

CASE REPORT

Novel assessment of intestinal anastomotic perfusion using ICG SPY in a continuous flow LVAD patient

Daniel Kaufman*, Danny Sherwinter, Ron Kaleya and Paul C. Saunders

Department of Surgery, Maimonides Medical Center, Brooklyn, NY 11219, USA

*Correspondence address. 17 Ernest Ct, Kings Park, NY 11754. Tel: +1-631-960-1412; E-mail: dakaufman@maimonidesmed.org

Abstract

HeartMate II left ventricular assist device (LVAD) assists heart failure patients by generating continuous flow via axial flow pump placed in the left ventricle. Little is known of the effect of continuous flow on intestinal anastomoses. This is the first case visually documenting altered perfusion patterns in patients with LVADs using indocyanine green (ICG). A 72-year-old male required a colon resection, for adenocarcinoma, following implantation of an LVAD. Perfusion of the anastomosis was evaluated using indocyanine. During the assessment, an unusual perfusion pattern was noticed. Normally, flow as measured by SPY is seen as an initial blush of contrast followed by a gradual, pulsatile increase in the progression of the indocyanine through the tissues. In this patient, instead of the usual initial blush, a continuous beam of ICG was seen to flow through the blood vessels. This novel perfusion pattern is consistent with flow generated from LVAD.

INTRODUCTION

The HeartMate II left ventricular assist device (LVAD) assists heart failure patients by generating continuous flow using an axial flow pump placed in the left ventricle [1]. Little is known about the effect of continuous flow on intestinal anastomoses under non-pulsatile conditions. ICG SPY is a relatively new technology that uses the fluorescence of indocyanine green (ICG) to assess tissue perfusion. It is frequently used in colorectal surgery, where it aids in the assessment of intestinal anastomoses [2]. We report a case of a patient supported by a HeartMate II LVAD who underwent successful low anterior resection for colon cancer using intraoperative perfusion assessment of the colo-colonic anastomosis using ICG SPY. In the setting of continuous flow, the SPY findings are markedly unusual, and this is the first report documenting the use of SPY to assess anastomotic tissue perfusion in an LVAD patient.

CASE REPORT

Our patient is 72-year-old male with a past medical history of ischemic cardiomyopathy, NYHA Class IV, who was referred for advanced heart failure therapy and was a candidate for LVAD implantation. Preoperative screening colonoscopy and biopsy revealed adenocarcinoma in the sigmoid colon with no CT evidence for distant metastasis. He underwent successful HeartMate II LVAD placement, and 2 months later underwent elective laparoscopic assisted low anterior resection. Pathology revealed T3N2aM0 Stage IIIB adenocarcinoma.

At our institution, ICG SPY is routinely used during colon resection to assess anastomotic perfusion. In a patient with normal pulsatile flow, the fluorescence pattern demonstrates an initial blush, and then slowly progresses in a pulsatile fashion. In this patient, the ICG SPY revealed an unusual pattern of perfusion through the anastomosed colon segment. Instead of

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the usual initial blush, a continuous beam of the ICG was seen to flow through the arteries in the mesentery. This novel flow pattern would only be in patients with a non-pulsatile driving force pushing blood through the body.

His postoperative course was unremarkable and started outpatient chemotherapy 2 months later without event.

DISCUSSION

To our knowledge, this is the first reported case of intraoperative ICG SPY to assess a bowel anastomosis in a patient supported with a continuous flow LVAD. The HeartMate II, the most widely used LVAD of this type, generates continuous, linear flow using an internal rotor that draws blood from the left ventricle to the ascending aorta [1]. The degree to which an individual patient sees pulsatile flow depends on the relative contribution of the patient's own left ventricular function. As LVAD's have been used more frequently over the past 10 years, more patients are undergoing non-cardiac surgical procedures while on continuous flow support [3, 4]. During this time, many have investigated the long-term effects of continuous flow at the tissue level, yet little is known about the effects of continuous flow on the viability of intestinal anastomoses [5].

It is particularly important to understand how this change in flow affects the colon anastomosis in this patient. In order for proper healing of the colo-colonic anastomosis to take place, there has to be adequate blood flow and oxygenation to the tissues [2].

Normally, flow as measured by ICG SPY is seen as an initial blush of contrast followed by a gradual, pulsatile increase in the progression of the ICG through the tissues. The rate and intensity of the contrast in the tissue indicate the quality of tissue perfusion. Normal findings are consistent with the pulsatile flow, which is typically seen when the heart acts as the main propulsive force of blood to the tissues.

However, when ICG SPY was used in this patient, an unusual pattern of perfusion was seen through the anastomosed colon segment. Instead of the usual initial blush, a continuous beam of ICG was seen to flow through the blood vessels. This novel perfusion pattern is consistent with what would be expected from a continuous flow LVAD, in contrast to the normal pulsatile flow produced in non-LVAD supported patients. ICG SPY, in this setting, demonstrates non-pulsatile flow at a tissue level. While

the flow dynamics were different, ICG SPY confirmed adequate perfusion of the anastomosed segments, and the patient recovered uneventfully.

In this patient supported by a HeartMate II LVAD, ICG SPY clearly demonstrated the altered perfusion characteristics created by continuous flow at the tissue level. ICG SPY can also aid in assessment of adequate perfusion in intestinal anastomoses in LVAD patients, although the findings will differ from those seen in pulsatile patients.

SUPPLEMENTARY MATERIAL

Supplementary material is available at *JSCREP Journal* online.

CONFLICT OF INTEREST

There are no conflicts of interest.

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