

# Percutaneous perirenal thrombin injection for the treatment of acute hemorrhage after renal biopsy

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## ABSTRACT

Percutaneous renal biopsy is a valuable diagnostic approach. While commonly safe, it is not without risk and the most feared vascular complications include hemorrhage, pseudoaneurysm, and arteriovenous fistula formation. We report a case of acute hemorrhage after renal biopsy that was immediately identified by ultrasonography and successfully treated with percutaneous perirenal thrombin injection. This technique may prove a useful addition to the armamentarium of any operator performing renal biopsies.

**R**enal biopsy is vital in the diagnosis of renal disease. Hemorrhage is the most serious complication, but can manifest as a spectrum from transient hematuria to asymptomatic hemorrhage and death (1, 2). The exact incidence of hemorrhage after renal biopsy varies in the literature, and much of the data is from the 1980–1990s. A recent large study reviewed 9288 biopsies between 1988–2010 and reported gross hematuria in 1.9%, hemorrhage necessitating blood transfusion in 0.9% and surgical intervention/catheterization in 0.2% (3). Traditional management of hemorrhage after renal biopsy involves either clinical observation or endovascular intervention. We offer a third option, percutaneous thrombin injection as a quick and simple method of immediate management.

## Case

A 67-year-old male patient presented with a large left renal mass requiring biopsy prior to treatment (Fig. 1). The mass was biopsied using a 16-gauge needle under ultrasonographic guidance using a Philips Epiq ultrasonography system (5 MHz probe). To access a viable part of the tumor (as most of the mass was necrotic), the biopsy was taken during inspiration under the 12<sup>th</sup> rib (Fig. 2). The initial specimen sample appeared inadequate, and in preparation for taking another sample, ultrasonography revealed a jet of Doppler flow (in keeping with active hemorrhage) into a rapidly expanding hematoma around the left kidney (Fig. 3). Due to the position under the 12<sup>th</sup> rib, direct compression with the probe to facilitate hemostasis was not possible.

A solution of human thrombin and calcium chloride was made (TISSEEL, Baxter Healthcare). Under ultrasonographic guidance approximately 2 mL was injected directly into the region of active hemorrhage through a 22-gauge needle. The needle tip was guided through the hematoma and placed approximately 2 mm superficial to origin of the arterial jet arising from the renal capsule. The thrombin induced hematoma can be seen as a slightly echogenic material. There was immediate resolution of the abnormal jet of Doppler flow (Fig. 4). No further hematoma expansion was seen on ultrasonography. The patient made an uneventful recovery and the biopsy sample was adequate for histologic analysis. As the patient remained stable, no follow-up imaging or reintervention was performed and the patient was subsequently discharged the following day.

## Discussion

TISSEEL achieves hemostasis by combining two components; the first is a sealer protein solution, which contains fibrinogen and synthetic aprotinin (fibrinolysis inhibitor), and the second a thrombin solution containing human thrombin and calcium chloride. Based on the manufacturer information, when combined, these components mimic the final segment of

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the clotting cascade forming a clot rapidly within 5–10 seconds. The thrombin solution is usually used alone. This is because active hemorrhage provides an ample supply of fibrinogen and other coagulation factors to form thrombus. This use of solely the thrombin and calcium chloride components is exactly the same as its use for the treatment of pseudoaneurysms. Thrombin acts upon fibrinogen within the blood to form fibrin, which crosslinks to form the basis for the thrombus. In our experience of treating pseudoaneurysms, we have found that using a single component is just as effective as and simpler than injecting the two components using the twin syringes supplied by the manufacturer.

The use of thrombin is wide ranging in medicine, and in vascular intervention it has been established as safe and effective in the treatment of peripheral pseudoaneurysms (5–8). Success rates of percutaneous thrombin injection for treatment of peripheral pseudoaneurysms is approximately 90% (9, 10). To our knowledge ultrasound-guided percutaneous thrombin use for active bleeding has not been reported, although theoretically should also be safe and effective. This is because the thrombin is not being injected into the vascular system and there is no chance of embolization. McAvoy et al. (11) showed thrombin to be a successful therapeutic option for endoscopic management of bleeding varices, while another study showed that thrombin can act as an effective “blood patch” to assist in endovascular repair of arterial perforation instead of a covered stent (12). Additionally, thrombin has been successfully used in treating endoleaks percutaneously via direct sac injection following endovascular aortic aneurysm repair (13).

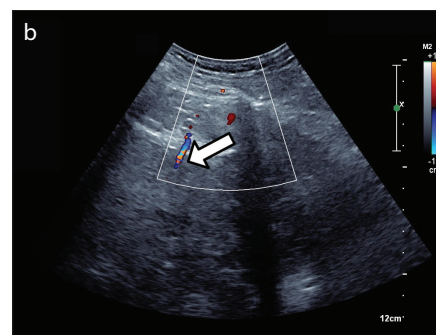
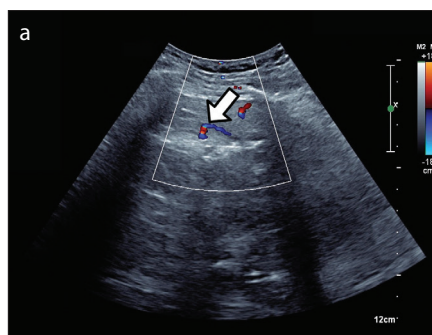
Identifying a perinephric hematoma after renal biopsy is a therapeutic dilemma because hematoma alone is not predictive of a complicated post-biopsy course (14). Tra-



**Figure 1.** Axial contrast-enhanced computed tomography image demonstrates a large left renal mass.



**Figure 2.** B-Mode ultrasonography with a C5-1 probe using a Philips Epiq ultrasonography system. Image shows a 16-gauge biopsy needle entering the kidney underneath the 12<sup>th</sup> rib.



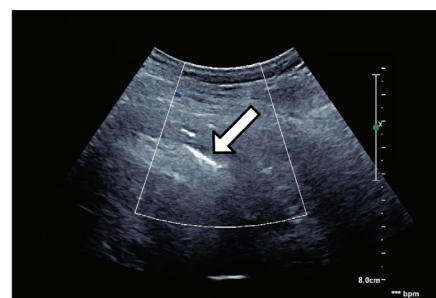
**Figure 3.** a, b. Color Doppler images (a, b) show active arterial hemorrhage (arrows) into an expanding (hyperechoic) hematoma overlying the kidney.

ditional teaching would recommend two options; first, the patient can be observed closely as the hemorrhage frequently settles spontaneously. Second, the patient may be taken to angiography to perform embolization. Angiography could have provided definitive treatment; however, this would have produced a treatment delay, would have required the use of ionizing radiation and contrast, and is not always technically or clinically successful. Most iatrogenic renal vascular injuries settle spontaneously and conservative management is frequently preferred (15).

This case is unique in that an arterial jet was seen going into a rapidly expanding hematoma. There is no definitive guidance on how to manage this situation. The patient was hemodynamically stable and could potentially have been managed conservatively. Indeed, we would rarely examine patients by ultrasonography immediately after biopsy.

Percutaneous perirenal injection of thrombin is a quick and effective alternative. As with all use of thrombin there remains the possibility of anaphylaxis.

In conclusion, renal biopsy is a commonly performed procedure with potential vascular complications. This case demonstrates a safe and effective use of



**Figure 4.** Color Doppler image shows cessation of active bleeding. Thrombin can be seen as echogenic material (arrow).

percutaneous thrombin in active renal post-biopsy hemorrhage. While this exact technique has not previously been reported to our knowledge, extensive literature on the use of thrombin supports the theory behind this application. We hope this technique may prove a useful addition to the armamentarium of any person performing renal biopsies.

#### Conflict of interest disclosure

The authors declared no conflicts of interest.

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#### Main points

- Hemorrhage is a known complication following percutaneous renal biopsy.
- This case demonstrates a novel application of ultrasound-guided percutaneous perirenal thrombin injection to successfully treat active renal hemorrhage after biopsy.
- Thrombin is a safe and effective treatment option in acute iatrogenic hemorrhage.

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