# Laparoscopic-assisted colectomy in heart transplant recipients

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abstract
Abstract: Reports of laparoscopy in heart graft recipients are scarce and, to our knowledge, laparoscopic colectomy has not yet been reported in heart transplant patients. The magnitude and the tolerance of the hemodynamic changes induced by pneumoperitoneum are unknown in heart graft recipients, who have a denervated heart and are "preload-dependent". The authors report the clinical courses of 2 heart graft recipients who developed acute diverticulitis without perforation or peritonitis and who underwent laparoscopic-assisted colectomy without complications.

Key words: transplantation – complication – diverticulitis – laparoscopy

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## Introduction

Since the clinical advent of cyclosporin A in the early 1980s, orthotopic heart transplantation (OHT) has become an alternative in the treatment of end-stage cardiac failure. Long-term survival of heart graft recipients is usually achieved (1). Nevertheless, heart graft recipients are susceptible to extracardiac surgical complications (2) but fortunately, they present only a moderate risk for general surgery.

The many benefits reported after laparoscopic surgery explain its increasing success and its extended use for gastrointestinal surgical procedures. Nowadays, reports present the feasibility and the effectiveness of laparoscopic colectomy (3). Pneumoperitoneum required for laparoscopy induces several pathophysiological changes, including cardiovascular changes (4). However, there are few data on the hemodynamic repercussions of pneumoperitoneum in patients with previous cardiopulmonary diseases. Particularly, reports of laparoscopic procedures in heart graft recipients are scarce (5). In these patients, potential intraoperative risks have to be balanced against postoperative benefits. We describe the clinical courses of 2 heart graft recipients who developed acute diverticulitis without perforation or peritonitis and who underwent laparoscopic-assisted colectomy without complications. The surgical procedures were similar to the technique described by Plasencia (6). To our knowledge, this is the first report of laparoscopic colectomy in heart graft recipients.

## Methods

Between January 1985 and December 1994, 145 patients underwent OHT in the Cardiovascular Surgery Department of the University Hospital of Liège. Their standard immunosuppression regimen consisted of triple-drug therapy with cyclosporine, corticosteroids and azathioprine. In addition, a course of antithymocyte globulin (ATG) was given prophylactically in the early posttransplantation period. Rejection episodes were diagnosed by endomyocardial biopsies and were initially treated with pulse doses of intravenous corticosteroids.

ATG or monoclonal CD-3 antibodies (OKT 3) were used in steroid-resistant rejections.

## Case reports

*Case 1:* A 59-yr-old man developed idiopathic dilated cardiomyopathy. His past medical history revealed a gastric ulcer and a past cytomegalovirus (CMV) infection. He underwent uneventful OHT. He was discharged from hospital at postoperative d 32 with standard triple-drug immunosuppression. The azathioprine administration was interrupted a few weeks after transplantation because of leukopenia. Five years after transplantation the patient was admitted to the hospital because of abrupt onset of rectorrhage without any abdominal discomfort or pain. Nausea and vomiting were not reported. At admission, clinical examination did not reveal any abdominal symptoms. Body temperature was normal. Laboratory tests demonstrated mild inflammation (white blood count (WBC) 11 800/mm$^3$, with 95% neutrophils, fibrinogen 4.08 g/l, C-reactive protein (CRP) 20 mg/l). Twelve hours after admission the patient developed fever. Colonoscopy located some diverticles and fresh blood at 25 cm from the anal margin. Routine abdominal radiographs were normal. A computed tomographic (CT) scan of the abdomen revealed terminal colonic diverticulitis with a parietal abscess. Systemic broad-spectrum antibiotherapy (Amikacin 15 mg/kg/d, Ornidazole 1 g/d, Piperacillin 150 mg/kg/d) was initiated. On the 4th d colonic enema revealed acute diverticulitis with abscesses and a limited parietal perforation without serosal involvement. Laparoscopic-assisted sigmoid colectomy followed by direct transanal end-to-end anastomosis was performed without complication 7 d after admission. Pathological analysis confirmed acute diverticulitis with abscesses. The patient was discharged on postoperative d 9 and no adverse event has been reported during the 1 yr of follow-up.

*Case 2:* A 71-yr-old man underwent uneventful OHT for idiopathic dilated cardiomyopathy. His past medical history was significant for past CMV infection. The triple-drug immunosuppression regimen was introduced. Six months after transplantation, the patient developed fever with acute abdominal pain and left lower quadrant tenderness. He developed nausea and constipation. Laboratory tests showed moderate inflammation (WBC 11 200/mm$^3$, CRP 61 mg/l). Routine abdominal radiographs were normal. Abdominal CT scan revealed acute colonic diverticulitis, with mesenteric inflammation. Barium enema confirmed the diagnosis of diverticulitis. After 11 d of intravenous broad spectrum antibiotherapy (Amoxicillin 3 g/d plus clavulanic acid 600 mg/d, metronidazole 1500 mg/d) and bowel rest, laparoscopic-assisted resection of the sigmoid colon was performed with transanal end-to-end anastomosis. Pathological analysis revealed acute diverticulitis and pericolonic abscesses. The patient was discharged at postoperative d 10 and the 1 yr follow-up was uneventful.

*Perioperative management:* Both patients underwent bowel rest with nasogastric suction. Broad spectrum intravenous antibiotherapy and fluid restauration were initiated. After a few days, laparoscopic-assisted sigmoid colectomies were performed. Before induction of anesthesia, the patients were preloaded with 500 ml hydroxyethyl starch 6%. Anesthesia was induced with sufentanil 20 µg and propofol 1.5 mg/kg. Orotracheal intubation was facilitated by atracurium 0.5 mg/kg. Lactated Ringer's solution was infused at a rate of 4 ml/kg/h. Anesthesia was maintained with isoflurane in 50% $N_2O:O_2$. Constant muscle relaxation was achieved using atracurium 0.3 mg/kg/h. Carbon dioxide pneumoperitoneum was induced at the rate of 1 l/min with the patient tilted in a 5° head down position. Intraabdominal pressure was maintained at 14 mmHg. The involved sigmoid colon was laparoscopically dissected through 4 trocars. During colonic dissection, infusion rate of lactated Ringer's solution was increased to 8 ml/kg/h. Dopamine infusion was used at a rate of 2 µg/kg/min. Once the distal margin of resection had been reached, the bowel was transected by an endoscopic stapler. The bowel was brought out through an incision created in the left lower quadrant. The resection of the proximal margin was performed externally. The detachable head and anvil of a circular intraluminal stapler were inserted in the lumen of the proximal bowel by tying a purse-string suture around it. Next, the left lower quadrant incision was closed and the pneumoperitoneum was re-established. The shaft of the circular stapler was passed through the anus. The head and anvil were then laparoscopically reattached to the shaft. The stapler was fired, creating a transanal double-stapled anastomosis. Both patients woke up in the postanesthetic care unit when intraoperative hypothermia was corrected.

## Discussion

As with other immunosuppressed patients, heart graft recipients are likely to develop surgical digestive complications (2). Recipients are susceptible to complicated colonic diverticulitis which may be favored by a combination of immunosuppressive

drugs. Open two-stage procedures with resection of the involved colon and end-colostomy (Hartmann procedure) were classically undergone by these patients.

Two of our heart graft recipients developed diverticulitis which was diagnosed before perforation occurred. These patients underwent preparation for a few days and elective one-stage laparoscopic-assisted colectomies with primary end-to-end transanal anastomoses were performed. Postoperative outcomes were uneventful. Laparoscopic colectomy may be performed without the need for end colostomy in recipients whose diverticulitis is not complicated by perforation and peritonitis at the time of diagnosis. Laparoscopic approach may be particularly favorable in immunosuppressed patients and lead to a decrease of complications such as chest and wound infections (3). Bowel functions may return more quickly and hospital postoperative stay may be shortened. Finally, laparoscopy may lead to a reduction of postoperative discomfort and pain (6).

Anesthetic management of heart recipients scheduled for laparoscopy must consider the physiology of the denervated heart. In the normally innervated heart, the increase in cardiac output is primarily achieved by an increase in heart rate with little change in stroke volume. Conversely, denervated hearts are "preload-dependent" and respond to stress primarly by increasing stroke volume (7). A denervated heart does not respond to atropine or digoxin. Arrhytmias, both atrial and ventricular, are common in heart graft recipients. They are promoted by lack of vagal suppressant tone and increased sensitivity to catecholamines (7). The heart rate increased in both patients during laparoscopy. This may be explained by the lack of vagal tone, and sensitivity to the catecholamines released during pneumoperitoneum (8). However, neither patient developed arrythmias throughout the procedures.

In healthy patients, pneumoperitoneum results in a significant reduction of the venous return and an increase of systemic vascular resistance (4). Consequently, cardiac output decreases. While heart rate does not change significantly, arterial pressure increases. Both mechanical and humoral (catecholamines, vasopressine) factors contribute to these pathophysiologic changes (8). The magnitude of and the tolerance to these changes are, however, unknown in heart transplanted patients. Increasing circulatory blood volume reduces the decrease in venous return produced by pneumoperitoneum (9) and is, furthermore, beneficial in these "preload-dependent" patients. Therefore, 500 ml of colloid solution were infused before the beginning of peritoneal insufflation. Insufflation

was performed with the patient in slight head-down position to improve further the venous return. A continuous infusion of atracurium was used to avoid brusque changes in the level of muscle relaxation, with consequent increases in intra-abdominal pressure. Indeed, these may lead to acute ventilatory and hemodynamic changes. Increased intra-abdominal pressure may produce a decrease in renal blood flow (10). Furthermore, chronic cyclosporine treatment may also alter renal function. Therefore, dopamine infusion at a rate of 2 µg/kg/min was used and neither of our patients developed acute postoperative renal dysfunction. Monitoring of cardiac filling pressure is difficult during pneumoperitoneum. Indeed, because pneumoperitoneum also results in an increase in intrathoracic pressure, right atrial pressure and pulmonary capillary wedge pressure no longer reflect cardiac filling pressure. An infusion rate of 8 ml/kg/h of lactated Ringer's solution was used according to our previous experience with laparoscopic colectomy in non-transplanted patients.

Using this protocol, hemodynamic changes induced by pneumoperitoneum were well tolerated by both patients with a well compensated transplanted heart. This good hemodynamic tolerance encourages us to propose laparoscopy to heart transplanted patients in case of uncomplicated diverticulitis, so they may derive the same postoperative advantages as non-immunosuppressed patients, such as reduced postoperative pain, pulmonary dysfunction, and respiratory or wound infections.

### References

1. HOSENPUD JD, NOVICK RJ, BREEN TJ, DAILY OP. The Registry of the International Society for Heart and Lung Transplantation: Eleventh Official Report – 1994. J Heart Lung Transplant 1994: 13: 561.
2. COLON R, FRAZIER OH, KAHAN BD, et al. Complications in cardiac transplant patients requiring general surgery. Surgery 1988: 103: 32.
3. MONSON JR, DARZI A, CAREY PD, GUILLOU PJ. Prospective evaluation of laparoscopic-assisted colectomy in an unselected group of patients. Lancet 1992: 340: 831.
4. JORIS JL, NOIROT DP, LEGRAND MJ, JACQUET NJ, LAMY ML. Hemodynamic changes during laparoscopic cholecystectomy. Anesth Analg 1993: 76: 1067.
5. LOPEZ P, PERRONE SV, KAPLAN J, et al. Laparoscopic cholecystectomy in heart transplant recipients. J Heart Lung Transplant 1993: 12: 147.
6. PLASENCIA G, JACOBS M, VERDEJA JC, VIAMONTE M. Laparoscopic-assisted sigmoid colectomy and low anterior resection. Dis Colon Rectum 1994: 37: 829.
7. FIRESTONE L. In: Barash PG, ed. Anesthesia for the patient after cardiac transplantation. Refresher courses of the American Society of Anesthesiologists. 1992: 19: 29.
8. JORIS J, LAMY M. Neuroendocrine changes during pneumoperitoneum for laparoscopic cholecystectomy. Br J Anesth 1993: 70: A33.

9. KASHTAN J, GREEN JF, PARSONS EQ, HOLFCRAFT JW. Hemodynamic effects of increased abdominal pressure. J Surg Res 1981: 30: 249.

10. IWASE K, TAKENATA H, ISHIZATA T, OHATA T, OSHIMA S, SAKAGUCHI K. Serial changes in renal function during laparoscopic cholecystectomy. Eur Surg Res 1993: 25: 203.