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Case Report

Laparoscopic Approach with ICG Fluorescence to Small Bowel Occlusions: Case Report

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Abstract

Small bowel occlusion is one of the main presenting causes in the emergency department. Despite traditional open approach, laparoscopy can represent a valuable alternative in those patients without both serious comorbidities and important bowel expansion. We present a case report about a 77 yo male with a small bowel obstruction due to adhesions; after laparoscopy approach and ICG florescence evidence of a small bowel ischemia, we perform a minilaparotomy and bowel resection; post-operative course was regular, ERAS protocol managed. Our experience shows the usefulness of laparoscopy approach and ICG fluorescence use in occlusive pathology even in emergency cases without an increase of morbidities and mortality rates.

Keywords: *Small Bowel Occlusion; ICG Fluorescence; Laparoscopy; New Technologies*

Introduction

Small bowel occlusion is one of the main presenting causes in the emergency department. Despite traditional open approach, laparoscopy can represent a valuable alternative in those patients without both serious comorbidities and important bowel expansion.

Case Report

A 77 yo male presented to our Emergency Department reporting worsening abdominal pain and vomiting for several hours. He had past history of open appendectomy and hypertension requiring therapy; BMI was 20.6 kg/m^2 (162 cm x 54 kg). Physical examination revealed a painful distended abdomen with hypoactive bowel sounds and diffuse tenderness without guarding or rebound; free hernial orifices. Routinary blood tests were normal except for a neutrophilic leukocytosis (WBC 10.4 x 10^3/uL) and the abdominal X-ray showed dilated small-bowel loops and multiple air-fluid levels. A CT scan was carried out with adhesive small bowel obstruction (ASBO) being considered as potential diagnosis. After preoperative assessment, the patient was planned for emergency surgical exploration by laparoscopy (Figure 1).

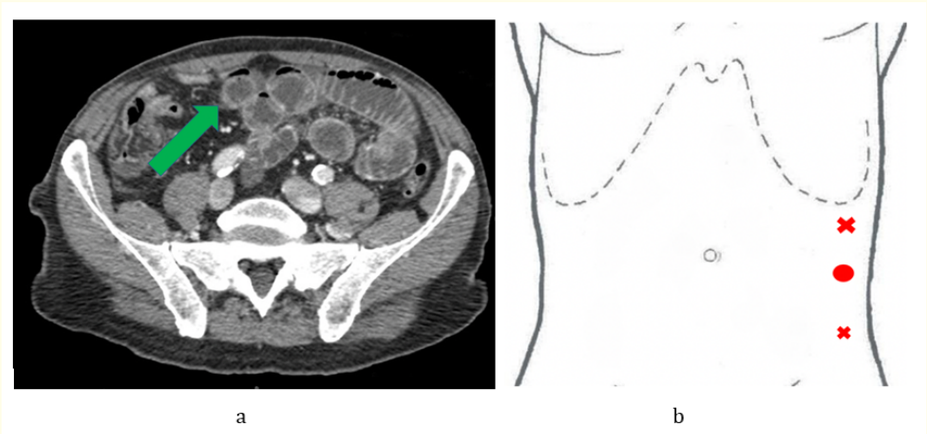

Figure 1: *CT scan (a); trocars position (b).*

Intraoperatively, we confirmed the picture of ASBO caused by a single fibrous band wrapping an ileal loop. Therefore, after an effective adhesiolysis (Figure 2), we assessed the intestinal perfusion using ICG-fluorescence.

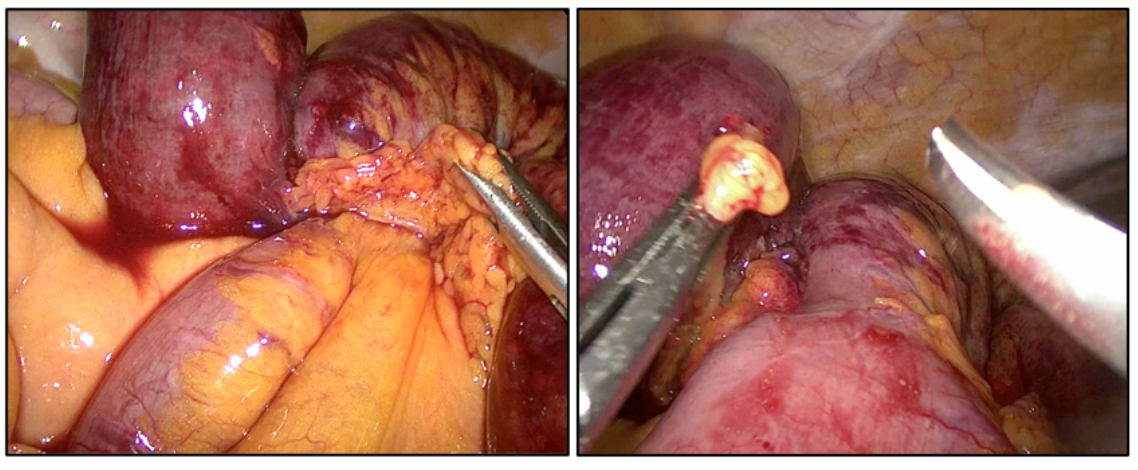

Figure 2: *Adhesiolysis.*

A bolus of 12.5 milligrams of ICG, diluted in 5 ml of soluble water was injected intravenously (0.2 mg/kg), revealing an evident sign of ischemia at a limited portion of 25 cm of ileus (Figure 3). A supra-umbilical mini-laparotomy was made and an ileal resection with ileo-ileal anastomosis was performed. On histological examination, ischaemic-haemorragic signs were observed. Postoperative course was uneventful. First flatus time was on 1st post-operative day (POD), oral intake was resumed on POD 2 and the patient was discharged at POD 4. No complications on the last follow-up at 9 months after surgery.

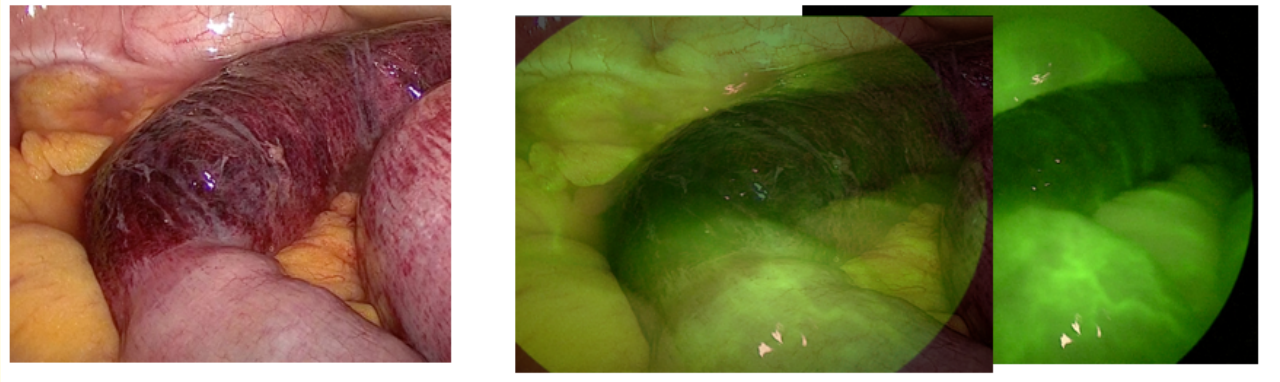

Figure 3: *ICG fluorescence.*

Discussion

Laparoscopic approach to bowel occlusions is not always the first choice [1,2]. However, it could be an alternative solution to traditional surgery. In this case, the patient was considered fit for surgery because of the absence of serious comorbidity, BMI and not sever

bowel dilatation at the CT scan. Trocars were placed as shown in figure 1, all on the left side (Hasson trocar and two 5 mm trocars) as in laparoscopic incisional hernia reparation.

In our case, laparoscopic approach was particularly effective because of the dilatation of the small bowel only, which allowed to perform a safe pneumoperitoneum. As showed by images, there was only a superficial, single adhesion, that was easily cut. However, we were worried by the presence of an ischemic area before the adhesion site, that was not perfused even after washing with warm physiological solution and 30 minutes of waiting. In order to evaluate the real tract of ischemic bowel, we chose to use ICG florescence which confirmed a 20 cm hypo-vascularization of the ileum. The repetition of the procedure after 15 minutes had the same result, so we only had to remove the ischemic bowel. The intestinal loop was easily approachable and well mobilized so it was no necessary laparotomic conversion: we performed a medial supra-umbilical minilaparotomy of not more than 4 cm through which we extracted and resected the bowel loop. After that, we developed a manual side-to-side isoperistaltic anastomosis.

Our choice allowed us to gain all laparoscopy advantages: the patient's faster recovery, less post-operative pain and better mobilization, as proved by first flatus in I POD, well tolerated feeding in II POD and the final better aesthetic result.

Laparoscopy approach success has demonstrated efficacy and safety of this method, if used with correct indications. However, it's essential to evaluate preoperative general conditions in order not to subject the patient to unnecessary risks, e.g. visceral lesions due to trocars placement.

In case of previous surgery, we can consider positive predictive factors to laparoscopy: previous laparoscopies or less than 2 laparotomies (better with medial approach); if the patient undergoes to operation before 24 hours since symptoms beginning; if there is only one adhesion or one volvulus (i.e. no multiple adhesions, no voluminous cancer or pseudotumor, no internal hernia). Otherwise, a small bowel dilatation > 4 cm, hemodynamic instability, ASA score ≥3 are negative predictive factors; as well described in literature, these conditions associated with laparoscopy increase morbidity and mortality in that kind of patients. So, we can say laparoscopy is not for everyone but, when applicable, it's been demonstrated to be very useful [3].

After that, we can say that new technologies as surely improved surgical outcomes and treatment opportunities. Minimally invasive techniques are not recent: in fact, it has been applied in different surgical theatres for decades. So, surgeons have to know basic laparoscopic skills, operative instruments and technical alternatives, in order to use them in the best way.

It's critical that the first approach to laparoscopy happens during residency and not in the older age. However, knowledge is important both for the residence and for the surgeon which try it later and the learning steps have been standardized in the last few years [4]. In primis, learning and exercising have not to be perform on the patient first. In the last years, different ways of learning have been proposed: traditional pelvic trainer, 3D or animal models (swine, most commonly). Basic skills have been after described, featured by progressively increasing difficulty, with the aim to teach the key points and fundamental steps of laparoscopy [5-7]. The achievement of these goals it's nowadays necessary when a surgeon decides to use a laparoscopy approach, even more in emergency setting, where decisions must be quickly made.

About real new technologies, we used high definition view (4K) and ICG fluorescence. Maybe, the last one was the most important in our case. ICG technique is now used in different surgical branches, such as colorectal, hepatobiliary or gastric surgery. It requires intravenous injection of a weight-related ICG quantity and every application has a different detection timing [8]. Referring colo-rectal surgery [9], 20 - 30 seconds are required to fluoroscopy detection, while more than 5 days are necessary in hepatobiliary surgery.

The colorectal short timing (only few seconds) for the intestinal perfusion evaluation was certainly a key point in our case and one of the most important reason we chose to use it (and that it worked properly). Being an emergency, the possibility to use the dye in a tim-

ing of only a lot of seconds allowed to evaluate quickly the ischemic loop, without conditioning operating times and, consequently, peri-operative and post-operative outcomes. In this case, ICG use was fundamental in choosing the best surgical treatment because it clearly highlighted the ischemic tract of the small bowel [10] and allowed for minimal resection, without losing organ' functions [11,12].

Conclusion

In conclusion, our case shows that good laparoscopic skills, advantages in using new technologies such as IGC fluorescence and an optimal preoperative evaluation of the patient since his entrance in the Emergency Department, allow a laparoscopy approach and that it has better outcomes than the open one, as expected

Minimally invasive approach to small bowel occlusion disease is often impracticable. Patients comorbidities, age, bowel expansion and emergency setting imply a significant increase of surgical risks. Nevertheless, laparoscopy can be a valuable alternative approach in selected patients, and it can even grant better outcomes. In addition, new technologies such as ICG fluorescence and full-HD/4K definition have now become essentials in everyday practice.

The management described in this case represents not only an alternative to common procedures but demonstrates that it can be also the best kind of treatment, even if only in selected patients. Our experience demonstrates that an excellent preoperative evaluation of the case and the knowledge of good laparoscopic skills could allow a better surgical management and, at the end, the best clinical results.

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Conflict of Interest

All authors have no conflicts of interest.

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