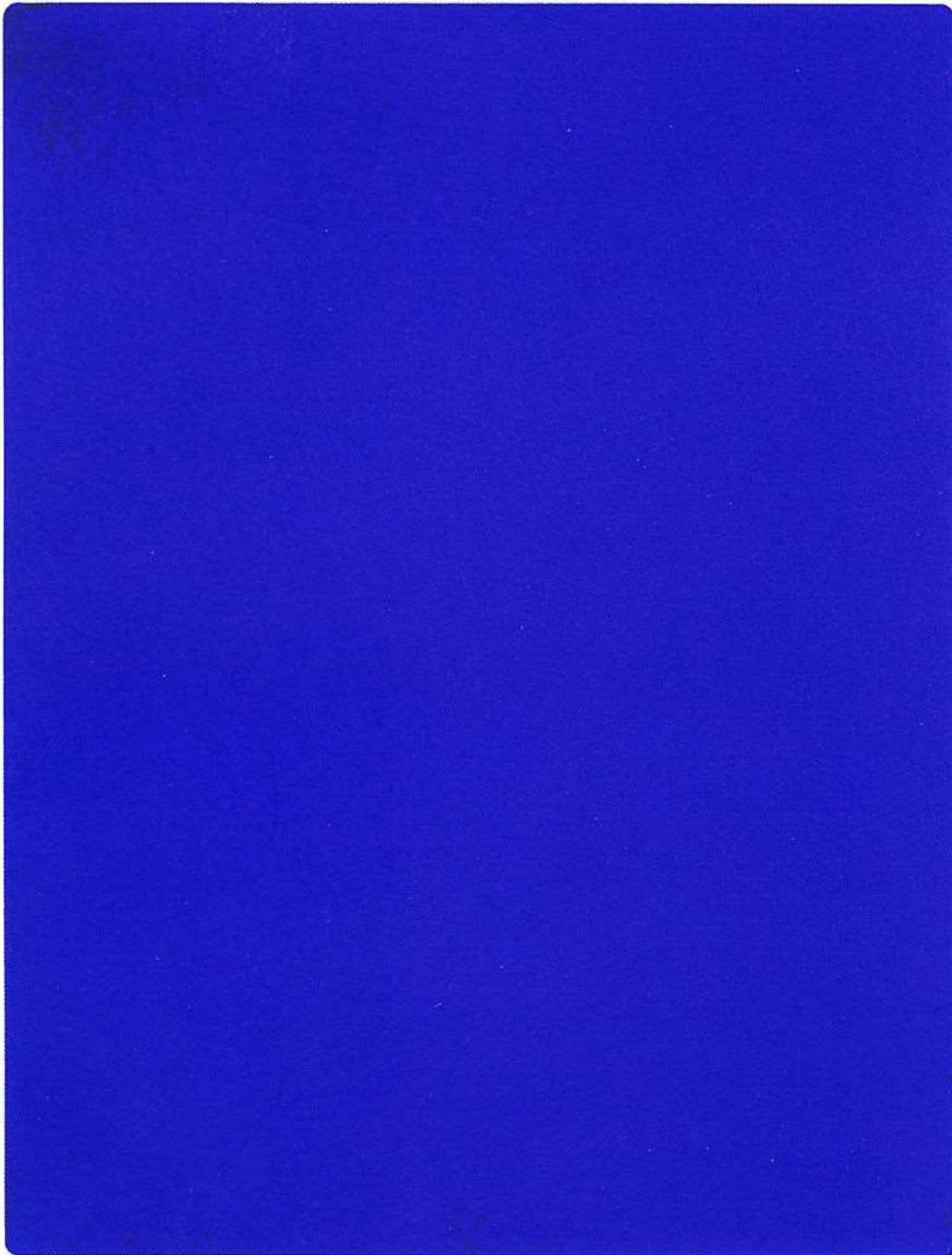


OVARIAN TORSION



“IKB 191” (International Klein Blue on canvas) 1962, Yves Klein.

“To sense the soul, without words, and to depict this sensation - this I believe is what led me to monochrome painting....

What is blue?. Blue is the invisible becoming visible...

Yves Klein, 1957.

Blue, the colour of the sea and sky, evokes distance, longing, infinity. This colour has a strange and almost unutterable effect upon the eye. It is, in itself, an energy....There is something contradictory in its aspect, both stimulating and calming. Just as we perceive the depths of the sky and distant mountains as blue, a blue surface appears to recede from the eye. Just as we wish to pursue a pleasant object that moves away from us, we enjoy gazing upon blue - not because it forces itself upon us, but because it draws us after it”.

Johann Wolfgang von Goethe, The Theory of Colour”, 1810.

If Matisse owned the colour red, then surely the colour blue was owned by Yves Klein. He was at the very lead of post World War II, French avant-garde Art. To classify him was difficult, but surely with his “monochrome” paintings the genre “Colour Field” painter could be applied, at least in part. Mark Rothko was counted by Americans as surely this genre’s greatest exponent, now finally confident in their own superiority over the Europeans. Indeed Klein was pretty much snubbed by Rothko when he visited the United States, though this new found American brashness and sense of superiority was perhaps a little premature when objectively stacked up against Klein’s work. Colour field painter he was, but in his monochromes he was probably more “evolved” than even Rothko. Apart from this debatable point however, he had more dimensions in his Art than the American Abstract Expressionists, and was certainly more original. An Artist decades ahead of his time, he heralded two genres that would become immensely popular in the 1970s and the 1980s, those of “Conceptualism” and “Performance Art”

Klein’s colour field painting, began with pure monochromes, but he was shocked to learn that his work was being misinterpreted at this time as no more than frivolous interior “decoration”. He resolved to correct this misconception by concentrating on just a single colour but he needed a pure and transcendental one. That colour Klein decided was to be blue. It would be the archetype of his monochrome works - in their most primal form canvases of brilliant unalloyed colour. Blue was the colour of the infinite sky. Deeply contemplative and without any fixed point of reference it enabled the expression of pure emotion and feeling uninfluenced by any point of reference to the concrete world - a key to the deep subconscious. Unlike Rothko he did not even divide his canvases with different shades, the sky blended seamlessly with the distant blue mountains and even the blue seas - nothing but blue was left! Inspired by the infinite blue of the heavens he claimed an epiphany, when in his mind he “signed the far side of the infinite” as his own work - the sky itself!

When asked once during this “Blue Epoch”, why he preferred working in monochrome, he answered with an ancient Persian story of a flute player: “There once was a flute player who, one day, began to play nothing but a single sustained uninterrupted note.

After he had continued to do so for about twenty years, his wife suggested that other flute players were capable of producing not only a range of harmonious notes, but even entire melodies, and that this might make for more variety. But the monotone flute player replied that it was no fault of his if he had already found the note which everybody else was still searching for!" So in the very best tradition of "sticking to a good thing when you find it", he stuck with blue for much of his short career. Though just before his death, he expanded to pink and to gold - it would be blue that remained his perfect note, his Holy Grail of colour.

To Klein, his Blue Epoch was not some mere transient fancy, as in the case of Picasso's "Blue Period", rather his work was to transcend all cultural barriers, even of time itself. But this was a difficult idyll, when he found much to his horror, works appearing in dreadful reproductions, in "blues" that did not do justice to his blue! To ensure the authenticity of his work, as well as preserving it from the ravishes of time exposed to ultraviolet radiation - the bane of all Art - he went so far as to employ the services of Edouard Adam, a Parisian chemical manufacturer who specialized in pigments for Artists. Klein longed for a blue that would preserve its original brilliance and lustre and with Adam's help they discovered it in 1955. A fixative resin for his blue pigment was developed called Rhodopas M60A. When diluted with ethanol and ethyl acetate they had found the perfect fixative, that preserved pigment without altering it. Klein patented his brilliant synthetic blue - as International Klein Blue - otherwise known as IKB. He had found the twentieth century's lapis lazuli. It would have been a challenge to any Abstract Artist to evolve from this point and to adapt to the ever changing tastes and fads of the modern Art world - but therein lay Klein's genius. Taking his monochrome works he integrated them into completely novel ideas of what Art could actually mean - his Performance Art - such as photographs of him leaping into the blue void, and his Conceptualist shows, when he exhibited multiple monochromes all exactly the same, but charged wildly different prices for each, captured the imagination and the amusement of the connoisseuring elite of post war Parisian society. Klein's fame began to rise exponentially when he took these Conceptualist and Performance Art pieces to stunning and novel extremes with productions of monochrome painting done at his direction, and with the assistance of his muse Rotraut Uecker, by nude women covered in blue paint acting as undulating "paintbrushes" to fresh canvases; all to the accompaniment of a mono-note orchestra - invitation only! Klein assured his place in the history of Twentieth century Art and indeed in Artistic immortality by dying at the height of his fame - or rather notoriety - at the tragically young age of just 34 years.

Yves Klein sought to bring out the deepest human emotions with his monochrome works - emotions and feelings uninfluenced and unencumbered by any reference to the external concrete world. The experience was necessarily unique to each individual observer. To Klein the best colour to achieve all of this was his IKB, that of the infinite sky that would mimic the deep contemplation people felt when they gazed up into it to wonder, as others have done since time immemorial, at their place in the Universe. For Klein the colour blue made visible to the mind the primal invisible of the subconscious.

The diagnosis of ovarian torsion is a difficult one indeed, there being no definitive investigation other than laparoscopy. We therefore approach the problem as we would a Klein work of Art - we strive as best we can to make visible what largely lies invisible.

OVARIAN TORSION

Introduction

Ovarian Torsion is a true gynaecological emergency that requires urgent surgical intervention to prevent ovarian necrosis.

Ovarian torsion refers to the complete or partial rotation of the ovary on its ligamentous supports, often resulting in ischemia.

The **fallopian tube** often twists along with the ovary; when this occurs, it is referred to as **adnexal torsion** or **tubo-ovarian torsion**.

The condition can be **intermittent** or **sustained**.

Ovarian torsion is a difficult diagnosis to make.

US or CT examination can assist in diagnosis, but ovarian torsion may ultimately have to be a clinical diagnosis in the first instance, based on, in particular, the nature of the clinical presentation, the age group and known risk factors.

A **definitive diagnosis** of ovarian torsion can only be made by direct visualization of a rotated ovary at the time of surgical evaluation.

Timely laparoscopic evaluation with the aim of preservation of ovarian function and prevention of potentially serious complications is the cornerstone of treatment.

Mortality resulting from ovarian torsion is rare.

Epidemiology

Ovarian torsion is an uncommon but important condition.

It can occur in all age groups, but the majority of cases occur in younger women of reproductive age of around 25- 35 years.

Pathology

Ovarian torsion refers to the complete or partial rotation of the ovary on its ligamentous supports, often resulting in ischemia.

This can be intermittent or sustained.

It results in venous, arterial and lymphatic stasis, which if unrelieved will result in ovarian necrosis.

In the early stages, continued arterial flow with blockade of the venous and lymphatic channels results in enlargement of the ovary and this can occasionally be massive.

If the torsion remains undiagnosed or untreated, arterial stasis can then lead to haemorrhagic infarction and necrosis of the ovary.

The mobility of the left ovary tends to be limited by the sigmoid colon, hence about **two thirds** of adnexal torsions are **right sided**.

Causes:

Torsion of a **normal ovary/ adnexa** is uncommon, and it is *usually* the result of an underlying risk factor.

Torsion may occasionally occur however in patients with no apparent underlying risk factor, particularly in premenarchal girls. ¹

Recognized risk factors include:

1. Developmental abnormalities leading to hypermobility of the ovary (< 50 % of cases).
 - Here there is an excessively long fallopian tube or an absent mesosalpinx that can predispose to torsion.

It may be seen in younger girls/ even children.

2. Adnexal mass lesions (approximately 50 - 80 % of cases).

These may be:

- Ovarian tumours:

These may be:

- ♥ Benign (such as dermoid cysts)
- ♥ Malignant

Malignant tumours are less likely to undergo torsion due to the presence of cancerous adhesions that fix the ovary to the surrounding structures.

Thus, tumours that have undergone torsion are most likely to be benign, with dermoid tumours the most commonly implicated.

- Ovarian physiologic cysts.
- Polycystic ovaries
- Paraovarian cysts

- ♥ A paraovarian cyst may be associated with ovarian or tubal torsion or a paratubal cyst may tort around its *own pedicle*.

As the size of the ovarian mass increases, the risk of torsion increases, until the mass becomes large enough to be fixed in place in the pelvis. Masses lesions that are between **5-10 cm** appear to be most at risk of torting.

3. Pregnancy: ²

- Enlarged corpus luteum cysts and the laxity of supporting structures in pregnancy can predispose to torsion.

The rate of torsion increases by five times during pregnancy.

The corpus luteum regresses in the second trimester, hence the risk of torsion is greatest in the **first trimester** and decreases thereafter.

4. Assisted conception:

- The induction of ovulation during infertility treatment can lead to **ovarian hyperstimulation syndrome** and expansion of the ovarian volume thus predisposing to torsion.

5. Previous pelvic surgery:

- Previous pelvic surgery, especially tubal ligation, can have an increased risk of torsion, possibly via adhesions, although the exact mechanism for this remains unclear.

6. Strenuous activity: ¹

- Some data suggest that ovarian torsion may occur following strenuous exercise or a sudden increase in abdominal pressure.

Complications:

Complications include:

1. Ovarian loss with necrosis:

The end result of the vascular compromise of ovarian torsion is haemorrhagic infarction and necrosis.

In severe cases infarction can occur within **hours** of torsion onset.

Spontaneous de-torsion has been reported.

A necrotic ovary can become infected and cause:

2. A local abscess
3. Generalized peritonitis.
4. Hemorrhage, (though this is not usually severe).

In the longer term:

5. Impaired fertility:
 - The necrotic tissue will involute over time, but there may be secondary pelvic adhesion formation, which can result in chronic pelvic pain or infertility.
 - Unrecognized tubal torsion will result in loss of tubal function, and likely hydrosalpinx or necrosis with eventual resorption of the damaged tissue.

Clinical features

US or CT examination can assist in diagnosis, but ovarian torsion may ultimately have to be a clinical diagnosis in the first instance, based on, in particular, the nature of the clinical presentation, the age group and known risk factors.

A **definitive diagnosis** of ovarian torsion can only be made by direct visualization of a rotated ovary at the time of surgical evaluation.

Typical clinical features include:

1. Pain (by far the most common presenting problem).
 - Moderate to severe lower abdominal/ pelvic
 - Sudden onset
 - Unilateral (though not invariably).

Note that the condition can be **intermittent** or **sustained**.

Sometimes the patient may therefore describe recurrent episodes of pain over the course of hours, days, or even weeks, if the ovary has been torting intermittently.

2. Nausea and vomiting (very common).
3. Abdominal examination
 - Typically unilateral tenderness

- Signs of frank peritonism are more ominous, and indicate possible infraction.
3. PV:
 - There is adnexal tenderness.
 - A mass may be detected.
 4. Necrosis of the ovary may lead to late systemic findings such as **pyrexia**, **tachycardia** and **hypotension**.

Investigations

Blood tests:

1. FBE:
 - An elevated white cell count is commonly seen, but is a nonspecific finding and of limited value.
2. U&Es/ glucose:
 - Electrolyte disturbances may be seen in cases where there has been persistent vomiting.
3. Beta HCG:

Beta-HCG should be done to exclude:

 - A concomitant pregnancy
 - A ruptured ectopic pregnancy (as an important differential diagnosis).

Ultrasound:

Ultrasound features of ovarian torsion include: ³

1. Ovarian tenderness to transducer pressure.
2. An enlarged hypo or hyperechoic ovary:
 - The main feature of torsion is ovarian enlargement

This is due to venous/ lymphatic engorgement, oedema and haemorrhage.

3. A **long standing infarcted** ovary may have a more complex appearance with cystic or haemorrhagic degeneration

Secondary signs include:

4. Free pelvic fluid:
 - Seen in > 80 % of cases.
5. An underlying ovarian lesion:
 - A possible lead point for torsion.
 - An ovarian mass causing the torsion must always be looked for.
5. A twisted dilated tubular structure corresponding to the vascular pedicle.
6. Abnormally placed ovary:
 - The normal location of the ovaries is lateral to the uterus, but in torsion, they may be located anterior to the uterus. ¹

Doppler ultrasound:

Doppler findings in torsion can be widely variable, but the following may be seen:

1. Blood flow abnormalities:
 - Little or no intra-ovarian venous flow (common)
 - Absent arterial flow (less common, but **poor prognostic sign**)
 - Absent or reversed diastolic flow

Note that the absence of ovarian Doppler flow is highly specific for torsion, however normal Doppler flow *does not completely exclude torsion*.

Normal vascularity does not exclude **intermittent** torsion.

Normal Doppler flow can also occasionally be found due to a dual blood supply from both the ovarian and uterine arteries

2. A “**whirlpool sign**” of a twisted vascular pedicle:
 - The whirlpool sign, is seen when a structure twists on itself.

It is most commonly described with regard to bowel rotating around its mesentery, with mesenteric vessels creating the whirls but is also seen in cases of **ovarian torsion**.

CT Scan:

CT scan good at **ruling out** ovarian torsion *if a normal* ovary/adnexa is seen.

It is also useful in situations where US is not available in an appropriately timely manner.

It is helpful in ruling out other differential diagnoses of pelvic pain in cases of diagnostic uncertainty

CT features suggestive of ovarian torsion include:

1. A twisted ovarian pedicle:
 - This is pathognomonic for ovarian torsion if demonstrated.
2. The torsion itself appears as a complex adnexal lesion representing:
 - **Enlarged ovary (> 4.0 cm)**
 - **Distended pedicle**
 - **Possible underlying ovarian lesion**
 - Lack of contrast enhancement may be seen
 - Hounsfield units > 50:
 - ♥ HU > 50 on non-contrast CT suggests is suggestive of haemorrhagic necrosis, (though this is of limited value as ovaries often bleed into themselves even when they are not torsted).
3. Surrounding fat stranding, oedema, and free fluid

MRI Scan:

Note that MRI is not the modality of choice if torsion is suspected, as **urgent imaging** is required.

MRI findings consistent with ovarian torsion include an enlarged, edematous ovary in an abnormal location and, with contrast enhancement, the coiled ovarian vessels may be visualized with the “whirlpool” sign.

Laparoscopy:

US or CT examination can assist in diagnosis, but ovarian torsion may ultimately have to be a clinical diagnosis.

Timely laparoscopic evaluation with the aim of preservation of ovarian function and prevention of potentially serious complications is the cornerstone of treatment.

Management

Ovarian torsion is a gynecological emergency requiring urgent surgery to prevent ovarian necrosis.

1. Analgesia:

- Pain is usually moderate to severe and titrated IV opioids will be required.

2. Fluid resuscitation:

- The patient is kept nil orally in anticipation of surgery.
- Fluid resuscitation may be required for significant vomiting.
- Rarely blood products may be required if there has been significant hemorrhage.

3. Antibiotics:

- These may be required for late presentations complicated by infection.

4. Surgery:

Whenever possible conservative management is favoured early in the course of disease and consists of laparoscopy with untwisting of the torqued ovary and possible oophoropexy.

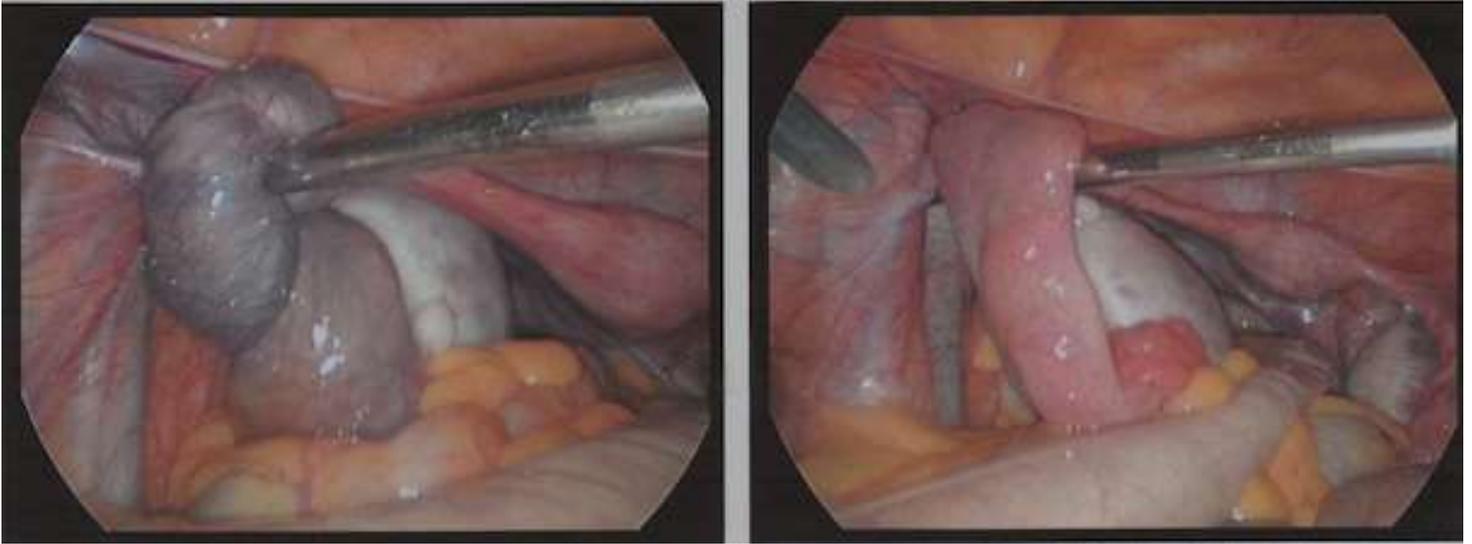
In many cases however the ovary is not salvageable as it is already necrotic and so a salpingo-oophorectomy will be required. If not removed the necrotic ovary can become infected and cause abscess formation or peritonitis.

Management of torsion in pregnancy is similar to non-pregnant women, but often technically more difficult due to the mass effect of the gravid uterus.

While there is no absolute cutoff to ensure viability, some studies have indicated that the best outcomes are achieved if the ovary is detorted within 8 hours, however viability will depend on the degree of ischemia as well as the time passed.

The important point is surgical intervention as soon as the diagnosis is suspected.

Appendix 1



Intraoperative photographs of a tortorted adnexa. The left photograph shows the fallopian tube and ovary in a tortorted state. The tube is dusky and engorged. The right photograph shows the same structures several minutes later after un-torting. The tube is now pink with good blood flow,(<http://www.cdemcurriculum.org>).



Performance Art, before this genre's time! Yves Klein (with safety net and rescuers artfully removed, all before the digital age!), performs a "dive into the void"; inviting the viewer to open their own minds and thereby soar with him into the blue void. Silver-gelatin photograph, Shunk Kender Rue Gentil-Bernard, Fontenay-aux-Roses October 1960. Metropolitan Museum of Art, New York.

References

1. Ovarian Torsion in Up to Date Website, 4 November 2013.
2. Ujwala Parashar and Talat Uppal, Ovarian torsion - an overview: RANZCOG Vol 13 No 1 Autumn 2011.
3. Matt A. Morgan and Andrew Dixon, Ovarian torsion in Radiopaedia Website:
 - <http://radiopaedia.org/>

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