ABSTRACT

Background: cesarean section is a common major hospital surgical procedure performed nowadays. One of the most common postoperative complications is postoperative gastrointestinal paralysis (Ileus) that must be minimized due to its possible serious consequences.

Objectives: this study aims to compare the time to regain intestinal motility after general anesthesia versus spinal anesthesia for cesarean section.

Methods: this prospective controlled study was carried out at Ain Shams University Maternity Hospital during the period from April 2016 to June 2017 after approval of the hospital health ethical committee. It included 150 patients who had C.S and they were subdivided into 2 groups according to a randomization scale (spinal versus general). **Results:** spinal anesthesia results in a quicker return of bowel activity after cesarean section, decreased hospital stay and less use of post-operative opioids than general anesthesia.

Recommendations: we recommend the use of spinal anesthesia for cesarean section especially if there's no contraindication for that.

Keywords: post-caesarean section ileus, GI hypomotility, spinal and general anesthesia.

INTRODUCTION

Cesarean section is a common major hospital surgical procedure performed nowadays. One of the most common postoperative complications is postoperative gastrointestinal paralysis (Ileus) that must be minimized due to its possible serious consequences including delayed enteral feeding resulting in patient discomfort, prolonged hospitalization and increased health care costs ***(Behm and Stollman, 2003) (Abe-El-Maeboud et al., 2009)***.

Postoperative hypomotility may affect all parts of the gastrointestinal tract but with different times or recovery to normal function, small intestine function generally normalizes first, often within several hours of surgery ***(Kehlet and Holte, 2001)***.

Gastric motility usually returns to normal within 24-48 hours after surgery. The colon is usually the final portion to regain normal motility within 48-72 hours ***(Geddels et al., 1999)***.

Postoperative ileus is generally defined as a transient impairment of bowel motility in the postoperative setting ***(Kehlet and Holte, 2001; Abd-El-Maeboud et al., 2009)***. Clinically, it's characterized by bowel distension, lack of bowel sounds and lack of passage of flatus and stool. Symptoms include nausea, vomiting and stomach cramps leading to postoperative discomfort ***(Teng and Kenkin,***

2004). Several factors may play a role including spinal-intestinal neural reflexes, local and systemic inflammatory mediators, generalized sympathetic hyperactivity, changes in various hormonal transmitters and electrolyte abnormalities as hypokalemia ***(Liu et al., 2009)***.

Several studies suggest that the human stress response to noxious stimuli can lead to significant changes in normal bowel motility as it activates inhibitory sympathetic splanchnic reflexes, so when these reflexes are blocked simply by spinal or epidural anaesthesia, increased motility may occur to overcome the development of ileus ***(Kehlet and Holte, 2001; Liu et al., 2009)***.

All anesthetics used for induction or maintenance of general anaesthesia may depress gastrointestinal motility ***(Sener et al., 2003)***, also incising the peritoneum and manipulation of the bowel will completely inhibit the motility ***(Behm and Stollman, 2003)***. The effect of anaesthesia and antispasmodics on the colon may also cause postoperative ileus. The large intestine is devoid of intercellular gap junctions, which make the colon more susceptible to the inhibitory actions of anesthetics, in particular, halothane, enflurane and atropine delay gastric emptying ***(Geddels et al., 1999).***

Some studies have shown that regional anaesthesia with bupivacaine hydrochloride significantly reduce ileus versus systemic opioid therapy in patients undergoing abdominal surgical procedures ***(Mann et al., 2000) (Teng and Jenkin, 2004)***.

Aim of the Work

Research Hypothesis:

In women undergoing caesarean section, Spinal anaesthesia may be similar to general anaesthesia as regards to regain of gastrointestinal motility after the operation.

Research Question:

In women undergoing caesarean section, Is there a difference between general and spinal anaesthesia in decreasing the time to regain gastrointestinal motility after the operation?

Objectives:

This study aims to compare the time to regain intestinal motility after general anaesthesia versus spinal anaesthesia for caesarean section.

NORMAL PHYSIOLOGY OF GIT MOTILITY

The GI tract extends from the mouth to the anus and includes the pharynx, esophagus, stomach, small intestine (duodenum, jejunum and ileum) and large intestine (colon, cecum and rectum), as well as the anus. The GI tract is a muscular tube of about 5 m long when one is alive; however, after a person dies and during autopsy or postmortem examination, the length of the tract can be doubled to 10m. This is due to the loss of muscle tone. The GI tract can contract and relax with different transit time in each segment of the tract, which, in turn, depends on its own specific function (i.e. motility or secretion) of each segment (***Leung, 2014***).

The primary purpose of the gastrointestinal tract is to break food down into nutrients, which can be absorbed into the body to provide energy. First food must be ingested into the mouth to be mechanically processed and moistened. Secondly, digestion occurs mainly in the stomach and small intestine where proteins, fats and carbohydrates are chemically broken down into their basic building blocks. Smaller molecules are then absorbed across the epithelium of the small intestine and subsequently enter the circulation. The large intestine plays a key role in reabsorbing excess water. Finally, undigested material and secreted waste products are excreted from the body via defecation ***(Prentice et al., 2001).***

Normal gastrointestinal (GI) function requires a system capable of adjusting to, at times, rapidly or dramatically shifting volumes due to food intake, fragmentation of larger ingested particles, and mixing and movement of chyme to bring nutrients to the absorptive sites and ultimately to expel residual materials from the gut. Many of these tasks depend on forces generated by the smooth muscle cells found in the mammalian gut. Abnormalities of GI motility may thus have significant implications on nutrient intake, transport, absorption, and fecal output. (***Bielefeldt et al., 2016***)

The major functions of the GI tract are motility, secretion, and absorption. Smooth muscle tone and contractility are modulated by interstitial cells of Cajal (ICC), which serve as the pacemaker creating spontaneous electrical slow waves that spread from the ICC to the smooth muscle in the presence of a stimulus such as a neurotransmitter leading to contraction of the GI smooth muscle. ***(Sanders et al., 2016)***

Small and large intestinal motility is under multiple levels of control including the ENS and CNS, as well as GI hormones and paracrine agents. In general, there are two distinct patterns of small intestinal motility (1) following a meal when the intestinal lumen contains chyme and (2) during the inter-digestive period. During the digestive phase the longitudinal and circular smooth muscle of the GI tract generates coordinated patterns of contractility termed peristalsis and segmentation. Peristalsis occurs in waves of contraction behind and relaxation ahead of the luminal bolus, and travels down the GI tract over short distances. Segmentation is a mixing pattern of contractility that is more irregular and allows for luminal contents and digestive enzymes to have adequate contact with the absorbing epithelium. ***(Meerveld et al., 2017)***

During the inter-digestive phase, a complex pattern of motility called the migrating motor complex (MMC) sweeps along the entire small intestine to clear the GI tract of any remaining luminal debris. ***(Meerveld et al., 2017)***

The MMC, first described by Szurszewski, is believed to serve a "housekeeper" function by propelling intraluminal contents distally during the fasting state. In humans, these contractions occur approximately once every 1 to 2 hours. ***(Khobragade et al., 2015)***.

Four phases are involved in the MMC during the fasting state. The first phase includes oscillating smooth-muscle membrane potentials without actual muscle contractions. The occurrence of intermittent muscle contractions marks the transition to phase II. During phase III, the contractions increase to the maximal contractile frequency **(**approximately 3 contractions per minute in the stomach and 11 contractions per minute in the duodenum). Phase IV is marked by cessation of contractions, and the bowel becomes quiescent. Feeding is followed by interruption of the MMC and the appearance of a different pattern consisting of sustained irregular phasic contractile activity ***(Andrew et al., 2003)***.

Large intestinal motility patterns serve to impede aboral movement of luminal contents, which facilitates water absorption. Contractility patterns of the colon are predominantly non-peristaltic and mix the colonic contents back and forth to enhance contact with the absorbing mucosa. A less frequent pattern of colonic motility which occurs 6–8 times/day is the high-amplitude propagating contractions (HAPC) which sweep the colon and often trigger the urge to defecate. ***(Meerveld et al., 2017)***

Enteric nervous system of the gastro-intestinal tract:

The enteric nervous system (ENS) or intrinsic nervous system is one of the main divisions of the nervous system and consists of a mesh-like system of neurons that governs the function of the gastrointestinal tract. It is now usually referred to as separate from the autonomic nervous system since it has its own independent reflex activity. The ENS is also called the second brain. ***(Dorland's, 2012)***

The ENS is capable of autonomous functions such as the coordination of reflexes; although it receives considerable innervation from the autonomic nervous system, it can and does operate independently of the brain and the spinal cord. ***(Dorland's, 2012)***

The enteric nervous system in humans consists of about 500 million neurons, more neurons than the human spinal cord and about 2/3 as many as in the whole nervous system of a cat. The enteric nervous system is embedded in the lining of the gastrointestinal system, beginning in the esophagus and extending down to the anus. **(*Young, 2012)*** It consists of 2 ganglionated plexuses: the larger, outer myenteric (Auerbach's) plexus and the smaller, inner submucosal (Meissner's) plexus ***(Goyal and Hirano., 1996)***.

The myenteric plexus lies between the longitudinal and circular layers of the entire gut; its main function is control over gut motor activity. Stimulation increases the tone of the gastrointestinal wall, intensity and rhythm of contractions, and conduction velocity. The submucosal plexus controls mainly local secretory and absorptive activity. The ENS communicates with the central nervous system (CNS) by way of afferent and efferent neurons of the sympathetic and parasympathetic nervous system ***(Goyal and Hirano, 1996)***.

The sympathetic fibers that enter the gut originate in the prevertebral ganglia. In general, sympathetic stimulation causes inhibition of gastrointestinal secretion and motor activity, and contraction of gastrointestinal sphincters and blood vessels. Conversely, parasympathetic stimuli typically have opposite effects: stimulation of intestinal motility and relaxation of sphincters and vascular smooth muscle. The sensory output of the gut is carried through the vagus and the splanchnic nerves. It is estimated that approximately 80% of the fibers in the vagus nerves are afferent. They react primarily to the distention of the bowel wall and to the intraluminal concentrations of various substances such as glucose, amino acids, and fatty acids ***(Goyal and Hirano, 1996)***.

Abdominal sounds (bowel sounds):

Are made by the movement of the intestines as they push food through. Since the intestines are hollow, bowel sounds can echo throughout the abdomen much like the sounds heard from water-pipes. The majority of the bowel sounds are harmless and simply indicate that the gastrointestinal tract is working. Abdominal sounds are evaluated by listening to the abdomen with a stethoscope (auscultation). While the majority of bowel sounds are normal, there are some instances where abnormal bowel sounds provide valuable information about the health of the body. Abdominal sounds are always evaluated in conjunction with symptoms such as nausea, vomiting, presence or absence of bowel movements, or gas. If bowel sounds are hypoactive or hyperactive, along with abnormal symptoms, continued evaluation by a health care provider is important ***(Bellier et al., 2004)***.

Reduced (hypoactive) bowel sounds include a reduction in the loudness, tone, or regularity of the bowel sounds. They indicate a slowing of intestinal activity. Hypoactive bowel sounds are normal during sleep, and also occur normally for a short time after the use of certain medications and after abdominal surgery. Decreased or absent bowel sounds often indicate constipation ***(Seidel, 2006)***.

Other causes of hypoactive bowel sounds:

- Anaesthesia
- Surgery in the abdomen (may cause reduced bowel sounds for 1 to 5 days).
- Certain drugs such as opiates (including codeine), anticholinergics, and phenothiazines.
- Irradiation of the abdomen (radiation therapy for cancer)

Increased (hyperactive) bowel sounds are sometimes heard even without a stethoscope. Hyperactive bowel sounds reflect an increase in intestinal activity. This can sometimes occur with diarrhea and after eating ***(Seidel, 2006).***

Other causes of hyperactive bowel sounds:

- Crohn's disease.
- GI bleeding.
- Diarrhea

POSTOPERATIVE ILEUS

Postoperative ileus (POI) is defined as a transient cessation of coordinated bowel motility after surgical intervention which prevents effective transit of intestinal contents or tolerance of oral intake ***(Delaney et al., 2006).***

It is normal for patients postoperatively to have "physiologic" gastrointestinal (GI) tract dysmotility. Some degree of dysmotility is expected in all patients following intra-abdominal surgery. Without treatment, it is expected to last 3–6 days following major abdominal surgery. ***(Stewart and Waxman, 2010)*** GI tract dysmotility may also occur following thoracic, orthopedic, urologic, and gynecologic operations. ***(Demars, 2015)***

Early postoperative bowel obstruction denotes obstruction occurring within 30 days after surgery. The obstruction may be functional (i.e., ileus), caused by inhibition of propulsive bowel activity, or mechanical as a result of a barrier. Ileus that occurs immediately after surgery in the absence of precipitating factors and resolves within 2 to 4 days is termed primary ileus. Ileus that occurs as a result of a precipitating factor and is associated with a delay in return of bowel function is termed secondary ileus. Mechanical bowel obstruction may be caused by a luminal, mural, or extra intestinal barrier. ***(Townsend et al., 2017)***