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## Case Report

# Magnetic resonance imaging findings in ovarian torsion post in vitro fertilization

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## ARTICLE INFO

## Article history:

Received 22 March 2018

Revised 18 July 2018

Accepted 3 August 2018

Available online 13 September 2018

## Keywords:

Ovarian torsion

In vitro fertilization

Pregnancy

Complication

## ABSTRACT

Patients who get pregnant after being treated with in vitro fertilization (IVF) are at significantly increased risk of ovarian torsion compared to the general population and also in comparison to patients who get pregnant normally [1,2]. The risk is further increased in patients who develop ovarian hyperstimulation syndrome [1]. This possibility should be considered in this group of patients presenting with acute abdominal pain and immediate management should be commenced. Here, we report 2 patients who received treatment for infertility with IVF and developed ovarian torsion and we discuss their management including the imaging workup. The first case is a 34-year-old woman at 11 + 3 weeks of gestation after IVF who presented with a 12-hour acute right lower abdominal pain with nausea and vomiting. She underwent an ultrasound examination and then further evaluated with magnetic resonance imaging which showed asymmetric enlargement of the right ovary and stromal edema and a diagnosis of ovarian torsion was made. The patient underwent laparoscopic detorsion and the ovary was salvaged. The second case is a 33-year-old woman at 9 weeks of gestation after IVF who presented with intermittent abdominal pain, vaginal bleeding, and nausea and vomiting for 5 days but became worse on the fifth day. Ultrasound and subsequently magnetic resonance imaging were performed which confirmed hyperstimulation syndrome. Abnormal location of the left ovary anterior to the uterus with higher volume as well as the clinical progression raised the possibility of ovarian torsion and prompted a diagnostic laparoscopy which showed right ovarian torsion and detorsion was performed.

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## Introduction

It is estimated that about 2.7% of surgical emergencies in women are comprised by ovarian torsion. Up to 80% of these cases occur in patients who are at the reproductive age. Over-

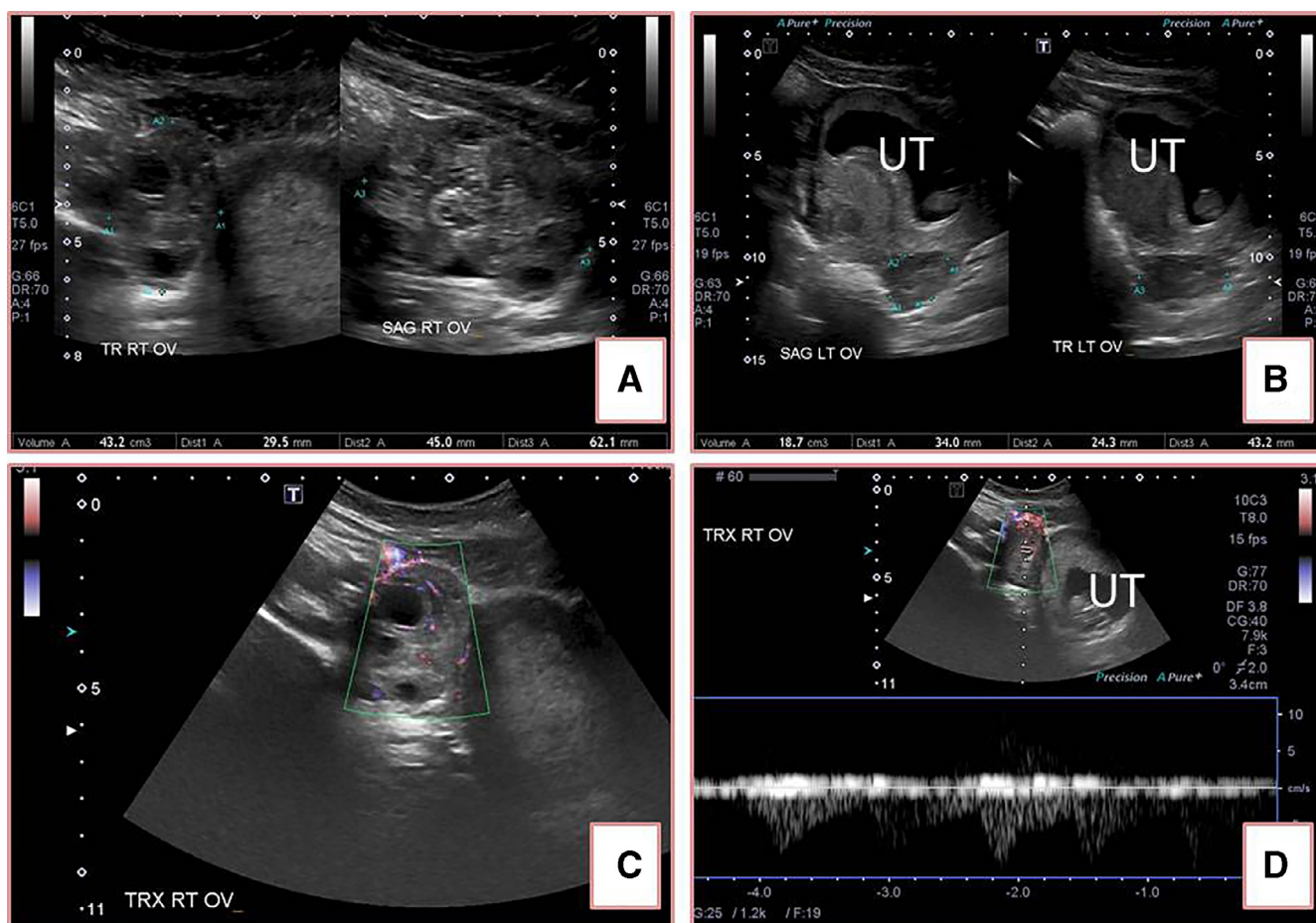
all, the incidence of ovarian torsion during pregnancy is about 1 in 5000 pregnancies. Currently many women with infertility are managed with in vitro fertilization (IVF) and there has been an associated increased risk of ovarian torsion to 0.2%–0.46%. This risk is further increases to up to 33% in patients who developed ovarian hyperstimulation syndrome

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<https://doi.org/10.1016/j.radcr.2018.08.003>

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**Fig. 1** – Patient 1: 34-year-old female at 11 + 3 weeks of gestation after in vitro fertilization. Pelvic ultrasound images: (a and b): demonstrate asymmetric enlargement of the right ovary (volume: right ovary 43.2 cm<sup>3</sup>, left ovary 18.7 cm<sup>3</sup>). (c and d): Color Doppler interrogation demonstrate presence of arterial and venous flow within the right ovarian parenchyma with normal spectral flow in (d) gravid uterus (UT). (Color version of figure is available online.)

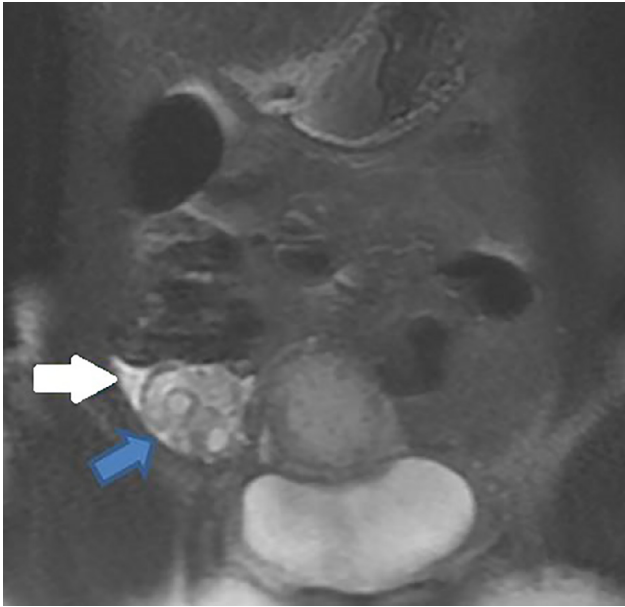
and in pregnant women. Here, we report 2 cases that received treatment for infertility with IVF and developed ovarian torsion in the first trimester.

### Case 1

A 34-year-old female, gravida 1, para 0, at 11 + 3 weeks of gestation after IVF for a male factor infertility who presented to the urgent care unit with a 12-hour sudden onset right lower quadrant abdominal pain. This is associated with nausea and vomiting. She is known to have ulcerative colitis and underwent colonoscopy since 2 years but no surgical intervention was carried out. She denies any fever, diarrhea, and bloody stools. There has been no bleeding from the vagina. While she is feeling a bit dizzy when she presented to the hospital; she denies any syncope or presyncope. She describes the pain as a constant pain that is exacerbated with movement. She struggled to characterize the pain but did describe it as a “twisting pain.” She was evaluated by a gastroenterologist who referred her to surgical care to evaluate for the possibility of acute appendicitis. Abdominal ultrasound was performed which re-

vealed a single viable intrauterine pregnancy with ultrasound estimated gestational age of 11 weeks and 3 days. It has also demonstrated an enlarged right ovary at the maximum area of tenderness which measures 43 cm<sup>3</sup> in volume; however, arterial and venous flow was depicted on Doppler ultrasound (Fig. 1). Small amount of free fluid in the right side of the pelvis was seen. The left ovary measured 18 cm<sup>3</sup> in volume. The appendix was not visualized. The examination was interrupted multiple times due to extreme tenderness and nausea. Magnetic resonance imaging (MRI) was suggested to further evaluate her pain. The MRI examination confirmed the asymmetric enlargement of the right ovary which sits higher up within the right lower quadrant and demonstrates higher T2 signal intensity compared to the contralateral ovary (Figs. 2 and 3) suggestive of stromal edema and lead to a diagnosis of right ovarian torsion. Adjacent to the right ovary, a tubular structure was seen which demonstrated inflammatory changes and possibility of tortorted part of the right fallopian tube was raised. The appendix was not identified with confidence but there were no inflammatory changes in the right lower quadrant.

Immediately after the MRI, the patient was taken to the operating room by the gynecology team with the surgery team being in standby. Intraoperatively, the right ovary was seen



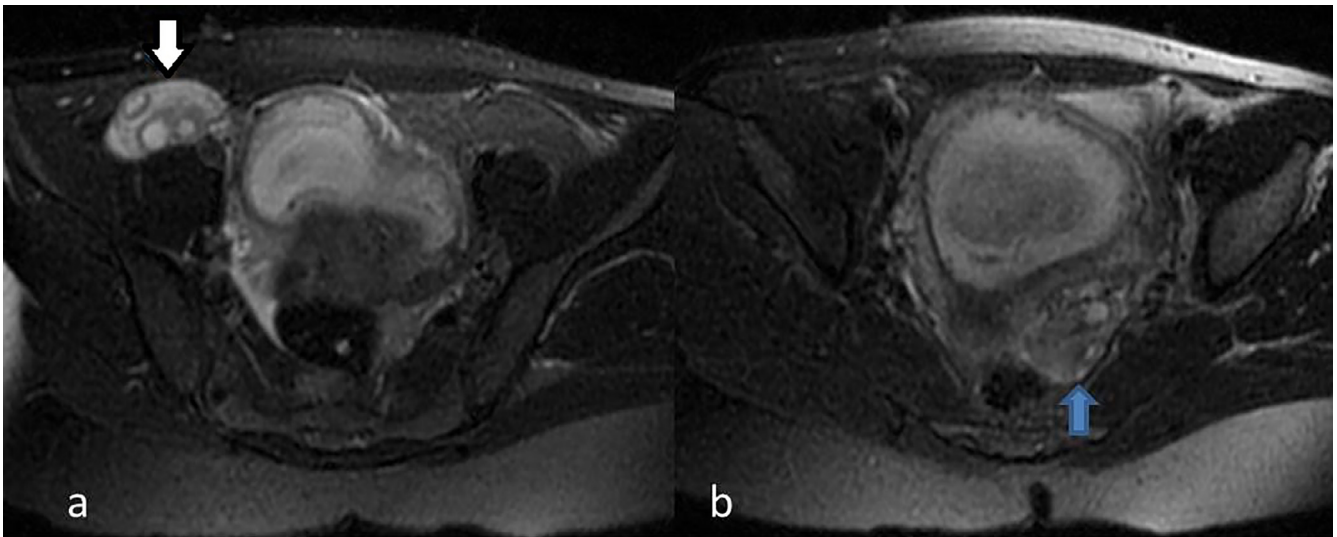
**Fig. 2 – Patient 1: Coronal T2-WI of the pelvis demonstrates swollen right ovary with stromal edema manifested by hyperintense T2 signal of the stroma and prominent follicles (blue arrow), free fluid in the right iliac fossa (white arrow). (Color version of figure is available online.)**

and was clearly found to be torsed. The tubular structure in the pelvis that was commented on in the MRI was determined to be the fallopian tube which did look quite abnormal as result of torsion. However, both the ovary and the fallopian tube were viable and therefore after the ovary was detorted they were deemed to be salvageable and left in situ. The intraoperative examination showed normal appendix.

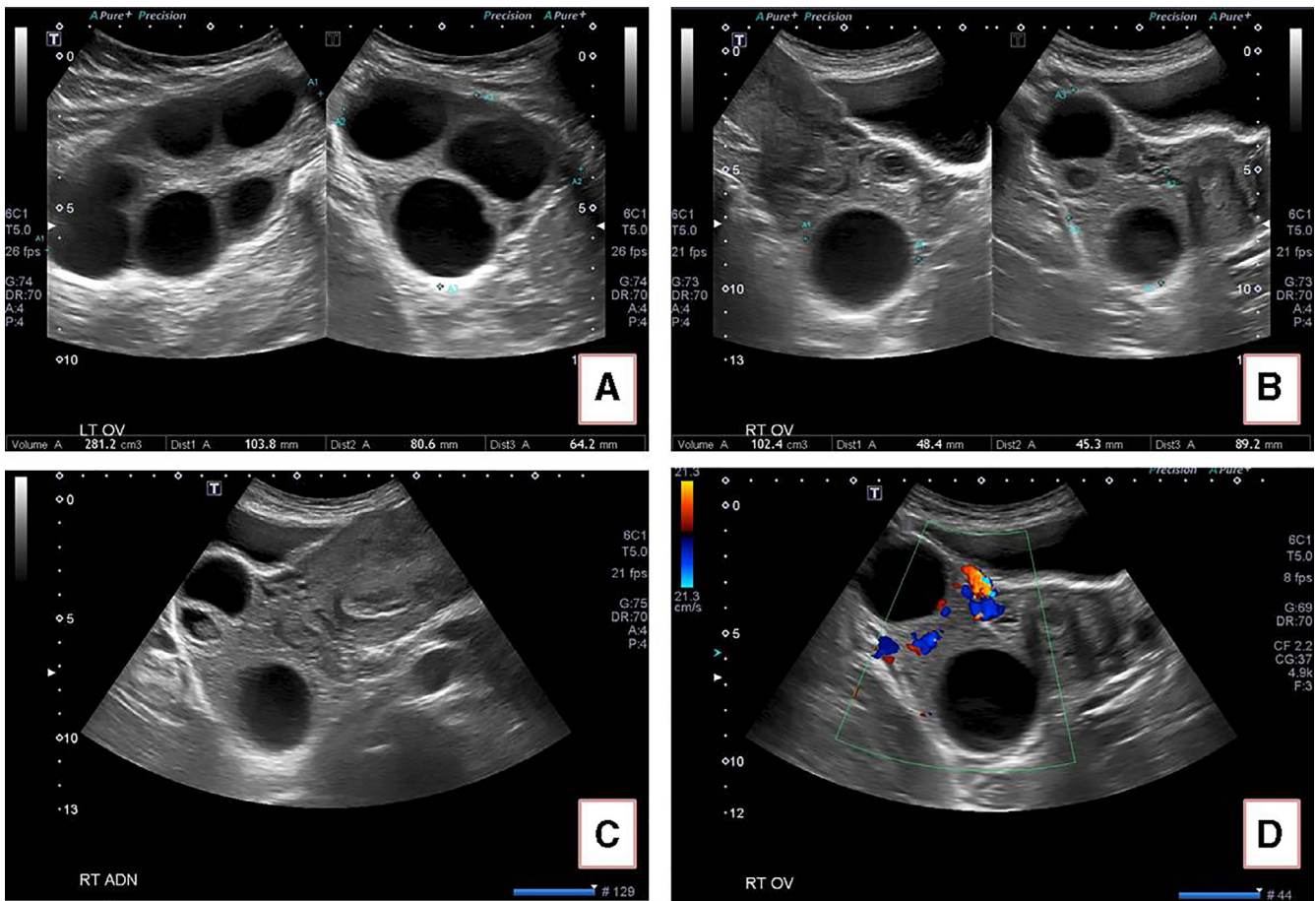
Postoperatively, the patient did quite well and the pain has completely disappeared. She continued her pregnancy normally till the time of writing this article.

## Case 2

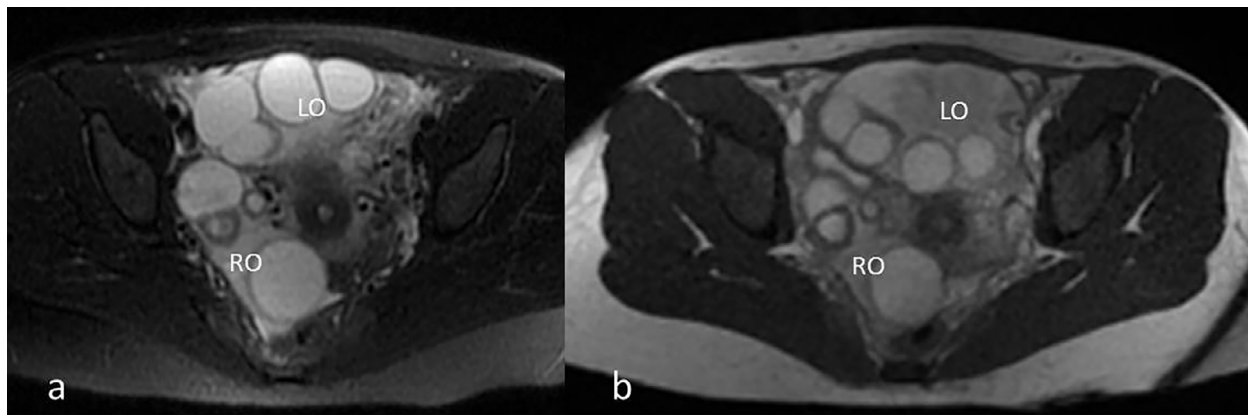
A 33-year-old female, gravida 3, T2, para 0, A0, L2 at approximately 9 weeks and 3 days gestational age, who presented with severe abdominal pain which started since 5 days and was intermittent during the last 4 days and became continuous during the fifth day, when she came to the hospital. She complained of nausea and vomiting on the fifth day. At the beginning, the pain was centered at the right upper quadrant but during the last 24 hours, it was mainly centered at the right lower quadrant. She had a few episodes of fresh vaginal bleeding with no clots. On examination, the vital signs were within normal limits. There was diffuse tenderness over the abdomen with no rebound tenderness. The blood tests demonstrated leukocytosis of  $17 \times 10^9/L$  (normal range  $4-11 \times 10^9/L$ ) on the day of admission. She underwent an abdominal ultrasound which demonstrated a single viable intrauterine gestation with a small subchorionic hemorrhage. Both ovaries were enlarged with multiple bilateral ovarian cysts. The left ovary measured  $281 \text{ cm}^3$  and the right ovary measured  $102 \text{ cm}^3$  in volume (Fig. 4). Trace of free fluid was also seen and the appendix was not visualized. The findings were consistent with ovarian hyperstimulation syndrome. The patient was further evaluated with pelvis MRI, which confirmed the ultrasound findings and demonstrated abnormal location of the left ovary anterior to the uterus (Fig. 5), which together with the increased volume raised the possibility of ovarian torsion. The appendix was normal.



**Fig. 3 – Patient 1: Axial T2-weighted images of the pelvis with fat saturation. The right ovary is enlarged and demonstrates T2 hyperintense signal of the stroma (white arrow in a), in comparison to the normal left ovary which demonstrates normal T2 signal intensity (blue arrow in b). The right ovary was proven to be torsed in laparoscopic surgery. (Color version of figure is available online.)**



**Fig. 4** – Patient 2: 33-year-old female at approximately 9 weeks and 3 days gestational age after in vitro fertilization. Pelvic ultrasound images demonstrate massive asymmetric enlargement of both ovaries with multiple bilateral prominent follicular cysts representing ovarian hyperstimulation syndrome (a). The left ovary measures 281 cm<sup>3</sup> in volume and the right ovary measures 10 cm<sup>3</sup> in volume (a and b). Color Doppler interrogation demonstrates presence of flow within the right ovary (d), however, intra-operatively, the right ovary was torsed and the left ovary was normal despite being larger in volume. (Color version of figure is available online.)



**Fig. 5** – Patient 2: (a) axial T2 WI with fat saturation and (b) T2 WI without fat saturation. Both images demonstrate massively enlarged ovaries (RO and LO) with multiple follicular cysts and stromal edema representing ovarian hyperstimulation syndrome post IVF. The asymmetric enlargement of the left ovary (LO) and its location anterior to the uterus raised the possibility of left ovarian torsion. Intra-operatively, the left ovary was normal and the right ovary was torsed. In ovarian hyperstimulation syndrome, the diagnosis of ovarian torsion remains challenging even with MRI.

The patient was preceded with diagnostic laparoscopy on the same day after the MRI examination, which showed no evidence of torsion of the left ovary but demonstrated ovarian torsion of the right ovary both at the level of the infundibulopelvic ligament as well as the utero-ovarian ligament. It was successfully detorted and appeared salvageable. She did well postoperatively and was discharged in a good condition. She carried out with her pregnancy with no complications till the time of writing this article.

## Discussion

Although rare, ovarian torsion is an acute surgical emergency with serious complications if unrecognized and if not treated in a timely manner. During pregnancy, this condition has the highest incidence during the first trimester but has been also reported even in the third trimester [1]. It occurs when the ovary twists around the infundibulopelvic and/or the ovarian ligament with associated compromise of the vascular flow to the ovarian tissue. The right ovary is thought to be at a higher risk of torsion which could possibly be due to the presence of the sigmoid colon on the left side of the pelvis, which gives limited space for free motion of the left ovary [3,4]. The risk factors of ovarian torsion include enlarged ovary, ovarian tumors, ovarian hyperstimulation syndrome, and pregnancy [1,2,4,5].

Nowadays, IVF has become a common procedure for patients with infertility. This has been associated with an increased risk of ovarian torsion of about 0.2% and the risk is higher in patients who develop ovarian hyperstimulation syndrome and in patients who get pregnant [2,6]. One of the main issues with those patients is that the signs and symptoms of ovarian torsion are nonspecific and they usually present with abdominal or pelvic pain, nausea, vomiting, fever, and leukocytosis. The picture is more difficult in patients, who have ovarian hyperstimulation syndrome as they may have similar manifestations [2,6].

The imaging work up of those patients play a critical role in diagnosing ovarian torsion and excluding other differential diagnosis like acute appendicitis and renal/ureteric stones which may present similarly. Ultrasound is the first imaging modality of choice due to its wide availability and safety in pregnancy as well as it is the investigation of choice to evaluate the fetal viability [1]. MRI has a complimentary role in further evaluating challenging cases, when the appendix is not visualized and no other diagnosis could be made on ultrasound. On both imaging modalities, the asymmetric enlargement of the ovary is the main diagnostic finding [1,7] but this is not true in patients with ovarian hyperstimulation syndrome [7]. The location of the ovary between the uterus and the urinary bladder is another imaging finding of ovarian torsion [6,7]. As described in our second patient, the asymmetric ovarian enlargement and abnormal location prompted the surgical intervention but the left ovary was normal intra-operatively and the right ovary was tortured. So, in patients with ovarian hyperstimulation syndrome, the asymmetric enlargement is not enough to call ovarian torsion and evaluation for other signs should be sought. Having said that, in the absence of ovarian

hyperstimulation syndrome, the asymmetric enlargement is still the best single indicator of ovarian torsion either with or without IVF [4–7]. In addition, the MRI is very helpful in evaluating for other diagnostic considerations like acute appendicitis in pregnant women. On Doppler ultrasound, reduced or absent blood flow in one of the ovaries is highly concerning for ovarian torsion but presence of vascularity does not exclude the possibility of ovarian torsion [1,2]. In our first case, the Doppler ultrasound depicted normal vascularity in both ovaries (Fig. 1) but the right ovary was found to be tortured intra-operatively.

If the diagnosis of ovarian torsion is made by imaging or highly suspected clinically, the patient should undergo laparoscopy or laparotomy for evaluation and instant treatment as soon as possible. The laparoscopic approach is preferred due to its lower risks to mother and fetus. The best time of rerotation is said to be within the first 24 hours [8].

## Acknowledgments

We would like to acknowledge the Obstetrics and Gynecology Department at St. Joseph's Healthcare Hamilton, Ontario, Canada.

## Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:[10.1016/j.radcr.2018.08.003](https://doi.org/10.1016/j.radcr.2018.08.003).

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