Urology Case Reports 56 (2024) 102795

Contents lists available at ScienceDirect

Urology Case Reports

journal homepage: www.elsevier.com/locate/eucr

Endourology

Thulium laser extraction of angioembolization coils in patient presenting with nephrolithiasis: A case report

Sascha Jakobs[a,*], David Stanley[b]

[a] Philadelphia College of Osteopathic Medicine-Georgia Campus, Suwanee, GA, USA
[b] Northeast Georgia Physicians Group Urology, Northeast Georgia Health System, Gainesville, USA

ABSTRACT

Renal Artery Embolization (RAE) is a first-line treatment for arteriovenous fistula complications, which may occur following percutaneous nephrolithotomy (PCNL). A rare complication of RAE is metal coil migration, which may present with nephrolithiasis symptoms, including hematuria and flank pain. Imaging like Computed Tomography (CT) Angiography can help assess the risk of hemorrhage due to coil location relative to vasculature. Subsequently, ureteroscopy can be done with thulium laser excision of the coils and lithotripsy of adherent stone. This case is one of the first to demonstrate that endourological thulium laser excision is a safe and effective management for migrated angioembolization coils.

1. Introduction

Renal artery embolization (RAE) is a first-line treatment for symptomatic arteriovenous (AV) fistulas formed as a complication of percutaneous nephrolithotomy (PCNL). In these cases, super selective catheters are used to embolize the fistula with micro coils. A potential long-term complication of RAE that occurs in less than 2 % of cases is coil migration.[1] This case describes a 66-year-old female with a prior history of RAE after PCNL who experienced hematuria with nephrolithiasis secondary to migration of the angioembolization coils into the renal collecting system.

2. Case presentation

The patient is a 66-year-old female with a history of nephrolithiasis, and prior PCNL complicated by AV fistula formation was admitted to the hospital secondary to obstructive pyelonephritis and a left lower pole collecting system stone just over 1 cm shown on CT scan (Fig. 1). Following her previous PCNL, she required subsequent selective renal artery angioembolization using metal coils due to AV fistula formation.

After initial urgent stent placement to decompress the collecting system and antibiotic therapy, she was scheduled for ureteroscopy with thulium laser lithotripsy to address her stone burden. During the procedure, the retrograde pyelogram showed an angioembolization coil in the lower pole of the collecting system (Fig. 2). Intraoperatively, blood clots were noted in the renal pelvis along with a large stone in the lower pole. Ureteroscopy confirmed the stone was protruding from the lower poly calyx. The thulium laser was employed for stone fragmentation within the lower pole calyx. During fragmentation, metal was found within the stone, which immediately raised concern for migration of the RAE coil. While fragmenting the edge of the stone that surrounded the metal, a portion of the stone was broken, exposing two metal tines projecting out of the renal tissue with the tips embedded in stone as well (Fig. 3). There were also two tines identified entering the lateral portion of the stone. At this point, the case was discontinued due to concern for potential significant renal injury caused by the metal tines of the angioembolization coils. The retrograde pyelogram at the end of the case showed the displacement of the metal tines that had erupted during the lasering of the stone (Fig. 4).

A subsequent CT angiogram of the abdomen was completed to determine the location of the coils within the renal collecting system and to ensure that the coils were not located within the vasculature (Fig. 5). After location safety was confirmed, we discussed the risks and plan with the patient to remove the stone and coil fragments from the kidney. The patient agreed to proceed with removing both the stone and the exposed coils to prevent the coils from continuing to serve as a nidus for stone formation. During repeat ureteroscopy, the bulk of the stone attached to the tines was fragmented and dusted first. After this, the tines with stones attached to them were carefully cut using the thulium laser at 0.6 J/30 Hz as close to the tissue as safely possible. After removing these pieces of metal tines, the remaining three tines, two of which were attached to the stone and one large metal tine protruding through the tissue, were lasered close to the tissue. There was no damage to renal parenchyma after lasering through the metal tines. The thulium laser

* Corresponding author. 1385 Rogers Mill Ln, Cumming, GA, 30041, USA.
E-mail address: sj1933@pcom.edu (S. Jakobs).

https://doi.org/10.1016/j.eucr.2024.102795
Received 28 May 2024; Received in revised form 2 July 2024; Accepted 8 July 2024
Available online 14 July 2024

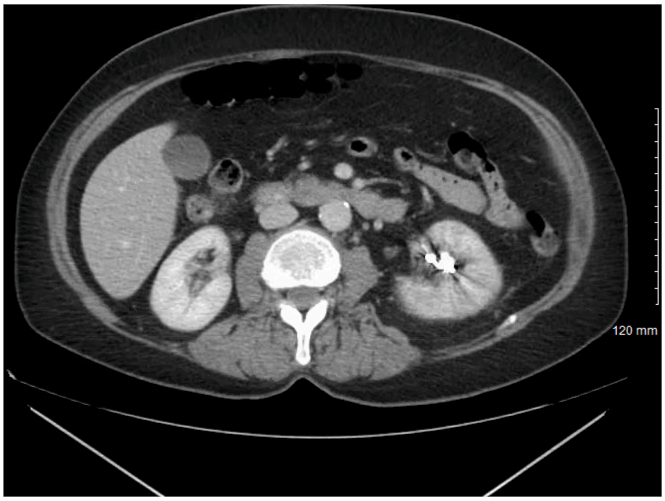

Fig. 1. Axial Standard CT showing 1cm renal stone in the lower pole of the left kidney.

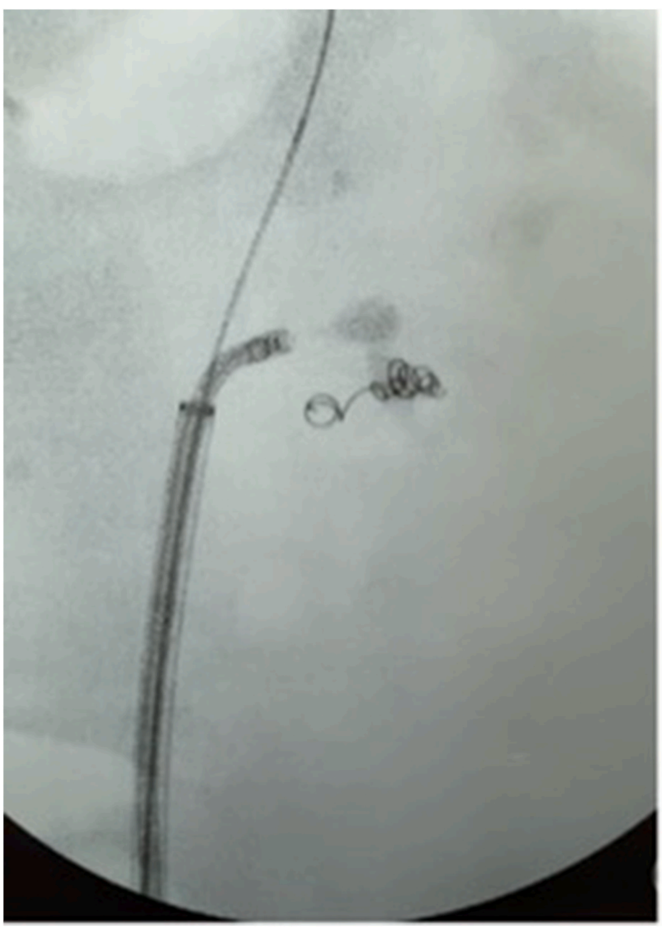

Fig. 2. Retrograde pyelogram showing angioembolization coils in the lower pole of the left kidney before the initial ureteroscopy with laser lithotripsy.

Fig. 3. Flexible ureteroscopy showing metal tines which had sprung up during lasering of the stone (White Arrow). Stone can be seen encrusted on the tips of the tines (Green Arrow). (For interpretation of the references to colour in this figure legend, the reader is referred to the Web version of this article.)

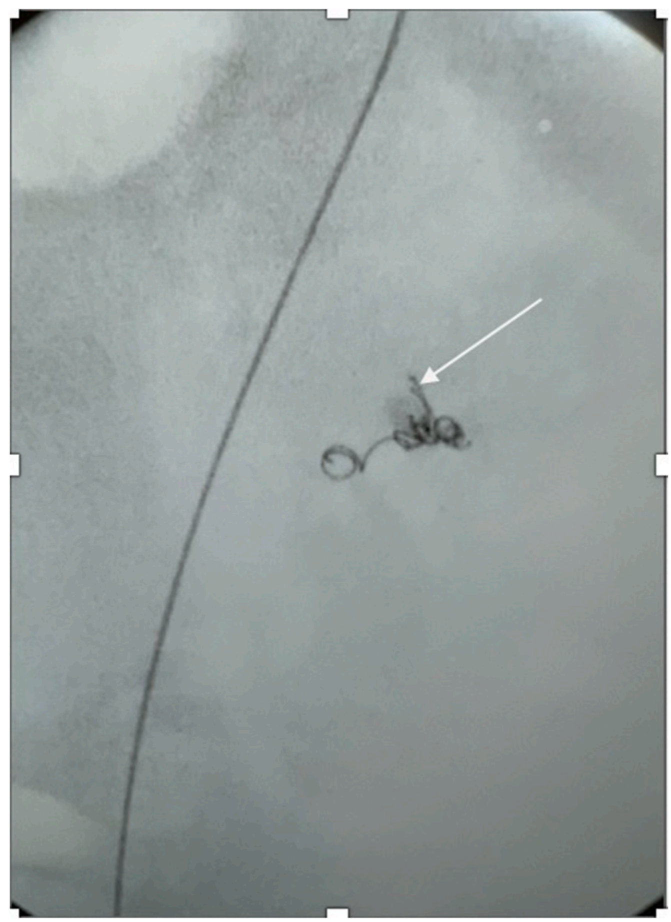

Fig. 4. Retrograde Pyelogram showing the same angioembolization coils after the initial laser lithotripsy. Arrow shows the tine which had erupted during lasering of adjacent stone now projecting up.

provided excellent hemostasis intraoperatively. There were two additional tines that looped through the tissue in the lower pole, but they were not lasered as they were not completely exposed. After this, the kidneys and ureters were examined under direct visualization with the ureteroscope, and no damage was found. Stone analysis revealed a stone composition of 50 % Calcium phosphate (apatite), 40 % Calcium oxalate monohydrate, and 10 % Calcium oxalate dihydrate with the stone formed around a metal device.

3. Discussion

Although migration of angioembolization coils is a very rare

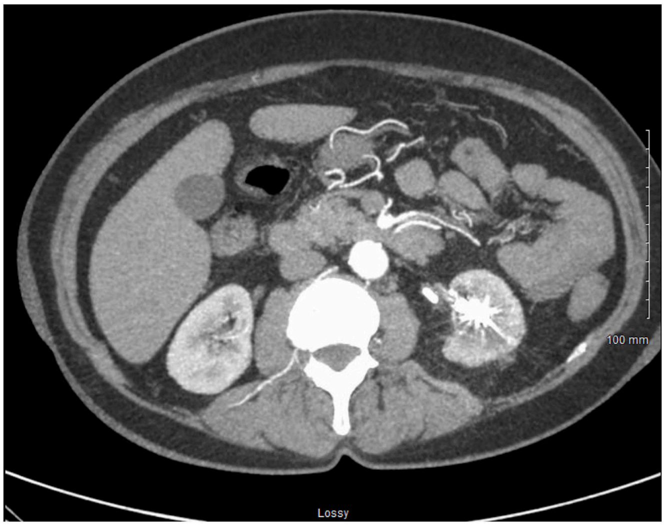

Fig. 5. Axial CT angiography showing left renal stone. There is no evidence of coils located within the vasculature.

complication of RAE, migration can occur years or decades after RAE. In the case report by Phan et al.,[2] the described patient experienced coil migration 18 years after RAE-highlighting the importance of obtaining a detailed surgical history regardless of how far in the past RAE was performed. This patient underwent RAE 8 years prior admission for obstructive pyelonephritis.

Furthermore, performing a CT angiogram of abdomen helped to stratify the risk of injury from lasering the metal coil pieces. Although there are other imaging modalities that could measure the coil burden and assess coil location, CT angiography was chosen as it would effectively identify the location of the coil relative to the vasculature. If the risk of hemorrhage or renal tissue damage was too significant, a conservative approach could have been taken where only the stones would be removed and the metal coils would be left in place. As described by Reed et al.,[3] with minor symptoms like mild gross hematuria and renal colic, expectant management with serial abdominal radiographs and the eventual spontaneous passage of the coils will lead to relief of symptoms. As this patient's coil had already served as a nidus for large stone formation and the patient had just been hospitalized with obstructive pyelonephritis, this approach would have been less than ideal.

Additionally, when it comes to different approaches to removing the eroded angioembolization coils, the literature reports multiple cases of removal using the holmium laser including Yeow et al. and Poyet et al..[4,5] Poyet et al.[4] describe an initial attempt to disintegrate the stone using Extracorporeal Shock Wave Lithotripsy, which showed negligible change to stone size, before accessing the kidneys with ureteroscopy and successfully removing adherent stones and tines using the holmium laser. Yeow et al.[5] describe two cases where the holmium laser was used successfully with retrograde access via ureteroscopy and percutaneous access via PCNL. As the previous literature mainly demonstrates success using holmium laser lithotripsy, this case provides important evidence that the thulium laser can safely and efficiently cut through the metal of RAE coils.

4. Conclusion

Migration of RAE coils should always be considered in patients with past medical history of PCNL with arteriovenous fistula presenting with symptoms of nephrolithiasis. When encountering eroded RAE coils in the collecting system, CT Angiography of the abdomen is an important imaging modality to stratify the risk of hemorrhage and coil burden. In patients with low coil burden and low risk for complications, endourologic management should be preferred over expectant management as the coils serve as a nidus for stone formation. Endourologic management with thulium laser is a safe and effective method of removing the coils, with the thulium laser being easily able to cut the metal coils.

CRediT authorship contribution statement

Sascha Jakobs: Writing – review & editing, Writing – original draft, Investigation. **David Stanley:** Writing – review & editing, Supervision, Methodology, Conceptualization.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

References

1. Sauk S, Zuckerman DA. Renal artery embolization. *Semin Intervent Radiol*. 2011;28(4): 396–406. https://doi.org/10.1055/s-0031-1296082.
2. Phan J, Lall C, Moskowitz R, Clayman R, Landman J. Erosion of embolization coils into the renal collecting system mimicking stone. *West J Emerg Med*. 2012;13(1): 127–130. https://doi.org/10.5811/westjem.2011.7.6784.
3. Reed A, Suri R, Marcovich R. Passage of embolization coil through urinary collecting system one year after embolization. *Urology*. 2007;70(6):1222.e17–1222.e18. https://doi.org/10.1016/j.urology.2007.09.007.
4. Poyet C, Grubhofer F, Zimmermann M, Sulser T, Hermanns T. Therapy-resistant nephrolithiasis following renal artery coil embolization. *BMC Urol*. 2013;13. https://doi.org/10.1186/1471-2490-13-29.
5. Yeow Y, Ortega-Polledo LE, Basulto-Martínez M, et al. Endourologic treatment of late migration of embolization causing nephrolithiasis in two patients. *J Endourol Case Rep*. 2020;6(4):278–282. https://doi.org/10.1089/cren.2020.0028.