



Assessment of Vasculature in Laparoscopic Colorectal Surgery

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Introduction

Anastomotic Leakage (AL) is one of the most dreaded postoperative complications in colorectal surgery. The reported leak rate ranges from 1% to 30%. Local blood supply is one of the crucial factors for bowel anastomosis healing [1-2]. Poor local tissue oxygenation secondary to inadequate anastomotic vascular perfusion seems to play a key role in the determination of anastomotic viability [3]. The most widely used "technique" to evaluate tissue perfusion is surgeon's intraoperative visual judgment based on clinical findings, such as colour, bleeding edges of resected margins, pulsations and temperature. Studies have proven that operating surgeon's clinical judgment usually underestimates the risk of anastomotic leak in colorectal surgery [4].

The ligation of Inferior Mesenteric Artery in left sided colonic resections devoid the blood supply of descending colon and this part of colon relies entirely on collateral blood supply from proximal territory through marginal arcades. Other factors affecting the vascular supply of colon includes increasing age with existing vascular pathology, previous radiation, diabetes and other systematic cardiovascular and autoimmune disorders.

ICG (Indocyanine Green) Angiography

Indocyanine green (ICG) is a sterile, anionic, water-soluble but relatively hydrophobic, tricarboyanine molecule and, once injected into the vascular system via the intravenous route, it binds to plasma proteins [5]. Its ability to bind with plasma protein and becoming fluorescent on excitation by mild infrared light made it a valuable asset for many surgical specialties including colorectal surgery. It allows assessment of perfusion of the cut end of bowel in real time hence, guides only appropriately vascularised bowel to be anastomosed.

Current literature supports the routine use of the technique. A recent systematic review and meta-analysis published in January, 2018 reported results of one thousand three hundred and two patients from 5 non-randomized studies evaluating Anastomotic Leak (AL) rates in two groups of patients based on use of ICG. There was overall significant reduction in AL rates in colorectal cancer resection with specific significant AL rate reduction (ICG 1.1% vs non-ICG 6.1%; $p = 0.02$) in rectal cancer surgery [6].

A multicentre prospective trial on fluorescence angiography in colorectal surgery in 147 patients who underwent laparoscopic or robotic left colectomy or anterior resection showed that ICG angiography led to change the surgical plan in eleven patients (7.9%); their overall anastomotic leak rate was low (1.4%, two patients), perhaps because none of the 11 patients with problematic vascular supply detected by this method had an anastomotic leakage after revision [7].

Kudszus et al. [8] reported 84% reduction in revision surgery for AL in the ICG angiography group in their study of 420 resections. They also reported a reduced overall hospital stay in ICG group. Similar findings were shared by Jafiri et al. [9]. Their AL rate was 6% versus 18% in favour of ICG angiography group. Three patients had revision of proximal bowel cut end in this study informed by ICG angiography. There are at least three RCTs currently in progress and will quantify the already proven benefit accurately.

Conclusion

In summary, ICG-fluorescent angiography is a promising tool to identify the most appropriate proximal bowel end based on vascular perfusion for anastomosis thus reduction in AL rates. There is a significant potential of deploying this technique in laparoscopic colorectal surgery as a routine in view of current available evidence.

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