Original Article

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Anaesthesia Section

Comparison between Intra-abdominal and Extra-abdominal Repair of the Uterus with Relation to Intraoperative Haemodynamic Changes in Patients Undergoing LSCS under Spinal Anaesthesia: A Cohort Study

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ABSTRACT

Introduction: Exteriorisation of the uterus during caesarean section offers the benefit of faster repair of uterine incision, reduced blood loss and shorter Duration of Surgery (DOS). However, this technique has been associated with haemodynamic disturbances in the intraoperative period particularly while repositioning the uterus into the abdominal cavity after repairing it. This could prove detrimental for the patient, if not corrected promptly.

Aim: To assess whether exteriorisation of the uterus for the repair of uterine incision has an effect on the haemodynamic changes and comparing the same with the intra-abdominal repair technique of uterine incision.

Materials and Methods: ASA I and II pregnant females undergoing elective/emergency caesarean section under spinal anaesthesia for various obstetric indications were enrolled in this cohort study. The duration of study was 6 months after getting approval from IEC (September 2019 to February 2020). As per the discretion of the operating surgeon, the uterus of the patients undergoing caesarean section was repaired either intra-abdominally (Group I) or after exteriorisation of the uterus (Group E) and the patients were grouped accordingly. Haemodynamic monitoring was done every 5 minutes after giving spinal anaesthesia until the completion of the caesarean section using a standard automated multi-parameter monitor. Data was recorded and the two groups were compared with regard to the haemodynamic changes during intraoperative period, DOS, the incidence of any adverse events namely nausea and vomiting and Time To First Rescue Analgesia (TTFRA) in the postoperative period. Unpaired t-test was used to compare and analyse the data between the two groups, where ever applicable. A p-value of less than 0.05 was considered statistically significant. Chi-square test was used for qualitative data analysis.

Results: Analysis of data between the two groups showed a significant fall in Systolic and Diastolic Blood Pressure (SBP and DBP) in Group E compared to Group I at 10 minutes [p=0.046 (SBP) and p=0.039 (DBP)], 30 minutes [p=0.047 (SBP) and p=0.002 (DBP)] and 35 minutes [p=0.046 (SBP) and p=0.006 (DBP)] time interval after giving spinal anaesthesia which was attributed to uterine exteriorisation to repair the uterine incision in Group E. The incidence of nausea, hypotension and pelvic discomfort was also significantly higher in Group E compared to Group I. Owing to less uterine handling, patients in Group I secured analgesia for a significantly longer time (TTFRA=244 min) in the postoperative period compared to patients in Group E (TTFRA=217 min) (p≤0.001).

Conclusion: Extra-abdominal repair of the uterine incision carries the risk of haemodynamic disturbances associated with nausea and vomiting.

Keywords: Exteriorisation, Faster repair, Haemodynamic disturbance, Uterine incision

INTRODUCTION

Normal vaginal delivery is associated with tremendous stress and pain to the body of a pregnant female [1]. Hence, in addition to the various obstetric indications, many pregnant females are opting for a caesarean section as a quick and safe method of delivering their baby [2,3]. This can be attributed to improvement in the standard of health care facilities across the nation and the evolution of safe technique of caesarean section.

Lower Segment Caesarean Section (LSCS) is most commonly used by the obstetrician for patients undergoing caesarean section. As per the discretion of the operating obstetrician, some employ the technique of exteriorisation of uterus outside the abdominal cavity to repair it, once the baby is delivered [4].

Studies comparing extra-abdominal repair of uterus with intra-abdominal repair during caesarean section have found that extra-abdominal repair of uterus has the benefit of reduced blood loss, faster repair of the uterine incision and shorter DOS. However, when compared with intra-abdominal repair, this technique has been associated with haemodynamic disturbance in the intraoperative period particularly while repositioning the uterus into the abdominal cavity after repairing it; for example: increased pelvic discomfort, pain and slower return of bowel movement in the postoperative period [5-14]. A clear picture of haemodynamic changes occurring during intraoperative period using a standardised anaesthetic regimen from anaesthetist's point of view seemed to be lacking in the above mentioned studies.

The aim of this study was to assess the effect of exteriorisation of the uterus for repair, during a caesarean section, on the haemodynamic status while comparing with the technique of intra-abdominal repair of uterine incision. Comparison was also done for incidence of adverse effects if any, estimation of blood loss, the DOS and TTFRA in postoperative period between the two surgical techniques. Also, the anaesthetic regimen was standardised thus eliminating any chance of influence on haemodynamic parameters as a result of anaesthetic technique. The research hypothesis of this study postulates that extra-abdominal repair of the uterine incision during caesarean section is associated with haemodynamic disturbance and pelvic discomfort to the patient when compared to the intra-abdominal repair of uterine incision.

MATERIALS AND METHODS

The study was a cohort study conducted at Sikkim Manipal Institute of Medical Sciences, Gangtok after obtaining approval from the Institutional Ethical Committee (SMIMS IEC Registration no: SMIMS/IEC/2019-105 Dated 7th September 2019). The duration of study was 6 months after getting approval from IEC (September 2019 to February 2020).

Pregnant females undergoing elective/emergency caesarean section under spinal anaesthesia for various obstetric indications over a study period of 6 months were enrolled in the study. A detailed pre-anaesthetic evaluation was done for all the patients prior to taking up for surgery. Informed written consent was taken from those patients who were willing to be enrolled in the study. Unwilling patients and patients with a previous history of caesarean section were excluded from the study to minimise surgical technical difficulties. Also, patients with contraindication of spinal anaesthesia were excluded from the study to minimise discrepancy in haemodynamic monitoring due to different anaesthetic technique.

Based on a previous study [5] and using confidence interval of 95% with 5% margin of error, 144 patients were enrolled in the study. Randomisation was not done as the patients were operated as per the discretion of the operating surgeon, with the uterus being repaired either intra-abdominally (Group I) or after exteriorisation of the uterus (Group E); and patients were grouped accordingly after the completion of caesarean section. Equal division of sample patient into two groups was not done as the study did not want to interfere with the surgical technique of the operating surgeon.

Upon the arrival of the patient in the operation theatre, baseline vitals monitoring and charting was done; namely, heart rate, blood pressure and percentage saturation of oxygen (SpO_2). Prior to giving spinal anaesthesia, all patients were co-loaded with ringer lactate-15ml/kg body weight. Spinal anaesthesia was given in sitting position using 2 mL of 0.5% hyperbaric Bupivacaine without any additives administered, into L3-L4 subarachnoid space with the help 25G Quincke spinal needle. Free-flowing aspiration of cerebrospinal fluid was used as a confirmation of correct placement of the spinal needle and patient placed in supine position once the drug was injected.

Haemodynamic monitoring was done every 5 minutes after giving spinal anaesthesia until the completion of the caesarean section using a standard automated multi-parameter monitor. The surgical procedure was started once sensory and motor blockade up to T6 dermatome level was achieved. Hypotension after giving spinal anaesthesia was defined as a fall in mean blood pressure to less than 60 mmHg or less than 30% of baseline value; and was treated with 6mg bolus dose of injection Mephenteramine and repeated if mean blood pressure did not rise above 60 mmHg. Tachycardia was defined as a rise in heart rate of more than 30% of baseline value while bradycardia was defined as a fall in heart rate to less than 60 beats per minute.

Data recording was done along with the comparison of the two groups with regard to the haemodynamic changes, DOS, and incidence of any adverse events namely nausea, vomiting, hypotension and tachycardia, and TTFRA in the postoperative period.

STATISTICAL ANALYSIS

Data analysis was done using IBM SSPE statistical software version 25.0 with Mean±SD. Unpaired t-test was used wherever applicable. A p-value less than 0.05 was considered statistically significant.

RESULTS

A total of 165 patients were enrolled, out of which 21 patients were excluded. Among these 21 patients, five patients did not want to be enrolled in the study and in 16 patients, mode of anaesthesia had to be changed intraoperatively from spinal anaesthesia to general anaesthesia. Thus, a sample size of 144 patients was drawn, out of which 98 patients underwent extra-abdominal closure of uterine incision (Group E) and 46 patients underwent intra-abdominal closure of the uterine incision.

The two groups were comparable in terms of age and ASA status [Table/Fig-1]. Also, the changes in the heart rate were comparable [Table/Fig-2]. Till the delivery of the foetus, the haemodynamic parameters were similar between the two groups with no statistical significance. The mean Time To Delivery Of The Foetus (TTDOF) was 7.45 minutes for Group E and 7.55 minutes for Group I which was comparable between the two groups. Ten minutes after giving spinal anaesthesia, the systolic and diastolic blood pressure dropped in Group E when compared to Group I (statistically significant) which corresponded to exteriorisation of the uterus in Group E to begin repair of uterine incision. A similar drop in blood pressure was also noted 30 to 35 minutes after giving spinal anaesthesia which corresponded to replacement of uterus into the peritoneal cavity after repairing it [Table/Fig-3-5].

Varaibles	Group E	Group I	p-value
Mean age (Years)	30.71±4.48	30.92±4.30	0.841
ASA (I:II)	69:29	33:13	NA

[Table/Fig-1]: Demographic profile of the two groups.

Heart rate (bpm)	Group E Mean±SD	Group I Mean±SD	p-value
Baseline	93.34±14.98	90.46±14.69	0.514
After SA	95.19±15.34	90.35±13.52	0.202
After 5 min	99.66±18.62	91.39±16.79	0.061
After 10 min	93.30±18.62	96.69±22.05	0.411
After 15 min	92.21±17.59	98.15±19.53	0.134
After 20 min	94.21±16.11	91.39±18.22	0.623
After 25 min	96.07±17.28	92.04±16.59	0.415
After 30 min	94.68±14.62	91.27±16.59	0.483
After 35 min	94.68±15.55	93.12	0.728
After 40 min	93.982±15.82	88.52	0.206
After 45 min	94.67	89.9	0.258
After 50 min	90.54	86.77	0.389
After 55 min	88.25	85.75	0.768
End of surgery	83.53±26.56	85.15±11.12	0.623

[Table/Fig-2]: Comparison of heart rate between the two groups.

SBP (mmHg)	Group E Mean±SD	Group I Mean±SD	p-value
Baseline	130.6±12.38	130.4±11.05	0.924
After SA	122.6±11.88	124.8±9.88	0.448
After 5 min	113.3±16.30	118.9±14.16	0.136
After 10 min	114.2±11.72	119.9±12.99	0.046
After 15 min	117.8±10.94	115.9±13.72	0.511
After 20 min	116.1±11.52	115±10.43	0.643
After 25 min	113.5±12.05	114.5±9.77	0.722
After 30 min	108.5±12.97	114.7±11.52	0.047
After 35 min	108.7±13.92	114	0.046
After 40 min	111.7±12.92	114.2	0.398
After 45 min	113.9	114.1	0.993
After 50 min	116.4	113.1	0.285
After 55 min	121	117	0.482
End of surgery	120±7.57	117.85±.20	0.172

[Table/Fig-3]: Comparison of Systolic Blood Pressure (SBP) between the two groups. p<0.05 statistically siginificant

DBP (mmHg)	Group E Mean±SD	Group I Mean±SD	p-value
Baseline	78.2±10.67	81.62±8.05	0.142
After SA	72.9±9.27	76.8±7.35	0.061
After 5 min	66.9±12.34	72.9±12.28	0.062
After 10 min	64.5±9.90	70.9±13.22	0.040
After 15 min	64.98±10.97	66.7±11.02	0.588
After 20 min	64.2±9.77	66.3±9.25	0.432
After 25 min	61.1±9.54	65.2±9.77	0.124
After 30 min	58.32±8.69	65.9±9.23	0.002
After 35 min	58.21±9.06	64.56	0.007
After 40 min	59.5±9.45	64.6	0.019
After 45 min	61.02	66.06	0.058
After 50 min	63.96	64.3	0.911
After 55 min	68	66.25	0.830
End of surgery	67.5±7.29	69.04±7.24	0.517

[Table/Fig-4]: Comparison of Diastolic Blood Pressure (DBP) between the two groups. p<0.05 statistically siginificant

MAP (mmHg)	Group E Mean	Group E SD	Group I Mean	Group I SD	p-value
Baseline	94.6±10.86		97.2±9.14		0.281
After SA	87.98±10.54		91.92±9.29		0.098
After 5 min	81.4±14.26		87.2±12.78		0.083
After 10 min	80.32±10.26		85.6±12.20		0.060
After 15 min	81.5±11.01		81.7±11.51		0.999
After 20 min	80.2±9.92		81.5±9.28		0.606
After 25 min	77.6±9.91		79.7±9.72		0.444
After 30 min	75.02±9.26		81.1±9.12		0.012
After 35 min	74.04±10.10		80.2		0.003
After 40 min	75.92±9.75		79.6		0.065
After 45 min	77.81		80.1		0.322
After 50 min	79.8		78.44		0.625
After 55 min	83.3		82.3		0.867
End of surgery	82.7±6.3116		83.08±6.3116		0.963

[Table/Fig-5]: Comparison of Mean Arterial Pressure (MAP) between the two groups. p<0.05 statistically siginificant

The haemodynamic parameters at other given time interval were similar and comparable.

Majority of cases was completed by 45 minutes but some cases went on beyond 47 minutes and as a result fewer data was analysed by the software after 45 minutes. Thus, the SD value was not obtained. It was evaluated on both excel and SSPE but both did not give the SD value.

Forty five patients in Group E developed hypotension while 22 patients in Group E and two patients in Group I experienced nausea during the intraoperative period [Table/Fig-6].

Criterion	Group E (N=98)	Group I (N=46)	p-value
Nausea	22	2	0.007
Vomiting	2	0	0.322
Hypotension	45	0	≤0.001
Tachycardia	8	2	0.391
Pelvic discomfort	28	2	≤0.001

[Table/Fig-6]: Comparison of adverse events between the two groups. p<0.05 statistically siginificant

Twenty eight patients in Group E complained of pelvic discomfort in the perioperative period while the same was complained by only two patients in Group I. (p-value ≤0.001) [Table/Fig-6]. This pelvic discomfort improved upon repositioning of uterus into the abdominal cavity and on verbal assurance. The Total DOS (TDOS) was 49.93 minutes in Group E and 47.5 minutes in Group I (p-value=0.2919) [Table/Fig-7].

The TTFRA was statistically significant between the two groups with Group E needing first analgesic dose after 217 minutes after completion of surgery and Group I needing it after 244 minutes (p-value ≤0.001) [Table/Fig-7].

Criterion	Group E	Group I	p-value
TTDOF (min)	7.45	7.55	0.095
TDOS (min)	49.93	47.5	0.292
TTFRA (min)	217.38	244.23	≤0.001

[Table/Fig-7]: Miscellaneous comparisons between the two groups. TTDOF: Mean time to delivery of foetus; TDOS: Total duration of surgery; TTFRA: Time to first rescue analgesia; p<0.05 statistically siginificant

DISCUSSION

During the course of the study, it was observed that haemodynamic disturbances occur during the extra-abdominal repair of uterine incision in patients undergoing lower segment caesarean section. The haemodynamic disturbances comprising of a fall in systolic and diastolic blood pressure during exteriorisation of the uterus for repair, probably (hypothesis) is due to a fall in intra-abdominal pressure. A similar disturbance is seen during repositioning of the uterus into the pelvic cavity after repairing it, probably due to compression of pelvic blood vessels and inferior vena cava thus causing a fall in the venous return [5]. It was also observed that the degree of uterine handling and haemodynamic disturbance was dependent on the experience of the operating surgeon.

Haemodynamic disturbance associated with nausea and vomiting encountered in the intraoperative period during extra-abdominal repair of the uterine incision is easily managed but requires vigilance and prompt action to ensure minimal patient discomfort and to prevent any untoward incidents which might endanger the life of the patient.

Siddiqui M et al., studied the complications of exteriorised repair compared with in situ uterine repair at caesarean delivery under spinal anaesthesia and concluded that exteriorisation of the uterus for repair is associated with an increase in the incidence of nausea and vomiting and tachycardia during caesarean delivery under spinal anaesthesia [5]. A similar increased incidence of nausea was observed in this study which was associated with a fall in systemic blood pressure during handling of the uterus.

Saphiratos V et al., did a systematic review and meta-analysis of 16 published studies on uterine exteriorisation compared with in situ repairs for Caesarean delivery and found that although uterine repair by exteriorisation had some benefit to the patient, intraoperative nausea, vomiting, pain, and haemodynamic instability were frequently encountered in these patients and this has not been studied in detail [6]. In this study, using a standardised anaesthetic regimen, to avoid any haemodynamic disturbance that may occur as a result of anaesthetic technique, it was found that exteriorisation of uterus for repair adversely affects the haemodynamic parameters of the patient. Also, the incidence of nausea, hypotension and pelvic discomfort is more in these patients.

Chauhan S and Devi SPK compared exteriorisation of uterus versus in situ intra-peritoneal repair at caesarean delivery and found that significantly more number of patients had increased postoperative pain and need for additional analgesia in exteriorisation group [7]. In this study, 28 out of 98 patients in Group E complained of abdominal discomfort in the intraoperative period as compared to two patients out of 46 patients in Group I. This translated to reduced pain free time in the postoperative period with the TTFRA in Group E being 217 minutes compared to 244 minutes in Group I.

Bharathi KR et al., did a comparative study of exteriorisation and intra-abdominal closure of uterus in caesarean delivery and found that there was a significant difference in the operating time between the two groups [8]. In this study, it was observed that although the TDOS was less in Group E compared to Group I, it was not statistically significant. Yet it follows the similar trend of the study by Bharathi KR et al., [8].

Abdellah MS et al., studied the incidence of nausea and vomiting in patients undergoing caesarean section and found nausea and vomiting to be significantly lower when the uterine incision was repaired intra-peritoneally compared to the exteriorisation group (24% versus 38.7%, p= 0.001) [9]. In this study also the incidence of nausea was significantly lower in Group I compared to Group E (4.3% Vs 22.4% p-value=0.007).

Coutinho IC et al., found the incidence of moderate to severe pain to be less in patients who had intra-abdominal closure of uterine incision compared to extra-abdominal closure [15]. Similar trend was observed in this study with patients in Group I remaining pain free for a longer period of time (244 minutes) compared to Group E (217 minutes).

Limitation(s)

The sample size was not equal in the two groups. Ideally, the sample size should have equal number of samples in both the groups. Minimum 72 patients were required in each arm, but due to the limitation of time, this was not achieved and the study was concluded. Also, the study could not have one obstetrician operating on all the patients which would have ensured a uniform surgical technique.

CONCLUSION(S)

While conducting caesarean section, it is important for the attending anaesthetist to remain vigilant during the intraoperative period, expect the haemodynamic changes that may occur during uterine handling and be prepared to treat the adverse events associated with it as soon as it is detected, so as to ensure an uneventful intraoperative period.

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