

# Hyperbaric oxygen treatment for late low colorectal anastomosis ischaemia: Case report

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## Key words

Gastro-intestinal tract; Surgery; Anastomosis; Wounds

## Abstract

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**Introduction:** This report describes the use of hyperbaric oxygen treatment (HBOT) to treat a case of colorectal anastomosis ischaemia following colorectal surgery.

**Case report:** A 47-year-old man developed post-operative colorectal anastomosis ischaemia with leak after laparoscopic low anterior resection for T3N0 adenocarcinoma of the rectum. The leak with concomitant ischaemia presented 17 days after surgery. HBOT was administered in 11 sessions over three weeks and the patient followed endoscopically and radiologically for two months. At two months the anastomosis showed both endoscopic and radiological healing; therefore the ileostomy was closed. Anal function was satisfactory with no incontinence or evidence of sepsis.

**Conclusions:** Intra-operative or late leak with concomitant ischaemia of a colorectal anastomosis is a challenging event in colorectal surgery. HBOT may be beneficial in promoting healing in selected patients. Further studies are needed to evaluate conservative treatments and the role of HBOT.

## Introduction

Anastomotic leakage (AL) is a severe complication of colorectal surgery, with reported incidences ranging from 3% to 12%.<sup>1</sup> AL seems associated with additional life-threatening complications and mortality, and could have an adverse impact on disease-free survival, and local recurrence rates.<sup>1,2</sup> Independent risk factors for anastomotic leak include male sex, age, diabetes, preoperative radiotherapy for rectal cancer, and certain characteristics of rectal cancers including tumour size and distance from the anal verge. Modifiable risk factors include alcohol consumption, smoking, obesity, and immunosuppressant therapy, such as steroids. A diverting stoma at the time of primary surgery does not appear to reduce the frequency of AL but may reduce morbidity, mortality and the need for additional surgery if an anastomotic leak does occur.<sup>1,3</sup> Management options can be conservative with use of broad-spectrum antibiotics, radiological (e.g., drainage of pelvic collections), vacuum therapy, or reoperation.<sup>4,5</sup> As experience in minimally invasive surgical techniques such as laparoscopy or transanal surgery is spreading, these less invasive approaches for surgical management of AL are advocated.<sup>6</sup> We report a case of a 47-year-old man who experienced anastomotic leakage with segmental ischaemia

after laparoscopic low anterior resection with ileostomy, that was treated with a conservative approach and hyperbaric oxygen treatment (HBOT).

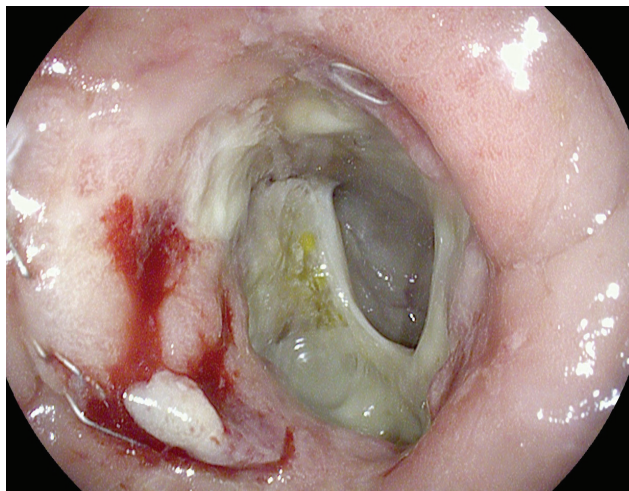
## Case report

The patient consented to the publication of this case report.

A 47-year-old male presented in October 2019 with tenesmus. Colonoscopy showed a substenotic neoplasm at 7 cm from the anal verge. Histopathology confirmed rectal adenocarcinoma. A computed tomography (CT) scan, magnetic resonance imaging (MRI) scan, and total-body positron emission tomography (PET) scan were performed, showing the presence of locally advanced rectal neoplasia and suspected loco-regional adenopathy. After multidisciplinary evaluation, a neoadjuvant treatment was adopted, consisting of simultaneous integrated boost mode radiotherapy with a total dose of 55 Gy (T, N+) and 45 Gy (regional lymph nodes), together with chemotherapy (Capecitabine). In December 2019 repeat CT and MRI scans revealed significant dimensional reduction. At the end of January 2020 the patient underwent laparoscopic anterior rectal resection with formation of a transanal ultra-low anastomosis and protective ileostomy. Definitive histological

**Figure 1**

Endoscopy showing segmental perianastomotic ischaemia at day 17 after surgery

**Figure 2**

Endoscopy showing resolution of the segmental ischaemia and normal perianastomotic mucosa two months after the first HBOT session



exam revealed a moderately differentiated adenocarcinoma (T3, N0, Mx). The patient was discharged after a week without early postoperative complications.

Seventeen days after surgery the patient presented with perineal pain. A CT scan was performed with evidence of vascularisation deficiency 3.5 cm upstream of the anastomosis. Colonoscopy showed peri-anastomotic ischaemia with a 3 mm anastomotic leak (Figure 1). The patient was afebrile and was managed with empiric antibiotic therapy. After multidisciplinary discussion it was decided to manage the segmental ischaemia conservatively with HBOT as the patient had no contraindication to this treatment. He was discharged and an outpatient clinic follow-up with monthly CT scan and endoscopy arranged. Beginning 35 days after surgery, the patient underwent 11 sessions of HBOT administered daily from Monday to Friday. The protocol for each session consisted of two 39 minute oxygen breathing periods at administration at 253.3 kPa (2.5 atmospheres absolute). Originally it was intended to continue for four to six weeks, but the patient had to interrupt it for regional restrictions related to COVID-19 infection spreading in the local area during March 2020. The patient did not receive any other treatment during the observational period. No complication related to administration of hyperbaric oxygen was observed. He was almost asymptomatic, experiencing occasional mild perianal discomfort that responded to analgesic therapy. Blood tests (red and white blood cell count) performed two weekly were normal during follow up. CT scan and endoscopic images showed progressive resolution of the anastomotic leakage and segmental ischaemia (Figure 2). Ileostomy closure was then performed and the patient was discharged home seven days later after physiological reactivation of bowel function. At follow-up day 30 after ileostomy closure the patient was asymptomatic with no anal leakage and in control of gas and

solid evacuation, with a Wexner incontinence score of 0.<sup>7</sup>

## Discussion

Rectal surgery remains a demanding procedure. Patients who have an anastomotic problems present a great challenge.<sup>2</sup> This report presents a single experience with the use of HBOT as an adjunct in nonoperative management of colorectal anastomotic complications. The case represents a singular success for this approach, as in our historical experience, these patients almost always require a definitive colostomy. Oxygen plays a central role in inflammation and wound healing, and HBOT has demonstrated its efficacy in the treatment of complex wound-healing problems in other settings. Oxygen is necessary for oxidative function of neutrophils, activation of leukocytes, fibroblast production, angiogenesis, and re-epithelialisation, which are of great importance in wound healing.<sup>8</sup> Evidence is still poor in the use of HBOT in surgical complications. The literature provides evidence of possible benefits of HBOT in animal models of colorectal anastomosis dehiscence with significant differences in oxidative stress markers in tissue specimen of the perianastomotic region after HBOT administration.<sup>9,10</sup> A small number of cases indicate benefit in tracheal and upper gastrointestinal surgery.<sup>11</sup> Few authors have explored potential benefit in humans with complications of lower gastrointestinal tract surgery,<sup>12</sup> although several relevant cases have been described,<sup>13</sup> and the present case adds to that experience. We believe more evidence is needed in order to encourage surgeons to use HBOT in selected patients.

## Conclusions

Very low colorectal anastomosis leakage with segmental ischaemia accounts for significant morbidity and mortality. Conservative approaches to anastomotic leakage are

desirable in order to avoid further major surgery. There is level IV evidence of use of HBOT in this setting. HBOT may be a valuable option in the treatment of anastomotic leak and segmental ischaemia in selected patients. The present case affirms the possible success of a wait-and-see approach in the management of this complication using HBOT. More related evidence is needed.

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