Case report

Duodenal perforation during percutaneous nephrolithotomy (PCNL) in a pediatric patient: A case report

A. Bansal*, V. Singh, R. Sinha

King George Medical University, Lucknow, Uttar Pradesh 226003, India

Received 13 September 2015; received in revised form 11 October 2015; accepted 12 October 2015
Available online 3 June 2016

KEYWORDS
Calculus; Duodenum; Injury; Paediatric; Percutaneous nephrolithotomy

Abstract
Introduction: Colonic perforations are known complications of percutaneous nephrolithotomy (PCNL). However, to the best of our knowledge, small bowel perforation has rarely been reported.

Observation: We report the case of a 7-year-old girl who presented with a duodenal perforation in the early postoperative period after undergoing PCNL for a calculus sized 2.5 cm in the right renal pelvis. She was successfully managed conservatively. The diagnostic workup and management are discussed.

© 2016 Pan African Urological Surgeons’ Association. Production and hosting by Elsevier B.V. All rights reserved.

Introduction
Percutaneous nephrolithotomy (PCNL) is a treatment of choice for large, complex or multiple renal stones. The most common complications are minor, like for instance postoperative fever. Major complications are rare and include hematuria and pleural injury [1]. Colonic or liver injuries are extremely rare [2,3]. Only 2 cases each of duodenal injury [4,5], one of jejunal injury [6] and one of ileal injury [7] have been reported. To the best of our knowledge, this is the first case report of a duodenal injury which occurred during PCNL in a pediatric patient from the Indian subcontinent.

Case report
A 7-year-old girl presented with bilateral flank pain. Intravenous pyelography revealed a stone sized 2.5 cm in her right renal pelvis, a stone sized 2 cm with multiple small inferior calyceal calculi in her left renal pelvis and a bladder stone sized 2.5 cm (Fig. 1). She underwent laser cystolithotomy in the first sitting followed by right-sided PCNL one week later. PCNL was performed in the prone position. A 4-Fr. ureteral catheter was placed and a retrograde pyelogram was done. Percutaneous access was obtained through the infra-costal middle-posterior calyx under fluoroscopic guidance using a
Duodenal perforation during PCNL

Figure 1  (IVP) – Stone sized 2.5 cm in the right renal pelvis, stone sized 2 cm with multiple small inferior calyceal calculi in the left renal pelvis and a bladder stone sized 2.5 cm with bilateral normal contrast excretion.

multidirectional C arm. The tract was dilated up to 20 Fr. using Alken’s coaxial dilators. Then a 24 Fr. Amplatz sheath was inserted. The stone was fragmented using the lithoclast. At the end of the procedure, stone clearance was found to be incomplete, leaving a small residual calculus. A nephrostomy tube was placed. On the second post-operative day, the output from the nephrostomy tube was bilious in color. A nephrostogram was performed and demonstrated that the tip of the nephrostomy tube had entered the second part of the duodenum (Fig. 2). So, a double-J stent (4 Fr) was inserted into the renal pelvis in a retrograde fashion, and the nephrostomy tube was relocated into the renal pelvis under fluoroscopic guidance. Postoperatively, the patient exhibited no peritoneal signs and remained afebrile. She was kept on nil per os regimen. Broad spectrum antibiotics were administered, and bowel rest was achieved by draining the gastric contents with a nasogastric tube, and by parenteral hyperalimentation. The patient was followed up with serial measurements of the abdominal girth and ultrasonography, which revealed no retroperitoneal collection. A repeat nephrostogram was done one week later showed free drainage of contrast into the bladder with no contrast extravasation (Fig. 3). The patient was allowed

Figure 2  Nephrostogram – The tip of the nephrostomy tube is located beyond the midline. The nephrostogram shows that the tip of the nephrostomy tube has entered the second part of the duodenum.

Figure 3  Nephrostogram – Free flow of contrast from the renal pelvis into the bladder with no extravasation.
to start oral food intake which she tolerated well. Eventually, her
diet was switched to a low-residue diet. The nephrostomy tube
was removed and the patient was discharged in good health with
a double-J stent in situ on post-operative day 10. According to the
modified Clavien-Dindo grading system, the grade of injury of our
patient was IIIa [1].

Discussion

Bowel injury may occur as a complication of PCNL due to anatomic
variations. The reported incidence of colon injury in the prone posi-
tion is less than 1% [8]. There is a higher risk of colonic injury in
a retrorenal colon found in 3–19% of the general population. The
management of colonic injury depends on its severity. The patient
can be managed conservatively by inserting a double-J stent and
pulling back the nephrostomy tube into the colon, provided the pen-
etration is retroperitoneal and the patient does not have peritonitis or
sepsis. Surgical repair is indicated when there is an intraperitoneal
perforation with signs of peritonitis.

Being intraperitoneal, the small bowel is located at a certain dis-
tance 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. This usually occurs when the renal pelvis is perforated
during dilatation of the tract, during placement of an Amplatz sheath,
during stone removal or if a needle or an instrument is advanced
too deeply. In 1985, Culkin et al. [4] reported one case of a nephro-
duodenal fistula complicating PCNL; in this case, the fistula was
managed conservatively.

Injury should be suspected when intestinal mucosa or contents are
visualized or when a communication with the small bowel is demon-
strated on a nephrostogram. Urgent surgical intervention is required
when the patient is unstable or when there is a large perforation.
However, when the injury is small and there are no signs of peri-
tonitis or sepsis, non-operative management may be attempted. In
our case, the second part of the duodenum was injured, proba-
dly due to an over advancement of Alken’s coaxial dilators or the
Amplatz sheath. The injury was diagnosed early when perform-
ing an antegrade contrast study through a nephrostomy tube. A
repeat nephrostogram was done one week later to check whether
there was contrast extravasation into the bowel. When there is no
contrast extravasation, the patient can be allowed to start oral food
intake observing a low-residue diet, and the nephrostomy tube can be
removed [9]. An immediate surgical exploration is necessary when
the patient shows signs of peritonitis or increasing retroperitoneal
collection/abdominal girth charting.

There are various techniques to prevent bowel injury during PCNL,
including ultrasound-guided puncture [10], observation of the
intestinal gas shadow posterior to the kidney, careful fluoroscopic
monitoring during access, tract dilatation, working sheath placement
and proper endoscopic manipulations.

Conclusion

Injury of the duodenum during PCNL is an extremely rare com-
plication. Conservative management with serial monitoring is a
safe and feasible approach; however, this should be guided by the
hemodynamic status of the patient.

Informed consent

Written informed consent was obtained from the patient’s parent
who participated in this case.

Ethical committee approval

This study was approved by the Institutional Ethical Committee.

Conflict of interest

No conflict of interest was declared by the authors.

Source of funding

None.

Acknowledgments

We acknowledge the cooperation of the residents of the urology
department of King George Medical University, Lucknow, Uttar
Pradesh, India, who participated in appointing and following up the
patient. We also appreciate the commitment and compliance of the
patient and her parents who provided the required data and attended
regular follow up.

References

M, et al. Classification of percutaneous nephrolithotomy complications
using the modified Clavien grading system: looking for a standard. Eur
I, El-Kenawy MR, et al. Colonic perforation during percutaneous
tive treatment of liver injury during percutaneous nephrolithotomy. J
complication of percutaneous nephrolithotomy. J Urol 1985;134:
528–30.
injury during relook percutaneous nephrolithotomy. Br J Urol 1994;74:
382–3.
tion during percutaneous nephrolithotripsy. Scientific World J
2005;5:496–549.
[7] Saad KSM, Hanno A, El-Nahas AR. Injury of the ileum during per-
cutaneous nephrolithotomy in a pediatric patient. Can Urol Assoc J
2014;8:204–6.
Colonic perforation during percutaneous nephrolithotomy. J Urol
Third prize: contemporary percutaneous nephrolithotripsy: 1585 pro-
T. Percutaneous nephrolithotomy with ultrasonography-guided renal
access: experience from over 300 cases. BJU Int 2005;96:875–8.