shunt implantation. Authors simply cut the catheter above the knot and the working shunt was replaced into the abdominal cavity. They thought that, longer peritoneal catheters can precipitate multiple looping and knot tightens during pulling out. Lo WB et al.<sup>(7)</sup> reported V-P shunt malfunction due to knotting of distal catheter in a 10 year old girl whom had revised the V-P shunt 3 weeks earlier. Charalambides C. et al.<sup>(4)</sup> determined peritoneal catheter knotting which cause to V-P shunt malfunction in a patient after 1 year of shunt implantation. Authors have thought combination of plastic material memory and bowel peristaltic movement could be underlying causes. We have noted, knotted peritoneal catheter during surgery and the knot had been untied, CSF flow was seen and the catheter was placed in the peritoneum again.

Ul-Haq et al.<sup>(13)</sup> reported that knotting is usually developed in distal peritoneal catheter. Eftekhar et al.<sup>(5)</sup> reported that repeated shunt surgeries increases the frequency of knotting. However there is no consensus on the mechanism of knotting. Theories are proposed as catheter-related factors such as shunt production materials, long catheter, small catheter diameter and insertion technique, patient-related factors such as anatomic structure of the abdomen,

increased intra-abdominal density, intra-abdominal adhesions or increased intestinal movements<sup>(1,2,3,5,8,13)</sup>. In a retrospective study, Couldwell et al.<sup>(3)</sup> used 120 cm of peritoneal catheter in 952 patients and reported that, they did not encounter any complications. However, long peritoneal catheter can cause to intestinal obstruction or necrosis by forming a loop around the intestine. In a retrospective study, Murtagh et al. evaluated 112 cases<sup>(9)</sup> and reported a case with intestinal obstruction which was developed as the result of distal catheter knotting. Starrevelled et al.<sup>(11)</sup> reported an intestinal necrosis due to peritoneal catheter knotting of V-P shunt in a 7-day-old newborn. Toshifumi et al.<sup>(12)</sup> reported intestinal obstruction due to distal end knotting in a 63-year-old male patient.

Still mechanism of knotting is unclear. However in shunt dysfunction, it is well known that shunt series are valuable radiological investigations that provide information about catheter connections and placements<sup>(9)</sup>. Ul-Haq et al.<sup>(13)</sup> detected shunt knotting by shunt series. Mohindra et al.<sup>(8)</sup> applied V-P shunt to a patient who had congenital hydrocephly and Crouzon syndrome. On follow up period on 7<sup>th</sup> year they observed knotting in peritoneal catheter on shunt series. Because of knotting did not lead to dysfunction, authors preferred clinical follow-up instead of revision. We detected peritoneal catheter knotting on shunt series and applied urgent operation because of her headache and somnolence and she was discharged.

## CONCLUSION

1. Shunt knotting is a very rare complication in V-P shunt system. Still mechanism of knotting could not be fully understood. However high intra-abdominal density, increased peristaltis, thin and elastic structure of the catheter are the potential risk factors. Catheter knotting

should be kept in mind as the cause of shunt dysfunction.

2. In the presence of suspicion for shunt dysfunction, shunt series provide information about the integrity and physical location of the V-P shunt system. It is an easily available and rapidly applicable examination with low radiation risk.

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