

Intraoperative ICG-NIR Fluorescence Angiography Visualization of Intestinal Perfusion in Primary Pull-Through for Hirschsprung Disease

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Abstract : Purpose: Assessment of anastomotic perfusion in Hirschsprung disease using Indocyanine Green (ICG)-near-infrared (NIR) fluorescence angiography. Introduction: Anastomotic stricture and leak are well-known complications of Hirschsprung pull-through procedures. Complications are due to tension, infection, and/or poor perfusion. While a surgeon can visually determine and control the amount of tension and contamination, assessment of perfusion is subject to surgeon determination. Intraoperative use of ICG-NIR enhances this decision-making process by illustrating perfusion intensity and adequacy in the pulled-through bowel segment. This technique, proven to reduce anastomotic stricture and leak in adults, has not been studied in children to our knowledge. ICG, an FDA approved, nontoxic, non-immunogenic, intravascular (IV) dye, has been used in adults and children for over 60 years, with few side effects. ICG-NIR was used in this report to demonstrate the adequacy of perfusion during transanal pullthrough for Hirschsprung's disease. Method: 8 patients with Hirschsprung disease were evaluated with ICG-NIR technology. Levels of affected area ranged from sigmoid to total colonic Hirschsprung disease. After leveling, but prior to anastomosis, ICG was administered at 1.25 mg (< 2 mg/kg) and perfusion visualized using an NIR camera, before and during anastomosis. Video and photo imaging was performed and perfusion of the bowel was compared to surrounding tissues. This showed the degree of perfusion and demarcation of perfused and non-perfused bowel. The anastomosis was completed uneventfully and the patients all did well. Results: There were no complications of stricture or leak. 5 of 8 patients (62.5%) had modification of the plan based on ICG-NIR imaging. Conclusion: Technologies that enhance surgeons' ability to visualize bowel perfusion prior to anastomosis in Hirschsprung's patients may help reduce post-operative complications. Further studies are needed to assess the potential benefits.

Keywords : colonic anastomosis, fluorescence angiography, Hirschsprung disease, pediatric surgery, SPY

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