Bowel perforation during percutaneous urological procedures

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Abstract

Iatrogenic bowel injury during percutaneous urological procedures is a rare complication but if it occurs it increases significantly the morbidity and the mortality of the procedure. The purpose of this paper is to highlight the technical details and anatomical features that may increase the risk for bowel injury and propose possible management in the case of occurrence.

Introduction

Iatrogenic bowel injury is a rare complication of suprapubic trocar cystostomy or percutaneous kidney surgery. It may seriously affect patient recovery by increasing morbidity and rarely lead to death, especially when the diagnosis is delayed. Herein, we discuss the special anatomic features, the risk factors and the technical details that may predispose to bowel injury. Therapeutic management is also highlighted.

Bowel injury and suprapubic cystostomy

Bowel injury may occur in up to 2.7% of the cases after a blind percutaneous or a transurethral, cystoscopically guided trocar cystostomy. It may happen primarily during the insertion of the suprapubic catheter or secondarily during the change of a catheter through an established mature tract. Various segments of the intestinal tract can be affected including the caecum and the sigmoid colon but the most commonly injured bowel segments is the terminal ileum.

Several anatomical, functional and technical factors may predispose to bowel injury during a suprapubic cystostomy. Anatomy may be altered and the bowel may be interposed through the cystostomy access tract when we treat patients with a small symphysis pubis-umbilicus distance (<11 cm), obesity and previous abdominal surgery. Decreased bladder capacity secondary to anatomical or neurological diseases may also predispose to bowel injury with the same mechanism. Technical errors include a blind unguided puncture, a puncture of a partially distended bladder, a puncture at the event of ileus or bowel obstruction.

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Bowel injury is usually confirmed by a cystography through the suprapubic catheter, computed tomography scan or even laparoscopy.

Preventing measures to avoid bowel injury during suprapubic cystostomy include the high suspicion of the injury, the recognition of the existing predisposing factors and the avoidance of blind puncture. The later is true even if the patient is under spinal or general anesthesia and the procedure is taking place inside the operating room under cystoscopic guidance. Indeed, anesthesia may further decrease the already poor tone of the anterior abdominal wall muscles allowing a sleeve of peritoneum to slip in front of distended bladder and a bowel loop to occupy its space.

Preliminary review of patient’s imaging such as ultrasound, computed tomography or magnetic resonance imaging prior to insertion of a suprapubic tube may identify those patients who are at risk for bowel injury. Furthermore, there is evidence showing that imaging-guided access by using ultrasound or computed tomography decrease the incidence of bowel injury. Real-time ultrasound during bladder puncture allows for continuous imaging of the needle as it transverses the tissues. This allows an optimal tract to be selected and followed. Their intraluminal gas identifies the loops of colon. They show as a bright echo sometimes changing shape with peristalsis. Small bowel may not contain gas and appears as a compressible circular or linear low echo. Moving the probe along the length of the bowel will aid evaluation. Alternatives to ultrasound guidance are fluoroscopic, computed tomography and magnetic resonance imaging guidance. The later two provide the greatest degree of certainty of bowel position. Finally, open suprapubic cystostomy is warranted in elderly/frail patients with poor abdominal/bladder wall tone.

Unexpected deterioration in clinical condition following uneventful insertion of a suprapubic catheter should raise the suspicion of a bowel injury and warrants a low threshold for exploration if deemed safe. Otherwise, such a complication may lead to a high death incidence.

When bowel injury occurs and is immediately recognized repositioning of the tube and close patient monitoring is warranted. In the lieu of peritonitis or delayed diagnosis a laparotomy is indicated to surgically correct the injury.

**Bowel injury and percutaneous kidney surgery**

Bowel injuries represent a rare complication of PCNL reported in less than 1% of the case. Both large bowel and small intestine can be injured with the former being more prone to such an injury. Human anatomy, patient position and surgical technique all play a significant role for bowel injuries to occur.

A colon positioned retrorenally and a kidney puncture located lateral to posterior axillary line predispose to large bowel injury. The colon is retrorenal in approximately 0.6% of the general population. Most often is found on the left side. Patient position may also affect bowel injury as the colon is found behind the kidney more often in the prone position (up to 10%) compared to supine position (up to 2%) Other risk factors that may predispose to a retrorenal colonic displacement include chronic constipation in elderly patients, previous major abdominal or renal surgery, neurological impairment, patients with very little retroperitoneal fat, patients with mobile kidneys, patients with kyphoscoliosis, anterior caliceal puncture, horseshoe kidneys and renal fusion or ectopias.

Small bowel injury is more commonly seen on the right side. The second and the third portions of the duodenum are in danger when the right renal pelvis is perforated during dilatation, placement of the working sheath or stone removal. Advancing the needle or an instrument too deeply during the various steps of PCNL is the most common mechanism of this complication.

Although colon injury is a rare complication of the
PCNL, prevention starts with the surgeon’s high suspicion that it may happen. Identification of the risk factors and the use of ultrasonography or CT scan to delineate the anatomy prior to the procedure or the use of this imaging during the puncture reduces the incidence of this complication. Especially, when the window of entry into the collecting system is quite small, CT-guided access should be considered as the safest. Small bowel injury can be avoided with careful fluoroscopic monitoring during access, tract dilation, working sheath placement and proper endoscopic manipulations.

The diagnosis of bowel injury should be suspected when mucosa or contents are visualized during endoscopy. End-procedure or post-procedure nephrostomography can reveal the presence of either colonic or duodenal contrast. When the complications is not recognized intraoperatively it should be highly suspected if the patient has diarrhea or hematochezia, signs of peritonitis or passage of gas or feces through the nephrostomy tube or tract.

In the event of major bowel perforation, intraperitoneal fluid effluence with peritonitis and/or sepsis development or patient instability, open surgical repair and proper drainage is necessary. Small bowel resection and re-anastomosis is usually adequate. In the case of colon injury a colostomy may be necessary. However, most of the cases of colonic perforation have been treated conservatively. As the lesions are usually extraperitoneal, proper kidney, bladder and colon draining are sufficient measures for injury to heal. Kidney should be drained by either a nephrostomy tube, through a different access, or a double JJ stent while a bladder catheter lowers the back-pressure to the collecting system. The initial nephrostomy tube should be withdrawn under fluoroscopic guidance inside the colon lumen. The patient should be given broad-spectrum antibiotics and placed on a low-residue diet.

Selecting a conservative approach a 7 to 10 days period is usually adequate for healing of the colonic injury. Gradual withdrawal of the tubes is necessary during convalescence. The bladder catheter is usually removed at the 5th to 7th postoperative day provided that a retrograde nephrostomogram or a colostogram does not show any extravasation or colonic communication with the collecting system. At the same day the colonic tube is positioned outside the colon lumen to work as a temporary drain of colon vicinity for 2-3 days more and finally is removed when there is no evidence of persistent nephrocolic fistula. Conservative treatment of small bowel injury may be feasible when the lesion is small and the patient remains stable. Similarly to large bowel injuries an intentional fistula formation and waiting for a 10-15 days period under antibiotic therapy and parenteral hyperalimentation is needed. The authors declared no conflict of interest.

Conflicts of interest
References