



*Genitourinary and Gynecologic Imaging* Case Report

## Partial Renal Transplant Torsion as a Cause of Abdominal Pain

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### ABSTRACT

Allograft torsion is a rare but potentially devastating outcome of renal transplantation. Patients typically present with an acute onset of abdominal pain, though symptoms are non-specific and can easily be missed in favor of more common diagnoses. Imaging, in particular ultrasound and computed tomography, can aid in the diagnosis of renal transplant torsion by demonstrating characteristic features, and once recognized immediate surgery is typically performed in an attempt to salvage the allograft. However, renal transplant torsion needs not be an acute event; patients can instead present with chronic, waxing, and waning symptoms if the allograft undergoes partial or intermittent torsion. The aforementioned characteristic imaging findings may not be present in this situation. It is essential to recognize partial, intermittent torsion as well, for which imaging can again play a role.

**Keywords:** Torsion, Transplant, Kidney, Rejection

### INTRODUCTION

Torsion of a renal transplant is a rare phenomenon that occurs when the allograft twists on its vascular pedicle. Acute torsion generally has a prompt onset, and immediate surgery is indicated. Ultrasound can be used to support a diagnosis of renal transplant torsion, often displaying alterations in the renal arterial flow rate and resistive indices. Importantly, however, in cases of partial or intermittent torsion, symptoms may be episodic rather than acute. In addition, the classic ultrasound findings may be absent. We report a case of a 36-year-old male who had partial, intermittent torsion of his transplanted kidney.

### CASE REPORT

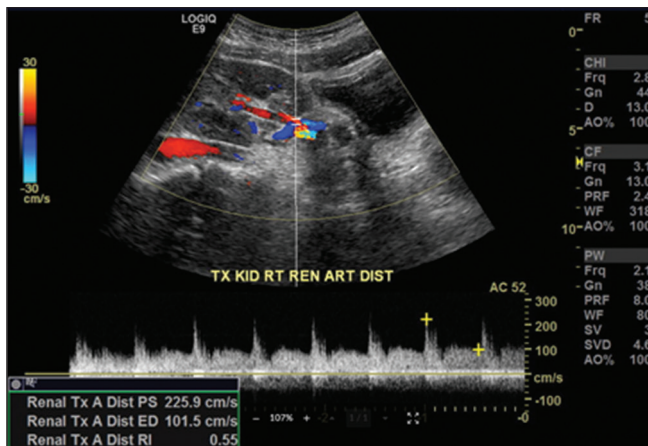
The patient is a 36-year-old male with a medical history of Type I diabetes mellitus, hypertension, and end-stage renal disease who received a living unrelated renal transplant. He had been on hemodialysis for 2 years before the transplant. As the surgery was performed laparoscopically with robotic assistance, the transplanted kidney was placed in an intraperitoneal position. Ultrasound performed shortly after transplant of the transplanted kidney showed it posterior and superior to the bladder, without evidence of hydronephrosis [Figure 1]. Renal artery velocity was elevated across the proximal, mid, and distal portions up to 269 cm/s, thought to be secondary to post-operative edema at the anastomosis, and interlobar resistive indices were

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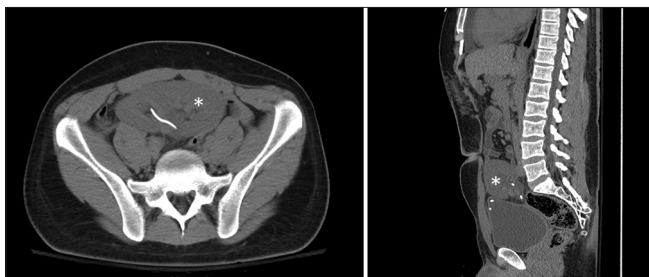
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low to normal and ranged from 0.46 to 0.60. Two months later, the patient presented with vomiting, thought to be secondary to gastroparesis. Axial and sagittal non-contrast computed tomography (CT) scans at this time showed the transplanted kidney in the non-torsed midline position oriented horizontally and at the anterior superior aspect of bladder [Figure 2]. No etiology for vomiting was found on the CT.

Three months later, the patient presented with severe abdominal pain, vomiting with a serum creatinine of 3.1, a significant elevation from his baseline. A transverse ultrasound of the transplanted kidney now showed it posterior to bladder [Figure 3]. It also showed new mild-to-moderate hydronephrosis. Renal artery velocity ranged from 122 cm/s to 166 cm/s, and interlobar resistive indices ranged from 0.46 to 0.53. Likewise, CT showed



**Figure 1:** A 36-year-old before transplant kidney partial torsion. Longitudinal post-operative ultrasound showing the transplanted kidney posterior and superior to the bladder, without evidence of hydronephrosis. Renal artery velocity was mildly elevated which may be related to posttransplant edema at the anastomosis. Interlobar resistive indices were low to normal and ranged from 0.46 to 0.60.

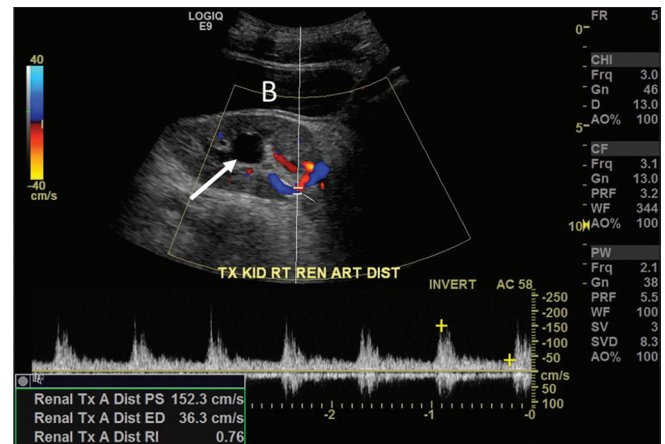


**Figure 2:** A 36-year-old before transplant kidney partial torsion. Axial and sagittal non-contrast computed tomography image shortly after surgery showed the transplant kidney (asterisk) in a non-torsed position in the midline, oriented horizontally and at the anterosuperior aspect of bladder. A ureteral stent is present.

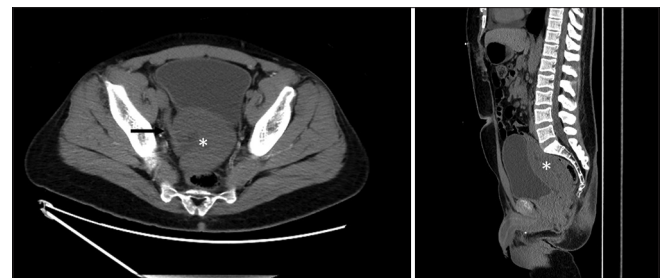
the transplanted kidney in a different position, more inferiorly located, posterior to the bladder and in a vertical orientation [Figure 4]. The vascular pedicle also appeared stretched, though not to such a degree to cause a change in the spectral Doppler. In retrospect, a change in orientation of the transplanted kidney was noted when compared to his previous CT. This change in axis was consistent with partial transplant kidney torsion. The creatinine came back down to his baseline with hydration. His pain and vomiting improved and he was discharged in stable condition with a diagnosis of gastroparesis, though it can be hypothesized that either the change on position of the transplanted kidney/partial torsion could also have contributed to the patient's abdominal pain. Afterward, the patient returned with similar symptoms multiple other times, and the transplant kidney was also seen to be in varying positions on imaging.

## DISCUSSION

Renal transplant failure can occur due to a wide range of etiologies, including but not limited to, vascular



**Figure 3:** Transplant kidney partial torsion. Transverse ultrasound of the transplanted kidney shows that it is located posterior to bladder ("B"). New mild-to-moderate hydronephrosis is seen (arrow).



**Figure 4:** Transplant kidney partial torsion. Axial and sagittal non-contrast computed tomography image shows the transplanted kidney (asterisk) in a posterior position to the bladder. The vascular pedicle appears stretched (arrow).

complications. Vascular etiologies of renal transplant failure include renal artery thrombosis, renal artery aneurysm, renal vein thrombosis, and allograft torsion.<sup>[1]</sup> Torsion occurs when the grafted kidney rotates around its vascular pedicle, compromising perfusion.<sup>[1]</sup> Only 24 cases of renal allograft torsion have been reported in the literature to our knowledge, though the true number of cases is likely unknown because many cases may go unreported or unrecognized.<sup>[2]</sup> Placement of the transplanted kidney in an intraperitoneal position, rather than the standard extraperitoneal position, can enhance mobility of the allograft, further contributing to its potential to torse.<sup>[3]</sup> Another predisposing risk factor is immunosuppressive use after transplant, which can prevent the formation of adhesions and enable intra-abdominal movement of the grafted kidney.<sup>[4]</sup> Intraperitoneal transplantation of a renal allograft is often done when simultaneous kidney-pancreas transplantation is performed.<sup>[2]</sup>

Torsion of renal transplants is a rare complication for which surgical detorsion is generally promptly indicated to preserve function of the transplanted kidney.<sup>[5]</sup> Torsion has been reported to occur as early as 1 day after transplant, up to 10 years after.<sup>[4]</sup> Failure to recognize renal allograft torsion can result in dire consequences, including necrosis, rejection, and possible transplant nephrectomy.<sup>[5]</sup>

Renal transplant torsion can be either acute or gradual,<sup>[6]</sup> the latter being most likely for our patient. Presenting symptoms of renal graft torsion can include fever, nausea, vomiting, abdominal pain, acute kidney injury, anuria, elevated creatinine, and edema.<sup>[5,7]</sup> These non-specific symptoms can also be misattributed to other disease processes, as seen in our patient. Due to these vague presenting complaints, patients are often misdiagnosed with more common causes of transplant failure, such as rejection or vascular thrombosis.<sup>[1]</sup> Imaging can, therefore, play a key role in making a diagnosis.<sup>[5]</sup>

There is currently debate as to which imaging modality best visualizes renal allograft torsion. The most suggestive finding is a change in axis of the allograft seen on CT or magnetic resonance imaging (MRI)<sup>[5]</sup> and less commonly on nuclear imaging;<sup>[3]</sup> previous imaging studies for comparison are useful. Contrast-enhanced imaging can demonstrate characteristic “kinking” of the renal artery.<sup>[5]</sup> Ultrasound can also show differences in transplant kidney positioning, but the difference may be less obvious with the smaller field of view of imaging. Doppler can demonstrate alterations in the arterial flow rate, including increased resistive index (RI) (peak systolic velocity-end-diastolic velocity/peak systolic velocity), or lack of Doppler flow.<sup>[5,6]</sup> However, the RI does not necessarily have to be drastically different during torsion, especially partial torsion, as seen in our case. In addition, other more common complications of renal transplantation (including rejection, hydronephrosis, and venous obstruction) can also present with increased RI.<sup>[6]</sup> Other

possible findings on ultrasound include a parvus tardus post-stenotic waveform pattern with decreased acceleration/prolonged acceleration time.<sup>[8]</sup> Complete torsion can demonstrate progression from no diastolic flow to reversed diastolic flow<sup>[2]</sup> or complete absence of flow.<sup>[6,7]</sup> Torsion can also obstruct the ureter, which can be evidenced by the presence of hydronephrosis or renal pelvic wall thickening.<sup>[9]</sup> It is important to note that cases of gradual or partial torsion may not demonstrate these classic findings on ultrasound.<sup>[6]</sup> For this reason, and because our patient’s symptoms occurred episodically, we hypothesize his renal transplant underwent partial, intermittent torsion. One potential underlying reason for torsion was a large iliac fossa, which creates a potential space in which torsion can occur.<sup>[4]</sup>

In some cases, ultrasound with Doppler is the only imaging necessary to make a diagnosis, with findings noted above, and reported sensitivity of 92% and specificity of 95% in general for vascular complications.<sup>[8]</sup> However, some authors argue cross-sectional imaging (CT and MRI) can better assess the axis of the graft, as well as assess secondary changes such as edema and perinephric fluid.<sup>[1]</sup> Imaging at times can fail to make the diagnosis of torsion, and some cases are diagnosed during laparotomy for presumed renal infarction.<sup>[3]</sup>

Once renal graft torsion is recognized, emergency laparotomy with detorsion is generally performed. However, because the torsion was only partial in this case, surgical intervention was not immediately necessary. As a result, a presumptive diagnosis of torsion was made based on imaging in this case, rather than a definitive diagnosis during surgery. The outcome of the operation can be determined by comparing creatinine values post-detorsion to baseline values.<sup>[1]</sup> Some authors believe a biopsy should be done at the time of detorsion, as risk of acute cellular mediated rejection is increased in an ischemic kidney.<sup>[4]</sup> When the diagnosis of torsion is in question, some authors advocate for serial ultrasound imaging, while others advise emergency laparotomy.<sup>[7]</sup>

Outcomes after renal graft torsion can vary: One study of 16 cases of torsion reported 7 (44%) of grafts were successfully detorsed and salvaged, 3 (19%) grafts were detorsed but lost, and 6 (38%) patients underwent nephrectomy.<sup>[7]</sup> Some authors suggest the use of prophylactic nephropexy to prevent torsion.<sup>[7]</sup> However, this is controversial because it is associated with higher rates of hemorrhage.<sup>[1]</sup> Prophylactic nephropexy may be recommended only for transplanted kidneys that have a relatively high probability of torsion, such as those with a pedicle longer than 5 cm or those with a >2 cm difference between the length of the renal artery and vein.<sup>[2,3]</sup>

## CONCLUSION

Renal allograft torsion is an uncommon complication of renal transplantation, and failure to diagnose it can result in

loss of the graft. Immediate surgical detorsion is generally indicated once torsion is recognized. On the other hand, partial torsion may present with more gradual symptoms and may contribute to symptoms of pain, nausea, and vomiting, as seen in our patient. It is important to compare the position of the transplant to prior imaging, as prompt recognition is essential.

#### Declaration of patient consent

Patient's consent not required as patient's identity is not disclosed or compromised.

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#### Conflicts of interest

There are no conflicts of interest.

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