Endourology

Duodenal perforation and a broken guidewire fragment inside the duodenum during supine percutaneous nephrolithotomy (PCNL) without adequate prior imaging: A case report

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Introduction

Percutaneous nephrolithotomy (PCNL) is a well-established treatment for complex or multiple renal stones. It is a safe procedure but associated with specific complications. Most are low-grade complications, such as postoperative fever or urinary leakage. Major complications, such as renal bleeding necessitating blood transfusion and pleura injury, are rare, while injuries to adjacent organs, such as the colon or liver, are very rare.\(^1,^2\)

In this report, we are to report a first case of duodenal perforation as a complication of supine PCNL procedure.

Case report

A 51-year-old female came to with chief complaint of right flank pain. Right kidney ultrasound revealed mild dilatation of the pelvocalyceal system with stone at the right kidney. Plain Abdominal x-ray revealed pain. Right kidney ultrasound revealed mild dilatation of the pelvocalyceal anatomy through retrograde pyelography.

The patient was placed in modified supine position. A 5-Fr ureteral catheter was placed through cystoscopy and a retrograde pyelogram was done. Percutaneous access was obtained through the infra-costal posterior calyx under fluoroscopic guidance. A stiff guidewire (0.038 inch) was placed into the lower calyx through the previous nephrostomy.

The tract was dilated up to 24 Fr using Alken’s coaxial dilators. Then a 26 Fr Amplatz sheath was inserted. A Nephroscope was inserted inside a tubular lumen with concentric folds. We realized that the nephroscope was punctured into a bowel, then we retract the nephroscope and found the distal end of the guidewire was detached and left inside the bowel.

We decided to perform open surgery conversion through flank incision to explore the kidney and to identify the injury. Intraoperatively we found a puncture site at posterior calyx of the right kidney. The stone was removed by nephrolithotomy through the puncture site. We also identify a through-and through injury from the posterior calyx to the pyelum and perforate to a structure we suspect as duodenum.

Intraoperative consultation to digestive surgery and laparatomy exploration was performed. One cm duodenal perforation at second part of the duodenum was found. The detached guidewire remnant was found inside the second part of the duodenum and immediately removed. The duodenal perforation was primarily sutured by Polyglactin 3.0. Total operative time was 4 hours with total blood loss was approximately 200 cc. Post operatively, the patient was kept on nil per os regimen. Patient was discharged on the 7th day in a good general condition.

Discussion

Bowel injury during PCNL is a very rare complication. Colon injury during PCNL accounts only 0.2–0.8% while for duodenal injury, only 3 cases had been reported so far.\(^3,^4,^5\) Small bowels are located intraperitoneally, so they are located at a certain distance from the kidney. Therefore, the risk of small bowel injury during PCNL is very low. However, second and third portions of the duodenum lie in the retroperitoneal space and are positioned antero-medially to the right kidney, so an injury during PCNL is possible, especially in supine position. This usually occurs when the renal pelvis is perforated during dilation of the tract, during placement of an Amplatz sheath, during stone removal or if a needle or an instrument is advanced too deeply.\(^5\)

In this case, we suspected that the stiff J-wire tip penetrate the fragile wall of the pyelum due to the stone, making a through-and through injury. The dilatation process through false route guidewire caused injury in the second part of the duodenum, probably due to an over advancement of Alken’s coaxial dilators or the Amplatz sheath.

In 3 previous case reports, 2 cases by Culkin et al. and Bansal et al. were able to identify duodenal injury post operatively from bilious output from nephrostomy tube and nephrostogram, while 1 other case...
by Kumar et al., the injury was able to identified intraoperatively from nephroscopic vision of concentric folds suggestive of bowel mucosa.\textsuperscript{3–5}

Our case was similar with previous case that experienced by Kumar et al., that the injury was able to identified intraoperatively from nephroscopic vision. In previous cases, duodenal injury was successfully treated by conservative management. one case performed perinephric drainage and 1 other case only placed a double J stent in retrograde fashion (Table 1).

Conservative treatment of retroperitoneal bowel injury (either colonic or duodenal) is usually successful. Different with previous cases, we recognized the duodenum perforation and detached guidewire inside the duodenum intra operatively. We decided not to continue the PCNL procedure and directly converted to open surgery procedure to remove the stone, the guidewire fragment and repair the duodenum. We also concerned with the fact that all cases with duodenal injury in PCNL procedures were lack of preoperative CT scan, including in our case. Preoperative CT scan has numerous advantages prior to PCNL procedure including identification of stone location, pelvocalyceal anatomy and identification of surrounding structure of the kidneys. Different from retrorenal colon, duodenum is normally located in the retroperitoneal space and positioned antero-medially to the right kidney. The role of preoperative CT scan in preventing duodenal injury

\begin{table}
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\caption{Comparison of previous cases of duodenal injury during PCNL.}
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\textbf{PCNL position} & Calkin et al.\textsuperscript{2} & Kumar et al. (1994)\textsuperscript{5} & Bansal et al. (pediatric patient) (2017)\textsuperscript{4} & Dahri et al. \\
\hline
\textbf{Guidewire} & Prone & Prone & Prone & Supine \\
\textbf{Dilatation technique} & Floppy (hydrophilic) & J-tip guidewire & Up to 20 Fr & Stiff guidewire \\
\textbf{Injury diagnosis} & Postoperative (nephrostogram) & Intraoperative (nephroscopy into bowel) & Postoperative (bilius nephrostomy, nephrostogram) & Sequential up to 26 Fr & Intraoperative (nephroscopy into bowel) \\
\textbf{Management} & Conservative (nasogastric tube) & Conservative (perinephric drainage, nasogastric tube, H2 antagonist, total parenteral nutrition) & Conservative (nasogastric tube, total parenteral nutrition) & Laparotomy (guidewire fragment inside duodenum), total parenteral nutrition \\
\textbf{Pre-operative CT scan} & none & none & none & none \\
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\end{table}
is not to detect duodenal location anomalies, but also to help the us in deciding direction and depth of nephrostomy puncture, relative to adjacent structures. Even though there was no previous data about the role of preoperative CT scan in reducing the risk of small bowel injuries due to the rarity of the cases, we strongly recommend preoperative CT scan in all PCNL procedure to avoid this kind of injury in the future.

**Conclusion**

Duodenal injury during PCNL procedure is extremely rare, and to our knowledge this is the first case of duodenal injury during supine PCNL. Most cases of duodenal injury can be treated conservatively. Preoperative CT scan might be needed to identify adjacent structure of the kidneys, in order to prevent organ injuries.

**Source of support**

None.

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