# When the Sun Can Set on an Unoperated Bowel Obstruction: Management of Malignant Bowel Obstruction

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**Patient 1:**

*Mr XY is a 75-year-old man with known recurrent rectosigmoid adenocarcinoma in the pelvis. He had an emergency Hartmann's procedure 2 years earlier for a bowel perforation caused by tumor. The patient had been offered a surgical intervention 3 months earlier for the recurrent pelvic mass visualized on CT, but he declined any additional surgical intervention. No metastatic disease was noted at that time. He had no symptoms of bowel obstruction at the time, although there were signs of minimal proximal bowel dilatation. He presented to the Emergency Department on three separate occasions in a 3-week period with nausea, vomiting, abdominal cramping, and no colostomy output. A partial small bowel obstruction was confirmed on plain film x-rays. Clinically, the patient was in good condition and had no physical inhibitions.*

*He was treated with nasogastric decompression on each occasion and the symptoms quickly resolved and bowel function resumed. On the first two occasions, he was able to eat a regular diet and return home within 3 to 5 days of being admitted to the hospital. He had a small bowel follow-through after the second obstruction episode, which was nondiagnostic.*

*After the third episode, a lengthy conversation was undertaken with the patient about his goals and concerns related to an operation. This revealed fears of the pain related to surgery. After discussion about the likelihood of continued episodes of bowel obstruction and the assurance that diligent perioperative pain management would be practiced, including the possible use of an epidural catheter, he agreed to have an operation. The goals of restoring his capacity to eat, and the hope of allowing him to remain home without multiple readmissions to the hospital, were clearly delineated. We believed that the obstruction was most likely from a single site at his pelvic recurrence, and we were likely to achieve these goals. It was made clear to the patient that he could have more disease or adhesions than expected, making a definitive surgical approach difficult or impossible, and necessitating alternative therapies. He was told that even with surgery, bowel obstruction and wound complications could occur in the future.*

*At operation, there were extremely dense adhesions throughout his entire peritoneal cavity, especially in the pelvis. He did not have peritoneal carcinomatosis, although he did have tumor nodules throughout his liver. The source of the bowel obstruction was difficult to locate because no area of decompressed bowel was found, and extensive adhesiolysis was required. The colostomy site was closely inspected to ensure that it was not the site of obstruction. Ultimately, a loop of very distal small bowel was adherent to a pelvic tumor mass overlaying the iliac vessels and ureter. The small bowel was folded on itself, creating a small blind loop. The decision was made to do a small resection instead of a bypass. This was accomplished with a primary anastamosis without complication. Postoperatively, the patient's bowel function was slow to resume. Otherwise, he recovered uneventfully and went home 8 days after the operation. One month after operation he remains at home without symptoms or signs of recurrent bowel obstruction.*

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An understanding of the management of malignant bowel obstruction (MBO) is integral to the care of end-of-life (EOL) patients. Although quality of life (QOL) can be severely impacted for all patients with intestinal obstructions, the treatment decision making can be more complex in the end-of-life patient. The aim of improvement of quality of life is paramount, and added





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**Abbreviations and Acronyms**

MBO = malignant bowel obstruction
Nd:YAG = neodymium-doped yttrium aluminum garnet
NG = nasogastric
PEG = percutaneous endoscopic gastrostomy

survival can be a secondary benefit. MBO has been noted to occur in 15% of terminally ill patients in a palliative care unit.[1] Other reports can show lower percentages, but MBO is a frequent clinical dilemma and surgeons must have a thorough understanding of this condition.

Because surgeons are often involved in the care of patients with intestinal obstructions, they must be aware of the alternatives and resources available. This can be the first time that the patient and his family are confronted with end-of-life issues, and the possible need for lengthy and difficult discussions should be anticipated. It is important to direct attention to the actual causes for the patient's decline and symptoms related to the progression of tumor, and not the mechanical obstruction. If surgeons are not aware of, or do not feel comfortable in discussing end-of-life issues with the patient, then a team approach is all the more advisable. This can include a palliative care team or hospice, if available, or at least a physician with demonstrated interest and competence in end-of-life care.

Causes of MBO may be directly related to cancer, its treatment, or common benign etiologies. Clearly, the cause of the obstruction, if it can be discerned, can play a role in the treatment decision-making process. Benign causes of intestinal obstruction, such as adhesions, radiation-induced strictures, and internal hernias, must be considered even for a patient with known metastatic or unresectable cancer. The rate of benign intestinal obstruction in patients with previously diagnosed malignancy is variable but significant (3% to 48%).[2] The incidence of radiation enteritis is directly related to the amount of small bowel in the radiation field and the dose of radiation received.

Malignant causes of obstruction include intralumninal tumor growth from recurrent, metachronous, or metastatic disease; tumor blockage from carcinomatosis or mass; intramural growth of tumor as in intestinal linitis plasitica;[3] or direct adherence and kinking from tumor. Carcinomatosis, rather than local tumor recurrence, is likely the cause of intestinal bowel obstruction from neoplasm.[2,4,5] This is in contrast to large bowel obstructions, which are usually at a single site.[5] The effects of mechanical obstruction by tumor can be complicated by inflammatory edema, constipation, cancer- or treatment-induced fibrosis, abnormalities in intestinal mobility, decreased production of intestinal enzymes and secretions, a change in fecal flora, and side effects of medications.[6]

There are many primary cancers known to cause malignant bowel obstruction, and knowledge of the primary disease and the individual patient's history are extremely important because they can impact treatment. Bowel obstruction occurs in 5% to 43% of patients with a diagnosis of advanced primary or metastatic intraabdominal malignancy.[6] The most common are ovarian (5.5% to 51%) and colorectal (10% to 28%) cancers;[7] nonabdominal cancers including lung, breast, and melanoma are known to occasionally lead to intestinal obstruction. Longterm survival for these patients is quite poor. Lower-grade tumors, such as pseudomyxoma peritonii, can have a better outlook warranting consideration of more invasive treatment approaches.[4]

## Radiographic evaluation

Radiographic evaluation of bowel obstruction has always served an important complementary role to history and physical examination in establishing the diagnosis of obstruction, assessing both its severity (partial obstruction versus complete obstruction) and potentially the cause of disease (adhesive band versus peritoneal metastases). Plain film radiography is the initial evaluation of patients with suspected bowel obstruction. Hallmark findings include dilated loops of small bowel, multiple air fluid levels on an upright film, and an absence or paucity of intraluminal gas distal to the point of obstruction. Plain films remain effective in ruling out other causes of painful abdominal distention such as free air from perforation, volvulus, and foreign bodies. Plain film radiography can correctly establish the diagnosis of small bowel obstruction with accuracy ranging from 30% to 70%.[8,9] Plain films are limited in that they offer minimal information on the cause of obstruction, and are unlikely to demonstrate multiple sites of obstruction. In some cases of MBO, plain films can be unremarkable because tumor encasement of the bowel will prevent the tell-tale sign of bowel dilitation seen in obstruction.

Small bowel contrast studies have long been used in identifying the location of a bowel obstruction, but opinion is divided on the utility of small bowel followthrough with either orally administrated barium or water-soluble contrast material.[10] The accuracy of gastrointestinal contrast studies is generally believed to be higher (70% to 100%) than plain films, and is enhanced by the ability to assess for passage of contrast at progressive time intervals. Generally, failure of contrast to reach the cecum in 24 hours is consistent with high-grade or complete obstruction.[11,12]

Barium enemas can be a valuable complement to upper intestinal studies in cases of suspected malignant bowel obstruction. If a barium enema elucidates a site of colonic obstruction, in addition to small bowel blockages seen on upper gastrointestinal studies, it is highly suggestive of multiple levels of bowel obstruction and consistent with carcinomatosis.[13] Barium enema can reveal metastatic implants in more than half the cases of carcinomatosis, and more than one-third of studies in these cases will demonstrate a "fixed colon sign."[13]

Enteroclysis studies, in which the duodenum is intubated directly under fluoroscopy and contrast injected under pressure, is highly reliable in pinpointing sites of obstruction in situations of both high-grade as well as low-grade obstruction.[14] It is most often helpful in situations of low-grade obstruction where patients have recurrent episodes of bowel obstruction but plain films are equivocal. By injecting contrast under pressure directly into the duodenum, and avoiding washout of contrast in the stomach, enteroclysis studies tend to be more accurate in both identifying the site and the degree of obstruction. Few radiologists routinely perform this procedure. Because enteroclysis tends to be operator dependent, its availability is subject to local expertise.[8]

A new gold standard in diagnosing bowel obstruction, particularly malignant bowel obstruction, is emerging with the use of CT. The American College of Radiology endorses CT as highly appropriate in the evaluation of bowel obstruction.[15] Studies have demonstrated CT to be quite sensitive (78% to 100%) in identifying small bowel obstruction, with specificities greater than 90%.[16,17] Additionally, the greatest use of CT can be in identifying the cause of obstruction,[16] including metastases.[17,18] CT can distinguish among possible pathologic processes resulting in bowel obstruction, including tumor involvement of the bowel wall, mesentery, mesenteric vessels, and peritoneum.[16] The establishment of bowel obstruction as secondary to a diffuse peritoneal process can alter the surgeon's recommended treatment approach. Finally, CT is also the best diagnostic modality in identifying complications of bowel obstruction, such as strangulation or ischemia, which might render nonoperative management futile.[16] But in patients with known advanced malignancy, identifying ischemic or nonviable bowel preoperatively can avoid the potential additional discomfort and costs associated with establishing this diagnosis in the operating room.

The definitive radiographic workup of malignant bowel obstruction has not been determined. The vast majority of radiographic clinical trials for patients with bowel obstruction have not limited entry criteria to those with known malignancy. So data from available studies need to be interpreted carefully regarding radiographic study appropriateness for patients with a history of malignancy or, perhaps, known metastatic disease. For patients with known previously unresectable abdominal disease, simple plain films and clinical examination will likely suffice in establishing the diagnosis of suspected initial or recurrent malignant bowel obstruction. For patients with a history of either completely resected abdominal malignancy or an earlier nonabdominal malignancy with known extraabdominal metastatic disease (breast cancer, lung cancer), additional imaging such as CT or combination of upper and lower gastrointestinal contrast studies can elucidate multiple sites of bowel obstruction. Because there are no comparative studies comparing cost, patient comfort, and diagnostic accuracy, the data currently available suggest that CT should be used in the evaluation of suspected MBO, especially if invasive treatment approaches are considered.

## Treatment options

There are many treatment options to consider for MBO. Surgeons attending to patients with MBO must outline aims and realities of therapies, being sensitive to the needs and desires of patients and families. Goals of treatment must be clear and be used to guide care. Because MBO is rarely an emergency,[19] time must be afforded to the patient and family to consider the many issues related to impending death, and the treatment approach they would most like used.

Although surgical approaches can be options to treat MBO, it does not mean that the patient should be operated on. Appropriate patient selection is imperative if

surgical procedures are contemplated because operative mortality is frequent (5% to 32%), most often related to progression of neoplasm.[2,20,21] Morbidity is also common (42%),[20] and reobstruction after operation can be quite high (10% to 50%).[21] These facts should be carefully considered with the patient, family, and medical team. Surgeons must educate as to the surgical options and acknowledge the availability of nonsurgical options, but be prepared to "back off" based on patient goals. With the advent of newer medications and other less invasive treatments, other nonsurgical therapies can and should be mentioned. Realistic objectives, not "magical thinking," should guide these conversations. These objectives are based on the patient's current clinical status, the cause of the obstruction, available expertise, and the patient or surrogate's decision about the relevance of these choices to their needs.

MBOs are usually partial and rarely urgent situations. The rarity of intestinal gangrene in malignant obstruction gives all involved some "breathing room" for making these difficult management decisions. Although medical management of complete bowel obstruction is less likely to succeed than that for partial bowel obstruction, it still should be considered in the patient who is extremely ill or functionally severely compromised because it might notably improve quality of life.[7] Nonoperative management must be considered and discussed in all MBO presentations, even in cases in which a patient could tolerate and benefit from operative intervention to ensure adequacy of the consent process and prepare the patient for the possibility that an operation might fail to palliate. Overall, the literature is often confusing concerning patients with intestinal obstruction and a history of cancer. Studies might combine patients who have no evaluable disease or other curative options. In addition, outcomes are variable and inconsistent. Reports must often be viewed with skepticism because of these limitations, and care must be individualized. There is no single treatment modality or definitive algorithm for MBO. Success must be measured by defined outcomes that adhere to individual patient values and goals.

The primary goals of treatments are multifold, including to ensure the patient does not have to tolerate continual obstruction-related nausea and vomiting, allow the patient to eat, alleviate pain, and permit the patient to return home or a nursing facility under hospice care. Individually, these goals must be considered and prioritized, and multidisciplinary approaches might be necessary. Overall patient status, including physical, social, psychological, and spiritual domains, is of primary importance. Outpatient care should be an important goal of therapy, no matter what the treatment approach initiated. Outpatient care can depend on appropriate resources, including hospice and caretakers who are willing and able to take on the multiple tasks necessary to care for these patients. Outpatient care will also depend on financing and insurance requirements.

If the patient can assume an acceptable quality of life, based on the patient's, caretaker's and surgeon's assessments, then invasive therapies can be considered. It is also imperative that the patient has a reasonable expected survival. The term "reasonable" leaves much for interpretation. Although it is often difficult or impossible to effectively gauge survival, life expectancy can be estimated based on clinical status and known survival rates in the literature. It should also be taken into account that a treatment might have a secondary gain of improved survival. If a patient can be expected to live for several months after an operation, barring major complications, surgical options should be contemplated. If it is estimated that a patient has only days to a few weeks of life remaining, then a major operation seems unreasonable. If the patient is deemed too sick for a surgical procedure, an operation is unlikely to help achieve goals, or if an operative intervention is refused, other modalities must be recommended. In this setting, minor surgical or endoscopic approaches with usually limited morbidity can be quite helpful.

It is unclear if specific contraindications to operation can be elucidated. A literature review of surgery in MBO[21] found all studies were retrospective, and no defined criteria could be discerned. Reports are variable as to the percentage of patients deemed inoperable (6.2% to 50%), with the most frequent reasons noted being extensive tumor, multiple partial obstructions, and inability to correct obstructions surgically.[3] Most authors believe that prognostic criteria for which patients are less likely to obtain a benefit from surgery include ascites, carcinomatosis, palpable intraabdominal masses, multiple bowel obstructions, and very advanced disease with poor overall clinical status.[3] Recommendations are not uniform; in one series of MBO from colorectal cancer, the number of obstruction sites played no role in the ability to regain bowel function or postoperative death.[22] It has been found that patients who undergo abdominal procedures with known large-volume ascites ($\geq$3 L)

have a perioperative mortality of 41%, and this mortality rate particularly pertains to patients with nonovarian primary cancers and advanced age.[23] Blair and associates[24] found that ascites with a small bowel obstruction was most likely to predict worse outcomes of surgery. It does seem that improved quality of life is significantly higher where there was local recurrence rather than carcinomatosis.[2]

The Krebs and Goplerud prognostic index is frequently used to determine optimal patients for operation.[25] This uses age, nutritional status, tumor status, ascites, previous chemotherapy, and previous radiation therapy as prognostic parameters. These authors define successful palliation or benefit from operation as survival of at least 2 months. Although this index based on physical and objective parameters is commonly used, it assumes that optimal palliation is reflected in survival and not quality-of-life outcomes. Clearly, this is a highly debatable but very common determination of success, adding to the problems of relying on much of the literature related to MBO for clinical decision making.

Although it is recognized that improvement in quality of life after operation is variable (42% to 85%),[21] there is no consistent parameter used to determine this clinical outcome. One must base decision making related to surgical and other approaches on the known retrospective literature and on patient and family goals and desires. Although aggressive surgical approaches have been advocated, most outcomes have been reported as survival and procedure-related morbidity, frequently omitting quality-of-life concerns. Quality-of-life measurements related to surgical approaches for MBO that are reported are inconsistent. They include the ability to tolerate solid food,[22] the ability to tolerate oral feeding at discharge, the ability to resume a normal diet, restoration of bowel function, ability to return home, ability to live without a recurrent obstruction, and survival of more than 60 days.[21] Clearly, without uniform parameters, it is difficult to measure success.

## Surgical options

Only after thorough discussion should one proceed with operation. One must feel comfortable that the patient and family clearly understand the reasonably expected outcomes, including unambiguous goals of operation, possible intraoperative difficulties, longterm morbidities, alternative procedures that can be used at the time of operation, and the reality that no helpful interventions might be accomplished. Recovery time and postoperative concerns must be addressed. Pain, as always, is a major anxiety and an epidural catheter should be considered if possible, as should other known postoperative pain management techniques. Because reobstruction rates are high (10% to 50%),[21] limitations should be set as to the possibility of further operative procedures. In addition, future treatment options should be delineated. Most importantly, it is imperative that there is no miscommunication if there is no expectation for cure; quality of life as the primary goal of treatment should be gently affirmed.

There are many options that must be in a surgeon's arsenal when attempting an operation for intestinal obstruction with a palliative intent. When an exploratory laparotomy is undertaken, one must be prepared for the multiple possible causes of bowel obstruction. The quickest and safest procedure that can alleviate the obstruction or favorably impact on symptoms should be considered. For MBO, resection of the obstructed segment can afford the best outcomes. Resection might or might not entail restoration of bowel continuity. If resection cannot be done safely, or a prohibitive amount of dissection is needed, alternative approaches can be considered either at operation or during the postoperative period.

If there is diffuse carcinomatosis, an intestinal bypass might be the best option. Intestinal bypass can be in the form of an intestinal stoma or an enteroenterostomy, enterocolostomy, or enterogastrostomy. In some cases, a simple gastrostomy tube for drainage purposes can be the best approach. A study by van Ooijen and colleagues[26] indicates those patients with ascites and or palpable masses have lower morbidity and increased survival with percutaneous tube gastrostomy alone when compared with patients undergoing an open operative approach. Although a gastrostomy tube alone for obstruction might not improve the ability to eat, it will usually alleviate the problems of nausea, vomiting, and pain. Patients might be able to take some form of oral diet in time. Some patients discover that they can enjoy solid food and relieve themselves of fullness by scheduled, self-induced vomiting as long as nausea is controlled. It is very helpful to explain to these patients that nausea is a distress signal and vomiting is a reflex to reduce distress.

If a benign cause of bowel obstruction is encountered, usual surgical techniques are often applicable, but bypass

or intestinal stoma can also be recommended if it will shorten the procedure and lead to less morbidity.

Recently, laparoscopy has been used to bypass obstruction from radiation injury.[27] This surgical technique is highly dependent on surgeon experience and ability, and is usually not appropriate for patients with dense adhesions and carcinomatosis. In properly selected patients, especially those who present initially with incurable cancer and a bowel obstruction, or who had only laparoscopic procedures previously, this can be a less invasive surgical option.

For patients with radiation-induced obstructions, intestinal bypass can be the preferred surgical treatment approach rather than resection.[28] This has been shown to lead to longterm alleviation of gastrointestinal obstructions and successful palliation in most patients.[28] Severe adhesions can make surgery impossible,[29] and other treatments must be considered in this situation.

A very aggressive approach to surgical palliation has been advocated by Averbach and Sugarbaker,[4] entailing maximal debulking and possible intraperitoneal chemotherapy for patients with recurrent intraabdominal cancer. Success is much more likely in cases of low-grade tumors such as psuedomyxoma peritonii, complete cytoreduction, and a relatively long interval between the primary operation and the obstruction. It should be noted that they report that aggressive operations are time-consuming (mean $>$ 10 hours), involve large blood losses (approximately 1,500 mL), and carry high morbidity (55%) and mortality (7.14%), and they advocate this treatment alternative only in the most experienced hands.

Focusing on survival outcomes, it is not clear that these techniques result in improvements in overall quality of life or in reduction of symptoms. This makes it difficult to interpret the role of these interventions when caring for patients who have been defined as having a terminal disease. Clearly, this treatment modality can be advocated only in a minority of the patients who present with intestinal obstruction in the palliative setting, but aggressive cytoreductive operations can be considered in limited settings.

### Nasogastric tube: Its role in MBO defined

Although nasogastric (NG) tube drainage is frequently used in the algorithm for treatment of bowel obstruction, it is uncomfortable, and its longterm use in malignant obstruction is not usually necessary given the array of alternatives currently available. Nasogastric decompression and hydration alone can be successful in the treatment of MBO, and should be considered initially on a time-limited trial basis. More time should be given to patients with advanced disease before pursuing operation because a significant number of episodes of malignant obstruction will resolve, though many of these will reobstruct.

NG tubes can make clearing secretions more difficult, increase the likelihood of aspiration and pneumonia, and in longterm use can cause painful nasal decubiti. In addition to physical discomfort, longstanding NG drainage also has practical and aesthetic drawbacks. Long intestinal tubes have been used with some success in the past, but are rarely effective for patients with malignant obstruction;[30] they might simply prolong hospital stay before a more definitive treatment, surgical or nonsurgical, can be accomplished. In the context of MBO, the use of nasogastric suction should be reserved for the period of initial evaluation, for temporary relief until more durable measures are initiated or resolution of the episode has occurred, or as an adjunct to perioperative care.

### Patient 2

*Mr LS presented to the Emergency Department with obstipation and a massively distended abdomen. He was receiving chemotherapy for extensive symptomatic hepatic metastases from an unknown primary tumor. His overall functional status was quite poor, and he spent most of the day in bed. Plain film x-rays confirmed a bowel obstruction, and CT imaging displayed bowel obstruction from a large mass compressing and invading the sigmoid colon. In addition, his liver was almost entirely replaced by tumor. His operative risks were believed to be considerable, so alternative approaches were considered. After discussion with the patient and his family about the goals of care, a rectal stent was successfully placed through the sigmoid stricture under fluoroscopic guidance. The stent relieved his obstruction, and he was able to resume eating and return home on hospital day 3. He had no further symptoms of bowel obstruction, and died several months later from progression of liver disease.*

### Endoscopic treatments

Numerous endoscopic procedures are available for patients with single site MBO. These techniques are ideally suited for patients who are poor operative candidates, those with prohibitively extensive disease, and patients refusing open operative intervention. In addition to avoiding a major surgical intervention, a significant goal of these techniques is to obviate the need for an intestinal stoma.

Endoscopic stent placement has successfully relieved obstruction at many sites of MBO along the alimentary canal. Endoluminal wall stents have a high success rate for placement and decompression with relief of symptoms (64% to 100%) in complete and incomplete colorectal obstructions,[31] and in more than 70% for upper intestinal malignant obstructions including gastric outlet, duodenal, and jejunal obstructions.[32] This approach should be considered if the necessary equipment and the expertise are available. The method frequently uses other endoscopic techniques to initially canalize the bowel, such as laser or balloon dilatation. A guidewire is often passed through the site of obstruction under fluoroscopy, and the Seldinger technique is used to canalize the bowel. Although the risks of stent placement for colorectal disease include perforation (0% to 15%), stent migration requiring replacement (0% to 40%), or reocclusion (0% to 33%), stents can frequently lead to adequate palliation for long periods of time.[31] It is thought by some that covered stents can provide prolonged patency over uncovered stents for rectal and distal colonic obstructions.[33] A specific useful application of covered stents is in managing fistulas involving respiratory, gastrointestinal, and genitourinary systems. Stent occlusion by tumor ingrowth is usually amenable to another endoscopic intervention such as laser or restenting.

The neodymium-doped yttrium aluminum garnet (Nd:YAG) laser can be used at the time of stent placement to initially canalize the bowel for low rectal tumors, but has little role for longterm palliation. Laser therapy frequently requires repeated treatments to maintain luminal patency.[31,34] Balloon dilatation is another shortterm measure and is frequently used at the time of stenting[31] or use of the Nd:YAG laser.[34,35] Combined endoscopic techniques, including balloon and mechanical dilatation and Nd:YAG laser and diathermal snare debulking, to recanulize the colon and rectum without stent use can frequently be successful (94%), but carries the burden of frequent monitoring and procedures to maintain patency.[34] Therefore, if stenting is possible, it is probably the optimal endoscopic technique.

Percutaneous endoscopic gastrostomy (PEG) tubes are generally well-tolerated venting procedures that can alleviate symptoms of intractable vomiting and nausea secondary to MBO. As with open gastrostomy placement, this procedure itself will not allow the patient to eat unless adjunctive pharmacologic and behavioral techniques are used. Although this is a major drawback, it is a less invasive procedure than an open gastrostomy and can ultimately improve quality of life. In combination with other medical techniques, both open and percutaneous gastrostomy offer the possibility of intermittentl oral intake.[36,37] PEG placement has been shown to help keep terminally ill patients at home instead of in a hospital situation.[36,38] This method has proved quite useful for patients with end-stage gynecologic malignancies.[37] Although complications are rare, even when puncturing other organs such as liver and colon, patients with ascites are poor candidates for PEG tube placement.[37] Traction necrosis must be carefully watched for in these patients with nutritional deficiencies.

### Patient 3

*Mrs LB was a 49-year-old woman with a diagnosis of chemorefractory ovarian carcinoma in the care of a home hospice program, who was admitted directly to a surgical floor of a regional hospital after complaints of persistent abdominal pain, nausea, and occasional vomiting unresponsive to antiemetic suppositories over a period of several days. Her husband complained that she "wasn't getting enough to eat and losing weight" because of her vomiting. The patient insisted she did not want "any more surgery or chemotherapy" and asked her husband to be sure to bring her "living will" to the hospital. She acknowledged feeling "rotten" the previous 2 weeks and stated she wanted to be home with her children as soon as she "felt better." On exam she was alert and oriented, though markedly cachectic. She had marked ascites and multiple palpable masses on abdominal exam. Bowel sounds were hypoactive. Rectal exam revealed a bulky hard mass in the pelvis. She was started on both haloperidol and hydromorphone subcutaneous infusions before transfer to the radiology department for diagnostic imaging. A decision was made to forego nasogastric drainage pending radiographic evaluation. An abdominal plain film was unremarkable except for a*

*single minimally dilated loop of small bowel, supporting the clinical diagnosis of malignant bowel obstruction from carcinomatosis.*

*Based on the x-ray findings and the fact that her symptoms were now controlled, no nasogastric tube was inserted. The x-ray findings and their implications for management were discussed with her and her husband. During this discussion the multiple reasons for her weight loss, not related to mechanical obstruction, were explained to her husband, resulting in his tearful acknowledgment, "I was afraid that was what you were going to tell us." She stated she was sad for her husband but relieved that he heard the true reasons for her lack of interest in food. Based on her wish to forego operation and the fact that operative management was unlikely to favorably impact her comfort or quality of life, continued pharmacologic management of her symptoms was selected.*

*Although her nausea and pain had abated after initiation of the subcutaneous infusions, she continued to have vomiting several times a shift. Octreotide 150 μg was given subcutaneously every 12 hours over the next 24 hours, during which her vomiting ceased. Arrangements were made to transfer her home on the afternoon of her second hospital day, with both subcutaneous infusions administered by portable pump under the supervision of the visiting hospice nurse and her attending surgeon. She died peacefully 10 days later, during which time she had excellent symptom control, allowing her to complete a scrapbook for her family and plan her memorial service.*

## Pharmacologic management of MBO

There are many pharmacologic therapies currently available to relieve signs and symptoms of MBO. They can be used when a surgical procedure is not an option, operation is refused, or as an adjunct to operations. The goal of pharmacotherapy is control of pain, nausea and vomiting, dehydration, and intestinal inflammation and edema. Pharmacotherapy targets different physiologic mechanisms, allowing selective control of individual symptoms. In combination, using a balanced approach not unlike anesthesia, one can manage each of the different symptoms related to MBO. This often can mean serially adding or subtracting medications based on results and side effects. Ideally, the fewest medications possible are used to address the maximum number of symptoms. Education for home care must be extensive to ensure adequate symptom relief of MBO.

Opioids, most commonly morphine and hydromorphone, can effectively alleviate pain related to intestinal obstruction and produce an advantageous adynamic ileus.[39] Methadone, which is less constipating, can also be used.[7] Isbister and colleagues[39] assert that when used in combination with metoclopramide for nausea and vomiting in continuous administration, patients can frequently take a fluid and low-fiber diet with rare vomiting or use of a nasogastric tube. Although they do not evaluate objective symptom control in their report, this is a relatively easy approach that may help significant numbers of patients avoid surgical intervention. Some believe that metaclopramide might be contraindicated in complete bowel obstruction because of its promotion of gastric motility, but it might be efficacious in incomplete bowel obstruction.[40]

There are many other antiemetics that can be used to help control refractory vomiting. Clearly, the route or administration is of vital importance because patients will do poorly with oral medications. These can be given rectally (prochloperazine, promethazine, hydroxyzine), subcutaneously (ondansetron), or intramuscularly methotrimprazine). Haloperidol, which can be given subcutaneously, is considered by some to be the drug of first choice to control nausea and vomiting.[3] Haloperidol has the added advantage of controlling agitated delirium, which is not uncommon in this patient population. Complete relief of emesis is achieved in only 30% of patients with antiemetics.[7]

Treatment of dehydration and nutritional depletion in advanced disease through intravenous fluids and total parenteral nutrition is controversial. Because severe dehydration can lead to multiple neurologic complications, parenteral fluids should be considered if other symptoms can be controlled. Delirium is reduced from 10% to 3% with hydration in some situations.[7] Total parenteral nutrition has been used to manage malignant bowel obstruction, but is fraught with potential complications related to venous access, metabolic disturbances, and sepsis.[41] Other important considerations include the degree of distraction from other concerns in life-limiting situations caused by total parenteral nutrition. Discontinuing parenteral feeding after it has been started can be seen as an ethical dilemma by the patient, family, or physicians. Nutritional support might be justified if the patient can be expected to have a reasonable quality of life or a life expectancy of many months to years.[42] Intravenous hydration and a venting gastrostomy, placed

either surgically or endoscopically, can allow patients to remain at home. This can potentially improve their quality of life and lead to a tremendous cost savings for the terminally ill patient.[38] Gemlo and coworkers[38] stress that longterm venous access catheters, either placed centrally or peripherally, can ease the burden of care for these patients and are the "cornerstones" of this treatment approach. Subcutaneous delivery of fluids is not commonly used in the United States, although this method should be considered in some patients. Fainsinger and colleagues[1] are proponents of hypodermoclysis as the optimal method to treat dehydration, with up to 90 mL/h given to the patient by this method, although most recommend far less fluid given this way.

Octreotide is one of the most effective medications for the relief of symptoms of MBO. A synthetic analog of somatostatin, octreotide dramatically decreases gastrointestinal secretions and prolongs small bowel transit time.[43] It can also delay the onset of edema and ischemia in the antimesenteric border of the intestine.[44] The effect can be dramatic reduction of MBO-related symptoms. Response is frequent (75% to 100%), with it most often being a complete resolution of symptom.[45-47] In addition, control of vomiting might be rapid, often within 2 to 4 hours of achieving the correct daily dose of octreotide;[45] it is usually several days before a complete response can be obtained. Typical doses are from 0.3 mg to 0.6 mg per day, usually given subcutaneously. Doses may be escalated to achieve response, which is defined as control of nausea and vomiting. Toxicity is rare or nonexistent, and is mainly related to pain at the subcutaneous injection site. Duration of treatment may be short-lived (median 9.4 to 17.5 days),[45,47] although symptoms are frequently relieved for the life of the patients.[46] Again, NG decompression might be necessary temporarily until symptoms are relieved. Some feel that octreotide should be used only when conventional antiemetics fail.[3] Because complete relief of emesis is low with antiemetics, octreotide should be considered early in the care of patients with MBO because its rate of response is high with relatively few side effects.

Anticholinergic medications can also decrease peristalsis and secretions and lead to improved control of vomiting and intestinal colic for malignant gastrointestinal obstruction. Anticholinergic side effects must be considered, but scopolamine might be more cost effective than octreotide.[48] In a comparison of scopolamine and octreotide, it appears that octreotide can have a greater effect on decreasing secretions, although there might be no difference in the ability to remove an NG tube.[48] Another comparative study by the same group indicated that octreotide did lead to less nausea and vomiting by 24 hours after initiation of treatment for those who did not have an NG tube placed.[49] The combination of antisecretory agents might potentially have a synergistic effect and improve symptoms. It has been postulated that the anticholinergic effects and reduction of gastrointestinal secretions by scopolamine, and the control of the hormonal and inflammatory cascade induced by octreotide, can result in bowel rest.[50] Scopolamine can be given either subcutaneously or as a transdermal patch.

Corticosteroids are commonly used in the treatment of malignant bowel obstruction for both gynecologic and gastrointestinal cancers, often in combination with other medications. The hope is to decrease peritumoral edema and activate its central and peripheral antiemetic effects.[40] Corticosteriods also act as coanalgesics to treat obstruction-related pain.[51] Although there is no statistical significance in metaanalysis review of the literature for the use of corticosteroids, there might be responses related to the use of corticosteroids, and morbidity is quite low.[51] Marked therapeutic response, measured as a decreased frequency of vomiting each day, has been noted in 9 of 13 patients with gynecologic cancers (11 ovarian).[52] Dosing of dexamethasone can be variable, from 2 to 60 mg/day has been used.[40,52] Because corticosteroids can result in an improved sense of well being, but have no proved effect for MBO, they should be reserved for patients in the terminal stages of disease.

There are multiple effective pharmacologic regimens for management of MBO. One must be flexible and base treatment on the evolution of patient symptoms and the response to treatment. Multiple trials of different drug combinations including octreotide, anticholinergics, antiemetics, and pain medications may be necessary. A venting gastrostomy might be necessary in conjunction with pharmacotherapy to effectively control symptoms. As a rule, the more distal the obstruction, the more likely symptom control with pharmacotherapy alone can occur.

### Other approaches

There are several reports on the use of palliative chemotherapy for patients with intestinal obstruction in ovarian cancer.[53,54] Chemotherapy can provide some symp-

tom relief for patients who are newly diagnosed; for patients who have been treated previously, chemotherapy probably has no role for MBO.[53] Drainage, either through NG tube or PEG, must accompany any attempt at this treatment route. Doyle and colleagues[54] showed that significant improvement in nausea, vomiting, and pain can be seen in some patients with advanced ovarian cancer, as well as substantive improvement in their emotional function and global quality of life. Unfortunately, women were frequently unrealistic concerning the ability of chemotherapy to improve their survival or cure them.

Radiation therapy may be an option and produce local palliation for isolated and targetable disease. This can include pelvic, duodenal, and intestinal stoma blockages, though small bowel obstruction or diffuse disease are usually unsuitable for radiation treatments.[55] In a palliative setting, a subjective response rate for rectal tumors of 63% (objective response of 82%) has been reported, although results were combined with several different tumor-related symptoms.[56] A wide range of response from obstruction has been reported for advanced gynecologic malignancies (20% to 88%), but most reports have small numbers of patients.[55] So results for obstruction alone cannot be delineated. Along with continuous infusion 5-fluorouracil, radiation therapy has been shown to prevent the need for a diverting colostomy from colorectal tumor-related bowel obstruction in 89% of patients with unresectable pelvic or metastatic disease.[57] Responses are slow and complications increase with dose, so radiation therapy can be used with endoscopic techniques, such as lasers,[58] to treat malignant rectal obstructions. Because many of the complications occur long after the radiation therapy, they might never manifest for the end-of-life patient.[55] Because of the overall poor condition of many terminal patients, radiotherapy might be a suboptimal option because it would necessitate multiple trips to the hospital for treatment.

In conclusion, malignant bowel obstruction is a common but difficult problem. Clear objectives including relief of pain, nausea, and vomiting, removal of an NG tube, helping the patient to remain out of the hospital, and restoring the ability to eat should be identified. Nonsurgical interventions should be considered in all patients with malignant bowel obstruction, especially those with limited survival or ability to impact disease control. The sun often can set on unoperated malignant bowel obstruction, especially when the sun is setting for the patient.

## Appendix

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## REFERENCES

1. Fainsinger RL, Spachynski K, Hanson J, Bruera E. Symptom control in terminally ill patients with malignant bowel obstruction (MBO). J Pain Symptom Manage 1994;9:12–18.
2. Legendre H, Vahhuyse F, Caroli-Bosc FX, Pector JC. Survival and quality of life after palliative surgery for neoplastic gastrointestinal obstruction. Eur J Surg Oncol 2001;27:364–367.
3. Ripamonti C. Management of bowel obstruction in advanced cancer. Current Opinion Oncol 1994;6:351–357.
4. Averbach AM, Sugarbaker PH. Recurrent intraabdominal cancer with intestinal obstruction. Internat Surg 1995;80:141–146.
5. Aabo K, Pedersen H, Bach F, Knudsen J. Surgical management of intestinal obstruction in the late course of malignant disease. Acta Chir Scand 1984;150:173–176.
6. Baines M. The pathophysiology and management of malignant bowel obstruction. In: Doyle D, Hanks GWC, MacDonald N, eds. Oxford textbook of palliative medicine. Oxford: Oxford University Press; 1998:526–534.
7. Davis MP, Nouneh D. Modern management of cancer-related intestinal obstruction. Curr Pain Headache Rep 2001;5:257–264.

8. Maglinte DD, Kelvin FM, O'Connor K, et al. Current status of small bowel radiography. Abdom Imaging 1996;21:247–257.
9. Daneshmand S, Hedley CG, Stain SC. The utility and reliability of computed tomography scan in the diagnosis of small bowel obstruction. Am Surg 1999;65:922–926.
10. Chung CC, Meng WC, Yu SC, et al. A prospective study on the use of water-soluble contrast follow-through radiology in the management of small bowel obstruction. Aust N Z J Surg 1996; 66:598–601.
11. Ericksen AS, Krasna MJ, Mast BA, et al. Use of gastrointestinal contrast studies in obstruction of the small and large bowel. Dis Colon Rectum 1990;33:56–64.
12. Anderson CA, Humphrey WT. Contrast radiography in small bowel obstruction: a prospective, randomized trial. Mil Med 1997;162:749–752.
13. Bundrick T, Cho SR, Ammann A, Walsh JW. Intraperitoneal carcinomatosis: incidence of its radiographic findings and description of a new sign. Br J Radiol 1983;56:13–16.
14. Shrake PD, Rex DK, Lappas JC, Maglinte DD. Radiographic evaluation of suspected small bowel obstruction. Am J Gastroenterol 1991;86:175–178.
15. DiSantis DJ, Ralls PW, Balfe DM, et al. The patient with suspected small bowel obstruction: imaging strategies. American College of Radiology. ACR Appropriateness Criteria. Radiology 2000;215[Suppl]:121–124.
16. Furukawa A, Yamasaki M, Furuichi K, et al. Helical CT in the diagnosis of small bowel obstruction. Radiographics 2001;21: 341–355.
17. Megibow AJ, Balthazar EJ, Cho KC, et al. Bowel obstruction: evaluation with CT. Radiology 1991;180:313–318.
18. Frager D, Medwid SW, Baer JW, et al. CT of small-bowel obstruction: value in establishing the diagnosis and determining the degree and cause. AJR Am J Roentgenol 1994;162:37–41.
19. Rubin SC. Intestinal obstruction in advanced ovarian cancer: What does the patient want? Gynecol Oncol 1999;75:311–312.
20. Makela J, Kiviniemi H, Laitinen S, Kairaluoma MI. Surgical management of intestinal obstruction after treatment for cancer Eur J Surg 1991;157:73–77.
21. Feuer DJ, Broadley KE, Shepherd JH, Barton DP. Systematic review of surgery in malignant bowel obstruction in advanced gynecological and gastrointestinal cancer. Gynecol Oncol 1999; 75:313–322.
22. Lau PWK, Lorentz TG. Results of surgery for malignant bowel obstruction in advanced, unresectable, recurrent colorectal cancer. Dis Colon Rectum 1993;36:61–64.
23. Yazdi GP, Miedema BW, Humphrey LJ. High mortality after abdominal operation in patients with large-volume malignant ascites. J Surg Oncol 1996;62:93–96.
24. Blair SL, Chu DZ, Scwarz RE. Outcome of palliative operations for malignant bowel obstruction in patients with peritoneal carcinomatosis from nongynecological cancer. Ann Surg Oncol 2001;8:632–637.
25. Krebs HB, Goplerud DR. Surgical management of bowel obstruction in advanced ovarian carcinoma. Obstet Gynecol 1983; 61:327–330.
26. Van Ooijen B, van der Burg ME, Planting AS, et al. Surgical treatment or gastric drainage only for intestinal obstruction in patients with carcinoma of the ovary or peritoneal carcinomatosis of other origin. Surg Gynecol Obstet 1993;176:469–474.
27. Lauter DM. Laparoscopic enterocolostomy of the palliation of malignant bowel obstruction. J Laparoendosc Adv Surg Tech A 2000;10:275–276.
28. Lillemoe KD, Brigham RA, Harmon JW, et al. Surgical management of small-bowel radiation enteritis. Arch Surg 1983; 118:905–907.
29. Kwitko AO, Peiterse AS, Hecker R, et al. Chronic radiation injury to the intestine: a clinico-pathologic study. Aus N Z J Med 1982;12:272–277.
30. Snyder CL, Ferrell KL, Goodale RL, Leonard AS. Nonoperative management of small-bowel obstruction with endoscopic long intestinal tube placement. Amer Surg 1990;56:587–592.
31. Harris GJC, Senagore AJ, Lavery IC, Fazio VW. The management of neoplastic colorectal obstruction with colonic endoluminal stenting devices. Am J Surg 2001;181:499–506.
32. Soetikno RM, Carr-Locke DL. Expandable metal stents for gastric outlet, duodenal, and small intestinal obstruction. Gastrointest Endosc Clin North Am 1999;9:447–458.
33. Repici A, Reggio D, DeAngelis C, et al. Covered metal stents for management of inoperable malignant colorectal strictures. Gastrointest Endosc 2000;52:735–740.
34. Arrigoni A, Pennazio, M, Spandre M, Rossini FP. Emergency endoscopy: recanalization of intestinal obstruction caused by colorectal cancer. Gastrointest Endosc 1994;40:576–580.
35. Stone JM, Bloom RJ. Transendoscopic balloon dilatation of complete colonic obstruction. An adjunct in the treatment of colorectal cancer: Report of three cases. Dis Col Rectum 1989; 32:429–431.
36. Scheidbach H, Horbach T, Groitl H, Hohenberger W. Percutaneous endoscopic gastrostomy/jejunostomy (PEG/PEJ) for decompression in the upper gastrointestinal tract. Surg Endosc 1999;13:1103–1105.
37. Campagnutta E, Cannizzaro R. Percutaneous endoscopic gastrostomy (PEG) in palliative treatment of non-operable intestinal obstruction due to gynecologic cancer: A review. Eur J Gynaecol Oncol 2000;21:397–402.
38. Gemlo B, Rayner AA, Lewis B, et al. Home support of patients with end-stage malignant bowel obstruction using hydration and venting gastrostomy. Am J Surg 1986;152:100–104.
39. Isbister WH, Elder P, Symons L. Non-operative management of malignant intestinal obstruction. J R Coll Surg Edinb 1990;35: 369–372.
40. Baumrucker SJ. Management of intestinal obstruction in hospice care. Am J Hosp Palliat Care 1998;15:232–235.
41. Philip J, Depczynski B. The role of total parenteral nutrition for patients with irreversible bowel obstruction secondary to gynecological malignancy. J Pain Symptom Manage 1997;13:104–111.
42. Souba WW. The role of tube feeding and total parenteral nutrition in advanced illness [Invited commentary]. J Am Coll Surg 2002;194:228–229.
43. Pandha HS, Waxman J. Octeotide in malignant intestinal obstruction. Anticancer Drugs 1996;7[Suppl 1]:5–10.
44. Dean A. The palliative effects of octreotide in cancer patients. Chemotherapy 2001;47[Suppl 2]:54–61.
45. Khoo D, Hall E, Motson R, et al. Palliation of malignant intestinal obstruction using octreotide. Europ J Cancer 1994;30A: 28–30.
46. Mangili G, Franchi M, Mariani A, et al. Octreotide in the management of bowel obstruction in terminal ovarian cancer. Gynecol Oncol 1996;61:345–348.

47. Mercadente S, Caraceni A, Simonetti MJ. Octreotide in relieving gastrointestinal symptoms due to bowel obstruction. Palliat Med 1993;7:295–299.
48. Ripamonti C, Mercadente S, Groff L, et al. Role of octreotide, scopolamine butylbromide and hydration in symptom control of patients with inoperable bowel obstruction and nasogastric tubes: a prospective randomized trial. J Pain Symptom Manage 2000;19:23–34.
49. Mercadente S, Ripamonti C, Casuccio A, et al. Comparison of octreotide and hyoscine butylbromide in controlling gastrointestinal symptoms due to malignant inoperable bowel obstruction. Support Care Cancer 2000;8:191.
50. Mercadente S. Scopolamine butylbromide plus octreotide in unresponsive bowel obstruction. J Pain Symptom Manage 1998;16:278–280.
51. Feuer DJ, Broadley KE. Systematic review and meta-analysis of corticosteroids for the resolution of malignant bowel obstruction in advanced gynecological and gastrointestinal cancer. Ann Oncol 1999;10:1035–1041.
52. Philip J, Lickiss N, Grant PT, Hacker NF. Corticosteroids in the management of bowel obstruction on a gynecological oncology unit. Gynecol Oncol 1999;74:68–73.
53. Abu-Rustum NR, Barakat RR, Venkatraman, E, Spriggs D. Chemotherapy and total parenteral nutrition for advanced ovarian cancer with bowel obstruction. Gynecol Oncol 1997;64: 493–495.
54. Doyle C, Crump M, Pinitilie M, Pza AM. Does palliative chemotherapy palliate? Evaluation of expectations, outcomes, and costs in women receiving chemotherapy for advanced ovarian cancer. J Clin Oncol 2001;19:1266–1274.
55. Smith SC, Koh WJ. Palliative radiation therapy for gynaecological malignancies. Best Practice Res Clin Obstet Gynaecol 2001; 15:265–278.
56. Overgaard M, Overgaard J, Sell A. Dose-response relationship for radiation therapy of recurrent, residual, and primarily inoperable colorectal cancer. Radiother Oncol 1984;217–225.
57. Janjan NA, Breslin T, Lenzi R, et al. Avoidance of colostomy placement in advanced colorectal cancer with twice weekly hypofractionated radiation plus continuous infusion 5-fluorouracil. J Pain Symptom Manage 2000;20:266–272.
58. Tobias JS. Palliation of malignant obstruction—use of lasers and radiotherapy in combination. Eur J Cancer 1991;27:1350–1352.