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EVIDENCE-BASED CURRENT SURGICAL PRACTICE

Urgent Management of Obstructing Colorectal Cancer: Divert, Stent, or Resect?

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Abstract

Despite the availability of effective colorectal cancer (CRC) screening strategies, up to 10% of CRC patients present with obstructive symptoms as the first sign of disease. For patients with acute or subacute malignant obstruction that requires urgent intervention, treatment options include endoscopic stenting as a bridge to surgery, one-stage surgical resection and anastomosis, or diverting ostomy which may or may not be followed by later tumor resection and stoma closure. However, to date, there is no consensus guideline for the optimal approach to manage malignant colorectal obstruction. This article aims to illustrate clinical scenarios in palliative, curative, and potentially curative settings, and delineate the key factors to be considered when making an individualized decision in order to determine the optimal treatment.

Keywords Colorectal cancer · Malignant obstruction · Emergency surgery · Diverting ostomy · Stent

Introduction

Despite colorectal cancer (CRC) screening programs designed to detect disease early in asymptomatic adults, up to 10% of CRC patients present with symptoms of acute colorectal obstruction that require urgent intervention.[1] Without prompt bowel decompression, potential complications include bowel ischemia secondary to distention and free perforation with sepsis. Patients with free perforation in the setting of a colonic malignancy not only have higher morbidity and mortality rates in the short-term, they also have adverse long-term oncologic outcomes.[2,3] Therefore, all efforts should be made to avoid these serious secondary complications.

Three main treatment options exist for patients with acute or subacute malignant obstruction: urgent primary tumor resection, diverting ostomy proximal to the tumor, and endoscopic stenting across the tumor. However, there is no consensus on appropriate selection of the optimal treatment option for all patients at this time. Clinicians are challenged to consider various clinical factors in order to determine the best treatment option for each patient.

In this review, we summarize and operationalize some of the factors that help practitioners determine the best course of action. These include procedural, disease, and patient factors that influence outcome and overall prognosis. Procedural factors include the immediate resectability of the tumor, technical success rates, procedure-related complication and morbidities rates, and any impact on short-term survival and long-term oncologic outcomes. Disease factors include the presence of locally advanced or metastatic disease, as well as neoadjuvant and adjuvant oncologic options which may be available. Patient factors include medical comorbidities, tolerance, and

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Learning Objectives
I. Recognize the different clinical scenarios of malignant colonic obstruction that warrant urgent or emergent intervention
II. Recognize available evidence for the management options for malignant colonic obstruction
III. Delineate key decision factors to be considered, and provide a clinically useful management algorithm for individualized clinical scenarios

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personal preference for each treatment option. We aim to illustrate clinical scenarios in palliative, curative, and potentially curative settings, and delineate the key factors to be considered when making an individualized decision in order to determine the optimal treatment.

Palliative Setting

Case Example

A 76-year-old woman was recently diagnosed with transverse colon cancer with multiple pulmonary and hepatic metastases. She was scheduled to begin palliative systemic chemotherapy as an outpatient. Prior to initiation of therapy, she presented with severe abdominal bloating, 5 days of intolerance to oral diet, and 2 days of obstipation. The imaging studies are shown in Fig. 1.

Patients with stage IV CRC with widely disseminated and unresectable metastatic disease involving multiple organs are typically not candidates for curative-intent therapy. Rather, the overall goal of treatment would be palliation and stasis of tumor growth. The disease burden and the effectiveness of palliative chemotherapy in disease control are typically the main determinants of life expectancy. In this case, the median life expectancy is short, often measured in months. The competing lethal risks in the setting of acute colorectal obstruction from end-stage metastatic CRC exist in free colonic perforation, septic insult, and/or procedural morbidity. Given patients' short life expectancy from the disease, the risks and benefits must be carefully considered when planning on an intervention for acute colorectal obstruction. The goal of treatment in the palliative setting is providing relief from the obstruction in a way that is expedient, effective, and with minimal morbidity, so that the patient can either continue palliative chemotherapy or return to their baseline quality of life as quickly as possible.

Historically, emergency primary tumor resection and diverting ostomy were the standard treatment for the palliative setting. However, endoscopic colonic stents can achieve many of the treatment goals outlined above and may decrease morbidity in this situation. Studies have reported very high technical and clinical success rates for emergent decompression.[4, 5] When compared with patients who underwent resection, patients treated with stents benefit from a shorter hospital stay and rapid recovery phase.[6–8] This minimizes the time away from palliative chemotherapy.[7–9] Moreover, the use of stents, compared with diverting ostomy, is often welcomed by patients and family members and is thought to better preserve the sense of quality of life.[10–12]

Data from the RCT and meta-analysis that compared stenting to primary tumor resection in patients with metastatic CRC have found no significant difference in overall survival rates.[7,10] However, some retrospective studies suggest that primary tumor resection may offer oncological benefit over stenting, in patients who were candidates to receive additional chemotherapy.[8,13,14] It should be noted that these studies did not stratify stage IV patients into symptomatic vs. asymptomatic from the primary tumor at the time of treatment decision-making. To date, there is little data on primary tumor resection in patients undergoing treatment for symptomatic obstruction and thus, the true morbidity and mortality outcomes of palliative resection have not been prospectively assessed.

While the morbidity and mortality rates associated with palliative stents are generally low, any morbidity in this patient population can have real consequences. A randomized controlled trial (RCT) conducted by Van Hooft et al.[15] compared stenting vs. resection for nearly-obstructing metastatic colonic cancer. This study was terminated for a high complication rate observed with stents, 22% had early stent-related perforation, and 44% had delayed perforation during adjuvant chemotherapy. Long-term complications also included delayed perforation, re-obstruction, and stent migration.[4,7] Up to 31% of post-stent patients reported recurrent obstructive symptoms by a mean of 120 days.[5] Additionally, the risk for stent-related perforation is significantly increased in patients who receive an anti-angiogenesis agent, with reports as high as 19.6-fold over the baseline populations.[16,17] Accordingly, anti-angiogenesis agents should not be used during the immediate post-stent period and may be a contraindication to urgent stenting.[18]

In some cases, a diverting ostomy may be the preferred palliative procedure, especially when it can be performed with low procedure-related morbidity. In particular, it is preferred over stenting for distal rectal cancers, secondary to the anticipated rates of pelvic pain, tenesmus, and incontinence after stent placement in the pelvis, thereby making stents.[19] As discussed above, diversion may also be a preferred treatment method in the setting of patients who were recently on anti-angiogenesis agents, given the high rate of delayed perforation in association with stenting. However, diversion requires a colostomy which does carry a certain rate of stoma-related complications such as prolapse and retraction.

Summary for Palliative Setting

The main priority of intervention in the palliative setting is providing an effective relief without morbidity to allow rapid return to either palliative chemotherapy or baseline quality of life.

In patients with a limited expected survival, in whom targeted anti-angiogenesis agents for systemic therapy can be held after stent placement, endoscopic stent would be the preferred option. This approach should be taken with the caveat that these patients merit close follow-up for stent-related perforations in the short-term and for the likelihood of needing additional endoscopic procedures in the long-term.

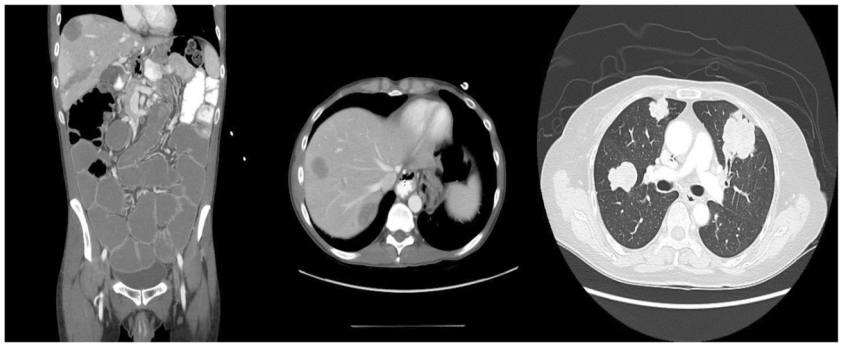

Fig. 1 Imaging studies of a patient in palliative setting

Diverting ostomy is preferred for obstructing rectal cancer because low-lying stent placement may cause pelvic pain, tenesmus, and incontinence. Ostomy is also preferred in patients who need to remain on anti-angiogenesis agents, given the high delayed complication rates with stent use.

Resection is typically not considered the first choice for patients in the palliative setting, but it is the only option when there is suspicion of bowel ischemia, serosal tear, and/or perforation. There is a significant controversy regarding whether resection of the primary tumor provides any oncologic benefit in patients with unresectable metastatic disease.

Curative/Potentially Curative Setting

Case Examples

A 63-year-old woman presented after 6 months of rectal bleeding and difficulty with defecation. Colonoscopy identified a circumferential sigmoid mass at 17 cm from the anal verge. Biopsy showed invasive adenocarcinoma. While waiting for an appointment, she came to the emergency department with abdominal distention and pain. The imaging studies are shown in Fig. 2.

A 50-year-old otherwise healthy man was found to be anemic at his routine annual physical. A colonoscopy identified a non-circumferential mass at 30 cm from the anal verge, and biopsy showed invasive adenocarcinoma. Fluorodeoxyglucose-18–avid positron emission tomography revealed bilobar liver lesions. He had been having two or three bowel movements per day but no obstructive symptoms. The treatment plan was neoadjuvant chemotherapy with FOLFOX, followed by synchronous right hepatectomy and sigmoidectomy. After 2 cycles of chemotherapy, he presented to a local emergency department with a near-complete large bowel obstruction.

The first scenario is a representative illustration for non-metastatic CRC patients who present with obstructive symptoms that warrant urgent intervention. The second scenario is representative of CRC patients who develop worsened obstructive symptoms during the course of curative-intent treatments. Substantial advances in systemic chemotherapy and targeted therapy have allowed the use of induction therapy with the goal of converting metastatic patients to candidates for curative-intent treatment. Patients with an intact primary CRC are vulnerable to developing acute or subacute obstruction, either during the period of induction chemotherapy or during time intervals after resection of extra-colonic metastatic disease. Options for managing acute obstruction in these patients should be based on the overall disease burden as well as time point along the overall intended sequence of oncologic treatments. Indeed, one key consideration is rapid return to intended oncology therapy (RIOT).[20]

In both scenarios, resection of the primary CRC is part of the intended oncologic therapy for the patient. Therefore, the feasibility of resecting the primary tumor in the emergent/urgent setting with no compromise to the oncologic standards of a curative-intent resection must be carefully assessed. Data supports that the morbidity and mortality rates for emergency resection are significantly higher than those of elective resection, especially in patients with malnutrition, renal dysfunction, immune deficiency, or ASA (American Society of Anesthesiologists) class 3–4 disease.[21–25] In addition, whether urgent primary tumor resection results in significant deviation from expected oncologic and quality-of-life outcomes than the original intended therapy must be assessed. For example, if urgent resection would deprive the patient of neoadjuvant pelvic radiation or would significantly compromise the sphincter function, then, consideration should be given as to whether a bridging option short of definitive primary CRC resection is available.[26]

To this end, both stenting and diverting ostomy have been used as a bridge to surgery (BTS). BTS strategy allows surgeons to optimize a patient's condition before a definitive resection. For example, BTS allows time for correction of fluid/electrolyte imbalance, normalization of bowel caliber, and/or use of mechanical bowel preparation. Moreover, this strategy provides time for the multidisciplinary team to complete staging workup, screen for synchronous lesions, and initiate neoadjuvant therapy for the primary tumor if needed. However, outcomes of BTS strategy should be evaluated in terms of success rate, complications, and long-term oncologic outcomes.

The short- and long-term outcomes for emergency resection versus BTS strategy have been compared in several

Fig. 2 Imaging studies of a patient in a Curative/Potentially Curative Setting

studies. Outcomes studied include anastomosis complication rate, stoma requirement rate, ability to perform minimally invasive resection, perioperative morbidity rates, and oncologic outcomes.

Several systematic reviews and meta-analyses have focused on short-term outcomes of stent as BTS.[27–32] The stent group (BTS) was associated with success rates as high as 97%, as well as fewer complications and shorter hospital stay when compared with resection.[27–29] Some studies additionally reported an increased rate of laparoscopic resection rate with primary anastomosis and a lower rate of stoma formation after stenting.[27,28] Recently, Saito et al.[33] conducted the largest prospective multicenter study of stenting in over 312 patients. The study demonstrated very high clinical success rate for stenting (98%) with low perforation rate (1.6%) and a high primary anastomosis success rate (92%) at a mean of 16 days after stent placement. These data demonstrate the efficacy of stenting particularly at high-volume medical centers with experience.[30]

Other meta-analyses have highlighted potential complications associated with stenting. Tan et al.[34] found no difference in anastomosis leak rate or in-hospital mortality rate but showed a clinically meaningful stent-related perforation rate of 7% and clinically "silent" perforation rate of 15%. Cirocchi et al[35] reported that the higher primary anastomosis rate observed in the stent group (64.9 vs. 55%, $p = 0.003$) was associated with an increased rate risk of anastomotic leakage (3 vs. 9%) although this was not noted to be significant. Furthermore, although the rate of stoma formation after tumor resection was significantly lower in the stent group, there was no significant difference in the permanent stoma rates. Two additional randomized trials were terminated due to stent-related perforation rates. Pirlet et al.[36] reported only modest technical and clinical success rates for stenting: 46.7 and 40%,

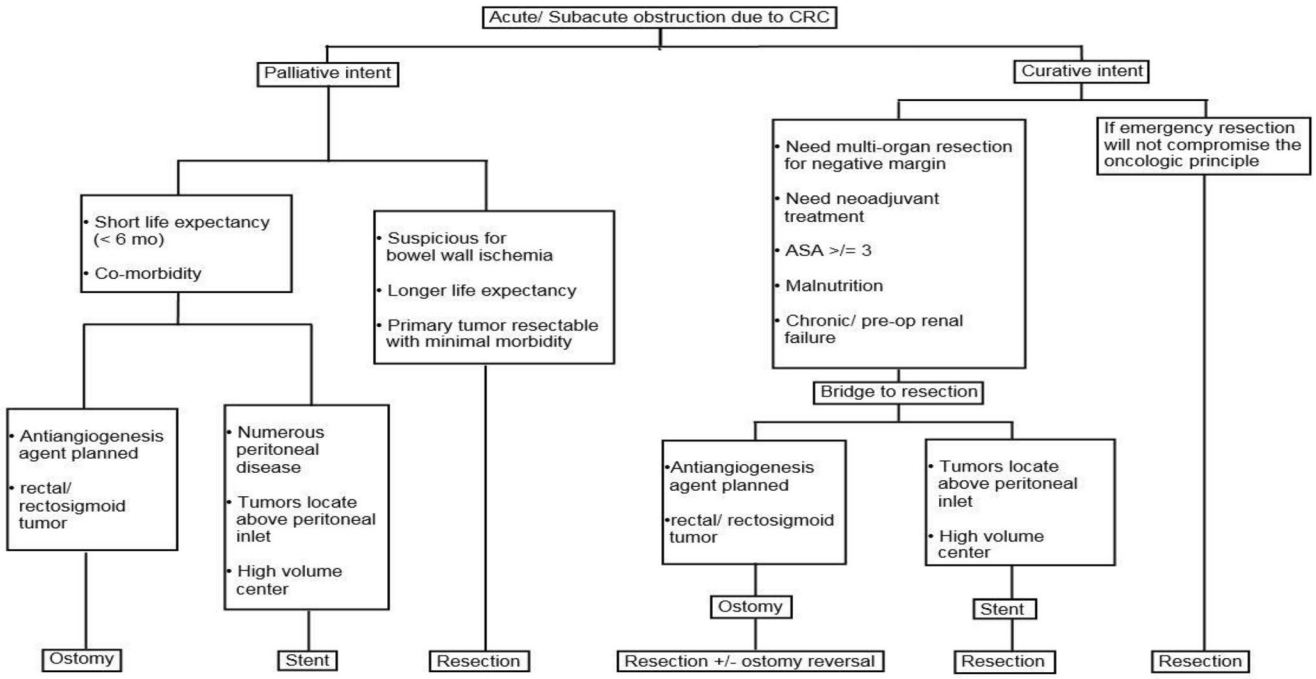

Fig. 3 Clinical management algorithms for patients presenting with obstructing colorectal cancer

respectively. After three cases of perforation, the study was terminated. In another multicenter RCT, Van Hooft et al.[37] reported a 13% perforation rate and the study was suspended due to concerns of perforations and tumor spreading. However, these studies may have differed from others in specifics of the stents used, the patient selection, and the experience of the endoscopists.

Studies have also examined the long-term oncologic safety of stenting as BTS when compared to emergency resection. In a large meta-analysis, Matsuda et al.[38] found no adverse oncological outcomes in the stent group. The authors highlighted that while most studies reported high success rates and low complication rates with stenting, those studies reporting high perforation rates and technical failure rates had also reported more unfavorable long-term outcomes in both groups. A retrospective analysis based on the Dutch Stent-In 2 trial supported these results. The incidence of disease recurrence and overall survival rate were lower in patients who experienced stent-related perforations compared with patients who did not have complications.[39] These two studies concluded that stent-related perforation may be associated with an increased risk of recurrence and a lower disease-free survival rate.

Concerns for the oncologic safety of stenting has stemmed from the theoretical concern that the radial force of the stent may disseminate tumor cells into the lymphatic channels or the bloodstream. If a stent-related perforation occurs, tumor cells may also disseminate into the peritoneal cavity. In a single study, Maruthachalam et al.[40] reported eight of 20 patients with obstructing tumors had increased levels of CK20 mRNA following stent placements. Sabbagh et al[41,42] suggested that unfavorable histologic features in the tumor after stenting, such as tumor ulceration, peritumoral ulceration, perineural invasion, and lymph node invasion, may be responsible for worse oncologic outcomes. More causal evidence is needed to link stent with long-term oncologic outcomes.

Few studies have compared diverting ostomy versus stenting as BTS. A retrospective study by Varadarajulu et al.[43] reported the outcomes associated with a selective approach: the author selected stenting for left-sided obstructing tumors above the pelvic inlet, but performed diverting ostomy for tumors below this level. This selective approach was associated with shorter hospital stays and fewer complications in the stent group. It was noted that the tortuosity of the rectosigmoid junction may compromise the technical success rate of stenting and that low stent placement in the pelvis can cause significant pelvic pressure, pain, tenesmus, and/or incontinence.

Finally, one systematic review and meta-analysis compared diverting ostomy with emergency resection. Amelung et al.[44] found no significant differences in terms of mortality and morbidity between the two treatment groups. When compared to emergency resection, patients who underwent diverting colostomy followed by interval elective resection had significantly increased rate of primary anastomoses and fewer permanent colostomies. Diverting ostomy, when compared to stenting, offers a high success rate for relieving obstruction without the need for tumor manipulation, sparing the patients from the potential risk of stent-related perforation or tumor spillage. Patients in the ostomy group experienced a better oncologic outcome.

Summary for Curative/Potentially Curative Setting

The main goal for patients in the curative or potentially curative setting is the need to return to the intended oncology therapy (RIOT) as soon as possible. The most suitable treatment for a particular patient requires a tailor-made decision considering the overall disease burden as well as the time point along the overall intended course of therapy. Based on the available evidence, stent is an effective option for BTS with many short-term benefits. However, it is an operator-, patient-, and tumor-dependent procedure. Stent should be utilized with the understanding of potential associated risks such as clinically apparent and occult perforation, highlighting the need for expert input and careful patient selection.

Conclusion

We have herein reviewed the current literature regarding three main treatment options for patients with acute or subacute malignant colonic obstruction: urgent primary tumor resection, diverting ostomy, and endoscopic stenting. No single approach is suitable for all patients in all clinical scenarios, but key clinical management algorithms are summarized in Fig. 3. A thorough understanding of decision-making factors related to the procedures, the patients, and their disease is mandatory for treatment selection.

Author Contributions All authors made substantial contributions to the study conception and design; acquisition, analysis, and interpretation of data; and drafting of the article and its critical revision for important intellectual content. All authors gave final approval of the version to be published.

Compliance with Ethical Standards

Conflict of Interest The authors declare that they have no conflict of interest.

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CME Questions

1. A 75-year-old man was diagnosed with sigmoid colon cancer with multiple unresectable liver and lung metastases. He was scheduled to receive palliative systemic chemotherapy next week. Unfortunately, he presented to the emergency department with severe abdominal bloating. Physical examination showed no sign of abdominal peritonitis. The imaging studies revealed left-sided colonic obstruction without any sign of hollow viscus perforation. Regarding to this scenario, current evidence supports the following statements EXCEPT?

a. The goal of treatment is relieving the obstruction in a way that is expedient effective, and with minimal morbidity, so that the patient can either continue palliative chemotherapy or return to their baseline quality of life as quickly as possible.

b. Endoscopic colonic stents may decrease morbidity in this situation.

c. Palliative resection will unequivocally provide a survival benefit.

d. The risk for stent-related perforation is increased in patients who is receiving an anti-angiogenesis agent

2. Regarding to the palliative management in obstructed stage IV colon cancer, current evidence supports the following statements EXCEPT?

a. The main priority of intervention in the palliative setting is providing an effective relief without morbidity to allow rapid return to either palliative chemotherapy or baseline quality of life.

b. Resection is needed when there is suspicion of bowel ischemia, serosal tear, and/or perforation.

c. Diverting ostomy can effectively palliate an obstructing rectal cancer.

d. Endoscopic stent is the treatment of choice in who need to remain on antiangiogenesis agents.

3. A 62-year-old woman presented after 6 months of rectal bleeding with chronic constipation and significant weight loss. She was diagnosed with a sigmoid adenocarcinoma at 25 from anal verge recently. She has no known distant metastases. While waiting for an appointment, she came to the emergency department with 2 day of obstipation and abdominal pain.

You recommend:

a. Diverting ileostomy only

b. Emergency exploratory laparotomy for primary tumor resection.

c. Endoscopic stenting only

d. Hospice care

4. A 60-year-old man was found to be anemic at his routine annual physical. A colonoscopy identified a non-circumferential mass at 30-cm from the anal verge, and biopsy showed invasive adenocarcinoma. Fluorodeoxyglucose-18–avid positron emission tomography revealed bilobar liver lesions. He had been having 2 or 3 bowel movements per day but no obstructive symptoms. The treatment plan was neoadjuvant chemotherapy with FOLFOX, followed by synchronous right hepatectomy and sigmoidectomy. After 2 cycles of chemotherapy, he presented to a local emergency department with a near-complete large bowel obstruction. Regarding to this scenario, current evidence supports the following statements EXCEPT?

a. The management options in this patient should be based on the overall disease burden as well as time point along the overall intended sequence of oncologic treatments.

b. Endoscopic stenting is contraindicated in this patient.

c. The morbidity and mortality rates for emergency resection are significantly higher than those of elective resection.

d. Diverting ostomy could be used as a bridge to surgery in this situation.

5. According to the treatment principles for obstructed potentially resectable stage IV colorectal cancer. Which of the following statements is FALSE?

a. The main goal for patients in the curative or potentially curative setting is to return to the intended oncology therapy as soon as possible.

b. The most suitable treatment for a particular patient requires an individualized decision considering the overall disease burden as well as the time point along the overall intended course of therapy.

c. Bridge to surgery strategy provides time for the multidisciplinary team to complete staging workup, screen for synchronous lesions, and initiate neoadjuvant therapy for the primary tumor if needed.

c. Endoscopic stent placement is the treatment of choice for all patients in this particular scenario.

6. Regarding the use of endoscopic stenting as a bridge to surgery (BTS) in malignant colonic obstruction, current evidence supports the following statements EXCEPT?

a. It is quite a straightforward procedure, the need for expert input is not necessary.

b. It is an effective option for BTS with many short-term benefits.

c. It is a patient, tumor, and operator dependent procedure.

d. Stent should be utilized with the understanding of potential associated risks such as clinically apparent and occult colonic perforation

7. Regarding the current evidences, these factors may effect on the outcomes of endoscopic stenting, EXCEPT?

a. Experience of physicians

b. Oncological treatment plan of each patient

c. Ethnicity of patients

d. Location of obstruction

8. Regarding the endoscopic stent insertion, which of the following statements is FALSE?

a. The tumor ingrowth is the most common etiology of late re-obstruction after a successful stent placement in palliative setting.

b. Stent migration is rarely occur after successfully stent placement.

c. Perforation should be suspected, if a patient has acute onset abdominal pain after stent placement.

d. Stent should be utilized with the understanding of potential associated risks such as clinically apparent and occult perforation, highlighting the need for expert input and careful patient selection.

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