Pathogenesis and Management of Postoperative Ileus

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ABSTRACT

Postoperative ileus (POI) is a predictable delay in gastrointestinal (GI) motility that occurs after abdominal surgery. Probable mechanisms include disruption of the sympathetic/parasympathetic pathways to the GI tract, inflammatory changes mediated over multiple pathways, and the use of opioids for the management of postoperative pain. Pharmacologic treatment of postoperative ileus continues to be problematic as most agents are unreliable and unsubstantiated with robust clinical trials. The selective opioid antagonist alvimopan has shown promise in reducing POI, but needs more rigorous investigation. Clinician interventions proven to be of benefit include laparoscopy, thoracic epidural anesthesia, avoidance of opioids, and early feeding. Early ambulation may also contribute to early resolution of POI; however, routine nasogastric decompression plays no role and may increase complications. Multimodal care plans remain the mainstay of treatment for POI.

KEYWORDS: Postoperative ileus, motility, postoperative patient care, postoperative stay

Objectives: On completion of the article the reader should be able to summarize the pathophysiology and management of postoperative ileus.

Defined as a temporary delay in gastrointestinal (GI) motility after surgery, postoperative ileus (POI) is a well-described surgical complication perceived as inevitable by some authors.[1] The symptoms of POI include nausea, vomiting, abdominal distention, abdominal tenderness, and delayed passage of flatus and stool. Prevention of POI may improve patient comfort, decrease length of hospital stay, and limit costs associated with postoperative recovery.[2] POI was first described by Cannon and Murphy in 1906, and is now commonly described as a transient postoperative period of gut motility dysfunction.[3,4] Long considered a routine event in the postoperative course, POI has emerged as an important facet of patient care and hospital stay, and its obscure pathogenesis merits considerable attention.[3,5]

PATHOPHYSIOLOGY

The pathophysiology of POI is not fully understood despite an increased understanding of mechanisms that contribute to altered GI motility following surgery, which include spinal-intestinal neural reflexes, sympathetic hyperactivity, opiate use, and electrolyte abnormalities.[3] Autonomic nervous dysfunction appears to be

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at the root of POI.[6] The sympathetic nervous system, which is generally inhibitory to the GI tract, becomes hyperactive in the postoperative period.[4,6] This heightened activity causes decreased release of the neurotransmitter acetylcholine and increased inhibition of motility. The stimulatory effect of the parasympathetic nervous system, which alternately promotes acetylcholine release into the myenteric plexus, is impeded.[5]

A host of other hormones and neurotransmitters including nitric oxide, vasoactive intestinal peptide, and Substance P likely contribute to POI via inhibitory action on the GI tract.[6] Attempts at clarifying the role each of these factors play in the pathogenesis of POI have been unsuccessful.[5] Local inflammatory mediators probably contribute to POI. In fact, animal models have shown that potentiation of POI occurs when leukocytes are stimulated by bowel manipulation.[7] Large numbers of leukocytes usually occupy the bowel wall. Manipulation of the bowel activates macrophages with subsequent neutrophil infiltration followed by decreased motility in the GI tract.[6] Functional changes in intestinal smooth muscle after surgical manipulation in animal models suggest that POI may encompass a spectrum of sustained inflammatory and hormonal responses to the trauma of surgery.[8]

It is universally acknowledged that opioids exacerbate POI. When administered in doses adequate for human analgesia, morphine sulfate increases intestinal tone and contraction amplitude, but mitigates propulsion in the colon. The net effect is diminished GI motility.[9,10] Deficiencies of magnesium and potassium are commonly associated with fluid shifts between physiologic compartments and may prolong POI.[11] Other possible mechanisms may include operative blood loss and total postoperative opiate dose, which have been shown to be independent risk factors for prolonged POI in a retrospective review of 88 patients.[1] Larger randomized studies are needed to validate these as risk factors for POI.

PHARMACOLOGY

A reliable pharmacologic means of hastening the return of intestinal motor activity has not been available, and multiple approaches have been attempted without success.[3,11,12] Agents directed at motility such as erythromycin and metoclopramide are unreliable and are used infrequently.[11] Nonsteroidal antiinflammatory drugs are thought to have both analgesic and antiinflammatory roles in alleviating POI, but their use is tempered by a side-effect profile that includes GI and surgical site bleeding.[4] The utilization of neostigmine as a stimulator of parasympathetic activity was thought to play a role in treating POI, but the associated incidence of side effects (blurred vision, cramping, fatigue, cardiac irritability) and its potential impact on an intestinal anastomosis have minimized its use.[4] Nonselective opioid antagonists such as naloxone and nalmefene possess the potential to reverse effective analgesia and are not indicated for the treatment or prevention of POI—neither agent has approval of the U.S. Food and Drug Association (FDA) for this purpose.[13]

In recent years, selective opioid antagonists have received attention for their promise in treatment of POI. Compared with placebo, alvimopan has demonstrated marked reductions in postoperative morbidity without sacrificing effective opioid analgesia[13,14] Taguchi et al demonstrated that alvimopan (ADL 8–2698) could antagonize target opioid receptors in the GI tract while maintaining adequate analgesia with systemic opioids.[12] Its inability to antagonize opioid analgesia is secondary to its limited penetration of the blood–brain barrier. An industry-sponsored study comparing patients receiving alvimopan versus placebo has demonstrated a potential to reduce healthcare costs by decreasing hospital length of stay.[14]

PERIOPERATIVE MANAGEMENT

Nelson and colleagues examined the role of nasogastic (NG) decompression in shortening the return of normal bowel function following abdominal surgery and found it to be ineffective.[15] Moreover, their review suggested that NG decompression does little to decrease pulmonary complications, lessen abdominal distention, protect surgical anastomosis, or decrease hospital length of stay. One study comparing early NG tube removal (24 hours) and late NGT removal (48 hours) among patients undergoing laparotomy for cystectomy and urinary diversion could not demonstrate a statistically significant difference when observing for the incidence of POI, anastomotic leak, wound dehiscence, and aspiration pneumonia.[16] A more selective, patient-guided approach to NG decompression is preferred, only used when faced with intractable vomiting and persistent abdominal distension.[4] Early postoperative ambulation plays a small to negligible role in the resolution of POI, despite its usefulness in the prevention of atelectasis, pneumonia, and deep venous thrombosis.[17] However, unless prevented by physical ailments that preclude ambulation, patients should be encouraged to participate in early ambulatory activity following operation.[18]

Epidural anesthesia has been shown to shorten duration of POI, as well as improve pain control, decrease pulmonary complications, and quicken recovery times. However, it does not appear to reduce overall length of stay.[4] Neudecker et al[19] were unable to reproduce the results of previous trials evaluating the effect of thoracic epidural analgesia on duration of postoperative ileus following laparoscopic sigmoid resection. Other studies have demonstrated that thoracic epidural analgesia diminishes hospital costs following GI operations

in patients at risk for cardiac or pulmonary complications.[20]

Historically, feeding after major abdominal surgery was initiated following return of bowel function.[3] In the postoperative period, intestinal motility returns first in the small intestine within hours of operation followed by return of gastric function within 1 to 2 days and colonic motility 3 to 5 days postoperatively.[11] Despite the delay in return of colonic function, immediate or early postoperative feeding appears to be beneficial. In fact, early oral feeding is well tolerated by most patients in the setting of elective colorectal surgery.[21] In a randomized trial examining early feeding in females undergoing abdominal gynecologic surgery, it was shown that patients offered food as soon as 6 hours after surgery had no differences in POI, operative complications, or GI symptoms.[22] Early feeding, however, is not tolerated in all patients.

Recent investigations have shown a possible association between gum chewing and relief of POI. This may increase vagal stimulation, which, in turn, may stimulate motility of the GI tract.[23] It has gained acceptance as an inexpensive and safe facet of postoperative care for patients with POI.[4] A recent meta-analysis of five randomized trials of patients undergoing colon resection suggests that gum chewing likely decreases time to resolution of POI, and may even reduce length of hospital stay at low cost to providers.[23]

Finally, laparoscopic surgery and the use of minimally invasive techniques have been shown to decrease postoperative pain, lessen analgesic requirements, promote improved pulmonary function, and diminish hospital stay.[4] A review of 12 randomized controlled trials comparing laparoscopic versus open surgery for colorectal cancer confirmed findings of less postoperative pain, decreased narcotic use, earlier return to bowel function, and shortened length of hospital stay.[24] Decreased bowel manipulation and associated inflammation are likely explanations for these findings, although other considerations include minimizing exposure of bowel to the hostile, nonphysiologic environment accompanying laparotomy, which may hinder motility.[3,25]

SUMMARY

Ileus is nearly ubiquitous in the setting of abdominal surgery and warrants consideration in the management of the postoperative patient. Financial implications of POI are increasingly important given societal focus on healthcare costs and, more specifically, issues surrounding hospital length of stay. An increase in early patient discharge stemming from appropriate management of POI has multiple ramifications—including cost effectiveness and improved efficiency of the healthcare system.[19] Mechanisms of POI still need further elucidation, as it is becoming increasingly clear that no one etiology exists. Likewise, existing treatment options need additional clarification with larger, more robust studies. Emerging management options will continue to contribute to the advancement of multimodality care plans. It appears that a combination of minimally invasive procedures, opioid-free analgesia, early feeding, gum chewing, ambulation, and selective use of NG decompression will define the standard of care.[4]

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