

Endovascular Management of Iatrogenic Renal Vascular Injury Complicating Percutaneous Nephrolithotripsy: An Atypical Case Report

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Abstract

Minimally invasive urological procedures have gained in popularity and replaced open surgery in various urological procedures. Although considered minimally invasive, these procedures are not free from complications, and life-threatening hemorrhage may occur. In hemodynamic stable patients endovascular embolization allows bleeding cessation with maximal preservation of the bleeding kidney tissue. Herein we describe a case who underwent minimally invasive urological procedure (PCNL) that was complicated with bleeding due to lacerated renal vasculature and not the usual mode of pseudoaneurysm. We used superselective angiographic coil embolization to stop hemorrhage and preserved more than 50% of the affected kidney.

Keywords: Endovascular injury; Haemorrhage; Percutaneous nephrolithotripsy

Introduction

Percutaneous nephrolithotripsy (PCNL) is a safe and effective treatment modality for the management of renal calculi. This technique is associated with high success rates, decreased morbidity, and few complications. The incidence of postoperative haemorrhage complicating PCNL ranges from 0.8% to 3.0% and can be in the form of pseudoaneurysms, arteriovenous fistulas or hematomas. Management of bleeding patients includes volume resuscitation by rapid fluid and blood administration. Hemodynamically unstable patient should be rushed to the operating theater; however stable patients should undergo vascular radiographic evaluation. According to previous investigators and our own clinical experience the examination of choice in those situations is Angiography [1-6]. Following the identification of the bleeding source, final management could be elected; the treatment varies between angiographic embolization, surgical resection of the bleeding organ and reconstruction of the damaged vessel/organ. Embolization has the advantage of being minimally invasiveness in nature with the ability of super selective blood vessels occlusion [7] allowing maximal preservation of viable non bleeding tissue.

Case Report

A 65 year old male patient, chronic smoker, normotensive, non-diabetic without any past history of CAD/PAD/CVA presented to us with gross hematuria, retention of urine and fever 3 days after a successful PCNL (Rt.) procedure. His Hb had dropped from 11.3 gm% to 10 gm%, TLC was raised, Coagulation profile was normal, USG-KUB showed blood clots in right pelvocalceal system and urinary bladder. Under IV antibiotic coverage his DJ stent and clots were removed, discharged after 3 days of hospital stay with resolution of hematuria & other symptoms. Two days later he was readmitted with

similar symptoms of gross hematuria, retention of urine and lower abdominal pain. This time open vesicotomy was needed to remove the large clots (400cc) which could not be removed transurethrally and a 3 way urethral catheter was placed for irrigation. His cardiac and other systemic examinations revealed no abnormality. We did a Renal angiogram (right side) to delineate the vascular anatomy which revealed tortuous renal arteries with decreased vascularity in lower pole and pruning effect of lower segmental arteries suggestive of external compression possibly by hematoma. In this case no clear cut pseudoaneurysm could be visualized which is the usual form of vascular abnormality seen in post PCNL hematuria cases. Thus a conservative approach was adopted with an expectation that external tamponade effect will seal off the bleeding points and prevent further hematuria. He remained free of gross hematuria for five days but than again it recurred and this time we decided not to wait further with conservative approach as hematuria has endangered pt.'s life by not only causing significant blood loss (Hb had dropped from 11.3 gm% to 7 gm% which required 4 units of blood transfusion) but also by repeated urinary retention due to clots & potential threat for UTI. Repeat selective right renal angiogram was done which revealed lacerated lower segmental arteries (multiple) with extravasation of dye in to surrounding areas and lower pole was grossly devoid of any vascular markings raising the possibility of a large hematoma (no pseudoaneurysm noticed) with ineffective tamponade effect. So we planned for superselective coil embolisation of lower pole renal artery so as to completely exclude the vascular lesions from rest of the renal vascular supply and there by achieving complete vascular stasis as well as saving the maximum possible renal vasculature for residual functioning kidney.

In the cath lab, Common femoral artery in right groin was punctured and a 7 french femoral sheath was placed. Abdominal aortogram was done via 6 french pigtail catheter to demonstrate the vascular anatomy and there by ruled out any accessory renal artery as well as excluded any iatrogenic injury to extra-renal vessels. Right renal artery was engaged with 3.5X5Fr Judkins Right guiding catheter and placing it in the proximal part of renal artery, selective renal angiogram

+DSA was done to identify the exact site and type of vascular injury. The most proximal point of extravasation of dye was located following which a 2.8X2.8Fr EV3 Microcatheter was proceeded through the guiding catheter to reach that point (superselective catheterization). A 6X5 Hilal embolisation microcoil (soft platinum multiple curried) was proceeded through the microcatheter and released in the renal artery just proximal to the proximal most bleeding point. Repeat Angiogram and DSA after 3 to 4 minutes revealed in situ coil and exclusion of the vascular lesions from rest of the renal vascular supply with complete vascular stasis. The endovascular procedure was completed successfully. No procedure-related complications such as nontarget embolisation, renal infarct, or groin haematomas were encountered. Hematuria significantly reduced on the same day it self, completely cleared off by next day and pt was discharged on third day. On follow up after 1 and 3 months pt is doing fine with normal renal parameters and no further hematuria.

Discussion

Minimally invasive procedures (endourological and laparoscopic) have changed the urological practice by reducing the need for large access surgical incisions, maximizing tissue preservation, shortening significantly the recovery and hospitalization period, lowering the need for narcotics, and reducing greatly the time to full recovery. Unfortunately, these procedures are not free from complications, and life threatening hemorrhage, although rare, is one of the most serious complications that may occur. The incidence of postoperative haemorrhage complicating PCNL ranges from 0.8% to 3.0% and can be in the form of hematomas, arteriovenous fistulas or pseudoaneurysm out of which pseudoaneurysm constitutes 50 to 80% and laceration of renal vasculature is very rarely encountered [1-6]. Severe acute bleeding usually arises from the injury of anterior or posterior segmental arteries, whereas postoperative delayed bleeding complications are usually caused by interlobar and lower-pole artery lesions mainly represented by post-traumatic aneurysm or arteriovenous fistulas development [8-13]. In the majority of cases, delayed bleeding can be managed expectantly with fluid resuscitation and blood transfusion as needed. Only persistent or symptomatic hemorrhage necessitates treatment. In those who continue to bleed, angiography with embolization becomes the procedure of choice. In contrast to surgery, the endovascular management is a minimally invasive Procedure and Super selective endovascular embolization allows rapid cessation of bleeding with maximal preservation of renal viable parenchyma [6-18]. In the largest single institution series, Richstone and associates [6] found 57 cases of major postoperative hemorrhage out of nearly 4700 (1.2%) patients treated with percutaneous renal surgery, and pseudoaneurysm was the most common etiology, found in 53%, followed by renal vessel laceration and arteriovenous (AV) fistula (25% each). The vast majority of these patients (95%) were successfully treated with selective embolization (SE). Large stone size appears to be the only preoperative predictor of delayed hemorrhage and pseudoaneurysm formation after PCNL.

In another single institutional study by Hany M.A. Seif and associates [10] carried out between May 2004 to January 2011 which included 28 patients, Postprocedural renal artery injury could be accurately diagnosed using angiography in 96% (27/28) of the patients showing positive signs on angiogram and all patients who showed positive angiographic signs were treated by endovascular method successfully without recurrence of the bleeding. In the literatures Successful vascular control with a single SE procedure has been

reported to range from 89% to 100% [6-18]. In this series both the technical and clinical success were equal; however they do not always parallel each other in prior published series, due to recurrent bleeding from the initially embolized lesions [18]. Many substances can be employed for embolization [6-18] like Ethanol; Gel Foam particles; Microcoil; Detachable Balloons; N-butyl-2- cyanoacrylate. Ethanol injected intra-arterially has been used to reduce the vascularity of tumors to facilitate their surgical resection; selective arterial injection exhibit luminal thrombus with endothelial loss and varying degrees of medial necrosis, leading to its occlusion. Gel-foam embolization has several shortcomings, including: 1) reflux of embolic material into the normal arteries, particularly if a small distal vessel has not been super-selectively cannulated; 2) a larger vessel may be difficult to occlude and it may also in more generalized embolization of the arterial tree; 3) gel foam can undergo resorption and allow recannulation of the vessel. In moderate-sized vessels, steel/platinum coils or detachable balloons may also be used. Cyanoacrylic glue is a persisting and efficient occluding agent that has been successfully used for more than 20 years in the endoluminal treatment of vascular cerebral malformation. In this case, we used soft platinum multiple curried microcoil and only one such coil was necessary for the complete obliteration of the lacerated artery, thus minimising the cost of procedure.

Conclusion

Renal or retroperitoneal hemorrhage following minimally invasive urological procedures can be life threatening. Prompt fluid and blood resuscitation is needed. If the patient is hemodynamically stable, angiography is fast, minimally invasive and accurate for the diagnosis of the site and cause of bleeding, promoting pre planned super selective endovascular embolization and preventing exploratory operation that may result in organ loss. Super selective endovascular embolization should be the procedure of choice being minimally invasive and allowing maximal preservation of renal parenchyma. Using these treatment options, fast and accurate diagnosis and treatment can be achieved, avoiding difficult emergency operations for severely ill patients.

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