A survey and evidence based analysis of caesarean section techniques amongst obstetricians in North India

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Abstract:

Objectives: To assess the surgical techniques used for caesarean section by obstetricians in North India and review them with respect to the current evidence. To improve the outcomes of caesarean sections through rectification of the surgical techniques, it is imperative to assess the current practices amongst the obstetricians and analyze the rationale behind their surgical preferences. **Methods:** This study carried out amongst practicing obstetricians in North India over a period of one month, is a descriptive, cross-sectional study which involved the use of a pre-tested questionnaire distributed online. **Results**: Out of total 203 respondents (50.75% response rate), the majority of respondents 140 (62.7%) were aged <40 years, were females 195 (96.06%) and112 (55.17%) had a post-PG experience of <5 years. Majority of respondents 130 (64.03%) preferred to give pre operative antibiotic one hour prior to surgery, 94(46.31%) preferred trimming while 72 (35.46%) shaving as a method of parts preparation. 197(97%) preferred transverse incision out of which 87% prefer pfannensteil. There is significant association (p value - 0.04) between the preference to use pfannensteil incision and the number of years of practice with younger obstetricians opting for pfannensteil incision. 117 (58%) practiced blunt dissection to open the abdominal layers while 86(42%) practiced sharp dissection. 92% of the obstetricians preferred to create bladder flap. Majority i.e. 117(63%) preferred blunt extension of uterine incision practice of blunt extension of the uterine incision was associated significantly (p value - 0.0004) with the years of practice of the obstetricians with senior obstetricians more in favour of blunt dissection. Majority, 65% (n=132) preferred to exteriorize the uterus while closure, 66% (n=135) preferred double layer running sutures for uterine incision closure, 76% obstetricians preferred not including decidua in uterine sutures and preferred to close visceral (60%)and parietal peritoneum (80%) and rectus muscle (65%) and subcutaneous fat (69%) as well. **Conclusion**: There is heterogeneity and variation in the caesarean section techniques being practiced among the obstetricians in North India, probably as the existing guidelines are not uniform regarding multiple issues. These varied practices are bound to continue until strong evidence based guidelines for the techniques of caesarean section are formulated.

Keywords: Caesarean section techniques, survey.

Caesarean sections (CS) are one of the most commonly performed operations worldwide. The WHO recommends an acceptable caesarean section rate of 10-15% for any population[1], while as per the latest data (National Family Health Survey 2015-16 (NFHS-4), the caesarean rates at population level in India seem to be 17.2 %. [2]

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Although one of the most commonly practiced operation a consensus on the most appropriate technique has not yet been reached, mostly because well-designed studies and solid evidences have been sparse[3]. This is mainly due to the fast evolving field of CS techniques with rapidly changing evidence. Therefore, the techniques used for the procedure vary widely amongst surgeons. Besides lack of evidence the variations in the surgical technique can also be attributed to personal preferences and differences in training.

The intraoperative complications and post operative morbidity are closely related to the techniques used for the surgery. Optimization of surgical techniques may be able to reduce both the short-term and the long-term morbidity associated with caesarean section and although differences may be relatively modest, the commonness of the operation means that even small improvements in outcome may result in substantial improvements in health for many thousands of women and considerable cost savings for health services[4]. To improve the outcomes of caesarean sections through rectification of the surgical techniques, it is imperative to assess the current practices amongst the obstetricians and analyze the rationale behind their surgical preferences.

The present study reviews the surgical techniques used for CS by obstetricians in North India. The CS techniques were evaluated and compared with the existing evidence regarding the same. The surgical techniques chosen by different surgeons in relation to their level of seniority were also assessed. We expected to get an insight into the ongoing practices and their level of adherence to the contemporary evidence.

Objectives

1. Assess the surgical techniques used for CS by obstetricians in North India
2. Review the techniques with respect to the current evidence
3. Evaluate the relationship between the technique used and the level of seniority of the surgeons

Methods and material

This study was carried out in Mayo Institute of Medical Sciences, Barabanki, Uttar Pradesh, North India over a period of one month in the year 2019 after obtaining ethical clearance from the institutional ethics committee. The practicing obstetricians over North India including both private and public institutes were surveyed. All those who gave their written informed consent were recruited in the study.

The following formula has been used to calculate the required sample size (Sample size determination in health studies- a practical manual WHO Geneva 1991)

$n = (z)^2 p (1 – p) / d^2$

n = sample size

z = level of confidence according to the standard normal distribution (for a level of confidence of 95%, z = 1.96)

p = estimated proportion of the population that presents the characteristic

d = tolerated margin of error

Based on previous studies[5] where the prevalence of double-layer hysterotomy closure, the most frequently used techniques for uterine closure among obstetricians was 73% with a confidence interval of 95% and 7% margin of error, the minimum sample size required was 154. It is a descriptive, cross-sectional study which involved the use of a pre-tested questionnaire. The questionnaire along with the written consent form, were distributed to the obstetricians online.

Questionnaire validation - The questionnaire was designed in English language and divided into 2 sections. The first part of the questionnaire involved the demographic variables of the respondents like their age, gender and years of post residency practice. The second part dealt with the caesarean section techniques which the participants follow in practice. The participants were asked to answer the questions with respect to an uncomplicated caesarean section of a primi gravida. It had 16 questions which analyzed the various steps involved in the caesarean section operation including the rationale behind their surgical preference. Pre-test of the questionnaires was carried out on 10 obstetricians. All information obtained from this study was kept confidential and not be linked to the participants in anyway.

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Statistical analysis: As the total knowledge, attitude and practice scores were continuous in nature and their distributions were normal, hence, a parametric evaluation plan was adopted. ANOVA, independent samples 't'- test and Pearson correlation coefficients were used to analyze the data. The data was analyzed using statistical package for social sciences (SPSS) version 21.0. A 'p' value less than 0.05 was considered as statistically significant.

Results

A total of 400 obstetricians over various parts of North India were contacted and requested to fill the survey questionnaire online. A total of 203 respondents (50.75% response rate) completed the questionnaire and were enrolled in the study. Age of respondents ranged from 26 to 71 years. The majority of respondents 76 (31.2%) were aged ≤30 years followed by those aged 31-40 years 64 (31.52%), >60 years 38 (18.71%), 41-50 years 19 (9.35%), and 51-60 years 6 (2.95%) respectively. Except for 8 (3.94%) male respondents, all the others were females 195 (96.06%). Majority of respondents 112 (55.17%) had a post-PG experience of ≤5 years followed by those having an experience of 5-15 years 49 (24.13%), >25 years 24 (11.82%) and 15-25 years 18 (8.86%) respectively. Number of respondents from private sector 85 (41.88%) and public sector 118 (58.12%) were almost comparable.

Majority of respondents 130 (64.03%) preferred to give pre operative antibiotic one hour prior to surgery, 70 (34.48%) on the operation table and 3 (1.47%) after clamping of the cord. Thirty seven (18.23%) respondents did not practice parts preparation prior to surgery, 94(46.31%) preferred trimming while 72 (35.46%) shaving as a method of parts preparation. More than half of the obstetricians 120 (59.11%) preferred patient's vaginal preparation with povidone iodine and 83 (40.88%) did not.

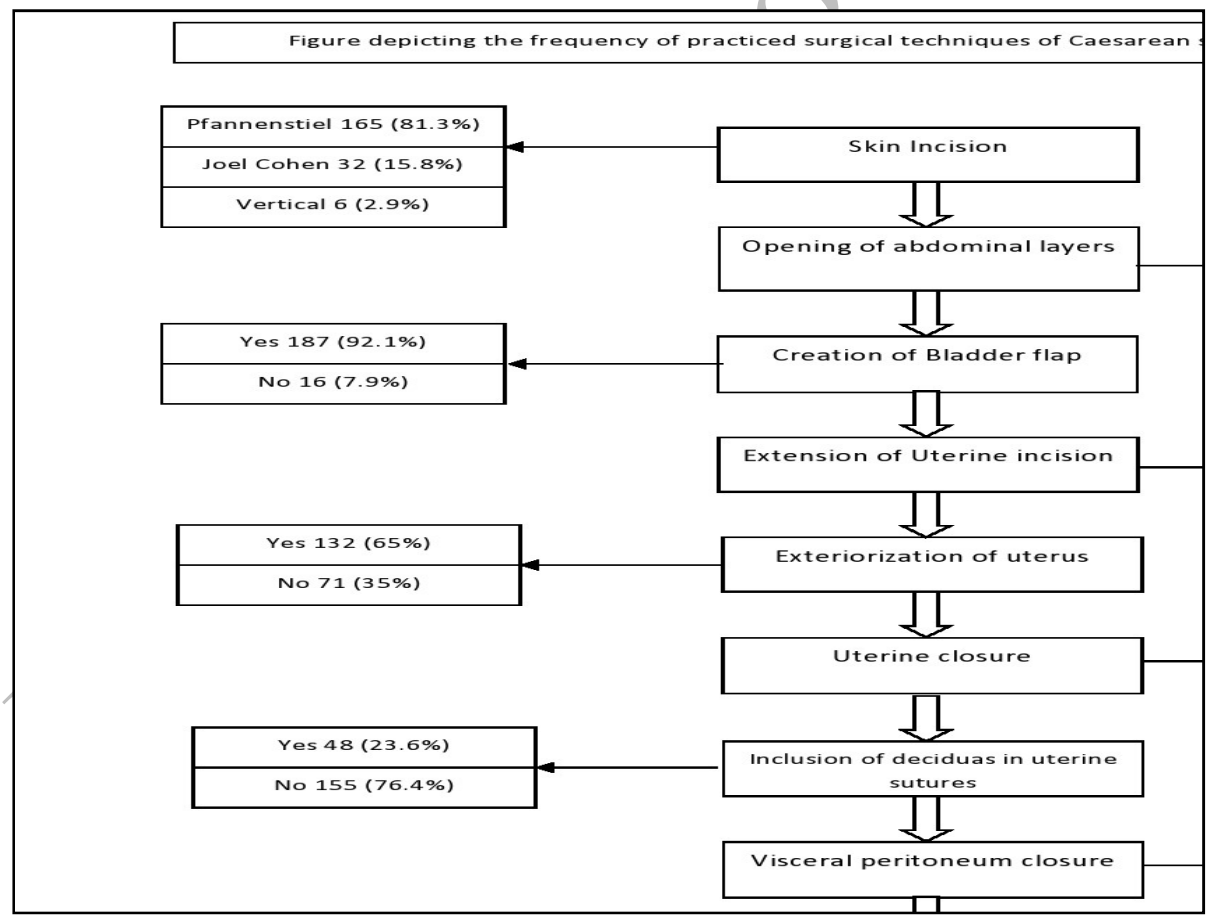

Figure 1: Depicts the frequency of practiced surgical techniques of caesarean section among respondents.

Table 1(a) : The surgical techniques preferred by the obstetricians and the correlation of the techniques with their years of practice

Parameters		**Years of experience**				**Chi-Square Statistic**	**p- value**
Surgical techniques	**Responses N=203**	**< 5 years**	**5-15 years**	**16-25 years**	**> 25 years**		
Which skin incision do you prefer	Pfannenstiel (165)	93(45.81)	38(18.72)	14(6.90)	20(9.85)	13.15	.040715*
	Joel Cohen (32)	17(8.37)	11(5.41)	3(1.47)	1(0.49)		
	Vertical(6)	1(0.49)	1(0.49)	1(0.49)	3(1.47)		
How do you prefer opening of abdominal layers	Sharp (86)	48(23.64)	21(10.3)	4(1.97)	13(6.40)	4.376	.223622
	Blunt (117)	64(31.52)	28(13.79)	14(6.90)	11(5.41)		
Do you create bladder flap	Yes (187)	101(49.7)	47(23.15)	17(8.37)	22(10.83)	1.887	.596192
	No (16)	10(4.92)	2(0.98)	1(0.49)	3(1.47)		
How do you prefer to extend the uterine incision	Sharp (76)	55(27.09)	15(7.38)	2(0.98)	4(1.97)	18.1586	.000408*
	Blunt (127)	56(27.58)	34(16.75)	16(7.88)	21(10.3)		
Do you exteriorize the uterus while closure?	Yes (132)	64(31.52)	35(17.24)	14(6.90)	19(9.35)	6.9509	.073478
	No (71)	48(23.64)	14(6.90)	4(1.97)	5(2.46)		

All figures in parenthesis is %; *P value <0.05 considered as significant.

Table 1(b) : The surgical techniques preferred by the obstetricians and the correlation of the techniques with their years of practice

Parameters		**Years of experience**				**Chi-Square Statistic**	**p- value**
Surgical techniques	**Responses N=203**	**< 5 years**	**5-15 years**	**16-25 years**	**> 25 years**		
Which technique of uterine closure do you follow	Single layer interrupted (17)	9(4.43)	4(1.97)	3(1.47)	1(0.49)	5.3933	.494442
	Double layer running (135)	79(38.91)	28(13.79)	11(5.41)	17(8.37)		
	1st layer interlocking 2nd running (51)	24(11.82)	17(8.37)	4(1.97)	6(2.95)		
Do you include deciduas in uterine sutures	Yes (48)	33(16.26)	8(3.94%0	4(1.97)	3(1.47)	5.3814	.145909
	No (155)	79(38.91)	41(20.19)	14(6.90)	21(10.3)		
Do you close visceral peritoneum/ third layer	Yes (123)	69(33.99)	33(16.25)	10(4.92)	11(5.41)	3.3287	.343667
	No (80)	43(21.18)	16(7.88)	8(3.94)	13(6.40)		
Do you close parietal peritoneum?	Yes (163)	92(45.32)	38(18.72)	16(7.88)	17(8.37)	2.6201	.453982
	No (40)	20(9.85)	11(5.41)	2(0.98)	7(3.45)		
Do you close Rectus muscle	Yes (133)	78(38.42)	28(13.79)	12(5.91)	15(7.38)	3.2218	.358672
	No (70)	33(16.25)	22(10.83)	6(2.95)	9(4.43)		
Do you close the subcutaneous layer	Yes (141)	80(39.40)	34(16.74)	14(6.90)	13(6.40)	3.163	.367172
	No (62)	31(15.27)	15(7.38)	5(2.46)	11(5.41)		

All figures in parenthesis is %; *P value <0.05 considered as significant.

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Table 1(a) and table 1(b) summarize the surgical techniques preferred by the obstetricians and the correlation of the techniques with their years of practice. As shown in table 1(a), out of 203 obstetrician, 197(97%) preferred transverse incision out of which 87% prefer pfannensteil while 13% choose Joel Cohen. There is significant association (p value-0.04) between the preference to use pfannensteil incision and the number of years of practice with younger obstetricians opting for pfannensteil incision. Out of 203 obstetricians, 117 (58%) practiced blunt dissection to open the abdominal layers while 86(42%) practiced sharp dissection. 92% of the obstetricians preferred to create bladder flap. Out of 203 obstetricians, majority i.e. 117(63%) preferred blunt extension of uterine incision practice of blunt extension of the uterine incision was associated significantly (p value - 0.0004) with the years of practice of the obstetricians with senior obstetricians more in favour of blunt dissection. 65% (n=132) of the obstetricians preferred to exteriorize the uterus while closure.

Table 2 : The preferred surgical techniques along with the reasons for choosing those techniques

Surgical techniques	**Responses N=203**	**Most frequent response**	**Second most frequent response**	**Third most frequent response**
Do you create bladder flap?	Yes	Reduces bladder injury (136)	It is how I was taught (55)	Reduced operative time (34)
	No	Reduced operative time (11)	Reduces bladder injury (3); Decreases blood loss (3)	It is how I was taught (1)
How do you prefer to extend the uterine incision?	Sharp	Decreases unwanted extension of incision (63)	It is how I was taught (17)	It is evidence based (9)
	Blunt	Decreases blood loss (71)	Decreases unwanted extension of incision (50)	Reduced operative time (44)
Do you exteriorize the uterus while closure?	Yes	Better exposure of uterus (106)	It is how I was taught (40)	Reduced operative time (36); Easy to assess uterine tone (36)
	No	Less handling of uterus (44)	Anatomical position maintained (42)	It is evidence based (16)
Which technique of uterine closure do you follow?	Single layer interrupted	Better hemostasis (10)	Reduced operative time (8)	It is how I was taught (2)
	Double layer running	Better scar integrity (79)	Better hemostasis (62)	It is how I was taught (45)
	1st layer interlocking 2nd running	Better scar integrity (34)	Better hemostasis (25)	It is how I was taught (14)
Do you include deciduas in uterine sutures?	Yes	Better hemostasis (22)	It is how I was taught (16)	Better scar integrity (14)
	No	Better scar integrity (125)	Decreased incidence of scar endometriosis (113)	It is how I was taught (25); It is evidence based (25)
Do you close visceral peritoneum/ third layer?	Yes	Reduces adhesions (104)	It is how I was taught (33)	Better hemostasis (27)
	No	Reduced operative time (42)	Reduces adhesions (29)	It is evidence based (21)
Do you close parietal peritoneum?	Yes	Reduces adhesions (127)	It is how I was taught (60)	It is evidence based (18); Better hemostasis (18)
	No	Reduced operative time (17); Reduces adhesions (17)	It is evidence based (15)	It is how I was taught (9)

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As shown in table 1(b), majority i.e. 66% (n=135) obstetricians preferred double layer running sutures for uterine incision closure, 25% first layer interlocking and second layer running and 9% single layer closure. 76% obstetricians preferred not including decidua in uterine sutures. Majority of the obstetricians preferred to close visceral (60%) and parietal peritoneum (80%) and rectus muscle (65%) and subcutaneous fat (69%) as well.

The preferred surgical techniques along with the reasons for choosing those techniques are enumerated in table 2.

Discussion

Our study demonstrated that the most consistently used technique in caesarean section amongst obstetricians in North India is the creation of bladder flap (92.11%), while the least commonly practiced technique is use of vertical incision (2.9%) for opening of the abdomen in an uncomplicated caesarean section of a primi gravida. There was a huge variation in the method of opening of the abdomen with 57.6% of obstetricians using blunt versus 42.36% using sharp dissection. The preference to extend the uterine incision bluntly was significantly associated with the increasing years of practice, whereas the preference to use pfannensteil incision was significantly associated with the younger obstetricians, who had relatively lesser years of practice.

Almost all of the participants choose to give antibiotic prior to surgery, 2/3rd one hour prior and one third on the operation table. The current guidelines support a single dose of a first-generation cephalosporin given 15 to 60 minutes prior to skin incision as per Society of Obstetrics and Gynaecology Canada [6]. In a systematic review done by Baaqeel et al, there was significant reduction in the rate of endometritis with preoperative administration of antibiotic when compared with intraoperative administration [7].

One fifth of respondents did not practice preoperative parts preparation and amongst those who did greater number preferred trimming over shaving. Hair removal at surgical site does not lower surgical site infections (SSI), however if necessary to remove hair, the evidence mentions that the incidence of SSIs are lower with use of clippers/chemical depilation than with shaving [8].

We found that more than half of the respondents preferred preoperative vaginal preparation with iodine. Haas et al did a cochrane based systematic review and concluded that when compared to saline or no cleansing, vaginal preparation with povidone iodine done immediately prior to caesarean delivery likely reduces the risk of post-cesarean endometritis [9] and also supported by guidelines for intraoperative care in cesarean delivery (Enhanced Recovery after Surgery Society Recommendations - Part 2)[10].

Almost all the obstetricians use a transverse incision, 80% prefer pfannensteil while 15% choose Joel Cohen, similar to the findings of Tully et al in a survey done in UK where pfannensteil incision was preferred by over 80% of the obstetricians[11]. The National Institute of Heath and Care Excellence (NICE) guidelines recommend use of transverse incision (preferably Joel Cohen) rather than vertical as it is associated with less pain in postoperative period, better cosmetic results, shorter operating times and reduced postoperative febrile morbidity [12]. The number of respondents opening the abdominal wall layers by blunt dissection was similar to those who use sharp dissection. We found a significant association between the preference to use pfannensteil incision and the number of years of practice with younger obstetricians opting for pfannensteil incision.

More than 90% of our participants created a bladder flap during caesarean section and the most common reason quoted for the same was reduction in the incidence of bladder injury. However, as per Tuuli et al, there was no increase in intra or post operative complications even after omission of the bladder flap at caesarean delivery but it shortened the operative time [13], also supported by Lanowski et al[14].

In the present study more than half the obstetricians choose to extend the uterine incision bluntly due to reduction in blood loss. The NICE guidelines also recommend that when lower uterine segment is well formed, blunt rather than sharp extension of the uterine incision leads to reduce blood loss, decreased incidence of postpartum haemorrhage and lesser need for transfusion at CS [12]. This practice of blunt extension of the uterine incision was associated significantly with the years of practice of the obstetricians with senior obstetricians more in favour of blunt dissection.

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Two third of the respondents choose to exteriorize the uterus for repair of uterine incision since they felt it provided better exposure. The current evidence by NICE guidelines recommends intraperitoneal repair of the uterus because exteriorization results in more pain and also does not lead to improvement in operative outcomes such as haemorrhage and infection[12]. However, a systematic review done by Jacob et al found no evidence to make definitive conclusions about which method of uterine closure offers greater advantages[15].

Double layer running suture were the most commonly used technique for uterine closure followed by 1st layer interlocking and 2nd layer running. As per our participants, maximum chose double layer running sutures for its better scar integrity. Similar to the results found by Lyell at al[5] and Tully et al[11] in their US and UK survey based surveys respectively, where most obstetricians were found to use double-layer hysterotomy closure. Contrary to a survey done by Demers et al in Quebec where 1st layer interlocking and 2nd layer running followed by double layer running sutures were preferred[16]. Whereas the NICE guidelines quotes that either single layer or double layer uterine closure can be done depending upon the clinical circumstances and the risk of post operative bleeding or uterine rupture in future pregnancies does not seem to increase when single layer uterine closure is done[12]. Similarly in CORONIS trial single versus double layer closure of the uterus found no evidence of a difference in maternal death or a composite of pregnancy complications[17].

Three fourth of the participants were not found to practice the inclusion of deciduas while closing the uterus as they believe that it results in better scar integrity. Bujold et al suggested suture technique should aim at correct approximation of the cut margins (decidua-to-decidua, myometrium to myometrium) to improve scar healing and it was evident by ultrasound findings done six months following cesarean[18]. Amongst the 25% of obstetricians who did not include the deciduas while suturing felt that this practice resulted in better hemostasis.

A greater number of obstetricians preferred to close the visceral as well as parietal peritoneum as most of them believed that it reduces the resulting adhesions. Contrary to the findings of Lyell et al[5] where only 12% of the surgeons closed the visceral peritoneum while surgeons were almost equally divided in terms of closure of parietal peritoneum. US Preventive Services Task Force and CAESAR collaborative study group recommendations also goes in favor of non-closure of both visceral and parietal peritoneum[19,20]. The NICE guidelines also support that neither the visceral nor the parietal peritoneum should be sutured at CS because as this leads to reduction in operating time and the requirement of postoperative analgesia, and leads to improvement in maternal satisfaction[12].

Rectus muscle closure was done by more than half of our participants. In the US survey done by Leyll et al[5] practices were found to be varied with respect to closure of the rectus muscle where almost similar number of respondents opted for both. Lyell et al also found that there is paucity of literature on rectus muscle approximation and hence no definite recommendations can be made regarding the same. Although he conducted a randomized controlled trial in 2017 and found that Rectus muscle reapproximation increased immediate postoperative pain without differences in operative time, surgical complications, or maternal satisfaction [21].

Seventy percent of surveyed obstetricians preferred to close the subcutaneous layer. However, both the NICE guidelines published in 2021 and US Preventive Services Task Force cite against the routine closure of the subcutaneous tissue space and advise it only if the woman has more than 2 cm subcutaneous fat [12, 19].

Conclusion

Caesarean section despite being one of the most commonly performed surgeries in the world has a wide variation in its techniques as evident by our study. The existing guidelines are not uniform regarding multiple issues which is probably the reason for the heterogeneity of the surgical techniques being practiced among the obstetricians. The other reasons responsible for such variation are the different ways in which obstetricians were trained and years of practice of the surgeons. These varied practices are bound to continue until strong evidence based guidelines for the techniques of caesarean section are formulated.

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