

The Effect of General Anesthesia versus Spinal Anesthesia in Restoration of Gastrointestinal Motility after Cesarean Section

Abstract

Background: Cesarean section is a fetal delivery through an open abdominal incision (laparotomy) and an incision in the uterus (hysterotomy). One of the most common postoperative complications is a dynamic paralysis (ileus) that must be minimized due to its serious consequences including delayed enteral feeding resulting in patient discomfort, prolonged hospitalization and increased health care costs. The pathophysiology of postoperative ileus is multifactorial. The aim of this study is to compare the effect of general versus spinal anesthesia in regain of the intestinal motility after elective cesarean section.

Methods: This randomized clinical study was conducted on 150 pregnant women aged from 18 to 35 years, who were set for elective caesarean section under either general or spinal anesthesia, attending to the Obstetrics and Gynecology department from August 2020 to October 2021. The participants were subdivided into 2 equal groups, group I included women delivered by using general anesthesia and group II included women delivered by using spinal anesthesia.

Results: Shows 1st intestinal, 1st passage flatus, 1st passage motion and hospital stay were significantly increased among general group than the spinal group ($P = 0.001^*$).

Conclusions: Spinal anesthesia results in a quicker return of bowel activity after cesarean section than general anesthesia with difference and spinal anesthesia results in a quicker

return to home as it decreases the length of hospital stay with significant difference between both groups.

Keywords: General anesthesia, spinal anesthesia, gastrointestinal motility, cesarean section

UNDER PEER REVIEW

Introduction:

Cesarean section is a fetal delivery through an open abdominal incision (laparotomy) and an incision in the uterus (hysterotomy). The first cesarean documented occurred in 1020 AD, and since then, the procedure has evolved tremendously. Cesarean delivery rate rose from 5% in 1970 to 31.9% in 2016. It confers risks of both immediate and long-term complications, for some women, cesarean delivery can be the safest or even the only way to deliver a healthy newborn ^[1].

One of the most common postoperative complications is a dynamic paralysis (ileus) that must be minimized due to its serious consequences including delayed enteral feeding resulting in patient discomfort, prolonged hospitalization and increased health care costs ^[2].

The pathophysiology of postoperative ileus is multifactorial. An important factor is activation by surgical trauma of the macrophages residing in the tunica muscularis externa of the bowel wall. These cells release cytokines that induce the activation of further proinflammatory cells and their migration to the site of injury. Next, other antiperistaltic cytokines (including interleukin-6 and TNF-alpha) are released, along with neuropeptides and nitric oxide. The full clinical picture of postoperative ileus ensues with inflammation of the tunica muscularis externa of the entire gastrointestinal tract ^[3].

Postoperative ileus usually manifests itself from the third to the fifth day after surgery, mainly with nausea, vomiting, retention of stool and flatus, and abdominal distention with sparse or absent bowel sounds. There are generally no major laboratory abnormalities ^[4].

In fact many factors appear to affect the delay in return of gastrointestinal activity including intraoperative bowel manipulation, postoperative sympathetic inhibitory pathway to gastrointestinal tract (GIT), inflammation, anesthetic agents and narcotics analgesia ^[5].

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 epidural or spinal anesthesia, increased motility may occur to overcome the development of ileus^[6].

All anesthetics used for induction or maintenance of general anesthesia may depress intestinal motility^[7] and cause postoperative ileus the large intestine is devoid of intercellular gap junctions which make the colon more susceptible to the of inhibitory actions of anesthetics, in particular halothane, enflurane and atropine delay gastric emptying^[8].

The aim of this study is to compare the effect of general versus spinal anesthesia in regain of the intestinal motility after elective cesarean section.

Patients and methods

This randomized clinical study was conducted on 150 pregnant women aged from 18 to 35 years, who were set for elective caesarean section under either general or spinal anesthesia, attending to the Obstetrics and Gynecology department from August 2020 to October 2021.

All procedures were carried out in accordance with the ethical standards of the institutional committee. The study received the approval of ethical committee of faculty Medicine.

Women with full term singleton pregnancy of gestational age between 37 to 41 weeks were included.

Exclusion criteria were contraindication to regional anesthesia (i.e., parturient refusal, coagulopathy, significant hypovolemia, systemic or local sepsis, increased intracranial pressure and severe stenotic valvular heart disease), high risk pregnancies (as pre-eclampsia, eclampsia), any medical disorder (DM, Cardiac and Thyroid disease), previous intestinal surgery, history of chronic constipation, any intraoperative complication, presence of intestinal or omental adhesions, increased intraoperative blood loss (more than 1000cc) and insertion of intra-peritoneal drain.

The participants were subdivided into 2 equal groups, group I included women delivered by using general anesthesia and group II included women delivered by using spinal anesthesia.

All patients were subjected to complete history taking personal history, past history, obstetric history, complete general examination. All patients were followed up postoperatively for detection of intestinal motility by auscultation of intestinal sound, symptom (pass flatus) without any drugs and early detection of ileus by vomiting, distension, absent of intestinal sound.

On arrival to the operation room, standard monitoring was applied with non-invasive blood pressure measurement and pulse oximetry. For general anesthesia 4-5 mg/kg thiopental and 100mg succinylcholine was administered and anesthesia was maintained with up to 1.5 % isoflurane and oxygen, neuromuscular blockade was maintained with 0.4mg/kg atracurium.

Spinal anesthesia was performed at L2-3 or L 3-4 intervertebral space using a fine spinal needle (size 22G "3.5 inch" Sterile Disposable, India). injection of local anesthetics into the subarachnoid space, Bupivacaine (heavy marcaine) (1.5-3.5ml) used.

The skin was opened with the modified Pfannenstiel incision, The peritoneum was opened by elevating it with two clamps placed about 2 cm apart, the peritoneum was incised sharply superiorly to the upper pole of the incision and downward to just above the peritoneal reflection over the bladder. The baby was delivered, the placenta was delivered by spontaneous delivery, with some cord traction. Skin incision was then sutured.

Patients were under close observation for vital data, vaginal bleeding, urine output and uterine massage every 1/2 hour for 2 hours then every 4-6 hours thereafter.

Both groups had the same hospital fluid regimen which was 500ml of 5% glucose every 6hrs, 500ml of ringer every 12 hrs. and 500ml of saline every 24 hrs. All participants

received the same intra operative prophylactic antibiotic Ampicillin + Sulbactam (Unictam, MUP, Egypt). Intramuscular doses of 75 mg diclofenac sodium were administered for analgesia. No oral or rectal bowel stimulants were given after surgery. Then auscultation for intestinal sound was started 2hours after operation and was performed at one hour interval till normal bowel sounds were detected. The patients were allowed to sip small amount of water only 6 hours postoperatively. The oral intake of clear fluid & soft food was allowed when normal bowel sounds were detected and flatus has passed with advancement to regular diet after passage of first bowel motion. Clinically significant ileus was considered with appearance of group of manifestations which include absent or hypo active bowel sounds, abdominal distension and more than three episodes of vomiting with or without crampy abdominal pain.

Eligible criteria for hospital discharge included, stable vital signs with no febrile morbidity for at least 24 hours, ability to ambulate and urinate without assistance, passage of a bowel motion, ability to tolerate solid food without emesis and absence of unresolved other postoperative complications.

Statistical analysis

Statistical analysis was done by SPSS v25 (IBM Inc., Chicago, IL, USA). Quantitative variables were presented as mean and standard deviation (SD) and were compared by paired Student's t- test for the same group. Qualitative variables were presented as frequency and percentage (%). Agreement: Measurements of TTE and EC were compared by paired Student's T test. Calculation of Bias and its SD between TTE and EC were calculated. Modified Bland Altman plots of TTE and EC measurements were done A two tailed P value < 0.05 was considered significant.

Results

Error! Not a valid bookmark self-reference. shows age and gestational age of the studied patients were not significantly different in spinal and general anesthesia groups. Meanwhile, 1st intestinal, 1st passage flatus, 1st passage motion and hospital stay were significantly increased among general group than the spinal group ($P = 0.001^*$). [Table 1]

Table 1: Comparison between spinal and general anesthesia as regard demographic data, regain of gastrointestinal motility and hospital stay after CS.

		General	Spinal	t. test	P value
Age/year	Range	18 – 30	19 – 31	0.433	0.666
	Mean \pm SD	24.72 \pm 3.32	24.48 \pm 3.46		
Gestational Age/wks.	Range	34 – 40	32 – 40	1.646	0.102
	Mean \pm SD	37.12 \pm 1.90	36.60 \pm 1.97		
1st intestinal	Range	13 – 26	5 – 11	27.756	0.001*
	Mean \pm SD	20.73 \pm 3.52	8.19 \pm 1.72		
1st passage flatus	Range	19 – 30	10 – 16	26.575	0.001*
	Mean \pm SD	24.61 \pm 3.17	13.23 \pm 1.94		
1st passage motion	Range	23 – 35	11 – 18	30.699	0.001*
	Mean \pm SD	28.36 \pm 3.36	14.52 \pm 1.99		
Hospital stays	Range	32 – 50	20 – 29	24.694	0.001*
	Mean \pm SD	39.53 \pm 4.58	24.76 \pm 2.43		

Data are presented as mean \pm SD, * significant as P value \leq 0.05.

distention was significantly increased among general group (34.7%) than the spinal group (14.7%), ($P=0.004$).

Table 2

Table 2: Comparison between spinal and general anesthesia as regard post-operative complications (signed of ileus)

		General	Spinal	X^2	P value
		N (%)	N (%)		
Distention	Yes	24 (34.7%)	11 (14.7%)	8.073	0.004*

Ileus	Yes	0 (0%)	0 (0%)	-	-
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Data are presented as frequency (%), * significant as P value ≤ 0.05 .

Figure 1 shows positive significant correlation between Duration of surgery and 1st intestinal sound in general anesthesia group and positive significant correlation between Duration of surgery and 1st intestinal sound in spinal anesthesia group.

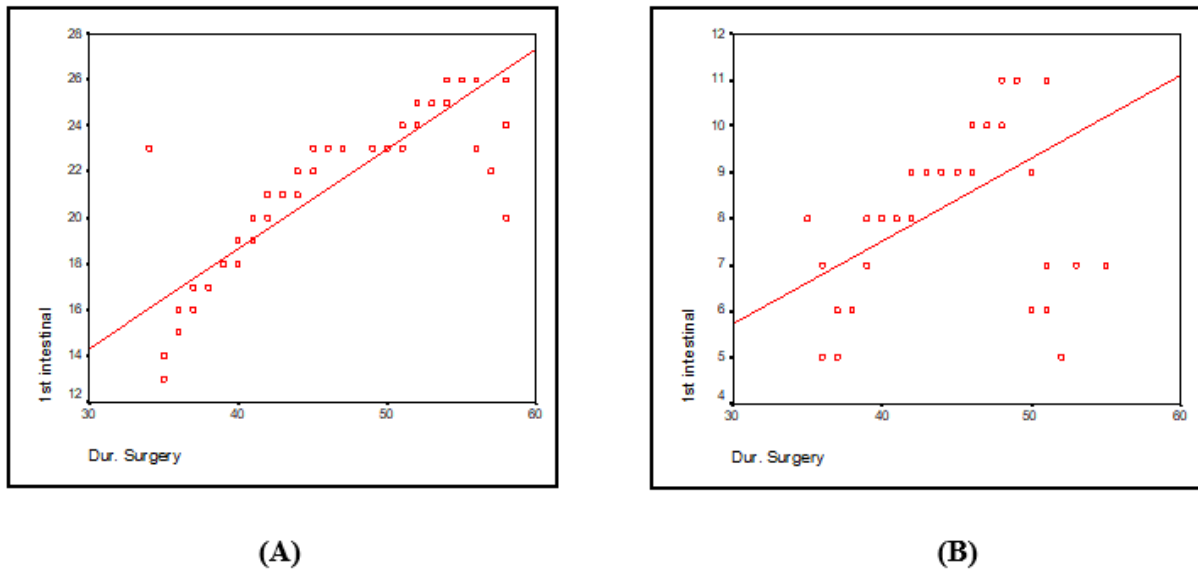


Figure 1: (A) relation between duration of surgery and 1st intestinal sound in general anesthesia group (B) relation between duration of surgery and 1st intestinal sound in spinal anesthesia group

Discussion

The present study showed that, age and gestational age of the studied patients were not significantly different in spinal and general anesthesia groups. The mean age and mean gestational age of the studied patients were 24.6 ± 3.38 years and 36.86 ± 1.95 weeks, respectively.

This is in agreement with Bayoumi et al., (2017) ^[9] showed the patients age was ranged from 18-35 years with a mean (23.58 ± 4.129) year, and gestational age in weeks ranged from (37-41 week) with mean (39.09 ± 0.941) weeks. It showed that there was no statistically significant difference between the two studied groups regarding to age, and gestational age. Also, no correlation was found between age, gestational age and (Regain of

gastrointestinal motility, postoperative complications) in the spinal and general anesthesia patients.

Also, consistent with Abd El-Sattar et al., (2020) ^[10] revealed patients age ranged from 18 to 31 years with a mean of 23.81 ± 3.03 years, gestational age in weeks ranged from 36 to 41 week with mean of 39.09 ± 0.941 weeks. There was no statistically significant difference between the two studied groups regarding demographic data (age and gestational age). Also, no correlation was found between age, gestational age, and regain of gastrointestinal motility and postoperative complications in spinal and general anesthesia patients.

The present study demonstrated that, the time of 1st intestinal, 1st passage flatus, 1st passage motion and hospital stay were significantly increased among general group than the spinal group. This is in accordance with Bayoumi et al., (2017) ^[9] found a significant effect of spinal anesthesia versus general anesthesia in term of shorter mean time interval to normal intestinal sound (9.36 versus 22.29 hours), passage of flatus (12.66 versus 26.05 hours), first motion (15.57 versus 29.63 hours), and discharge from hospital (34.41 versus 56.18 hours).

This agreed also, with the result of Liu et al., (2009) ^[6] revealed that patients who underwent spinal or epidural anesthesia had a significantly quicker return of bowel activity than those who received general anesthesia. The difference between general and regional anesthesia were 1.56 ± 0.64 days and 1.39 ± 0.56 days, respectively. Patients who received regional anesthesia had an apparently shorter time to first flatus passage compared with those who had general anesthesia. Thus, spinal anesthesia demonstrated a beneficial effect on postoperative ileus and post-operative pain control.

Also, Abd El-Sattar et al., (2020) ^[10] showed statistically significant beneficial effect of spinal anesthesia in decreasing the time interval to hear first bowel sounds, passage of flatus, first passage of motion and length of hospital stay after a CS to (7.7h, 11.35 h, 13.8 h

and 24.6) hrs., respectively, versus (22.4, 24.3, 29.37 and 43.44 h) hrs., respectively in the general anesthesia group, And this agreed with the results of Havas et al., (2013) ^[11] study which showed a decrease in the spinal anesthesia group than the general anesthesia group in the time interval to hear first bowel sound, passage of flatus, first passage of motion and length of hospital stay (4.75 h versus 16.6 h, (19 vs. 24 h), (24 vs. 32.5 h) and (48 vs. 52 h).

One important reason for early return of flatulence and defecation in Group SA is the sympathetic blockade. Sympathetic flow is the dominating inhibitory control for gastrointestinal system. When sympathetic flow is blocked and unopposed parasympathetic stimulation remains, motility in stomach, small bowel and proximal colon is increased. Another reason may be late oral intake observed in Group GA. This late intake may be due to residual sedative effects of general anesthetics ^[11].

While, these results differed from that reported by Akalpler and Okumus, (2018) ^[12] found the mean time for bowel sounds in women following cesarean delivery with spinal anesthesia included in this study was 12.62 ± 7.73 hours in the experimental group and 16.35 ± 5.20 hours in the control group. The bowel sounds started four hours earlier in the experimental group.

Also, El Shakhs et al., (2015) ^[13] stated that there was a significant decrease in the hospital stay period for those patients who received general anesthesia with epidural analgesia. This difference may be due to different study designs and the different criteria of selecting patients.

Epidurals with local anesthetics can block afferent and efferent inhibitory reflexes, increase splanchnic blood flow, and have anti-inflammatory effects. Epidural anesthetics have the added benefit of blocking the afferent stimuli that trigger the endocrine metabolic stress response to surgery and thus inhibit the catabolic activity of hormones released during

this process. thoracic epidurals with bupivacaine hydrochloride reduced ileus vs systemic opioid therapy in patients undergoing abdominal surgical procedures ^[14].

The current study showed significant positive correlation between duration of surgery and 1st intestinal sound in both general and spinal anesthesia group. Another study by Resnick et al., (1997) ^[15] concluded that GI motility is known to be altered after general anesthesia. The extent of the change in motility is proportional to the length of anesthesia.

Contrasts to our findings, Bayoumi et al., (2017) ^[9] found no correlation between duration of surgery in both spinal and general anesthesia groups and regain of gastrointestinal motility this because narrow range of difference in the duration between the operations (40-60minute). This agreed with the result of Graber et al., (1982) ^[16] found that the length of operation had little or no effect on the duration of colonic stasis. After some procedures lasting more than 3 hrs., colonic motility returned within 40 hr, whereas, with some procedures lasting only 1 h, activity failed to rectum until 60 h after surgery. Madkour et al., (2019) ^[17] study, showed no statistically significant difference as regards duration of surgery between spinal and general anesthesia groups.

In addition, Abd El-Sattar et al., (2020) ^[10] revealed no correlation between the duration of surgery in both spinal and general anesthesia groups and regain of gastrointestinal motility, this is due to that, it depends on the type of surgery. Also, authors concluded that prolonged exposure and handling of abdominal contents did not appear to be as important a factor in the duration of PI as had previously been thought.

Limitations

The lack of other neuraxial techniques can be seen as a limitation of the study. But we aimed to compare the two routine anesthesia methods, namely general and spinal anesthesia of our daily practice. We also think that spinal anesthesia was more comparable with general

anesthesia rather than a neuraxial technique with catheter, for it was applied as single shot and did not include long-acting opioids.

The use of high inspired oxygen concentration until delivery can be seen as a drawback of the study. We administered 100% oxygen to increase fetal oxygenation during this period as hysterotomy causes an interruption in oxygen delivery to the fetus. This may help to overcome a decrease of fetal oxygen reserve in unexpected prolonged hysterotomy to delivery periods. The reported incidence of awareness in cesarean section is 0.1-0.3%, therefore this study is underpowered to comment about awareness. However, we did not encounter recall in the postoperative period.

Fast-tracking in elective cesarean section is not well studied in terms of anesthetic technique as most western countries employ regional anesthesia.

Conclusions

Spinal anesthesia results in a quicker return of bowel activity after cesarean section than general anesthesia with difference and spinal anesthesia results in a quicker return to home as it decreases the length of hospital stay with significant difference between both groups.

COMPETING INTERESTS DISCLAIMER:

Authors have declared that no competing interests exist. The products used for this research are commonly and predominantly use products in our area of research and country. There is absolutely no conflict of interest between the authors and producers of the products because we do not intend to use these products as an avenue for any litigation but for the advancement of knowledge. Also, the research was not funded by the producing company rather it was funded by personal efforts of the authors.

References

1. Clapp MA, Barth WH. The future of cesarean delivery rates in the United States. Clin Obstet Gynecol. 2017;60:829-39.

2. Abd-El-Maeboud K, Ibrahim M, Shalaby D, Fikry M. Gum chewing stimulates early return of bowel motility after caesarean section. *BJOG: An International Journal of Obstetrics & Gynaecology*. 2009;116:1334-9.
3. Vilz T, Wehner S, Pantelis D, Kalff J. Immunomodulatory aspects in the development, prophylaxis and therapy for postoperative ileus. *Zentralbl Chir*. 2013;139:434-44.
4. Vilz T, Pantelis D, Kalff J. Prophylaxis and therapy of postoperative ileus. *Chir Prax*. 2013;76:407-20.
5. Senagore AJ. Pathogenesis and clinical and economic consequences of postoperative ileus. *Am J Health Syst Pharm*. 2007;64:3-7.
6. Liu Y-F, Chen K-B, Lin H-L, Ho C-H, Liu S-K, Liu Y-C, et al. Comparison of the effect of epidural and intravenous patient-controlled analgesia on bowel activity after cesarean section: a retrospective study of 726 Chinese patients. *Acta Anaesthesiol Taiwan* 2009;47:22-7.
7. Hemmings Jr H. Sodium channels and the synaptic mechanisms of inhaled anaesthetics. *Br J Anaesth*. 2009;103:61-9.
8. Bergendahl H, Lönnqvist PA, Eksborg S. Clonidine in paediatric anaesthesia: review of the literature and comparison with benzodiazepines for premedication. *Acta Anaesthesiol Scand*. 2006;50:135-43.
9. Bayoumi M. Effect of general anesthesia versus spinal anesthesia in cesarean section on regain of gastrointestinal motility. *Egypt J Hosp Med*. 2017;68:1332-8.
10. Abd El-Sattar MM, Rezk MA, Nofal AM, Hashish AH. Regain of gastrointestinal motility after general anesthesia versus spinal anesthesia in a cesarean section. *Menoufia Med J*. 2020;33:427.

11. Havas F, Orhan Sungur M, Yenigün Y, Karadeniz M, Kilic M, Özkan Seyhan T. Spinal anesthesia for elective cesarean section is associated with shorter hospital stay compared to general anesthesia. *Agri*. 2013;25:55-63.
12. Akalpler O, Okumus H. Gum chewing and bowel function after Caesarean section under spinal anesthesia. *Pak J Med Sci*. 2018;34:1242.
13. El-Shakhs S, El-Sisy A, Eskander A, Gaber A, Elshafey E. A study on enhanced recovery after abdominal surgery. *Menoufia Med J*. 2015;28:923-7.
14. Luckey A, Livingston E, Taché Y. Mechanisms and treatment of postoperative ileus. *Arch Surg*. 2003;138:206-14.
15. Resnick J, Greenwald DA, Brandt LJ. Delayed gastric emptying and postoperative ileus after nongastric abdominal surgery: part I. *Am J Gastroenterol*. 1997;92:751-62.
16. Graber JN, Schulte WJ, Condon RE, Cowles VE. Relationship of duration of postoperative ileus to extent and site of operative dissection. *Surgery*. 1982;92:87-92.
17. Madkour NM, Ibrahim SA, Ezz GF. General versus spinal anesthesia during elective cesarean section in term low-risk pregnancy as regards maternal and neonatal outcomes: a prospective, controlled clinical trial. *Res opin Anes Intens care J*. 2019;6:119.