# Comparative Evaluation of Intra-Operative Adhesions in Post-Caesarean and Repeat-Caesarean Cases

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**ABSTRACT**

**BACKGROUND**

Adhesions after Caesarean section often create difficulties in subsequent Caesarean deliveries. Intra-operative adhesions result in delayed entry into the uterine cavity & subsequently baby-delivery, affecting neonatal morbidity; and on the other side – bladder / bowel injury, wound extensions, difficulty in uterine wound repair and uterine atony, affecting maternal morbidity. The study was conducted to comparatively evaluate the extent of intra-operative adhesions in post and repeat Caesarean cases and their impact over maternal and neonatal morbidity.

**METHODS**

The present prospective observational study consecutively recruited equal number (102) of post and repeat Caesarean cases, elective or emergency, over 10 months. Primary outcome measure was the presence & nature of intra-operative adhesions, evaluated with a pre-designed adhesion scoring system. Secondary outcome measures included baby delivery time, total operating time, neonatal Apgar-1, incidence of post-partum haemorrhage, bladder / bowel injury and Caesarean wound extension. $P < 0.05$ was considered significant for comparative evaluation.

**RESULTS**

Adhesions were found more significantly in post-Caesarean cases ($\chi^2 = 23.2385$, $P < 0.0001$), and most were (59.1 %) of filmy type. Adhesion score was significantly higher in repeat-Caesarean group ($P = 0.00694$) because adhesions were mainly dense-type (59.5 %). In either group, however, adhesions between uterus and bladder were found predominant. In cases with adhesions, post-Caesarean group shows significantly lesser Apgar-1 score ($P < 0.0001$), although median baby-delivery time was found comparable ($P = 0.74896$). Median total operating time was more in repeat Caesarean group, though not statistically significant ($P = 0.11876$); yet causing significantly more complications ($P = 0.0252$).

**CONCLUSIONS**

Intra-operative adhesions were more common in post-Caesarean cases, significantly affecting neonatal morbidity. Adhesions in repeat-Caesarean cases were mostly dense, significantly increasing total operating time and thereby maternal morbidity.

**KEYWORDS**

Intra-Operative Adhesions, Maternal and Neonatal Morbidity

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## BACKGROUND

Postsurgical adhesions are often difficult to interpret but present with varied clinical consequences. They are defined as abnormal fibrous connection between two anatomically injured tissue surfaces following surgical trauma. Similar to any abdomino-pelvic operations, adhesions after Caesarean section (CS) are of obvious squeal and are known to increase the major complications in subsequent operative procedures.[1] But in contrast to other abdomino-pelvic surgeries, delay in entry into the uterine cavity and subsequently increase in baby-delivery time due to adhesion in Caesarean section are important issues affecting neonatal morbidity. Moreover, uterine atonicity and post-partum haemorrhage, bladder injury, wound extensions and difficulty in uterine wound repair due to adhesion affect maternal morbidity.

The World Health Statistics (WHS-2015)[2] reports that Caesarean delivery accounts for 17 % of total deliveries worldwide; whereas only 8 % of all births in India. Federation of Obstetrics and Gynaecological Society of India (FOGSI) states that over the last two decades, deliveries by Caesarean section have increased by about 25 % in teaching hospitals and by at least 50 % in private hospitals.

On the rising trend of Caesarean section, post Caesarean (with one previous Caesarean delivery – Group A) and repeat Caesarean (with more than one previous Caesarean delivery – Group B) cases are naturally increasing with obvious intra-operative hazards due to adhesions.

### Objectives

1) To comparatively evaluate the extent of intra-operative adhesions in post and repeat Caesarean cases.
2) To assess the impact of adhesions over maternal and neonatal morbidity.

## METHODS

The present prospective observational study was conducted in the Department of Obstetrics and Gynaecology of RG Kar Medical College and Hospital, tertiary care government teaching hospital at North Kolkata, West Bengal, India, over a period of ten months (July 2016 to April 2017) and was approved by institutional ethics committee.

Cases were recruited consecutively, elective or emergency, in either groups, after having proper written informed consent. Cases with singleton pregnancy and cephalic presentation were included as cases with multiple or non-cephalic pregnancy often affect baby-delivery as well as total operative time and Apgar score. Cases with fetal distress, suspected scar rupture, pre-term, growth restriction, ante-partum haemorrhage were excluded due to possible increase in neonatal morbidity. Cases with any kind of prior abdomino-pelvic surgery or history of medical co-morbidities like tuberculosis, pelvic inflammatory disease, and endometriosis were excluded due to the possibility of adhesion other than prior Caesarean origin.

Primary outcome measures were the presence and nature of adhesions which were evaluated with a pre-designed adhesion scoring system. Adhesions were graded at '5' adhesion sites i.e. uterus-bladder, uterus-omentum, uterus-intestine, uterus-abdominal wall and omentum-abdominal wall. A score of '0' for no adhesion, '1' for filmy adhesion (requiring only finger dissection for adhesiolysis; also including those released with uterine incision) and '2' for dense adhesion (requiring sharp dissection with scissor or diathermy for adhesiolysis) at each site had been assigned; for a minimum score of '0' and a maximum score of '10'.

Secondary outcome measures included possible outcomes affected by intra-operative adhesions like incision to baby delivery time, total operating time (skin incision to skin closure), neonatal Apgar-1, incidence of post-partum haemorrhage (more than usual Caesarean blood loss), bladder / bowel injury and Caesarean wound extension.

Recruitment was done by on-duty medical officer and outcome evaluation by the researchers. Data was taken with uncontrolled (natural intra-operative findings) observation method on pre-designed study proforma.

Sample size (N) was calculated as 102 (for each group) using standard statistical formula for comparative study where comparison was done between two independent proportions.

$$N = [Z\alpha\sqrt{2P(1-P)} + Z\beta\sqrt{P1(1-P1) + P2(1-P2)}]^2 / (P1-P2)^2$$

Zα = Desired level of statistical significance = 1.96 (for 5 % significance level)
Zβ = Desired power = 0.84 (for 80 % power)
P1 = Proportion of group A (quoted study) = 0.244 [3]
P2 = Proportion of group B (quoted study) = 0.428 [3]
P = (P1 + P2) / 2

### Statistical Analysis

Assessment of distribution pattern of the observations belonging to two groups was done by Kolmogorov-Smirnov test. Values were expressed in median (with interquartile range) as per distribution pattern and Mann–Whitney U test has been used for comparison. Chi-square test was applied for comparison where data was presented in number (%). Data analysis was performed with the help of MedCalc statistical software bvba-2018. P of < 0.05 has been considered significant.

## RESULTS

One hundred and two subjects were recruited in either groups as per sample size requirement in accordance with inclusion criteria. Because cases with > 2 prior CS was rare in our institution, all cases with > 1 previous CS were included in Group-B. It took only 4 months to recruit cases in Group-A, but 10 months were needed to recruit all cases of Group-B as the institutional repeat CS case rate was less.

Most (72) of the cases in Group-A had undergone emergency CS because scheduled admission of post-CS cases and trial of labour after Caesarean (TOLAC) were not practised in our institution; and even if cases were admitted in labour, vaginal birth after Caesarean delivery (VBAC) was not routinely practised unless cases were admitted in advanced stage. On the other hand, most (81) of the cases in Group-B had undergone elective CS because scheduled admission of repeat-CS cases and elective CS at term were usually done in the institution.

Two groups were found to be matched (P = 0.50926) with respect to body mass index (BMI). Age was significantly (P < 0.00001) more in repeat CS cases whereas gestational age was significantly (P < 0.00001) more in post CS group. (Table 1)

| Variables | Group–A (N = 102) | Group-B (N = 102) | P |
|---|---|---|---|
| Age (years) | 23.0 (3) | 28.0 (2) | < 0.00001 |
| BMI | 24.45 (2.8) | 24.3 (3.4) | 0.50926 |
| Gestational age (weeks) | 37.6 (1.4) | 37 (1.2) | < 0.00001 |

***Table 1. Basic Characteristics***

Values are in Median (Interquartile range)

Adhesions were found more significantly in post-Caesarean cases ($\chi^2$ = 23.2385, P < 0.0001), and mainly (59.1 %) of filmy type. Adhesion score was significantly higher in repeat-Caesarean group (P = 0.00694) because adhesions were mainly dense-type (59.5 %). In either groups, however, adhesions between uterus and bladder were found to be predominant. (Table 2)

| | Variables | Group-A | Group-B | P |
|---|---|---|---|---|
| | Presence of adhesion | 76 [74.5] | 42 [41.2] | < 0.00001 |
| | Adhesion score | 1.5 (2) | 3 (2.3) | 0.00694 |
| Site of adhesion | Uterus-bladder | 66 [62.9] | 40 [54] | |
| | Uterus-omentum | 17 [16.2] | 12 [16.2] | |
| | Uterus-intestine | 2 [1.9] | 5 [6.8] | |
| | Uterus-abdominal wall | 8 [7.6] | 4 [5.4] | |
| | Omentum-abdominal wall | 12 [11.4] | 13 [17.6] | |
| | **Total** | **105** | **74** | |
| Types of adhesions | Filmy | 62.[59.1] | 30 [40.5] | 0.0145 |
| | Dense | 43 [40.9] | 44 [59.5] | |

***Table 2. Extent of Intra-Operative Adhesions***

Values are in number [%] or median (interquartile range)

Non-significant difference (P = 0.492936) was found between two groups in terms of numbers of CS done by different experts. (Table 3)

| Variables | Group-A | Group-B | P |
|---|---|---|---|
| **Grade of Surgeon (N = 102)** | | | |
| Visiting surgeon (VS) | 26 [25.5] | 19 [18.6] | 0.493926 |
| Senior resident (SR) | 15 [14.7] | 17 [16.7] | |
| Junior resident (JR) (supervised) | 61 [59.8] | 66 [64.7] | |
| | Case with adhesions (N = 76) | Cases with adhesions (N = 42) | |
| Baby delivery time (min) | 3 (1) | 3 (1) | 0.74896 |
| Total operating time (min) | 45 (9) | 47.5 (11.7) | 0.11876 |

***Table 3. Surgical Details (Others)***

Values are in number [%] or median (interquartile range)

In cases with adhesions, Group-A showed significantly lesser Apgar-1 score (P < 0.0001), although median baby-delivery time was found comparable (P = 0.74896). Median total operating time was more in Group-B, though not significant (P = 0.11876); yet causing significantly more maternal complications (P = 0.0252). (Table 3 & 4)

| Variables | Group-A (N = 76) | Group-B (N = 42) | P |
|---|---|---|---|
| Apgar-1 | 9.0 (2) | 10 (2) | < 0.0001 |
| PPH | 7 [9.2] | 8 [19.1] | |
| Bladder-bowel injury | 4 [5.3] | 3 [7.1] | |
| Wound extension | 5 [6.6] | 6 [14.3] | |
| **Total** | **16 [21.1]** | **17 [40.5]** | 0.0252 |

***Table 4. Morbidities in Cases with Adhesions***

Values are in median (interquartile range) or number [%]

## DISCUSSION

Reported incidence of intraperitoneal adhesion in subsequent surgery ranges from 67 % - 93 % even up to 97 % after open gynaecologic pelvic procedures.[3-5] In clinical and autopsy studies of patients who had prior laparotomies, the incidence of intra-abdominal adhesions was 70 – 90 %.[6,7]

From the first report more than 100 years ago by Bryant[8] to present day, adhesions have been held responsible for a multitude of intraoperative & postoperative complications;[9] especially so in CS where multiple lives are involved.

Caesarean section represents a subset of laparotomy, which is frequently associated with factors that are known to induce adhesions (such as undue tissue injury while rough handling or tight suturing, extensive thermal trauma, residual blood, postoperative infections, tissue desiccation, and foreign bodies like suture material, glove powder). Surgical expertise, experience and techniques play obvious role in this scenario.[10]

Unlike many published studies[1,11,12-16] and contrary to popular belief, our study detected adhesions more significantly in post-Caesarean cases. Retrospective design of most studies, with reliance on medical records, may introduce recall bias and under-reporting of the true incidence. On the other hand, fewer cases in an individual life-time experience without comparison in equal number made repeat Caesarean cases too scary before intervention.

Lack of uniform Caesarean techniques and expertise probably made obvious difference in our study. Primary C-sections are mostly dealt by juniors where more tissue handling or tightening during suturing, extensive cautery use, hurried steps might result in more adhesions in post-CS group. On the other hand, post / repeat C-sections are mostly dealt by seniors where more meticulous and experienced approaches might result in less adhesion in repeat-CS group.

Peritoneum closure is an obvious issue of debate for long term outcome like adhesion, where even Cochrane database[17] ends with limited evidence. Systematic review by Cheong et al.[18] has demonstrated that there is some evidence to suggest that non-closure of the peritoneum after CS is associated with more adhesion formation compared to closure. In our institution, parietal peritoneum is most often left unsutured in primary CS but not in post-CS, which might have shown impact in our study.

Tulandi et al.[11] study stratified repeat CS cases into 3 groups 2-CS, 3-CS & ≥ 4-CS; where total adhesion score was significantly increased in 2nd group compared with 1st one but comparable in 3rd group. In our study, adhesion score was significantly higher in repeat-Caesarean group.

Most of the studies did not report overall adhesions; rather stratified adhesions into mild or dense ones. But similar to ours, in such of published literature,[1,11,13-15,19,20] dense adhesions were more common in repeat CS group. Adhesions were predominantly detected between uterus & anterior abdominal wall in other studies;[11,15] whereas in our study, adhesions between uterus and bladder were mostly found in either group.

In our study, age was significantly more in repeat CS cases for obvious reason; but gestational age was significantly more in post CS group as CS is done usually earlier in repeat CS cases. Similar results are echoed in Tulandi et al.[11] Morales et al.[15] & Sobande et al.[16] studies.

Baby delivery time was significantly more in repeat CS cases in different studies;[11,15,21] where lack of uniform surgical expertise may be a confounding factor as reported. But in ours, incision-to-baby delivery time was comparable between two groups.

Total operating time (skin incision to skin closure) was found more in Group-B, though not significant. Similar result was found in other studies.[1,11,14,16,21]

Adhesions have obvious potential to give impact on morbidity pattern where > 1 life is involved. In our study, both neonatal and maternal morbidities were found to be increased in Group-B; but no significant difference in Apgar score was seen in other studies[1,11,14,16] and similar raised maternal complications were found in most of the published literature.[1,14,16,22,23]

Strength of our study is that prospective design virtually eliminates recall bias. Primary data collection by direct observation method eliminates subjective bias and data is independent to respondent's variable (as in interview method).

## CONCLUSIONS

Intra-operative adhesions, often challenge for the obstetrician, are less commonly seen in repeat-Caesarean cases; but importantly, when encountered, are mostly dense-type & significantly influence perioperative morbidity.

### Limitations

Major limitation of our study is that practice pattern and quality of prior Caesarean section might affect extent of adhesions. Competence of different surgeons doing Caesarean sections was different which could influence baby-delivery and total operative time.

Data sharing statement provided by the authors is available with the full text of this article at jebmh.com.
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Disclosure forms provided by the authors are available with the full text of this article at jebmh.com.

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