

Andrology and fertility

## Use of intraoperative Indocyanine green fluorescence to assess testicular perfusion and viability when managing testicular torsion in a 26-year old man

Rémy Kohler, MD<sup>\*</sup>, Antoine Hamdani, MD, Michelle Grämiger, MD

Pourtalès Hospital, Department of Surgery, Neuchâtel, Switzerland



### ABSTRACT

Testicular torsion is a urological emergency requiring early diagnosis and immediate surgical intervention for successful salvage. Decision for testicular salvage is made during surgery by assessing the color of the testis. We present a case where Indocyanine green fluorescence was used to assess testicular perfusion during surgery as an additional evaluation tool for testicular viability.

### Introduction

Testicular torsion (TT) is a surgical emergency requiring early diagnosis and immediate surgical intervention for successful testicular salvage. Delay in management leads to severe consequences such as testicular loss, hemorrhage or infection.

Recently Indocyanine green (ICG), combined with near infrared (NIR) fluorescence technology, became an excellent tool to assess perfusion in tissues, especially during surgical procedures.

In this case, we report a case of TT where ICG fluorescence was used to assess testicular perfusion during a testicular torsion surgery.<sup>1-5</sup>

### Case presentation

A 26-year-old healthy male patient, with no previous surgical history presents himself at 6am in our emergencies department due to an acute left testicular pain having suddenly started 4 hours ago.

Clinical examination revealed a painful, hard and swollen, high-riding left testicle associated with scrotal edema. Left cremasteric reflex was absent.

An ultrasound was quickly performed and confirmed an acute TT, with absence of blood flow on Duplex examination.

The patient was referred for immediate surgical exploration.

Time from onset of symptoms to incision is estimated to be around 6 h and a half.

Scrotal exploration was made through a vertical midline raphe incision, quickly showing a left ischemic testicle with a 360° cord twist (Fig. 1).

Manual detorsion and testicular warming was done, allowing a progressive color recovery. At this point, the testis was considered as salvable.

We then performed an ICG angiography using our in-hospital ICG protocol which consists of a single intravenous injection of 7.5mg of an Indocyanine green solution to assess the perfusion of the affected testicle.

The operating room was then put into darkness to allow proper visualization of the fluorescence under NIR light. An excellent ICG signal appeared after 45 seconds, showing a homogeneous vascularization of the whole testicle (Fig. 2).

Bilateral triangular orchidopexy was finally performed before closure of the skin.

The immediate postoperative course was uneventful allowing discharge the following day.

The first post-operative follow-up was done on post-operative day 6, with a slightly sensitive left testicle and a small residual scrotal hematoma.

A testicular Duplex ultrasound control was performed 2 weeks after surgery, showing symmetrical testicular perfusion and testicular volumes (Fig. 3).

Ultimately, the patient was seen on post-operative day 30, having no complaints nor residual pain and the clinical examination was normal, allowing end of follow-up.

### Discussion

Any doctor, regardless of his specialty, should be alert to acute

<sup>\*</sup> Corresponding author. Pourtalès Hospital, Department of Surgery, Maladière 45, 2000, Neuchâtel, Switzerland.

E-mail address: [remy.kohler@h-ne.ch](mailto:remy.kohler@h-ne.ch) (R. Kohler).

<https://doi.org/10.1016/j.eucr.2019.101063>

Received 7 October 2019; Received in revised form 23 October 2019; Accepted 30 October 2019

Available online 31 October 2019

2214-4420/© 2019 The Authors.

Published by Elsevier Inc.

This is an open access article under the CC BY-NC-ND license

(<http://creativecommons.org/licenses/by-nc-nd/4.0/>).



**Fig. 1.** The intraoperative macroscopic aspect of the ischemic testicle.

scrotal pain with or without paralytic testicular examination and should in no way delay its management.<sup>1</sup>

TT is still considered a clinical diagnosis and it is widely recognized that surgical management should not be delayed by carrying out an ultrasound exam when clinical suspicion is high or symptoms started several hours ago.<sup>2,3</sup>

Testicular salvage rates clearly decreases with prolonged ischemia and higher degrees of testicular twisting has also been associated with higher rates of testicular loss.

So far, testicular viability is mainly assessed by the intra-operative macroscopical aspect of the testis, for which several visual appearance scoring system exist.<sup>1-4</sup>

Since several years, ICG has demonstrated its application and effectiveness in tissue perfusion evaluation in a wide range of surgical procedures. Therefore, patients and surgeons benefit more and more from the increasing use of ICG angiography with a fast, costless and relatively nontoxic application.<sup>5</sup>

In our reported case, the ICG test showed an excellent perfusion recovery of the affected testicle after manual detorsion, result that was correlated to the macroscopic evaluation of the testicle. The procedure was carried out in a manner that would not delay the time to surgical management nor detorsion, both remaining the urgent, standard and mandatory approaches in the operative treatment for TT.

ICG angiography could improve the management of TT by increasing testicular salvage rates, especially when macroscopic evaluation of the affected testis remains questionable after detorsion and orchiectomy is strongly considered. In this context, using ICG fluorescence would clearly be beneficial as an additional intra-operative decision-making tool.

Unilateral orchiectomy in young male patients being regrettable and irreversible, it should be avoided in the most cases possible. Therefore, if a simple, affordable and reproducible technology could help achieve a higher rate of testicular conservation during surgery, it should be exploited.

Furthermore, a larger use of ICG in the setting of TT could also lead to the development of a viability index to identify in selected cases, when orchiectomy could be avoided.

Finally, we found one main drawback concerning the use of ICG fluorescence being its use in the pediatric population. Testicular torsion commonly affects young boys and ICG technology have not been used, studied nor validated in this population for obvious ethical reasons. Therefore, we cannot advise yet its use in the pediatric population.

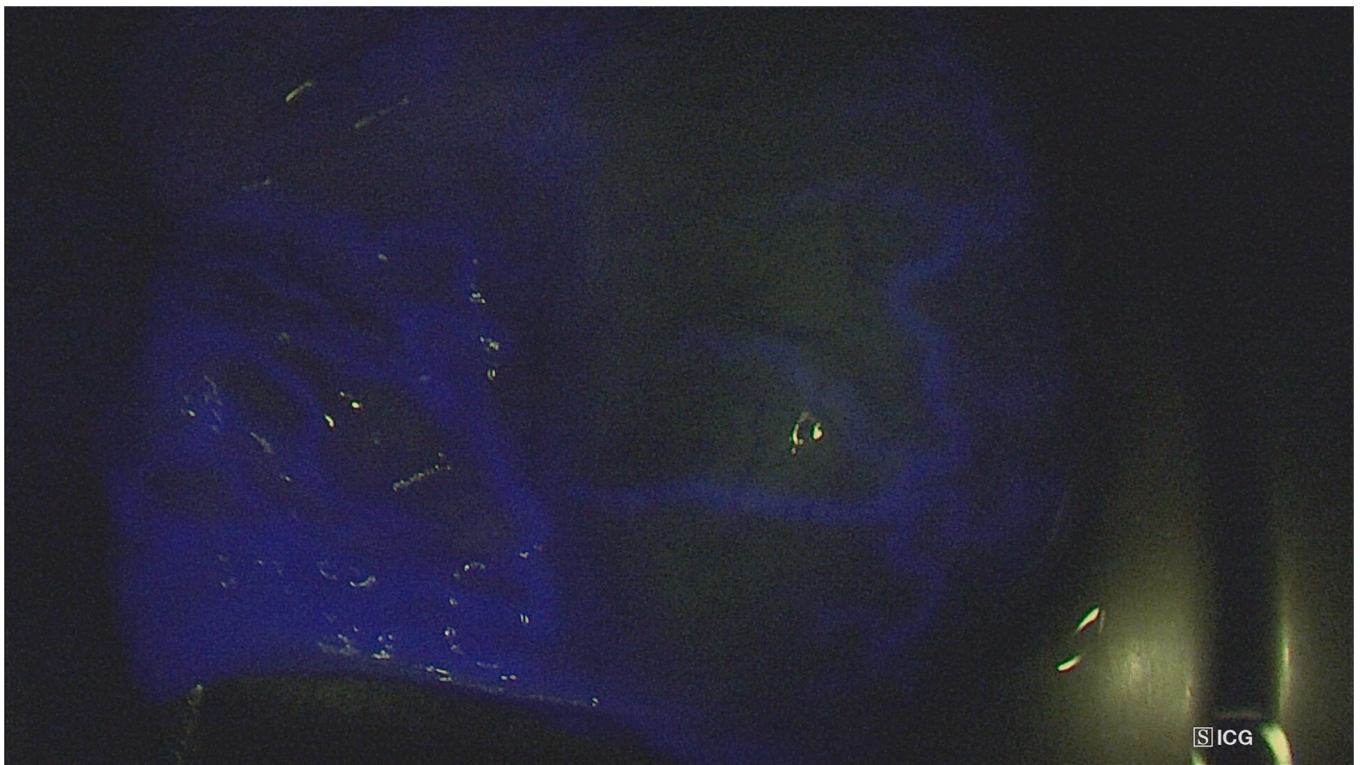
## Conclusion

In our case, we decided to extend the use of ICG angiography to assess the testicular viability during a TT emergency surgery. We think that the use of ICG fluorescence technology, if available, could certainly improve the management of TT by increasing testicular salvage rates. Of course, larger-scale studies should be done to support our findings. In our center, we are currently starting a prospective study for ICG use in the setting of acute TT surgery in adults.

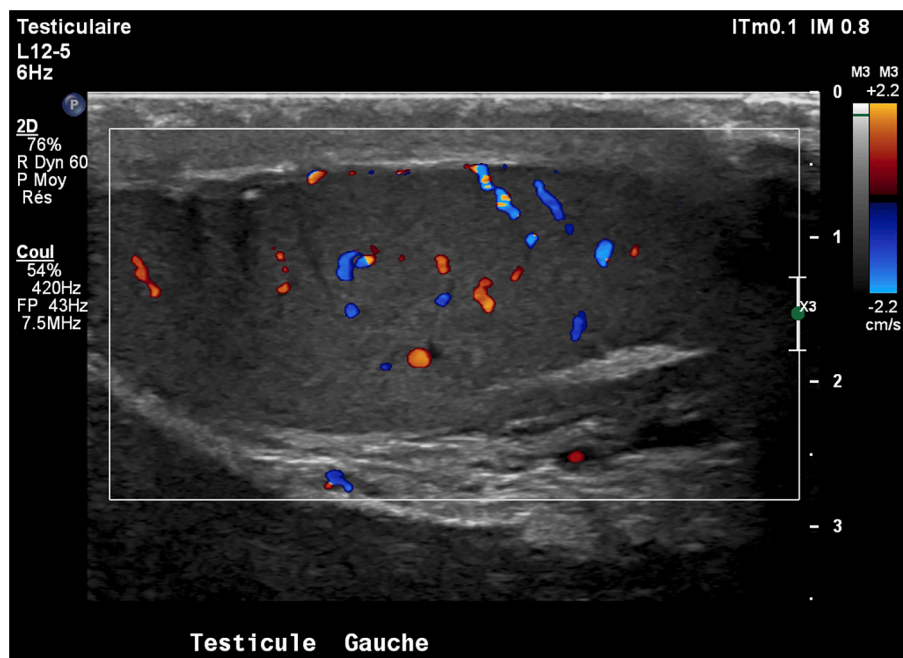
## Consent

Written informed consent was obtained from the patient for ICG test procedure, publication of this case report and accompanying images. A copy of the written consent is available for review for the Editor-in-Chief





**Fig. 2.** The intraoperative ICG testing showing homogenous vascularization of the testicle. The operating room is kept in the dark during the test to enhance visibility of the fluorescent ICG. The ICG signal appears purple under NIR light and shows the numerous vessels supplying the testis. The white spots are artefacts due to the reflection of the camera's light on the testis.



**Fig. 3.** The control duplex examination of the affected testicle two weeks after surgery.

of this journal.

**Declaration of competing interest**

The authors certify that there is no conflict of interest with any financial organization regarding the material discussed in the

manuscript.

**References**

1. Hyun GS. Testicular torsion. *Rev Urol.* 2018;20(2):104–106. <https://doi.org/10.3909/riu0800>.

2. MacDonald C, Kronfli R, Carachi R, O'Toole S. A systematic review and meta-analysis revealing realistic outcomes following paediatric torsion of testes. *J Paediatr Urol*. 2018;xx:1–7. <https://doi.org/10.1016/j.jpuro.2018.09.017>.
3. DaJusta D, Granberg CF, Villanueva C, Baker LA. Contemporary review of testicular torsion: new concepts, emerging technologies and potential therapeutics. *J Paediatr Urol*. 2014;9(6):723–730. <https://doi.org/10.1016/j.jpuro.2012.08.012>.
4. Sharp VJ, Kieran K, Arien AM. Testicular torsion: diagnosis, evaluation, and management. *Am Fam Physician*. 2013;88(12). <https://doi.org/10.1111/j.1651-2227.2012.02644.x>, 835-840. 2012;101:e282e6.
5. Alander JT, Kaartinen I, Laaksi A, et al. A review of Indocyanine green fluorescent imaging in surgery. *Int J Biomed Imaging*. 2012;2012:940585. <https://doi.org/10.1155/2012/940585>.