Diverticular Disease and the Obese Patient

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ABSTRACT

Diverticular disease is common in the Western world and is a considerable source of morbidity. Many have proposed an association between diverticular disease, its complications, and obesity. We examine this question through a review of the available literature. While it is likely that an association between diverticular disease and obesity exists, there is no evidence suggesting that obese patients should be managed any differently from the non-obese.

KEYWORDS: Diverticulitis, obesity, complicated diverticular disease

Objectives: On completion of this article, the reader should be familiar with evidence supporting the association between obesity and diverticular disease, and with pitfalls in the surgical management of diverticulitis in the obese.

Diverticular disease is a common entity in the Western world affecting up to two-thirds of individuals by the age of 85.¹ While only 10–25% of those having the disease will become symptomatic, it remains a substantial cause of morbidity and mortality in the 15% of symptomatic patients who develop a serious complication related to diverticular perforation.² While there is little debate over the necessity for surgery in those with peritonitis, the majority of patients do not have this type of presentation. There remains controversy surrounding the surgical management of this ailment with conflict centering on which patients require surgery, and whether or not the disease is more severe in specific population groups. The following discussion addresses the latter question as obesity and the obese patient may in fact be a predisposing factor to the etiology of diverticulitis and may serve to make more complex the treatment and surgery for diverticulitis.

Obesity is an epidemic in the United States, with as much as one-fourth of our population being considered obese.³ A relationship between obesity and diver-

ticular disease has been suggested^{4–10} and surgery in the obese can be associated with inferior outcomes. These factors are important to consider when managing these challenging patients. The purpose of this review is to outline the association between obesity, diverticular disease, and the complications related to diverticular disease and its management.

EPIDEMIOLOGY/PATHOPHYSIOLOGY

Burkitt and Painter described the relationship between the lack of dietary fiber and development of diverticular disease in 1972.¹¹ There has been little advancement in our understanding of this disease process since that time. It is not exactly clear whether or not obesity leads to diverticular disease or whether the presence of obesity simply increases the complications associated with the disease. Physical activity does appear to independently decrease the risk of developing diverticular disease.¹² The apparent coexistence of these conditions has led several groups to explore this question. In the 1980's and

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1990's there was a general belief that diverticulitis occurring in individuals aged 40 or younger was a more virulent disease process. Schauer et al found that the disease process was more severe in younger individuals and that the most common co-morbidity was obesity (84% of the study population).⁴ A similar study also discovered that 97% of the young population with disease were overweight.⁵

These studies encouraged other investigators to address the relationship between complicated diverticular disease and obesity. In 2005, a retrospective analysis found that patients with uncomplicated diverticulitis had a significantly lower BMI (body mass index) than patients presenting with perforation ($p=0.001$) or recurrent disease ($p=0.002$).⁷ Zaidi and colleagues addressed this issue by analyzing abdominal obesity as a measurement by sagittal abdominal diameter on CT (computed tomography) scan. They found that acute diverticulitis was occurring more frequently in a young, urban population (age 20–50 years) and that abdominal obesity was significantly more common ($p=0.05$) in the young age group compared with the over 50 age group.⁸

A prospective cohort study of 47,228 male health professionals, between 40–75 years old and free of diverticular disease at baseline, was published in 2009.¹⁰ The authors looked specifically at cases of diverticulitis and diverticular bleeding and monitored patient weight as well as waist and hip circumferences. Men with a BMI of 30 or greater had a relative risk (RR) of 1.78 for diverticulitis and 3.19 for diverticular bleeding compared with men having a BMI of 21 or less (95% confidence interval [CI], 1.08–2.94; 1.45–7.00). Waist circumference and waist to hip ratio were also associated with increased risks for diverticulitis and diverticular bleeding.

Another retrospective review included 104 controls and 614 patients hospitalized with complicated diverticulitis. This study was actually unable to demonstrate any correlation between BMI and the incidence of complicated diverticulitis.¹³ A Korean study from 2008 showed an increased incidence of right-sided diverticulitis in obese patients.¹⁴ These patients were also significantly younger than those with left-sided disease, and had lower complication rates. These factors may be significant in this geographic population considering the higher incidence of right-sided disease in Asian countries in general. It suggests that the association of obesity and diverticular disease may not be related simply to dietary factors.

In summary, the aforementioned evidence does show a likely link between obesity and symptomatic diverticular disease. However, the precise relationship between obesity and the onset of disease at a younger age is more difficult to elucidate. Recognizing a considerable yet undefined association between these diseases may help physicians from all specialties maintain a high index

of suspicion for diverticulitis in the obese. This may help ensure the provision of high quality care and avoid the morbidity associated with a missed diagnosis.⁶

DIAGNOSIS AND TREATMENT

While the basics of diagnosis and treatment of diverticulitis in the obese patient are no different than when this process occurs in the non-obese, a few issues that are unique to obesity should be discussed. Morbid obesity can limit a clinician's ability to use radiologic resources to assist with diagnosis and treatment. There is also considerable debate over the dosing of antimicrobials in obese patients.

The diagnosis of diverticulitis is often suspected based on an individual's history and physical exam, but in today's day is often confirmed through the use of computed tomography scanning. CT not only assists in making the diagnosis, but also allows for the assessment of abscess formation and perforation that will ultimately dictate a change in management. Morbid obesity may eliminate the use of CT in the assessment of a patient. Typically, if a patient can fit through the scanner aperture (many scanners 70cm, newer scanners up to 90 cm), the images will be diagnostic.¹⁵ One must take into account the height of the table when determining fit. The standard CT scanner weight limit is 205 kg (451 lbs), with newer scanners having the ability to accommodate weights up to 308 kg (677 lbs). This allows us to evaluate most patients, but one will still occasionally encounter a patient beyond these limits.

Intra-abdominal fat can actually aid in the diagnosis of visceral pathology, as the fat will separate the internal structures potentially improving the radiologist's view. Unfortunately many images are degraded by artifact created by the patient's size, and obese patients are exposed to higher doses of radiation during a standard scan.¹⁵ Percutaneous drainage of abscesses remains possible in the obese, as long as they are suitable for the CT scanner based on size and weight. Again, the visceral separation caused by intra-abdominal fat may actually aid in the safe passage of a percutaneous drain.

Treatment with oral or intravenous antimicrobials forms the mainstay of therapy for acute diverticulitis. While drug companies tend to conduct pharmacokinetic studies in special populations, investigations of patients of various body sizes and compositions are not required for regulatory approval.¹⁶ The literature would suggest that several agents (β -lactams, vancomycin, fluorquinolones, macrolides, linezolid, sulfonamides, and fluconazole) should be administered in higher doses to individuals with large body size to attain better pharmacologic targets.¹⁷ Because the actual effect of obesity on the pharmacokinetics and clinical efficacy of antimicrobials is unknown, this remains a controversial area. Tissue and serum concentrations will differ depending

on whether or not the antimicrobial is hydrophilic. Care must be taken with drugs possessing a narrow toxic-therapeutic window. If drugs are dosed simply by actual body weight, there is risk of potential toxicity in the morbidly obese patient with a relatively low lean body mass. Dosing weight correction factors (DWCF) have been calculated for some antimicrobials- 0.3 times the difference between actual body weight and ideal body weight for hydrophilic antibiotics, 0.4 for aminoglycosides, and 0.45 for fluoroquinolones.¹⁸ Most infections do not occur in cells themselves, but reside in the interstitial space where concentrations may be vastly different than those in plasma. This would certainly be the case with diverticulitis with or without an abscess. One study of tissue concentrations of ciprofloxacin in obese patients revealed higher plasma concentrations of drug in obese individuals dosed based on actual body weight, with much lower concentrations of drug at the tissue level.¹⁹ The authors suggest that dosing this drug based on an established DWCF could result in inadequate tissue concentrations of drug. We would recommend the use of broad-spectrum antimicrobials with appropriate coverage with consideration for hospital pharmacology consultation in the morbidly obese patient.

SURGICAL MANAGEMENT/COMPLICATIONS

It is well known that the presence of abdominal obesity can increase the difficulty associated with the performance of a surgical procedure as well as the occurrence of postoperative morbidity. These technical difficulties are amplified with the laparoscopic approach, amongst surgeons with less experience, and in the face of acute or chronic inflammation.

Surgical site infection (SSI) after elective colorectal surgery is common and accounts for 14–16% of all hospital acquired infections.²⁰ Recent standards have been enforced to minimize SSI and report on its occurrence. Smith and colleagues in 2004 reported on their experience with wound infection after elective colorectal surgery over a 2-year period.²¹ They found a 26% rate of wound infection in 176 patients, 49% of which were diagnosed following hospital discharge. Of all factors measured, increasing BMI and intraoperative hypotension were the only independent predictors of incisional SSI.

Patients undergoing emergent surgery for complicated diverticular disease are at higher risk for SSI and often require the construction of a gastrointestinal stoma. A study of 164 patients undergoing placement of an ostomy for various indications in 2002 reported a 25% morbidity rate related to the stoma construction itself.²² Significant predictors of ostomy malfunction included inflammatory bowel disease and obesity (OR=2.66; 95% CI 1.15–6.16). The authors comment

that use of an enterostomal therapist may minimize these complications, however the majority of obese patients with diverticulitis undergoing placement of a stoma will not have this benefit preoperatively. Parastomal infection has also been shown to be related to the presence of obesity in a retrospective review by Liu and colleagues.²³

When surgical management becomes necessary in the treatment of diverticulitis, many advocate the laparoscopic approach. The laparoscopic approach has several advantages yet it can be technically difficult in the abdominally obese. Experienced laparoscopic surgeons report increased conversion rates in the obese. Bouillot and colleagues reported a conversion rate of 13.9% in 179 cases of laparoscopic sigmoidectomy performed for diverticular disease.²⁴ Of the 25 patients that underwent conversion, 20% were related directly to abdominal obesity making it the second most common reason for conversion after inflammation. A 2006 study of consequences related to conversion of laparoscopic colectomy to an open procedure showed that converted cases suffered increased morbidity, particularly wound complications and increased lengths of hospital stay.²⁵ Obesity was also a major cause for conversion in this cohort. Tuech et al studied outcomes in normal, overweight, and obese patients and reported no difference in conversion rates, which ranged from 14.8 to 19%.²⁶ They did however demonstrate significantly longer operative times when comparing the normal group to the obese group. A 2003 retrospective database analysis of 582 elective sigmoid resections for diverticular disease revealed a mortality rate of 1.2% and a morbidity rate of 24.9%.²⁷ Multivariate analysis revealed two independent significant risk factors for mortality: age greater than 75 and obesity (OR=5.2; 95% CI 1.1–27.9; $p=0.04$).

Intraoperative complications in obese patients undergoing laparoscopic sigmoid colectomy for diverticulitis have not been well studied. Injury to the ureter during resection results in both significant morbidity and the probable need for additional procedures. The crucial step of the operation when the ureter is identified is routinely complicated by increased abdominal obesity. The overall incidence of ureteral injury during abdominal and pelvic surgery ranges from 1–8%.²⁸ The injury rates in obese patients have not been specifically reported as being higher but increased conversions are common when the ureter cannot be identified. Preoperative placement of ureteral catheters may reduce the likelihood of injury.²⁹ A review of 100 laparoscopic sigmoidectomies where all patients had lighted ureteral catheters placed preoperatively reported a single ureteral injury.³⁰ Another study of 151 patients undergoing both open and laparoscopic surgery for complex pelvic pathology demonstrated no ureteral injuries in the 145 who had lighted stents placed preoperatively and 2 injuries in the 6 patients who did not have stents placed.²⁸ The authors added that stent placement added minimal time and cost

Figures 1 and 2 CT images depicting acute diverticulitis in obese patients with inflammatory changes abutting the area adjacent to the left ureter.

to the procedure. Therefore it may be reasonable to consider the use of preoperatively placed ureteral stents when preoperative CT images suggest inflammatory change immediately adjacent to the path of the ureter in obese patients (Figs. 1–4).

While there is a lack of convincing evidence to support the following recommendations, we will discuss a few other technical issues based on anecdotal experience. The presence of excessive amounts of intra-abdominal fat can increase the difficulty associated with resection of the sigmoid colon. This may also lead to the necessity for additional efforts during a procedure that may not be otherwise required in a non-obese individual.

Intra-abdominal fat tends to collect in two places, the omentum and the mesentery. There are often large deposits in the appendices epiploica that can obscure the colon to view nearly completely. These phenomena are more common in males than in females who store more adipose tissue in the abdominal wall.

When adipose is deposited in the mesentery, it often becomes foreshortened which can reduce its mobility or stretch. This may often require that the splenic flexure be completely mobilized after a sigmoid resection to ensure a tension free anastomosis. Mobilization of the splenic flexure in the obese patient can be technically demanding even during open procedures. When performing a laparoscopic procedure, often a simple change to a hand-assisted approach may facilitate this maneuver. When performing an open procedure, the wisdom to simply extend the incision in the cephalad direction may simplify the effort and prevent an unnecessary splenectomy.

Dividing a thickened mesentery presents another challenge, and care must be taken to ensure adequate ligation/ sealing of the vasculature to prevent postoperative hemorrhage. One useful technique is to perform high ligations of the colonic vasculature if possible. This will keep the surgeon in a mostly avascular plane where the adipose can be divided with electrocautery. When a

Figure 3 CT image demonstrating a complex pelvic abscess adjacent to the area of the left ureter.

Figure 4 CT image obtained after drainage of a diverticular abscess. Significant peri-colonic inflammatory change remains and abuts the left ureter.

major vascular structure is encountered (typically the IMA) one can use any technique they are comfortable with to perform the ligation (stapler, energy device, ligatures). It is recommended to clear the vessel of adipose tissue as much as possible to insure a secure sealing of the vessel.

It is recommended to minimize the amount of adipose tissue contained within the anastomosis. An adipose wrapped colon can make this a challenging proposition. One should ensure that the majority of fat is cleared from the distal colon (not as much a problem on the rectal side of the anastomosis) to facilitate exclusion of adipose tissue from the staple line or suture line. Many modern circular stapling devices will prevent stapler firing if too much tissue is contained within the staple line. The clearing of perianastomotic fat must be done with care to ensure the blood supply to the distal colon is not interrupted. The authors do not support the notion of proximal diversion to protect an anastomosis simply for the reason of obesity. A surgeon must use solid judgment based on several factors to determine the need for proximal diversion.

CONCLUSION

The evidence suggesting an association between obesity, diverticular disease, and complicated diverticulitis is limited and consists only of a few level 3 studies and a single level 2 study. This makes it difficult to draw definitive conclusions, but the highest quality study supports a relationship between obesity and symptomatic diverticular disease in men. Given that diverticular disease appears to be related to maintaining a diet low in fiber, we often assume that a diet leading to obesity will also lead to the formation of colonic diverticuli. This may be accurate but does not explain the relationship between complicated diverticular disease and obesity. A lifestyle leading to obesity may also be a significant factor. There appears to be a delay in diagnosis when obese patients develop diverticulitis. This theoretically contributes to the increase in both severity and morbidity amongst this population. . Currently, we cannot support recommending any difference in management strategy based on the presence of obesity. Overall, surgeons should maintain a high index of suspicion for the diagnosis of diverticulitis to reduce the morbidity associated with a missed diagnosis or unnecessary procedure.

DISCLAIMER

The views expressed in this presentation are those of the authors and do not reflect the official policy of the Department of the Army, the Department of Defense, or the United States Government.

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