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Intraoperative ICG-NIR Fluorescence Angiography Visualization of Testicular Perfusion in Operations for Testicular Torsion

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Disclosures

- The authors have no relevant disclosures.

Introduction

- Determination of viability of a testicle after reduction of testicular torsion has been performed by numerous methods including visual assessment, Doppler ultrasound, and cutting the capsule. Each of these has limitations, are not always reproducible, and may involve damage to the testicle and confusion of capsular blood flow for internal perfusion.
- Viability assessment in urologic surgery using ICG-NIR (also referred to as ICG-FA, fluorescence angiography) has not been evaluated in children or adults but has been proposed as a possible beneficial modality to evaluate oxygenation.
- Indocyanine Green (ICG) near-infrared (NIR) fluorescence angiography is used at this institution in assessing testicular perfusion after reduction of testicular torsion to assess viability.

Purpose

- The purpose of this study is to report on the efficacy of using ICG-NIR fluorescence angiography intraoperatively in cases of testicular torsion for assessment of perfusion and tissue viability.
- We believe this is a safe and effective technology which can change operative management during use in the pediatric population for testicular torsion reductions.

Methods

- Thirty patients in a single center presented with testicular torsion from November 2015 – August 2019, and were evaluated by a combination of 3 Pediatric Surgeons and 2 Pediatric Urologists using ICG-NIR during torsion reduction procedures.
- ICG was administered intravenously by the anesthesiologist at a dose of 1.25 mg (<2 mg/kg) and NIR camera was used to visualize the testicle In-situ to assess the local perfusion before and after testicle reduction.
- SPY imaging camera (Stryker) was used for the imaging, allowing the surgeons to capture images and videos live, as well as to measure relative perfusion concentration of the testicle to surrounding normal tissues.
- Based on visual assessment, decision was made either to attempt salvage of the testicle or proceed with orchiectomy after torsion reduction. Visual assessment was correlated to ICG-NIR findings. All patients received contralateral orchiopexy.

Results

- Video and photo imaging was performed and perfusion of the testicle was compared to surrounding tissues. This identified the extent of perfusion, and differentiated capsular and internal perfusion. It provided assurance or definitively confirmed lack of viability.
- In some cases, there was perfusion in the capsule but the testicle remained ischemic.
- Prompt perfusion of the testicle was seen with the NIR camera in those that were clearly salvageable on gross examination. None of the testicles without perfusion on fluorescence angiography had gross visual appearance that suggested viability, although improved when compared to before untwisting.
- Doppler evaluation of all the testicles found to be ischemic on ICG-NIR demonstrated no flow. Incision into the testicles on these patients also demonstrated no bleeding or perfusion. Ischemia on ICG-NIR correlated to pathologic diagnosis.

Results (cont.)



- Well-perfused normal testicle on the right, left ischemic testicle after reduction
- Non-viable testicle after reduction, no flow seen in testicular capsule or tissue; reflected in gross appearance
- Left testicle well-perfused, strong capsular flow with penetration into testicular tissue. Ischemic right testicle after reduction of torsion

Conclusion

- In this observational study, utilization of ICG-NIR fluorescence angiography in the pediatric population during reduction procedures for testicular torsion was an effective method for evaluation of tissue viability.
- The visual assessment of testicular viability in testicular torsion patients after reduction is subjective but seems to correlate well with the ICG-NIR perfusion scan. Use of technologies that image vascular irrigation prior to decision to resect or leave the testicle in place may help to reduce orchiectomy in patients with questionable viability.
- Long term, higher volume studies to compare testicular salvage and postoperative complications using this technology will help elucidate benefits to current surgical outcomes in patients where viability is in question.

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Thank you!



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