The Role of Obesity in the Patient Undergoing Colorectal Surgery and Fecal Diversion: A Review of the Literature

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Abstract
The obese colorectal surgery patient may face several challenges, including a high risk for the development of colorectal cancer, an increased risk for complications with diverticular disease, and surgical risk factors including anastomotic leaks, inability to perform a low anastomosis, and septic complications. The purpose of this literature review was to examine available data on the implications of obesity on colorectal disease and colorectal surgery, particularly stoma surgery. Obesity has been documented as a risk factor for colorectal disease, but results of studies examining surgery-related problems secondary to obesity are inconsistent. However, clinicians generally believe obese patients undergoing colorectal surgery may be at higher risk of complications than their non-obese counterparts. The obese patient requiring the creation of a fecal diversion may encounter stoma-related issues such as stenosis, retraction, and inability to maintain a consistent pouching system seal. Stoma site marking can be challenging because of the large shifts in subcutaneous tissue and the inability for a person with a large abdomen to be able to visualize the stoma if the stoma is placed too low on the abdomen. Additional research to elucidate complication rates and risk factors is needed to help clinicians develop optimal plans of care.

Keywords: obesity, colorectal surgery, retraction, stenosis, peristomal pressure ulcers

O"bese patients, defined as persons with a body mass index (BMI) >30 kg/m², may experience more complications undergoing colorectal surgery when compared to non-obese patients. However, not all study results demonstrate obesity is a risk factor for the development of postoperative complications (prolonged operating time and length of stay, technical difficulties in mobilizing the colon, anastomotic leak, and wound infection). Despite these inconsistencies in the literature, in the clinical setting obese persons may present with complications that need to be addressed in the plan of care.

The purpose of this literature review was to examine the information available on the implications of obesity on colorectal disease, as well as complications in the obese colorectal patient undergoing abdominal surgery, particularly the colorectal patient with a stoma. The review was conducted using the Ovid, MEDLINE, and PUBMED databases as well as the Cochrane Library of articles published in English between 1993 and 2013 using the terms obesity, colostomy, ileostomy, stoma complications, colorectal, inflammatory bowel disease, and abdominal surgery.

Colorectal Surgery and the Obese Patient
Colorectal cancer (CRC) is the third leading cause of cancer-related mortality in the United States. The cause of CRC is multifactorial, and the majority of cases can be ascribed to environmental factors such as smoking, diet, and physical activity. Obesity recently has emerged as a leading environmental risk factor for CRC. The mechanism responsible for this relationship is unclear; however, a review of the literature found obesity was associated with immune dysregulation, resulting in a systemic chronic inflammatory response. A pathophysiological mechanism may link obesity to CRC via chronic inflammation. A review of the role of obesity on perioperative morbidity and mortality in the person undergoing colorectal surgery found that for men with a BMI >30, the risk for colorectal cancer increased up to 80%, the prognosis of CRC was potentially poorer, and the incidence of recurrence higher in obese patients than in non-obese patients. Operating time and length of stay have been reported to be longer for obese versus non-obese patients with advanced
rectal cancer who undergo radical resection after neoadjuvant therapy. Aytac et al’s retrospective cohort study, conducted in a high-volume colorectal unit, compared surgical outcomes in obese and non-obese patients undergoing surgery for mid and low rectal cancers; researchers found technical difficulties can be encountered in obese patients during a rectal resection, including anatomic confines of the pelvis and a bulky mesocolon that can limit the delivery of the colon to the anal canal. A retrospective study reported preoperative tumor size and BMI are independent factors for sphincter preservation. However, Aytac et al found the outcomes and ability to restore intestinal continuity were the same in obese and non-obese patients with rectal cancers. This study also noted proctectomy in obese patients was associated with risk of anastomotic leak in comparison to non-obese patients.

Obesity may predispose the person with diverticular disease to an increased risk of complications, more pronounced in men, and abdominal obesity may be an even stronger risk factor than BMI itself.

Although obesity in inflammatory bowel disease (IBD) was once considered uncommon, the prevalence of obesity has increased in patients with IBD in the last two decades, many of whom will have surgery that results in a stoma. There is speculation that obesity may be a risk factor for development of IBD, but no research exists to support this idea. However, chronic obesity has been associated with an immune dysregulation and a low-grade, pro-inflammatory response, and patients with IBD have elevated serum levels of interleukin-6 and tumor necrosis factor-alpha (a response to inflammation), a relationship may exist between IBD and obesity, the clinical implications of which are yet to be fully understood.

Postoperative complications. Opinions vary on whether obesity is a risk factor for postoperative complications such as anastomotic leaks, stoma retraction, necrosis, and a resultant inadequate pouching system seal in the patient undergoing colorectal surgery. Studies demonstrate inconsistent findings on the impact of obesity and postoperative complications in the patient undergoing rectal surgery. A retrospective study by Ishii et al examined the effect of visceral obesity (the area of tissue at the level of the umbilicus) on surgical outcomes in the patient undergoing rectal surgery and found visceral fat to be an independent risk factor for the development of postoperative complications such as wound infection and anastomotic leak. Obesity adversely affected the outcomes in a retrospective study of 95 patients with a mean BMI 29 (>2 kg/m²) who underwent a Hartmann’s reversal (closure of the intestinal continuity); BMI correctly predicted adverse outcomes (wound infections, time between ileostomy and reversal).

In a prospective review of a surgical database that examined factors associated with the development of septic complications that included 3,233 patients undergoing restorative proctocolectomy (ulcerative/indeterminate colitis or Crohn’s disease), a BMI >30 was associated with septic complications. Two hundred patients (6.2%) developed septic complications within 3 months of restorative proctocolectomy or within 3 months of ileostomy closure. On multivariate analysis, BMI >30 (P = 0.02, OR = 1.77), final pathologic diagnosis of ulcerative/indeterminate colitis (P = 0.02, OR = 2) or Crohn’s disease (P = 0.02, OR = 3.6), and intraoperative (P = 0.02, OR = 1.6) and postoperative transfusions (P = 0.01, OR = 1.9) were all independently associated with septic complications. The authors suggest restorative proctocolectomy in obese patients may be associated with adverse outcomes due to technical problems with the reach of the pouch to the anal canal.

In a meta-analysis that included 33 studies of the effect of obesity on outcomes of laparoscopic colorectal resections, obesity was associated with longer operative times and higher rates of conversion to open procedures because of the problem of exposure and difficulties in dissection. This analysis found no evidence of any negative impact on intraoperative blood loss, perioperative mortality, and reoperation rate. Obesity as a risk factor for wound infection remains unclear.

Overall, the presence of obesity in the patient undergoing colorectal surgery must be taken into consideration when planning care. It appears obesity may predispose to the risk for complications; however, the data regarding the impact of obesity on surgical risk are inconsistent.

Stoma complication rates vary between 25% and 59% depending on the time frame studied and the descriptions of the complications. The lack of standard stoma complication definitions hinders the comparison of studies, but it is well known that the majority of people undergoing a fecal diversion will encounter a stoma or peristomal complication. Arumugam et al conducted a prospective audit of 97 patients with stomas and found that a high BMI was associated with an increased risk of retraction, early skin “excoriation,” and leakage. Duchesne et al’s multivariate analysis found...

**Key Points**

- **As the number of obese persons requiring colorectal surgery and the creation of a stoma increases, so does the need to understand the effect of obesity on potential complications.**
- **The author reviewed the literature and concludes obesity is not consistently found to increase the risk of surgery-related complications.**
- **However, obese patients present unique care challenges, and close monitoring of the stoma and ongoing stoma management is warranted.**

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the presence of IBD and obesity were significantly associated with stoma complications including necrosis, prolapse, and skin irritation (all with P values <5). Several authors suggest obese patients often have shortened, thick mesenteries, which preclude ease of bringing the stoma to the skin through a thick subcutaneous layer. The thick, shortened mesentery can result in tension at the stoma/skin junction, causing retraction, creasing of the peristomal skin, and compromised blood supply to the stoma, resulting in necrosis. These problems create difficulties in maintaining a seal on the ostomy pouching system.

**Stoma site marking.** Preoperative stoma site selection has been shown to decrease stoma and pouching complications after surgery. Considerations for an ideal stoma site include a location where the patient can visualize the stoma, a 2- to 4-inch area around the stoma that is free of creases and folds in the standing and sitting positions, and through the rectus muscle. When considering the stoma site for the obese patient, the proposed site should be assessed in both a sitting and standing position, because large shifts in subcutaneous tissue in various positions might influence the site selection. The literature includes several suggestions for the obese patient: the upper quadrants should be considered for the best stoma location because in many cases the upper abdominal quadrants have a less prominent adipose layer. A stoma in the upper abdominal quadrant may be better visualized
by the patient for self-management. Clinical practice suggests several sites should be selected because of the challenge in mobilizing the intestine to a selected site (see Figure 1).

Select complications in the obese stoma patient.

Stoma necrosis. Stoma necrosis is defined as the death of stoma tissue resulting from impaired blood flow (see Figure 2). According to Duchesne et al and Leenan and Kuyper, stoma necrosis is the most common complication in the obese patient. Necrosis is thought to result from vascular compromise and is a “balance between mobilizing a segment of the bowel that reaches the skin adequately and maintaining an adequate vascular supply in the process.” The necrosis can be partial or superficial and in some cases can be complete, extending to or below the fascia. An evaluation of the stoma for necrosis includes a brisk rubbing of the stoma tissue to determine if bright red blood is present, indicating adequate blood supply to the tissue; or the use of a lubricated test tube gently inserted into the stoma using a pen light for illumination. Necrosis at or below the fascia level requires an urgent return to the operating room. Superficial necrosis generally is assessed at frequent intervals using a two-piece pouching system to allow direct stoma visualization. Superficial necrosis may result in a mucocutaneous separation, a retracted stoma, and in some cases stoma stenosis. A patient with superficial stoma necrosis should be followed for several months after surgery to determine stoma function and viability.

In some cases where the surgeon is unable to deliver the stoma to the skin level without compromising blood supply, an “end-loop” stoma is constructed to achieve adequate length without losing the blood supply.

Stoma retraction. Stoma retraction is defined as the disappearance of normal stomal protrusion in line with or below skin level (see Figure 3). Arumugam et al analyzed risk factors and found obese patients had a higher risk of retraction. Retraction can occur soon after surgery as the tension of the bowel pulls the stoma to or below skin level or when necrosis is present and the stoma mucosa sloughs and the remaining mucosa is below skin level. The retraction can pull the skin inward, causing creasing around the stoma and also possibly causing the stoma effluent to exit at the skin level, contributing to leakage and skin loss. Management of the patient with a retracted stoma can include the use of a convex pouching system to flatten the peristomal skin and apply pressure around the stoma to effect some stoma protrusion. In some cases, a thin, flexible pouching system should be considered if the area around the stoma is deeply creased and the use of convexity may cause pressure around the stoma. A thorough evaluation of the stoma and the skin around the stoma should be performed to determine the best pouching system. Referral to a colorectal surgeon for a stoma revision may not be an option, because the thickness of the abdominal wall again will result in a less-than-optimal stoma creation.

Other Care Issues Specific to the Obese Patient

Because the mesenteric side of the intestine can be difficult to free as the intestine is pulled through a thickened abdominal wall, the stoma lumen can be at or below the skin level despite good stoma protrusion everywhere else (see Figure 4). The problems encountered with the lumen at the skin level can undermine the stoma output below the skin barrier, causing skin erosion and the loss of the seal. As the postoperative edema subsides, there may be less tension on the mesenteric side, and the stoma lumen may “move” closer to the middle of the stoma. During this accommodation period, the use of convexity with a belt may help protect the skin and seal, and in some cases the use of accessory products such as skin barrier paste or a barrier ring may enhance the seal.
Pressure ulcer. A pressure ulcer in the peristomal area can occur in the obese patient with a stoma due to the quality of the peristomal skin (soft and shifting) and can be caused by the use of firm convexity (see Figure 5), a two-piece system with a firm flange (abdominal folds over the outer portion of the flange), or a support bridge (see Figure 6). Reassessment of the pouching system, especially during the postoperative period, is key, because the tissue planes can shift with the loss of the postoperative edema and weight loss that frequently accompany a surgical procedure.

Conclusion

The number of obese patients presenting for colorectal surgery is increasing. It is important to understand the factors that can place them at increased risk for surgical and stoma complications. These complications may include prolonged hospital stay, anastomotic leak, wound infection, sepsis, and stoma complications such as necrosis and retraction. Although data on the risk factors are inconsistent, they should be considered when managing the obese patient undergoing colorectal surgery and a stoma creation. The obese patient will present unique challenges to the healthcare team. The care developed for this patient population should include close observation of the peristomal area to assess the presence of possible problems so care can be tailored for early intervention and the development of a management plan.

References