

Effect of General Anesthesia versus Spinal Anesthesia in Cesarean Section on Regain of Gastrointestinal Motility

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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

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⁽¹⁾. All anesthetics used for induction or maintenance of general anesthesia may depress gastrointestinal motility, also incising the peritoneum and manipulation of the bowel will completely inhibit the motility. Effect of anesthesia 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⁽²⁾.

METHODS

This prospective controlled study was carried out at Ain Shams University Maternity Hospital from April 2016 to June 2017 after approval of the hospital health ethical committee. It included 150 patients who had C.S and were subdivided into 2 groups according to a randomization scale. On the day of the operation each randomly received a closed opaque envelope for the selection of the procedure (Spinal versus general).

Inclusion criteria

Patients set for planned C.S under either general or spinal anesthesia: age from 18 to 35 years, full term singleton pregnancy (37-41 weeks).

Exclusion criteria

Contraindication to regional anesthesia i.e. parturient refusal, coagulopathy, significant hypovolemia, systemic or local sepsis, increased intracranial pressure, severe stenotic valvular heart disease, preexisting neurologic conditions and local anesthetic or fentanyl allergy. High risk pregnancies as pre-eclampsia, eclampsia, any medical disorder (DM, cardiac and thyroid diseases), previous intestinal surgery or previous gynecological operations or previous CS, History of chronic constipation and increased operative time more than 50 minutes.

Elimination criteria

Any intraoperative complication, presence of intestinal or omental adhesions, increased intraoperative blood loss (more than 1000cc), insertion of intra-peritoneal drain and excessive small bowel manipulation.

Patients were asked for informed consent, full history taking, examination of vital signs and BMI.

General anesthesia

Parturients in this group received standard rapid sequence induction with pre-oxygenation by 100% oxygen for 3 minutes followed by 4-5 mg/kg thiopental and 1-1.5mg/kg succinylcholine, anesthesia was maintained with up to 1.5 % isoflurane and oxygen, neuromuscular blockade was maintained with 0.4mg/kg atracurium.

Spinal anesthesia

Spinal anesthesia was performed at L2-3 or L 3-4 inter vertebral space using a fine spinal

needle (size 22G "3.5 inch"). Injection of local anesthetics into the subarachnoid space, Bupivacaine (Marcaine) (1.5-3.5ml) used.

Operative data

The skin was opened with the modified Pfannenstiel incision, the anterior abdominal wall was opened in layers. The peritoneum is incised sharply superiorly to the upper pole of the incision and downward to just above the peritoneal reflection over the bladder. The lower flap of visceral peritoneum is elevated and the bladder is gently separated by blunt dissection from the underlying myometrium.

The uterus was opened transversely in the lower segment. The baby was delivered, an intravenous infusion containing two ampules (20 units) of oxytocin per liter of crystalloid is infused at 10 mL/min until the uterus contracts satisfactorily. The placenta is then delivered by spontaneous delivery, with some cord traction.

The uterine incision is then closed with two layers using blunt needle and continuous absorbable suture (Vicryl No.0) intra abdominally. The visceral and parietal peritoneum were closed using continuous absorbable suture (Vicryl No. 0). The rectus muscles were approximated with two figure-of-eight sutures of 0 Vicryl.

The rectus sheath and subcutaneous tissue were sutured using continuous absorbable suture (Vicryl 1) and the skin was closed by subcuticular suture (Prolene 2.0).

After the end of surgery

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

All participants received the same intra operative prophylactic antibiotic Amoxicilline trihydrate + Flucloxacilline monohydrate 1:1 (Flumox) vial 1gm before skin incision that had been repeated every 8hrs for the first 24hrs and from the same formula one capsule 500mg tds for one week was recommended.

For postoperative analgesia, intramuscular doses of 75 mg diclofenac sodium (Voltaren, Novartis Pharma, Egypt), a nonsteroidal anti-inflammatory medication, were offered, the need for additional use of narcotics (pethidine, 100mg) was recorded.

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 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 (persisting longer than 24hrs or requiring nasogastric tube placement) which include absent or hypo active bowel sounds, abdominal distension and more than three episodes of vomiting with or without crampy abdominal pain.

STATISTICAL ANALYSIS

The data were coded, entered and processed on computer using SPSS (version 16).

- Qualitative data are presented as number and percentages while quantitative data are presented as means and standard deviations.
- Student's t-test was used to assess the statistical significance of the difference between two population means in a study involving independent samples.
- Pearson correlation coefficient (r) was used to assess the relation between the quantitative parameters.
- Logistic regression analysis was used to assess the effect of quantitative parameter on an outcome
- Roc curve The Receiver operator characteristic curve was used to assess the best cut off point between two groups with a sensitivity, specificity.

The confidence interval was set to 95% and the margin of error accepted was set to 5%. So, the p-value was considered significant as the following:

P > 0.05: Not significant

P < 0.05: Significant

P < 0.01: Highly significant.

RESULTS

The current study was conducted upon 150 pregnant women at Ain Shams University Maternity Hospital from April 2016 to June 2017 to compare the time needed to regain gastrointestinal motility after general versus spinal anesthesia in cesarean section.

Table 1: demographic data of the patients participated in this study

	Range	Mean	SD
Age (years)	(18-35)	23.58	4.129
Body mass index kg/m ²	(21-35)	25.37	2.168
Gestational age (weeks)	(37-41)	39.09	0.941

Table 2: comparison between spinal and general anesthesia as regard demographic data.

	Spinal (n= 75)		General (n= 75)		Independent t-test	
	Mean	SD	Mean	SD	t	p-value
Age (years)	23.28	4.022	23.79	4.198	-1.186	0.236
Body mass index kg/m ²	25.54	2.092	25.25	2.216	1.332	0.184
Gestational age (week)	39.14	0.81	39.05	1.023	0.889	0.375

Table 3: comparison between general and spinal anesthesia regarding regain of gastrointestinal motility, duration of surgery and hospital stay after CS

	Spinal (n= 75)		General (n= 75)		Independent t-test	
	Mean	SD	Mean	SD	T	p-value
1 st Intestinal Sound (hour)	9.36	2.976	22.29	8.251	-20.479	0.000**
1 st Flatus (hour)	12.66	2.362	26.05	8.173	-21.865	0.000**
1 st Motion (hour)	15.57	2.427	29.63	8.134	-23.011	0.000**
hospital stay (hour)	34.41	4.801	56.18	15.54	-18.595	0.000**
Duration of surgery (minutes)	48.45	4.69	47.85	4.82	1.239	0.215

** Highly significant

Table 4: comparison between spinal and general anesthesia as regard postoperative complications

		Spinal (n= 75)		General (n= 75)		Chi-square test	
		No	%	No	%	X2	P-value
		Fever (temp>37.2) 1 st day	No	64	85.3%		
	Yes	11	14.6%	3	4%		
Distension	No	63	84.%	45	60%	28.400	0.000**
	Yes	12	16%	30	40%		
Ileus	No	75	100.00%	73	97.33%	2.801	0.094
	Yes	0	0.00%	2	2.66%		

* Significant

** Highly significant

Table 5: comparison between spinal and general anesthesia regarding use of postoperative analgesia

		Spinal (n= 75)		General (n= 75)		Chi-square test	
		No	%	No	%	X2	P-value
Opioid use	No	67	89.33%	65	86.66%	0.617	0.432
	Yes	8	10.66%	10	13.33%		
Non steroid (NSAID) use	No	49	65.33%	15	20%	14.324	0.002**
	Yes	26	34.66%	60	80%		

** Highly significant

Table 6: correlation between age and regain of gastrointestinal motility in the spinal and general anesthesia patients

	Age			
	Spinal (n= 75)		General (n= 75)	
	r	p-value	r	p-value
1 st Intestinal sound(hour)	-0.066	0.407	0.042	0.391
1 st Flatus (hour)	0.026	0.744	0.091	0.922
1 st Motion (hour)	0.039	0.626	0.050	0.972

Ileus comparison was not applicable because there were no positive cases in the spinal anaesthesia group.

Table 7: correlation between age and postoperative complications in the spinal and general anesthesia patients.

		Age							
		Spinal (n= 75)				General (n= 75)			
		Mean	SD	t	p-value	Mean	SD	t	p-value
Fever	No	23.23	3.947	0.357	0.721	23.62	4.04	1.212	0.413
	Yes	23.57	4.578			24.78	6.14		
Distension	No	23.45	3.894	1.252	0.212	23.47	3.75	1.406	0.161
	Yes	22.33	4.65			24.26	4.78		
Ileus	No	23.28	4.022			23.66	4.04	1.115	0.416
	Yes					26.7	6.93		

Ileus comparison was not applicable because there were no positive cases in the spinal anesthesia group.

Table 8: correlation between body mass index and postoperative complications in spinal and general anesthesia groups

		BMI							
		Spinal (n= 75)				General (n= 75)			
		Mean	SD	t	p-value	Mean	SD	t	p-value
Fever	No	25.32	1.86	3.548	0.001**	25.02	1.84	8.850	0.000**
	Yes	27.00	2.86			30.78	3.346		
Distension	No	25.58	2.24	0.535	0.593	24.43	1.333	7.625	0.000**
	Yes	25.33	0.87			26.47	2.676		
Ileus	No	25.54	2.092			25.16	2.10	4.511	0.000**
	Yes					30.00	3.46		

** Highly significant

Ileus comparison was not applicable because there were no positive cases in the spinal anesthesia group.

Table 9: Roc curve of body mass index in predicting postoperative complications after CS

Study parameters	Cut off value (kg/m ²)	AUC (area under curve)	Sensitivity	Specificity	+PV	-PV
Fever	25	79.8	81.25	64.67	16.7	97.5
Ileus	26	93.1	100	82.83	5.6	100
Distension	25	66.4	55	67.86	42.3	77.9

Table 10: correlation between gestational age and regain of gastrointestinal motility in the spinal and general anesthesia groups

	Gestational age			
	Spinal (n= 75)		General (n= 75)	
	R	p-value	r	p-value
1 st Intestinal sound(hour)	-0.181	0.058	-0.051	0.44
1 st Flatus (hour)	-0.052	0.520	-0.04	0.55
1 st Motion (hour)	0.008	0.921	-0.036	0.585

Table 11: comparison between the regain of the 1st intestinal sound and postoperative complications in the spinal and general anesthesia groups

		1 st intestinal sound							
		Spinal (n= 75)				General (n= 75)			
		Mean	SD	T	p-value	Mean	SD	T	p-value
Fever	No	9.94	2.659	4.833	0.000**	19.15	4.15	14.037	0.000**
	Yes	13.1	3.52			48.00	11.71		
Distension	No	10.31	2.956	3.212	0.012	18.04	3.03	5.328	0.000**
	Yes	15.67	3.13			23.66	5.78		
Ileus	No	9.36	2.976			19.35	4.41	24.009	0.000**
	Yes					72.50	2.89		

** Highly significant

Ileus comparison was not applicable because there were no positive cases in the spinal anesthesia group.

Table 12: comparison between the time of the 1st flatus and postoperative complications in spinal and general anesthesia groups

		1stFlatus							
		Spinal (n= 75)				General (n= 75)			
		Mean	SD	t	p-value	Mean	SD	t	p-value
Fever	No	13.26	1.99	6.068	0.000**	22.90	3.95	14.414	0.000**
	Yes	16.29	2.90			51.89	12.71		
Distension	No	13.52	2.33	5.213	0.000**	21.29	2.92	6.851	0.000**
	Yes	17.42	2.45			28.20	6.25		
Ileus	No	12.66	2.362			23.11	4.21	25.280	0.000**
	Yes					76.50	1.73		

** Highly significant

Ileus comparison was not applicable because there were no positive cases in the spinal anesthesia group.

Table 13: correlation between the regain of gastrointestinal motility (1st Sound, 1st Flatus and 1st Motion) and hospital stay in spinal and general anesthesia group

	Hospital stay			
	Spinal (n= 75)		General (n= 75)	
	r	p-value	r	p-value
1 st Intestinal sound (hour)	0.334	0.000**	0.488	0.000**
1 st Flatus (hour)	0.444	0.000**	0.767	0.000**
1 st Motion (hour)	0.396	0.000**	0.872	0.000**

** Highly significant

Table 14: correlation between duration of surgery and regain of gastrointestinal motility

	Duration of surgery	
	r	p-value
1 st Intestinal sound (hour)	0.065	0.694
1 st Flatus (hour)	0.293	0.070
1 st Motion (hour)	- 0.014	0.932

DISCUSSION

Postoperative ileus (POI) is defined as a temporary disturbance in gastric and bowel motility following abdominal surgery including cesarean section⁽³⁾. Transient Postoperative ileus is recognized as an expected outcome of any major abdominal surgery, especially when the peritoneum is entered, or the bowel is extensively manipulated or reconstructed⁽⁴⁾.

The effect of laparotomy on GI electrical activity also is dependent upon the extent of the surgery. Skin incision has no effect on MMC (Migrating Motor Complex) activity, whereas division of the abdominal muscles causes a transient inhibition of MMC activity. MMC activity is completely abolished by opening the peritoneum, and the duration of inhibition is prolonged if the bowel itself is manipulated⁽⁵⁾.

Management strategies for postoperative ileus can be divided into prevention and supportive care. For prevention, one can alter the choice of anesthesia, the surgical technique, and the means of providing pain relief. For supportive care, early ambulation, early oral feeding and prokinetic agents. These strategies have been designed to shorten Postoperative ileus and hasten discharge⁽⁶⁾.

The current study was conducted upon 150 pregnant women at Ain Shams University Maternity Hospital from April 2016 to June 2017 to compare the time needed to regain gastrointestinal motility after general versus spinal anesthesia in cesarean section.

In this study the patients age was ranged from 18-35 years with a mean±SD (23.58±4.129) years, body mass index ranged (21-35kg/m²) with mean±SD (25.37±2.168) kg/m² and gestational age in weeks ranged from (37-41 week) with mean ±SD (39.09±0.941) weeks.

It showed that there was no statistically significant difference between the two studied groups regarding to demographic data (age, body mass index and gestational age).

There was a highly statistically significant difference between the two studied groups and BMI regarding to postoperative complications (Fever,

distension and ileus). The cut off value of BMI was 25 kg/m² with the sensitivity for predicting fever was 81% and the specificity was 64%, while the sensitivity for predicting ileus was 100% and the specificity was 82%, the sensitivity for predicting distension was 55% and the specificity is 67%.

No correlation was found between age, gestational age and (Regain of gastrointestinal motility, postoperative complications) in the spinal and general anesthesia patients.

There was statistically 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), Also there was statistically significant effect of spinal anesthesia versus general anesthesia in term of less use of opioids (10.36% versus 13.47%), less use of non-steroidal anti-inflammatory drugs (NSAID) (34.72% versus 80.31%), less incidence of distension (15.54% versus 40.41%), less incidence of ileus (0% versus 2.07%). This agrees with the result of **Liu et al.**⁽⁷⁾ which was done at China Medical University Hospital Taichung, Taiwan, which included 726 patients who consented to receive either regional or general anesthesia for elective cesarean section delivery. The study 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. Also patients who underwent spinal anesthesia had less use of (NSAID) and opioids. Thus, spinal anesthesia demonstrated a beneficial effect on postoperative ileus and post-operative pain control.

There was 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 agrees with the result of **Graber *et al.***⁽⁸⁾ they found that the length of operation had little or no effect on the duration of colonic stasis. After some procedures lasting more than 3 hr, colonic motility returned within 40 hr, whereas, with some procedures lasting only 1 h, activity failed to rectum until 60 h after surgery. They 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.

Also **Resnick *et al.***⁽⁹⁾ 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.

Among all the studied patients (in both groups) there was a highly statistically significant positive relation between 1stSound, 1stFlatus, and (distension and ileus), this agree with the result of **Scheinin**⁽¹⁰⁾ concluded that decrease narcotic use and use of spinal anesthesia as anesthetic agents have been found to decrease the duration of postoperative ileus.

In all patients there was a highly statistically significant positive relation between hospital stay and fever, distension and ileus and there was a highly statistically significant positive relation between hospital stay and regain of gastrointestinal motility (1st intestinal sound, 1st flatus and 1st motion) in both types of anesthesia. This agrees with the result of **Jeffrey**⁽¹¹⁾ in his meta-analysis assimilated data from 15 randomized controlled trials involving 787 patients underwent CS. The author concluded that with regional anesthesia there was earlier recovery of bowel function and this reduced the length of hospitalization and healthcare costs.

CONCLUSION AND RECOMMENDATIONS

- Spinal anesthesia results in a quicker return of bowel activity after cesarean section than general anesthesia with difference (12.93 hours).
- Spinal anesthesia results in a quicker return to home as it decreases the length of hospital stay with difference (21.77 hours).

- Spinal anesthesia is safe and effective in patients experiencing post cesarean section pain as use of opioids and (NSAID) is less.
- We recommend the use of spinal anesthesia for cesarean section especially if there's no contraindication for that.

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