

## Summary of Postoperative Diverticulitis and Outcomes

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### Abstract

While diverticulitis is a common disease in the field of general surgery, much less is known about immediate postoperative diverticulitis. This paper summarizes the case reports of postoperative diverticulitis with particular attention paid to the type of surgeries the patients had prior and the treatment outcomes for their diverticulitis. Most of the cases of postoperative diverticulitis occurred after either renal transplantation or cardiac surgery. Compared to the general patient population, postoperative diverticulitis resulted in more operative treatment. There are several theories regarding the etiology of postoperative diverticulitis including certain drugs that are commonly used in the postoperative setting and physiologic changes in the body after surgeries.

**Keywords:** general surgery; cardiac surgery; non-cardiac surgery

### Introduction

Diverticulitis is a common surgical illness, most frequently affecting the colon, with a significant burden on healthcare costs, as well as significant morbidity and mortality. In the United States alone, diverticulitis accounts for more than 2.7 million outpatient visits and 200,000 inpatient admissions annually [1]. Numerous studies demonstrate that risk factors for diverticulitis include low fiber diet, obesity, red meat consumption, and smoking [1]. Post-operative diverticulitis is a rare occurrence, described in only a small number of case reports and case series that have been published. To date, the precise etiology of postoperative diverticulitis, as well as the relative contribution of surgery to the development and severity of diverticulitis remain unclear.

### Cardiac Surgery

Post-operative diverticulitis was first described following open cardiac surgery [2]. Most gastrointestinal complications after cardiac surgery involve the upper gastrointestinal tract with bleeding being the most common [3]. Cases of postoperative diverticulitis following cardiac surgery remain rare, with Aranha et al reporting eight cases of acute diverticulitis from a total patient population of 5719 following cardiac procedures between 1976 to 1982 0.14%, or 1 case in over 714 patients [2]. In 1986, Burton et al. published three cases of acute diverticulitis following open heart surgery, two of which were coronary artery bypasses (CABG) and one a valve replacement [3]. In all three cases, the patients underwent exploratory laparotomy and were found to have sigmoid diverticulitis; two of the cases were found to be free perforations [3]. In 2020, Acheampong et al published a case of colonic diverticulitis following open heart surgery [ach]. The patient was a 57-year-old woman who developed perforated diverticulitis after she underwent a left ventricular aneurysm repair [4]. Postoperative course was relatively unremarkable until post-operative day five when she

developed leukocytosis and watery stools [4]. *C. difficile* assay was negative, and the patient subsequently underwent a CT scan after an episode of bilious emesis the next day, which showed perforated diverticulitis with multiple small pelvic abscesses and associated small bowel obstruction [4]. She managed successfully non-operatively with intravenous fluids, bowel rest, nasogastric tube suction, analgesics, and broad-spectrum antibiotics, and was discharged home with 14 days of oral antibiotics [4].

### Non-cardiac Surgery

Acute diverticulitis following non-cardiac surgery, though not as commonly reported as in cardiac surgery, have also been cited in the literature. Badia et al. published four cases (three of which are non-cardiac cases) of post-operative diverticulitis in 1989 [5]. Two of the three non-cardiac cases had perforated diverticulitis; one following a thalamic hemorrhage and one following a right inguinal hernia repair [5]. Both patients underwent surgical intervention and had complete recovery [5]. The third case was following a laminectomy and perioperative course involving steroid use for five days prior to surgery [5]. He developed classic symptoms of diverticulitis on postoperative day 4 and was treated non-surgically [5]. In another paper published in 2005, Dalla Valle et al. identified a 0.9% incidence of colonic perforation in 875 renal transplant recipients from 1986 to 2004 [6]. All eight patients had constipation prior to their operation [6]. While none of the eight patients required re-transplantation, all of them required surgical intervention [6]. Four patients received steroids while the other half received steroid free immunosuppression [6]. The mortality rate for perforated diverticulitis for this group of patients was 12.5% while the morbidity rate was 75% [6]. There is debate on the role of steroids contributing to the high incidence of perforation as only half of the patients who developed perforated diverticulitis in Dalla Valle et al. were on steroids [6].

Immunosuppression, however, seems to be an agreed upon contributor to free perforation [6]. Prophylactic measures, such as a use of bowel regimen to prevent constipation and use of steroid free immunosuppression have been suggested to decrease the risk and severity of diverticulitis in the post renal transplant patient [6].

## Results

Postoperative diverticulitis seems to be most cited after renal transplantation or cardiac surgery compared to other types of surgeries. Unlike most patients with who develop diverticulitis, the majority of patients who develop

postoperative diverticulitis needed to be treated operatively. The postoperative population seemed to have more serious disease with perforations. Few were successfully treated nonoperatively with antibiotics only. Acheompong et al noted one patient who developed complicated diverticulitis with abscess after cardiac surgery [4]. While the patient did not undergo surgery, she still needed to undergo drain placement for pelvic abscess [4]. These postoperative patients, especially after cardiac surgery or renal transplantation, tend to have more comorbidities than the average patient coming in with diverticulitis. Furthermore, the postoperative state as well as the postoperative medications place these patients at higher risk for more severe diverticulitis.

Author, year	Subjects	Type of surgeries	Results
Burton, 1986	3	Cardiac	100% operative.
Badia-Perez, 1989	4	Cardiac, head/neck, abdominal, spine	50% operative.
Soravia, 1995	9	Renal transplant	50% operative, 33% delayed surgery.
Gaya, 1997	3	Cardiac, neurosurgery, orthopedic	100% operative
Dalla Valle, 2005	8	Renal transplant	62.5% Hartmann's, 25% resection with primary anastomosis
Acheompong, 2020	1	Cardiac	Nonoperative with pelvic drain.

**Table 1:** Summary of case reports

## Conclusion

In the postoperative cardiac patient, the combination of the low flow state and the use of narcotics are thought to increase the risk of diverticulitis [2]. Splanchnic hypoperfusion during cardiopulmonary bypass and vasopressor use are also thought to be contributing factors to tissue ischemia and subsequent diverticular infection [4].

Management of acute diverticulitis following cardiac procedures is complex due to the cardiac issues such as arrhythmias, low cardiac output, and need for postoperative anticoagulation [2]. Initial management with nasogastric tube placement and broad-spectrum antibiotics is acceptable for the first 24 hours but if the patient fails to improve, Burton et al recommends operative intervention [3]. The role of surgical intervention is dependent on the severity of the diverticulitis, often classified using the Hinchey score. Patients with a Hinchey score of I or II can usually be managed medically with bowel rest and antibiotics, while patients with a Hinchey score of III or IV usually require bowel resection with primary anastomosis with or without a diverting ileostomy or less preferably, a Hartmann procedure [4].

Diverticular obstruction resulting in subsequent inflammation, ischemia, and micro-perforation is the most long-standing explanation for the pathophysiology of diverticulitis [1]. More recent theories, however, suggest that chronic inflammation and alterations in colonic microbiome play bigger roles than expected for the development of diverticulitis [1]. Certain medications have also been shown to increase the risk of developing diverticulitis. Non-aspirin NSAIDs have been shown in one prospective study to have a positive correlation with the development of diverticulitis [1]. Opiate and steroid use are also tied to a higher incidence of diverticulitis in multiple source [bad, 1]. Morphine sulfate is known to increase intraluminal pressure of the colon and cause diverticula distention theoretically increasing the risk of perforation and subsequent infection [bad].

The role of low fiber diet and constipation are commonly accepted contributors to development of diverticulitis. In the postoperative period, the combination of change in bowel habits, anesthesia, opioid use, surgery, and bed rest often lead to worsening of constipation, potentially precipitating acute diverticulitis [5]. The recovery phase and the regain of colonic motility cause an increase in intraluminal pressure and can lead to perforation [5].

Postoperative diverticulitis remains a rarely identified, and poorly characterized entity. Case series have focused on cardiac surgical and immunocompromised (especially renal transplant) patients. Numerous pathophysiology has been suggested, though none definitively proven, and are often individualized to a particular operative intervention. Despite the cases identified, and the plausible pathophysiology, it remains unclear whether postoperative diverticulitis represents a unique entity or are in fact a matter of timing. Nonetheless, with numerous cases identified in the literature, postoperative diverticulitis remains an important part of the postoperative abdominal pain differential and should be familiar to all surgeons.

## Conflicts of Interest

There are no conflicts of interest or funding to disclose.

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