

An Unusual Case of Severe Renal Hemorrhage Following Transcutaneous Electrical Nerve Stimulation (TENS) Use for Chronic Back Pain

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Abstract

Spontaneous renal hemorrhage is a rare and potentially lethal condition. We report a case of a 77-year-old male with sudden, severe renal hemorrhage immediately following transcutaneous electrical nerve stimulation (TENS) applied to his back for chronic pain related to ankylosing spondylitis. To our knowledge, this represents a newly described potential cause of renal hemorrhage.

Keywords

Renal hemorrhage, TENS, Transcutaneous electrical nerve stimulation, Wunderlich's

Introduction

Renal hemorrhage can be a life-threatening emergency and requires timely diagnosis and appropriate management. The most common causes of spontaneous, non-traumatic renal hemorrhage (Wunderlich's syndrome) are renal neoplasms and vascular diseases of the kidney.

Transcutaneous electrical nerve stimulation (TENS) is the application of an electrical current through the skin to stimulate nerves for therapeutic purposes. TENS devices are most commonly used for acute and chronic pain, however, the efficacy of TENS for any condition remains controversial. A recent Cochrane review, which included an evaluation of all previous reviews, determined the quality of available evidence to be very low [1]. The authors were unable to conclude if TENS is harmful or beneficial for any chronic pain condition. The most common adverse event is minor skin irritation at the site of application [2-5]. The only reported serious adverse event reported was a case of severe dermatitis following sham treatment [6].

To our knowledge, spontaneous renal hemorrhage following TENS has not previously been described in the literature.

Case report

A 77-year-old man with a history of a non-ST segment elevation myocardial infarction requiring stent placement, hypertension, and ankylosing spondylitis presented to the emergency department after experiencing a sudden onset of right flank pain and presyncope. His relevant medications included ticagrelor 90 mg twice daily. On physical examination, his blood pressure was 102/58 and his heart rate was 82 beats per minute. His abdomen was soft and not distended. Tenderness was elicited by palpation of his right lower quadrant without signs of guarding. A Foley catheter was placed which did not show gross hematuria.

His bloodwork revealed hemoglobin of 97g/L and a white blood count of $20.8 \times 10^9/L$. His platelets were 276,000/mL and his INR was 1.1 with a PTT of 25 seconds. His CT demonstrated brisk arterial extravasation from the right kidney with a large subcapsular hematoma (Figure 1). No solid mass, calculus, pseudoaneurysm, or arteriovenous fistula was identified.



Figure 1: Contrast-enhanced CT of the abdomen and pelvis performed in the arterial phase shows active arterial extravasation from the lower pole of the right kidney with a large subcapsular hematoma exerting mass effect on the renal parenchyma.

He was then transferred to the interventional suite for further management. On further history he described using a popular, commercially available TENS device applied his back for chronic back pain related to his ankylosing spondylitis immediately before his onset of pain. He had used the device for one hour at its maximal intensity setting and experienced pain suddenly at the end of his treatment session. The pain was severe, markedly different than his chronic back pain, and began suddenly after using the TENS device. On angiography, there was a possible 2 mm pseudoaneurysm near the site of bleeding and two micro-coils were deployed (Figure 2). No active arterial extravasation was reproduced.

The patient remained hemodynamically stable following the procedure and was discharged home the following day.

Discussion

Spontaneous subcapsular renal hemorrhage in the absence of trauma referred to as Wunderlich's syndrome is a rare clinical syndrome. The rate of idiopathic spontaneous renal hemorrhage reports in the literature are very low, ranging from 2.5–6.7% of all spontaneous atraumatic renal hemorrhages [7–9]. The most common etiology of spontaneous non-traumatic renal hemorrhage is benign or malignant neoplasm [7, 8]. We have presented a case of spontaneous renal hemorrhage in an anticoagulated patient with no identifiable renal mass. We question whether TENS applied to the back could be a risk factor that may have precipitated the hemorrhage in this patient which has not been previously described.

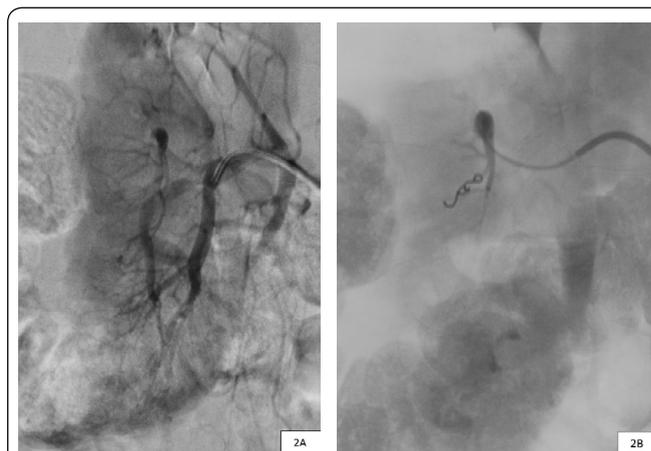


Figure 2: Image (A) shows a possible triangular 2 mm pseudoaneurysm arising from an arcuate or interlobar artery at the lower pole of the right kidney. Image (B) shows two microcoils deployed into the feeding arterial branch. No pseudoaneurysm or active arterial extravasation was identified following embolization.

The last available abdominal imaging in our patient before the renal hemorrhage was 8 years earlier and demonstrated simple cortical renal cysts with no other lesions. The patient was anticoagulated with ticagrelor 90 mg twice daily. The most important common side effect of antiplatelet therapy is bleeding [10]. However, the risk of retroperitoneal hemorrhage is very low. There are few case reports of subcapsular renal hemorrhage with antiplatelet therapy [11, 12]. Nonetheless, anticoagulation is a rare cause of Wunderlich syndrome [13]. The patient was not taking any other medications that would predispose him to renal hemorrhage, such as dual antiplatelet therapy or immunosuppressive agents. Although ankylosing spondylitis can have renal involvement it is more commonly intrarenal pathologies. As far as the authors are aware it is not associated with subcapsular renal hemorrhage [14]. Altogether, the history is not convincing for a cause other than TENS use. The patient had only been using the TENS device for 5 days. The new character of the patient's pain, and rapid onset immediately following TENS use raise the possibility of a TENS related cause for the renal hemorrhage.

A rare cause of spontaneous renal hemorrhage with potentially related mechanism of injury is extracorporeal shockwave lithotripsy. Gross hematuria is common with extracorporeal shockwave lithotripsy, but subcapsular hemorrhage occurs in less than 1% of cases [15, 16]. However, when imaging is routinely performed after extracorporeal shockwave therapy, incidence rates of subcapsular hematomas can be as high as 20–25% [17]. The mechanism of damage from extracorporeal shockwave is unclear, however hematoma rates may be higher with machines that exert greater pressure on the renal capsule [18]. A similar mechanism may occur with forceful rhythmic contractions of the back musculature during TENS device use, causing an increase in renal capsule pressure. Alternatively, the force could have been sufficient enough to cause a mechanical shearing force with subsequent rupture of a vulnerable artery or existing small unseen angiomyolipoma or cyst, resulting in subcapsular hemorrhage in this patient.

Classically, patients with spontaneous atraumatic renal hemorrhage present with Lenk's triad of severe flank pain, palpable flank mass and hypovolemic shock [7, 19]. Other common signs and symptoms include anemia, shock, and hematuria [7]. Our patient presented with two of the classic symptoms: flank pain and grade I shock. He was also anemic. He did not have a palpable abdominal or flank mass, or hematuria.

Timely recognition and diagnosis of renal hemorrhage is crucial for proper management. CT scan is the initial modality of choice for diagnosis and to characterize the etiology and underlying secondary causes of hemorrhage [13, 20]. CT scan has been increasingly utilized as the initial investigation to facilitate early intervention [7]. Transarterial embolization is the most common intervention for Wunderlich's syndrome. Most patients treated with transarterial embolization will not need any further management, which was the case for our patient who remained hemodynamically stable following the procedure and was discharged home the following day.

Conclusion

Wunderlich's syndrome is a rare but clinically significant condition. The mechanism of renal injury with application of a TENS machine is unclear, and possibly co-incidentally related to spontaneous renal hemorrhage in our patient. However, given the temporal association in the presented case it is an important consideration as a rare complication of TENS machine use, perhaps more specifically in anticoagulated patients. This case outlines a newly described potential cause of spontaneous renal hemorrhage and demonstrates the importance of timely recognition and diagnosis for successful management of this condition.

Conflict of Interest

The authors declare no conflict of interest.

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