Learning Objectives

- To review the causes of postoperative gastrointestinal paralysis;
- To learn in some detail about the perioperative interventions that have been shown to promote postoperative gut function;
- In particular, to learn about the uses of epidural analgesia and multimodal analgesia to promote bowel function, the importance of fluid balance, and the role, if any, of prokinetic drugs;
- To review additional interventions which may be of use.

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Key Messages

- Postoperative ileus is preventable;
- The main alterable causes are inhibitory sympathetic activity, manipulation of the bowel, exogenous and endogenous opioids and fluid overload;
- Mid-thoracic epidural analgesia promotes postoperative bowel function by blocking inhibitory reflexes, catecholamine release and eliminating the need for systemic opioid analgesia;
- NSAIDs and paracetamol reduce the need for opioids once the epidural analgesia is discontinued;
- Maintaining postoperative fluid balance, rather than fluid overload, helps prevent postoperative ileus;
- Prokinetic drugs have no current role in postoperative ileus, apart from magnesium oxide, which may be beneficial;
- Combining several of the above interventions in an enhanced-recovery protocol, it is possible to maintain a normal gastrointestinal transit time after colonic surgery.
1. Postoperative gastrointestinal paralysis

Paralysis of the gastrointestinal tract has been a major problem in traditional surgical care, limiting the tolerance to oral or enteral nutrition (1). The time to recovery of gastrointestinal function has often been cited as 2-5 days. Delayed oral or enteral nutrition significantly delays recovery and increases the risk of infectious complications as compared to early reintroduction of feeding (2). The causes of postoperative gastrointestinal paralysis are multifactorial. The main causes are inhibitory sympathetic activity in response to pain and dissection in the peritoneum, local release of inhibitory neurotransmitters in response to manipulation of the bowel, a direct inhibitory effect of exogenous and endogenous opioids, and fluid overload. Most of these effects can be influenced by perioperative interventions, minimising or even eliminating postoperative ileus (3).

2. Thoracic epidural analgesia

Catecholamine release occurs during and after surgery both systemically from the adrenal medulla in response to apprehension and pain, and locally from sympathetic nerve endings in response to dissection in the visceral peritoneum. The adrenal medulla is innervated via segments T5-T11, the small bowel via T9-T12 and the colon via T11-L2. Not surprisingly, an epidural block with a local anaesthetic at a mid-thoracic level effectively decreases circulating concentrations of catecholamines (4, 5) and significantly shortens the duration of postoperative ileus (6) as compared to systemically administered opioids (Fig. 1).

Peritoneal dissection and postoperative ileus

Peritoneal dissection triggers sympathetic viscerovisceral reflexes, inhibiting motility
A mid-thoracic epidural block inhibits afferent and efferent limbs
Local anaesthetic must be used; not opiates alone

Mid-thoracic epidural is required for sympathetic block of the intestinal tract

"Sympathectomy with local anaesthetic requires mid-thoracic placement."

"Low-thoracic epidural was not shown to be beneficial on postoperative ileus."

"Not surprisingly, studies using low-thoracic epidurals have not demonstrated the positive effects of epidural analgesia on ileus."

Fig. 1

As is apparent from the innervation of the adrenal medulla and the bowel, the epidural block must be mid-thoracic rather than low-thoracic or lumbar (7 - 9) to achieve this sympathetic block (Fig. 2). Thus, this requires a more cephalad level of epidural block than that required for analgesia alone in lower abdominal or pelvic surgery.

To increase the analgesic effect of epidurally administered local anaesthetics, opioids are often added to the epidural infusate. Although the addition of a low dose of opioids to the epidural infusate may contribute to postoperative ileus, the effect is small (7) and it allows for a lower dosage of epidural local anaesthetic, minimising lower limb paralysis.

3. Avoidance of opioids

The gut paralytic effect of opioids is four times as strong as their analgesic effect (10). One benefit of epidural analgesia is that it eliminates the need for postoperative systemic opioid analgesia. When epidural analgesia is discontinued, non-steroidal anti-inflammatory drugs (NSAIDs) and paracetamol reduce the need for opioid analgesia and can be expected to decrease postoperative ileus.

However, even though the systemic administration of opioids can be avoided by multimodal analgesia based on epidural analgesia, NSAIDs and paracetamol, endogenous opioid production is significant in the postoperative period (11). Locally active oral opioid receptor antagonists, although still experimental, have been shown to significantly decrease postoperative ileus (12).

4. Perioperative fluid balance

It is traditional to substitute real and perceived fluid losses during and after surgery liberally. This practice, which originated in trauma surgery, has recently been shown to be detrimental to gastrointestinal function (13) and postoperative morbidity (14) in elective surgery. From animal studies, it is clear that such fluid overload causes oedema and paralysis of the stomach wall.

In humans, a perioperative fluid regime aiming at maintaining fluid balance rather than the traditional fluid overload has been shown to significantly decrease the time to return of bowel function and discharge following colonic resection (13) (Fig. 3).

Three factors partly responsible for an increased need for perioperative fluids are preoperative bowel preparation, preoperative overnight fasting and epidural analgesia. The negative effects of these factors can be minimised in modern perioperative care.

In colonic surgery, routine preoperative bowel preparation is now known to confer no clinical benefits, and in fact increases the risk of anastomotic dehiscence (15). Preoperative overnight fasting has also been shown to confer no benefits (see module 17.2). Epidural-induced vasodilatation is preferably treated by vasopressants rather than fluid boluses (16).

5. Other interventions to limit postoperative ileus

Preoperative patient education and coaching has been shown to confer multiple benefits to postoperative recovery as compared to general reassurance, among those an earlier return of bowel function (17). This is a simple, inexpensive intervention that is easily implemented.

Prokinetic drugs have had a disappointing track record in affecting postoperative ileus (10). Cisapride had significant clinical effects in some trials, but has now been withdrawn. Metoclopramide, although still popular, has been shown to have no effect on postoperative ileus (10).
A postoperative laxative agent has been shown to significantly shorten the time to return of bowel function in a double-blinded study in patients after appendicectomy (18) (Fig. 4). Postoperative bowel stimulation with magnesium oxide has now been part of enhanced-recovery protocols in elective colonic surgery for several years without an increase in complications (19). Surgical technique may influence the duration of postoperative gastrointestinal paralysis. Interestingly, mere manipulation of the small bowel causes the same distribution and duration of postoperative intestinal ileus as does extensive dissection of the right or left colon in a primate model (20). Thus, efforts to minimise the magnitude of the surgical trauma, such as the use of minimal abdominal wall incisions, may be beneficial on postoperative bowel function. Laparoscopic colonic surgery may promote gastrointestinal function as compared to open surgery (10), although no such benefit was seen in a recent blinded study within an enhanced-recovery protocol (21).

Routine postoperative nasogastric drainage not only prevents oral feeding, but has been shown not to be of any benefit and should be abandoned after elective laparotomy (22).

6. Gastrointestinal function after colonic surgery in enhanced-recovery protocols

Enhanced-recovery protocols combine several of the interventions described above. The effect on postoperative gut function is impressive. Gastrointestinal transit was unaffected by colonic resection in a protocol combining thoracic epidural analgesia and postoperative magnesium oxide, as compared to healthy controls (3). Such protocols allow for oral intake of solid food and oral nutritional supplements early after surgery (23).

References