

Peritoneal catheter knot formation

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Knot formation usually occurs at the terminal end of the [peritoneal catheter](#).

Mechanism

The exact mechanism of knot formation is not clearly known. The various factors proposed by different authors include catheter characteristics, capacity and configuration of abdominal cavity, and direction of catheter movement ¹⁾.

A catheter's greater length, lesser diameter, and highly elastic material predispose it to knotting. Increased abdominal volume, crowding of abdominal contents, intra-abdominal adhesion, and vigorous peristalsis can also trigger knot formation ²⁾.

Raymer and Smith reported on the mechanism of knot formation. The researchers placed a string perpendicular to the pull of gravity within a rotating cubic box, causing the string to form a knot. The authors found that the length of string and the increase in string motion raise the probability of knot formation. In our case, knot formation occurred during the removal of the peritoneal catheter due to the adhesions of the omentum to the point of entry of the peritoneal catheter ³⁾.

Fekete et al., think that the knot tightens during pulling out. Longer peritoneal catheters can precipitate multiple looping and/or axial torquations and increase the peripheral resistance of the shunt. In such cases when the pulling out is challenged conversion to laparotomy is suggested ⁴⁾.

Lo et al., reported the first case of VP shunt disconnection associated with a spontaneous distal knot formation. The likely mechanism was that the spontaneously formed knot acted as an anchor at the peritoneal wall, preventing free relative movement of the distal catheter. The resultant tension led to failure at the weakest point of the system, resulting in a disconnection at the proximal straight connector site ⁵⁾.

Kataria et al, reported a case of erosive bladder perforation, intra-corporeal knot formation, and perurethral extrusion of the distal end of VPS. This was the second only case report so far in the world literature showing triad of uncommon VPS complications in a single patient ⁶⁾.

Complications

The formation of a knot in a [peritoneal catheter](#) commonly results in VP [shunt malfunction](#) ^{7) 8) 9) 10) 11)}.

Knotting of the catheter around the bowel can lead to bowel obstruction and gangrene ^{12) 13)}.

Occasionally, the knot is an incidental finding ¹⁴⁾.

Evaluation

The issue can be diagnosed by a VP shunt X-ray series and CT scan.

Radiographic investigation is warranted in children who have unusual shunt arrangements (e.g., Y-connectors and multiple catheters) in order to exclude disconnections or those who develop shunt problems years after implantation, to exclude material fracture in the neck or migration of any kind. In shunt systems which have been implanted for shorter time periods, the need for radiographs is less apparent. Some surgeons proclaim that when clinical circumstances fall outside the realms of obvious possible proximal obstruction, radiographic evaluation of the shunt system should be considered ¹⁵⁾.

Treatment

Treatment consists of laparoscopic exploration of the peritoneal cavity or minilaparotomy. The peritoneal catheter can be unknotted or removed and replaced with a new catheter; alternatively, the whole shunt system can be replaced ¹⁶⁾.

Asymptomatic knots on the peritoneal catheter can be observed with serial VP shunt X-ray series and a CT scan, and symptomatic patients require laparoscopic exploration and the unknotting or total replacement of the peritoneal catheter ¹⁷⁾.

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