International Journal of Multidisciplinary and Current Research ISSN: 2321-3124
Research Article Available at: http://ijmcr.com

A Prospective Study on the Maternal and Perinatal Outcomes in Patients with Delivery after previous Cesarean Section

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Received 08 Feb 2020, Accepted 10 April 2020, Available online 13 April 2020, **Vol.8 (March/April 2020 issue)**

Abstract

*Introduction**:** Vaginal birth after cesarean section is a method to control the rising rate of cesarean sections. In an appropriate clinical setting and properly selected group of women, VBAC offers distinct advantages over a repeat caesarean section, since the operative risks are completely eliminated and the hospital stay is short.*
Aims and objectives: To evaluate the maternal and neonatal outcome in vaginal birth after caesarean section and repeat caesarean section, to analyse the factors affecting and the complications arising out of it.
Material and methods:979 pregnant women with previous caesarean section presenting in antenatal clinic and labour room were recruited in study. A detailed history was taken and mode of delivery decided as per the standard protocol. 343 patients were given trial of labour of which 226 delivered vaginally.
Result: The rate of vaginal birth after caesarean section was 65.89%. Foetal distress and failure to progress were most common indications of repeat caesarean section. Incidence of infectious morbidity and post op complications were significantly more in repeat caesarean section group along with incidence of birth asphyxia and other neonatal complications.
Conclusion: With appropriate selection of patients, successful trial of labour in previous caesarean is associated with better outcome than repeat caesarean section.

***Keywords**: VBAC, fetal distress, previous cesarean section, TOLAC, APGAR score*

Introduction

Caesarean section, also known as C-section or Caesar, is an operation consisting of removal of one or more fetuses from the uterus by giving abdominal incision after 28th completed weeks or surgical incision through the mother's abdomen [laparotomy] and uterus [hysterotomy] to deliver one or more fetuses. This definition is not applied to removal of the fetus from the abdominal cavity in the case of uterine rupture or with abdominal pregnancy. Rarely, cesarean section is performed in a woman who has just died or in whom death is expected soon known as postmortem or perimortem cesarean delivery.

In 2004, the World Health Organization estimated the risk of cesarean sections between 10% and 15% of all births in developed countries. Cesarean section rate was about 20% in the United Kingdom, while in Canada the rate was 22.5% in 2001-2002 (Lumbiganon P *et al*, 2010). As per the latest data (National Family Health Survey 2015-16 (NFHS-4), the cesarean rates at population level in India seem to be 17.2 %

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DOI: https://doi.org/10.14741/ijmcr/v.8.2.11

Maternal mortality associated with caesarean section can be 3 times that of vaginal delivery (Esteves-Pereira *et al* 2016) . Evrard and Gold *et al* found that 1/3rd of deaths occurred in cases of repeat caesarean section. (Evrard and Gold *et al*, 1977). With support and encouragement from the American College of Obstetricians and Gynaecologists, enthusiastic attempts were begun to increase the use of vaginal birth after cesarean-VBAC.

With the increasing number of primary CS, there has been an increasing number of women with previous cesarean section in subsequent pregnancy. Previous section has become the major factor for repeat cesarean section. The increasing number of cesarean section multiplies intraoperative complications (Sheth Shrirsh S *et al*, 2009)

Vaginal birth after cesarean section (VBAC) is a trial of vaginal delivery in selected cases of a previous CS in a well-equipped hospital (Miller DA *et al*, 1994). In 1916, Cragin popularized the dicsstum, "once a caesarean section, always a caesarean section" (Flamm BL *et al*,1990) . That was the era of the classical CS. In the present era of lower segment caesarean section (LSCS), cesarean-related

morbidity and mortality are significantly reduced. The dictum now is “once a caesarean section, always an institutional delivery in a well-equipped hospital”.

A trial of VBAC is considered safer than a routine repeat CS. Trial of labour after previous caesarean delivery (TOLAC) provides women who desire a vaginal delivery with the possibility of achieving that goal-a vaginal birth after caesarean delivery (VBAC). When deciding whether to plan for VBAC or repeat Caesarean section, it is important to understand full range of risks to patient and the fetus. This means comparing the short and long term risks of Caesarean section and the risk of accumulating Caesarean surgery scars to mother and baby on one hand & the risk that uterine scar will give way if TOL given on the other hand.

The overall assessment of the case has to be made with due consideration to:

1. Indication of primary Caesarean section - Recurrent or Non-recurrent.
2. Number of previous Caesarean sections
3. Interpregnancy interval
4. Estimated weight of the baby.
5. Size of the pelvis.
6. Associated Obstetric complicating factor.
7. Strength of scar, elicited from history and clinical examination.

Planning a Trial of Labour after Caesarean section (SOGC, 199)

Once you have decided that the previous indication was non-recurrent then you can plan to give TOL provided other factors are not operable, women and her health care provider must decide together whether an appropriate situation exist for considering TOL after Caesarean. The evaluation and discussion should address following issues:

1. *Documentation of previous uterine incision*: Documentation of the location and type of uterine incision used during the previous or repeat Caesarean section is ideal. In most cases if required, this information can be obtained by reviewing the operative record from the previous surgery. If the operative record is not available, the scar is considered unknown.
2. *Establishment of Fetal Maturity prior to Elective Repeat Caesarean Delivery:* Fetal maturity may be assumed if one of the criteria is met (AGOG,2017)

Clinical criteria needed to confirm a term gestation are:

a. Fetal heart sounds have been demonstrated for at least 20 weeks by non-electronic fetoscope or at least 30 weeks by Doppler ultrasound and appropriate uterine size was established by pelvic examination prior to 16 weeks of gestation

b. It has been 36 weeks since a positive serum or urine chorionic gonadotropin (HCG) pregnancy test was performed by a reliable laboratory.

Ultrasound determination needed to confirm a term gestation:

a. *Facilities and Resources:* A trial of labour after caesarean is always associated with a risk of uterine rupture, however small.TOL after caesarean can be offered to women within any hospital setting where there is an ability to perform an Emergency Caesarean section
b. *Maternal Monitoring:* Woman planning for a TOL after Caesarean should have appropriate monitoring in labour. The presence of a devoted birth attendant is ideal. Progress of labour should be assessed frequently, as there is some evidence that prolonged labour is associated with an increased risk of failure and uterine rupture.
c. *Fetal Monitoring:* Continuous electronic fetal monitoring in labour is recommended for all women attempting TOL after Caesarean. The most reliable first sign of uterine rupture is a non-reassuring fetal heart tracing. This may be sudden in onset and may not be related to contractions.

3. Evaluation of Soundness of Scar:

During course of labor & before trial of labor, the evaluation of soundness of scar is to be done.

- Previous Operative Notes, which show technical skill of surgeon. The strength of scar depends upon site and type of scar, the upper segment classical scar, the chances of scar rupture are as high as 42% during subsequent pregnancy and in labour. In contrast to this, lowers segment scar accounts for very little risk of rupture during pregnancy & labour 0.1 %. (Munrokerr, 1999).
- Another factor influencing the strength of scar is the number of previous sections. Two lower segment scars are more than twice liable to rupture than those with one lower segment scar.
- Previous normal vaginal delivery influences outcome of previous Caesarean section. Previous vaginal delivery is associated with higher rate of successful TOL but increases the rate of scar dehiscence
- Indication of Caesarean section: Placenta previa makes a scar weak due to imperfect opposition due to quick surgery.
- Following prolonged labour chances of sepsis, imperfect opposition and chances of weak scar are high.
- Technical difficulty in primary operation and any lateral extension.

- By Hysterography: In interconceptional state, the integrity of scar can be assessed by hysterography following 6 months after operation, which may reveal defect on scar (wedge depression of more than 5 mm). (Bockner V *et al*, 1960)
- Pregnancy complications such as multiple gestation & polyhydramnios puts stretching effect on the scar.
- History of previous vaginal delivery following operation is likely to weaken the scar.
- Placenta previa in present pregnancy weakens the scar.

McCallum *et al* (2007), concluded, from experiments & other studies that healing occurs by fibrous tissue bringing together the muscle edges at the site of defect

In 2015, WHO proposed the use of the Robson classification (also known as the 10-group classification) as a global standard for assessing, monitoring and comparing caesarean section rates both within healthcare facilities and between them (Betran AP *et al*, 2016). The system classifies all women into one of 10 categories that are mutually exclusive and, as a set, totally comprehensive. The categories are based on 5 basic obstetric characteristics that are routinely collected in all maternities (parity, number of foetuses, previous caesarean section, onset of labour, gestational age, and fetal presentation).

A modification to the Robson criteria is proposed. This modification includes subclassification of women having Caesarean section after spontaneous onset of labour, after induction of labour, and before labour

Modified Robson's Classification

Group	Description
1	Nullipara, singleton cephalic, ≥ 37 weeks, spontaneous labour
2	Nullipara, singleton cephalic, ≥ 37 weeks A: Induced B: Caesarean section before labour
3	Multipara, singleton cephalic, ≥ 37 weeks, spontaneous labour
4	Multipara, singleton cephalic, ≥ 37 weeks A: Induced B: Caesarean section before labour
5	Previous Caesarean section, singleton cephalic, ≥ 37 weeks A. Spontaneous labour B. Induced labour C. Caesarean section before labour
6	All nulliparous breeches A. Spontaneous labour B. Induced labour C. Caesarean section before labour
7	All multiparous breeches (including previous Caesarean section) A. Spontaneous labour B. Induced labour C. Caesarean section before labour
8	All multiple pregnancies A. Spontaneous labour B. Induced labour C. Caesarean section before labour
9	All abnormal lies (including previous Caesarean section but excluding breech) A. Spontaneous labour B. Induced labour C. Caesarean section before labour
10	All singleton cephalic, ≤ 36 weeks (including previous Caesarean section) A. Spontaneous labour B. Induced labour C. Caesarean section before labour

This classification is simple, systematic, reproducible, and prospective and gives excellent information regarding the delivering population

Current VBAC recommendations by American College of Obstetrics & Gynaecology, 1998-99, now renewed in 2010 (ACOG, 2010) are as follows:

The selection criteria for VBAC are:

1. No more than 2 prior lower transverse cesarean delivery.
2. Clinically adequate pelvis.
3. No previous rupture or other scar.
4. Physician immediately available throughout active labour who is capable of monitoring labour and performing emergency cesarean delivery.
5. Availability of anesthetist for emergency cesarean delivery.

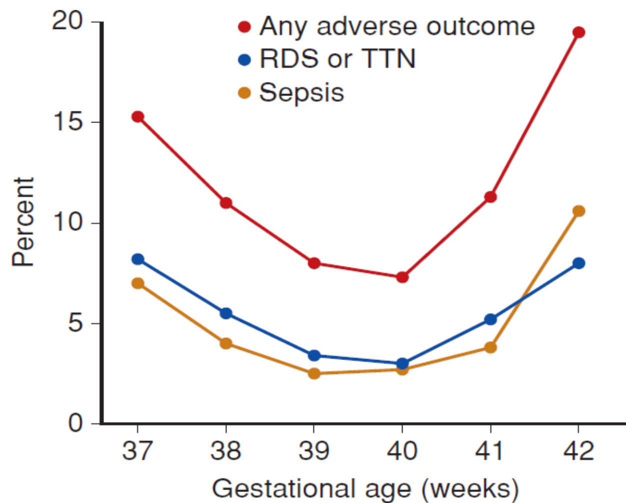
Factors affecting subsequent outcome are:

1. Type of prior uterine incision- Women with one prior low transverse cesarean have the lowest risk of symptomatic scar rupture i.e. 0.2-0.9% (ACOG, 2017)
2. Number of prior Caesarean section- There is a double or triple rate of rupture of uterus in women with two compared with one prior transverse cesarean. (Macones *et al*, 2005).
3. Indication for prior section- Women with a non recurrent indication- for example, breech presentation- have the highest VBAC rate of nearly 90% (Wing *et al*, 1999). Prior second-stage cesarean delivery can be associated with second- stage uterine rupture (Jastrow *et al*, 2013)
4. Condition or soundness of scar- Residual myometrial thickness is defined as the smallest measurement between urine in maternal bladder and amniotic fluid. Risk of uterine rupture is low if the thickness of this segment is >=2.5mm and high if thickness is <2mm (Jastrow *et al*, 2016)
5. Prior uterine rupture- Those with previous low segment rupture have up to a 6 % recurrence risk whereas prior upper segment uterine rupture confers a 9 to 32 % risk (Ritchie *et al*, 1971)
6. Interdelivery interval- Intervals of <=18 months were associated with a threefold greater risk of symptomatic rupture during a subsequent TOLAC compared with intervals >18 months (Shipp *et al*, 2001).
7. Prior vaginal delivery- Prior vaginal delivery either before or after a cesarean birth, improves the prognosis for a subsequent vaginal delivery with either spontaneous or induced labour (Aviram *et al*, 2017, Grinstead *et al*,2004). Prior vaginal delivery also lowers the risk subsequent uterine rupture and other morbidities (Cahill *et al*, 2006 ; Hochler *et al*, 2014)
8. Fetal size and lie- Increasing fetal size is inversely related to VBAC rates(Jastrow*et al*, 2010). With a

preterm fetus, women who attempt a TOLAC have higher VBAC rates and lower uterine rupture rates (Durnwald *et al*, 2006; Quinones *et al*, 2005)

9. Multifetal gestation- Twin pregnancy does not appear to increase the risk of uterine rupture.According to the American College of Obstetricians and Gynaecologists (ACOG,2017a), women with twins and a prior low-transverse cesarean can safely undergo TOLAC.
10. Maternal obesity- Multiple studies have reported an inverse relationship between prepregnancy body mass index (BMI) and VBAC rates (Hibbard *et al*,2006)

The American College of Obstetricians and Gynaecologists the Society for Maternal-Fetal Medicine (2017) recommended delaying nonmedicated indicated deliveries until 39 completed weeks of gestation or beyond. As shown in the figure significant and appreciable adverse neonatal morbidity has been reported with elective cesarean delivery before 39 completed weeks (Chiossi *et al*, 2013; Clark *et al*, 2009).



Percentage of neonatal morbidity with elective section at different gestational age

Induction of Labor in cases of VBAC

- Oxytocin augmentation is not contraindicated in women undergoing TOL (Cahill *et al*, 2008) reported a dose related risk of rupture with oxytocin.
- Medical Induction of Labour with PGE2 (dinoprostone) is associated with an increased risk of uterine rupture and should not be used except in rare circumstance after appropriate counseling. PGE1 (misoprostol) is associated with high risk of uterine rupture and is contraindicated for TOL after Caesarean.(ACOG, 2017)
- A Foley's catheter may be use safely to ripen the cervix in a woman planning for TOL after Caesarean section. (Bujold *et al*, 2004).

Management of Labour for VBAC:

Vaginal delivery should be monitored:

1. To note the progress of labour.
2. To watch maternal and fetal condition.
3. To note the behavior of uterine scar - look for signs of scar dehiscence:
   a. Non-assuring fetal heart rate pattern.
   b. Maternal tachycardia, falling B.P.
   c. Continuous Scar pain
   d. Ballooning of lower uterine segment
   e. Vaginal bleeding
   f. Haematuria
   g. Failure in progress of course of labour without any apparent cause.

Uterine rupture, the most serious complication of TOL after caesarean is defined as complete separation of the myometrium with or without extrusion of the fetal parts into the maternal peritoneal cavity and requires emergency Caesarean section or postpartum laparotomy. It is an uncommon complication of VBAC, but is associated with significant maternal and perinatal morbidity and mortality.

With present techniques and skill, the incidence of cesarean scar rupture in subsequent pregnancies is very low. The strength of the uterine scar and its capacity to withstand the stress of subsequent pregnancy and labor cannot be completely assessed or guaranteed in advance. These cases require the assessment and supervision of a senior obstetrician during labor. Hence, the present study was undertaken to assess the success and safety of VBAC in selected cases of previous LSCS and to evaluate the maternal and fetal outcome in these cases (Ezechi OC *et al*, 2005).

Material and Method

Study design

This prospective study was conducted in Department of Obstetrics and Gynecology, S. S. Medical College and associated G.M.H. Rewa (M.P.) from March 2018 to Feb 2019.

Sampling and study population

Total number of cases with previous cesarean section were 1080 out of which 979 cases were included in the study. 101 cases were not included in the The various reasons are:

- 30 cases had short interpregnancy interval (less than 18 months)
- 28 cases had history of wound sepsis in previous pregnancy
- 9 cases had history of uterine rupture in previous pregnancy

- 19 cases had medical complications
- 7 cases had features of chorioamnionitis
- 4 cases because of previous uterine surgery like myomectomy.
- 4 cases did not give consent for the study.

The criteria taken into consideration are

Inclusion criteria

1.Inter pregnancy duration >=18 mo
2. Multifetal pregnancy with first fetus with vertex presentation
3. Lower uterine segment incision in previous caesarean
4. Pregnancy with one or two previous LSCS
5. Postdated pregnancy with previous LSCS
6. Gestational age>=34 weeks

Exclusion criteria

1. Gestational age <34 weeks
2. History of wound sepsis in previous LSCS
3. Previous classical incision, other Uterine scars or undefined scars (Eg: - Myomectomy scar)
4. History of previous rupture of the uterus or scar dehiscence
5. Those having other medical complications associated with pregnancy (eg- DM, HTN, Asthama, Heart Disease, Renal Disease, Seizure Disease)
6. Chorioamnionitis
7. History of complete perineal tear.
8. Congenital or acquired uterine malformations
9. Unfavourable Bishop's score
10. Interpregnancy duration <18 months

Methodology

All cases were analysed prospectively and data was collected in a proforma, meeting the objectives of the study.

Out of 979 cases, 636 cases underwent elective repeat cesarean section, looking into the circumstantial safety of the mother and fetus. 343 were allowed for a trial of labour, out of them women who had failed TOL were taken for emergency LSCS for various indications.

The word elective repeat section here refers either to the women being taken for repeat section directly without trial of labour electively or on emergency basis when the woman was already in labour. Trial of labour refers to trial for vaginal delivery, which may end as successful VBAC or failed TOL, resulting in repeat section.

Thorough history was elicited from all cases as per the proforma. All study subjects were analyzed in full details regarding age, parity, previous obstetric performance including number of vaginal deliveries prior to this pregnancy and the indication for LSCS. History of intraoperative and postoperative complications were also noted which could have bearing in future obstetric life.

After ruling out contraindication for vaginal delivery and ensuring that there was no obvious feto-pelvic disproportion, women with gestational age upto 40 weeks were allowed for trial of labour. Patients who were allowed for VBAC-TOL, were carefully monitored in intrapartum period for any sign of impending rupture like tachycardia, hypotension, scar tenderness, suprapubic bulge, vaginal bleeding, FHR variability and hematuria, etc.

Induction and augmentation of labour was done in selected cases with intracervical prostaglandins where the Bishop's score was poor.

Few cases that had undergone a TOL required repeat CS due to various indications. In cases where rupture was suspected TOL was immediately abandoned and taken for emergency laparotomy and necessary steps were taken promptly.

In all the cases that had undergone repeat LSCS, the indication for LSCS, intraopertaive and postoperative details were noted.

In all the cases immediate fetal outcome was noted and the following parameters were used to know the fetal outcome.

1. APGAR score
2. Birth weight
3. Prematurity
4. Death
5. Neonatal morbidity in the form of birth asphyxia/ RDS/ hypoxic ischemic encephalopathy/ meconium aspiration syndrome/ intraventricular hemorrhage/ birth trauma/ sepsis/ others.

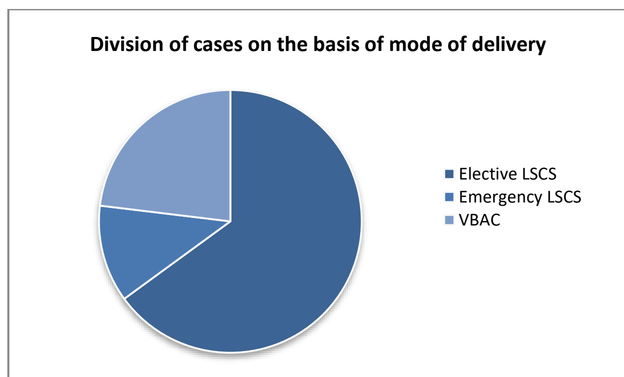
The data were analyzed using various statistical tests and standard deviation tests viz Chi-square test. A p value of <0.05 was taken as statistically significant.

Results

1. *Division of cases on the basis of mode of delivery*

S.No.	Mode of delivery	No. of cases	%
1	Elective LSCS	636	64.96
2	Emergency LSCS	117	11.95
3	VBAC	226	23.08
4	Total	979	

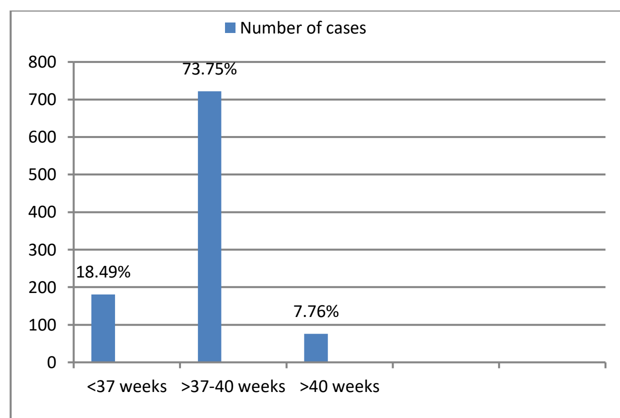
Out of the 979 cases selected for the study, 636 cases underwent elective repeat cesarean section, 226 had successful VBAC and 117 cases were taken for emergency LSCS.



2. *Gestational Age*

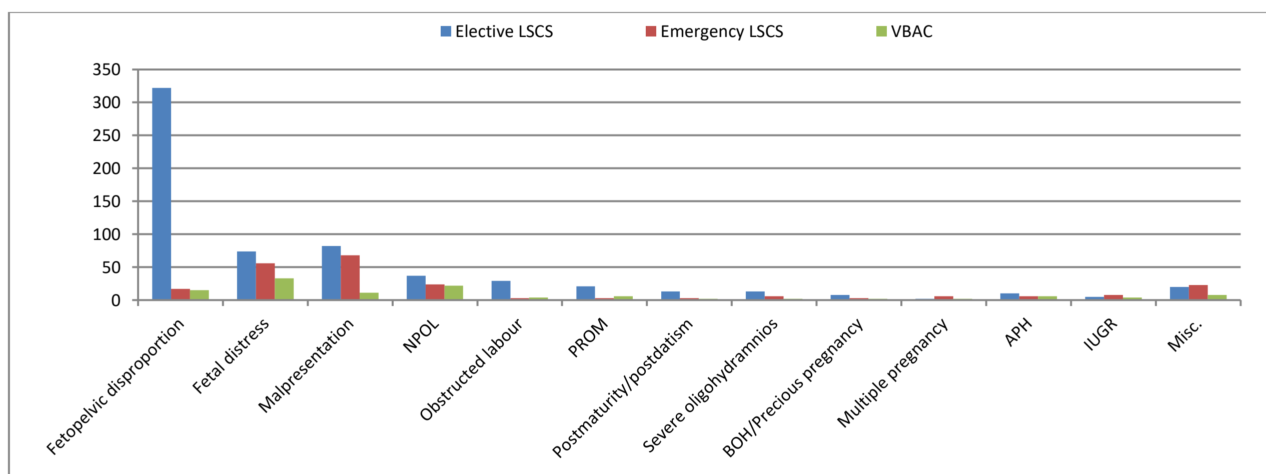
S.no.	Gestational age	Cases	%
1.	<=37 weeks	181	18.49
2.	>37-40 weeks	722	73.75
3.	>40 weeks	76	7.76

It is evident from the table that among 979 cases, 722(73.75%) were of term gestational age (>37-40 weeks). Only 181 cases (18.49%) were <37 weeks and 76 (7.76%) were more than 40 weeks of gestation.



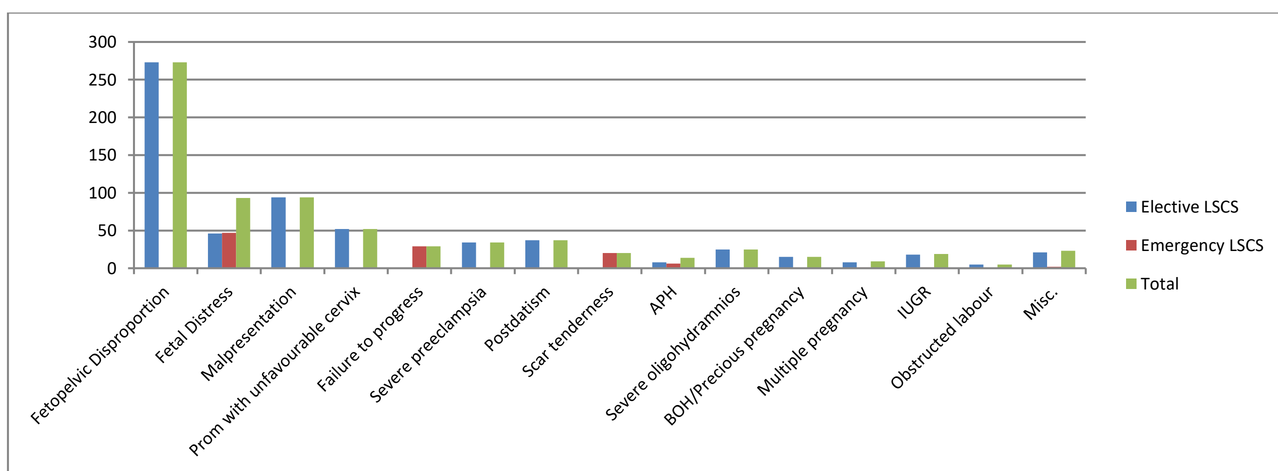
3. Indication of previous cesarean

S.no.	Indication	Elective LSCS (n=636)		VBAC(n=226)		Emergency LSCS (n=117)		Total (n=979)	
		No.	%	No.	%	No.	%	No.	%
1.	Fetopelvic Disproportion	322	50.62	17	7.52	15	12.82	354	36.16
2.	Fetal Distress	74	11.6	56	24.78	33	28.21	163	16.65
3.	Malpresentation	82	12.9	68	30.09	11	9.4	161	16.44
4.	NPOL	37	5.8	24	10.62	22	18.80	83	8.48
5.	Obstructed labour	29	4.6	3	1.32	4	3.42	36	3.7
6.	PROM	21	3.30	3	1.32	6	5.13	30	3.06
7.	Post Maturity/ Post datism	13	2.04	3	1.33	2	1.71	18	1.83
8.	Severe oligohydramnios	13	2.04	6	2.65	2	1.71	21	2.14
9.	BOH/Precious pregnancy	8	1.3	3	1.33	2	1.71	13	1.32
10.	Multiple pregnancy	2	0.3	6	2.65	2	1.71	10	1.02
11.	APH	10	1.6	6	2.65	6	5.12	22	2.24
12.	IUGR	5	0.8	8	3.54	4	3.42	17	1.73
13.	Misc.	20	3.14	23	10.18	8	6.84	51	5.21



It is evident from the above table that Fetopelvic disproportion was most common indication i.e. 354 (36.16%) followed by fetal distress 163 (16.65%), malpresentations 161(16.44%), non progression of labour 83(8.48%),misc. causes 51 (5.21%), obstructed labour 36 (3.7%), PROM 30 (3.06%), APH 22(2.24%), Severe oligohydramnios 21 (2.14%), and postdatism 18 (1.83%)

S.No.	Indication	Elective LSCS (n=636)		Emergency LSCS (n=117)		Total(n=753)	
		No.	%	No.	%	No.	%
1.	Fetopelvic Disproportion	273	42.92	0	0	273	36.25
2.	Fetal distress	46	7.23	47	40.17	93	12.35
3.	Malpresentation	94	17.78	0	0	94	12.48
4.	PROM with unfavourable cervix	52	8.1	0	0	52	6.90
5.	Failure to progress	0	0	29	24.79	29	3.85
6.	Severe preeclampsia	34	5.34	0	0	34	4.51
7.	Postdatism	37	5.82	0	0	37	4.91
8.	Scar tenderness	0	0	20	17.09	20	2.66
9.	APH	8	1.26	6	5.13	14	1.86
10.	Sever oligohydramnios	25	3.93	0	0	25	3.32
11.	BOH/Precious pregnancy	15	2.39	0	0	15	1.99
12.	Multiple pregnancy	8	1.26	1	0.85	9	1.19
13.	IUGR	18	2.83	1	0.85	19	2.52
14.	Obstructed labour	5	0.79	0	0	5	0.67
15.	Misc.	21	3.3	2	1.72	23	3.06



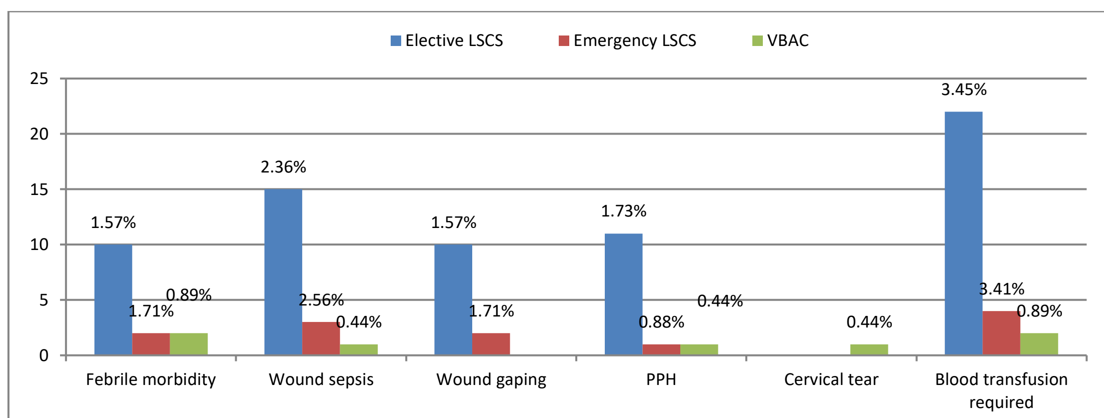
Commonest indication for ERCS was FPD (36.25%). Malpresentation (12.48%), fetal distress (12.35%), PROM with unfavourable cervix (5.58%), postdatism (4.91%), failure to progress (3.85%) and severe preeclampsia(4.51%) were the common indications for emergency LSCS following TOL.

4. Post-op/ postnatal maternal complication

S.No	Maternal morbidity	Elective LSCS(n=636)		Emergency LSCS (n=117)		VBAC (n=226)	
		No.	%	No.	%	No.	%
1.	Febrile morbidity	10	1.57	2	1.71	2	0.89
2.	Wound sepsis	15	2.36	3	2.56	1	0.44
3.	Wound gaping	10	1.57	2	1.71	0	0
4.	PPH	11	1.73	1	0.88	1	0.44
5.	Cervical tear	0	0	0	0	1	0.44
6.	Blood transfusion required	22	3.45	4	3.41	2	0.89

$\chi 2$ = 7.89, p value=0.002 significant

It is evident from the above table that maternal morbidity like fever (1.57%) , wound sepsis(2.36%), wound gaping (1.57%), BT requirement (3.45%), prolonged catheterization (1.57%) and PPH (1.73%) were more in elective LSCS as compared to VBAC

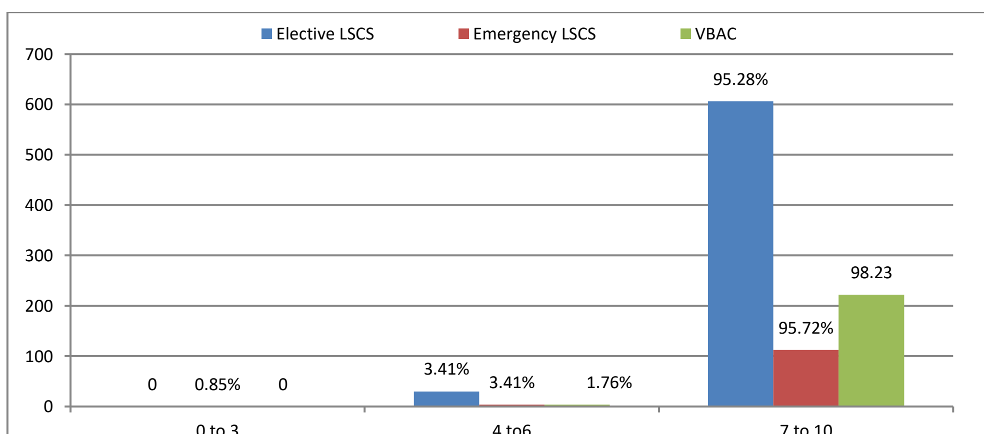


5. Analysis of APGAR score at 5 minutes

APGAR score	Elective LSCS(n=636)		Emergency LSCS(n=117)		VBAC(n=226)	
	No.	%	No.	%	No.	%
0-3	0	0	1	0.85	0	0
4-6	30	4.71	4	3.41	4	1.76
7-10	606	95.28	112	95.72	222	98.23
Total	636	100	117	100	226	100

$\chi 2$ = 8.23, p value=0.002 significant

Above table shows that maximum (98.23%) babies in VBAC group were healthy with APGAR score between 7-10, and only (1.76 %) babies had APGAR <7. While in elective LSCS, (95.28%) had APGAR 7-10 and (4.71%) babies had APGAR <7



Discussion

During this study, there were 2243 caesarean section out of 11532 deliveries from March 2018 to February 2019 (12 months) making an incidence of caesarean section 19.45%. The incidence of caesarean section in present study was 19.45% which is comparable to 19.2% of Rao M.A. Ramkrishna (Mahale Arun Ramakrishnan Rao *et al*, 2008) . It is also comparable to the results of National Family Health Survey of 2015-16 which was 17.2%.

The incidence in our study is slightly higher than the NFHS 2015-16. This might be due to the fact that NFHS takes into account all the hospitals including the CHC and PHC which deal with less complicated cases too leading to higher number of normal vaginal deliveries. In tertiary care hospitals like our Medical College, there is a higher percentage of complicated cases including referrals from CHCs and PHCs which lead to a higher percentage of cesarean sections.

Table 1 – Division of cases

Out of the total admissions of previous cesarean section, admitted through outpatient department or in emergency hours, 979 cases were taken in study, based on inclusion and exclusion criteria Out of these trial of labour was given to 343 cases from which 226 cases(65.89%) achieved successful VBAC while emergency LSCS was performed in 117 cases (34.11%).

The results are comparable to the study by Pathania *et al* and Knight *et al* in which the rate of successful VBAC was 63.2% and 63.4% respectively (Pathania *et al*, 2000); Knight *et al*, 2014)

Table 2- Gestational age

Out of all gestational groups, maximum (73.75%) delivered vaginally at term (37-40 weeks). In present study, 722 (73.75%) women were of gestational age > 37 to 40 weeks.

Similar observations were made by Yun-Xiu Li *et al* in which maximum number of successful VBAC were in those with gestational age less than 41 weeks (Li YX *et al*, 2019). Out of the 1686 women who underwent successful trial of labour 1170(86.73%) women were of gestational age less between 37-40 weeks.

The chances of spontaneous labour are maximum at term and so are the chances of successful induction. The chances of having normal vaginal delivery decrease after 41 weeks of gestation. This could be due to the number and activity of oxytocin receptors being maximum during this time. The amniotic fluid also begins to decrease beyond 41 weeks which also further decreases the chances of successful vaginal delivery.

Table 3 - Indication of Previous Caesarean Section

Indication of previous caesarean section is important for determining the mode of subsequent delivery. Out of the 979 cases, elective repeat caesarean section was performed in 636 cases. Fetopelvic disproportion (FPD) was indication of primary section in 354 (36.16%). Out of them elective CS was done in 322 cases (90.96%) remaining 32 (9.04%) underwent TOL, 17 (4.8%) delivered vaginally and 15 (4.23%) were taken for emergency LSCS. Amongst remaining 197 (20.12%) cases of absolute indications (eg. Obstructed labor and Malpresentation), elective CS was done in 111 (56.34%), VBAC occurred in 71 (36.04%) and remaining 15 cases (7.61%) underwent emergency LSCS following TOL.

Out of 428 cases with indications like fetal distress,PROM, BOH, NPOL, APH, postdatism, multiple pregnancies,IUGR and other miscellaneous, elective CS was done in 203 (47.42%), VBAC occurred in 138 (32.24%) and 87 (20.32%) underwent emergency LSCS following TOL.

Indications of previous caesarean Section in Various Studies

Indication of Previous LSCS	Chhabra S Arora (2006)	M. Arun Ramakrishna Rao (2008)	Shah Jitesh Mafatlal (2009)	Bhargava M (2010)	Present study (2018-19)
FPD	51.1%	22.64%	42.2%	36.51%	36.16%
Fetal Distress	26.9%	22.64%	21.7%	16.89%	16.65%
Mal Presentation	8.4%	14.28%	8.3%	16.08%	16.44%
Failure to progress	5.6%	3.83%	9.8%	8.72%	8.48%
APH	3.36%	1.74%	5.6%	2.45%	2.24%
Obstructed labour	0.8%	1.74%	2.1%	3.81%	3.7%
Other	3.64%	2.43%	5.7%	3.81%	5.21%

*BOH, Twin, failed induction, post maturity

Though incidence of VBAC following recurrent indication was found to be much lower, but it indicates that there was place for vaginal deliveries in some cases due to inaccurate assessment in previous pregnancy.

In present study, incidence of VBAC following non-recurrent indication is very low, this might be due to incorrect/misleading history, non availability of previous records, illiteracy and indication based on interrogation. To curtail the rate of cesarean deliveries, it is important to decrease the rate of primary cesarean sections.

Table 4- Indications of Repeat Caesarean Section

In present study 636 (64.96%) elective caesareans were done. Fetopelvic disproportion (46.61%) was the commonest indication of Elective Repeat Caesarean Delivery (ERCD). Similar to the study of Kamlesh Yadav (2000) major indication for repeat elective section was CPD (40%).

In study by Pathania *et al* (2000), malpresentation contributed 11.2% as an indication for ERCS with is comparable to present study (9.82%). Other indications of elective LSCS were PROM (5.58%), Postdatism (4.91%), BOH (1.99%) and IUGR (1.19%). In study by M. A. Ramakrishna Rao*et al* elective CS done in 3.48% cases of Postdatism & 2.57% of BOH (M. A. Ramakrishna Rao *et al*, 2008)

In present study, 117 (34.11%) women were taken for emergency LSCS for failed trial of labour. Fetal distress (40.17%) was the commonest indication for emergency CS. Other indications were failure to progress (24.79%), APH (5.13%) and scar tenderness (17.09%). Indications of emergency CS in our study are comparable to that of Shah Jitesh *et al* and Kamlesh Yadav *et al* (Shah Jitesh *et al*, 2009; Kamlesh Yadav *et al*, 2000)

In our study, trial was terminated on minimal obstetric indications. Rate of elective caesarean is higher because of early decision for repeat caesarean was made in cases with BOH, history of PROM, severe oligohydramnios, non reassuring CTG and patients without antenatal care.

Indication of Repeat Caesarean Section either Elective or Emergency in other studies are given below:

Indication of Elective Repeat Caesarean Section in Various studies

Indication	Kamlesh Yadav *et al* 2000	Pathania *et al* 2000	M.A. Ramakrishna Rao *et al* 2008	Bhargava M (2010)	Present Day (2018-19)
FPD	50.00%	23.7%	22.99%	45.36%	46.61%
Malpresentation	22.22%	3.2%	11.84%	9.62%	9.82%
APH	5.50%	-	-	2.06%	1.86%
IUGR	5.50%	-	-	1.03%	1.19%
BOH	3.60%	3.2%	-	2.06%	1.99%
Postdatism	-	6.31%	3.48%	4.81%	4.91%
Obstructed Labour	-	-	2.18%	0.69%	0.67%

Indication of Emergency Caesarean section in various studies:

Indication	Kamlesh Yadav *et al* 2000	Pathania *et al* 2000	M.A. Ramakrishna Rao *et al* 2008	Shah Jitesh Mafatlal 2009	Bhargava M (2010)	Present Day
Fetal Distress	38.46%	20.6%	19.5%	47.3%	40.38%	40.17%
Scar tenderness / ±dehiscence	-	4.8%	6.62%	21.8%	17.31%	17.09%
Rupture Uterus	11.45%	1.6%	2.09%	-	-	-
Failure to progress	11.54%	20.6%	1.74%	3.6%	25%	24.79%

Table 5 : Post-op/ postnatal maternal complication

In cases of elective repeat cesarean section, the incidence of hemorrhage was more common (1.73%) than among women who delivered by VBAC(0.44%) but somewhat less compared to emergency LSCS (1.70%).

Similarly, post operative maternal morbidity in the form of fever(1.57%), wound sepsis(2.36%) and wound gaping(1.57%) were higher in elective cesarean cases than VBAC cases.

The requirement of blood transfusion was also higher in elective repeat cesarean section (3.45%) as compared to VBAC (0.89%).

Study by Shah Jitesh Mafatlal *et al* also found higher maternal morbidity in repeat LSCS as compare to VBAC (Shah Jitesh Mafatlal *et al* (2009). 1.23% cases which underwent LSCS had fever as compared to 0.7% cases which achieved VBAC. 1.6% cases of LSCS had PPH as compared to 1.4% cases of VBAC. Wound gaping was seen in 1.23% cases of LSCS and in 0 cases in VBAC. Similary blood transfusion was required in 1.23% cases in LSCS and in 0 cases of VBAC. There was no maternal mortality in study cases of previous one CS.

Similar results were also found by Mamta *et al* in which the rate of maternal morbidity and mortality was higher in the LSCS group (Mamta *et al*, 2018).

Short term morbidities noted in the study were:

- Haemorrhage-It is the most common cause of maternal morbidity. The reported incidence is 2.2 % in elective CS and 3.4% in emergency CS. Significant risk factors for PPH after adjusting for confounders are: age ≥35 years (OR 1.5), multiple pregnancy (OR 2.8), fibroids (OR 2.0), preeclampsia (OR 3.1), amnionitis (OR 2.9), placenta previa or abruption (OR 7.0), cervical laceration (OR 94.0), uterine rupture (OR 11.6), and CS (OR 1.4) . In our study too, the rate of PPH was more in elective LSCS (1.73%) than VBAC (0.44%) group.
- Blood Tranfusion-Blood transfusion was the most common morbidity, as reported in National Vital Statistics, required in 280.4/100,000 live births. It was more common in cesarean section group. This is also comparable to our results in which it is required in 3.45% cases of elective repeat LSCS and 0.89% cases of VBAC.
- Other intraoperative complications These include accidental incision of foetal skin, laceration of cervix, vagina, uterus and uterine arteries, injury to bowel, bladder and ureter. These injuries are higher in emergency CS and with inexperienced surgeon. Bladder injury is more common with prior caesarean scar, emergency CS, prior pelvic surgery and head deep in pelvis. Intraoperative complications ie tissue damage that required extra suturing, bowel/bladder lesion, technical difficulties because of adhesions, and other events that were judged as a complication by the surgeon) amounted to 8.1% of the operations.
- Infections- Febrile morbidity was more in women undergoing CS. Serious infectious morbidity (defined as bacteremia, septic shock, septic thrombophlebitis, necrotising fascitis or death attributed to infection) was reported following 1–2% of caesarean births . Emergency CS is a risk factor (adjusted OR: 5.53; 95% CI) for infections. Prohlylactic use of antibiotics has decreased infection rate. In our study also the rate of febrile morbidity was 2.04% in the ERCS group which is higher than the VBAC group (0.89%).
- Wound infection and wound hematoma- Surgial Site Infections (SSI) after CS was 8.9% during a 30 days follow-up, though at hospital discharge it was only 1.8%. The risk factors for SSI are: emergency CS, premature rupture of membranes, anaemia, obesity, operating time > 38 minutes. Anaemia has been

reported as an independent risk factor for SSI (risk ratio 2.39). Wound haematoma was recorded in 1.2% of women after CS in a study from Israel and in 3.7% of women after CS in a study from Norway. It can get infected leading to wound sepsis and dehiscence. Wound sepsis was seen in 2.36% cases of ERCS, while it was seen only in 0.44% cases of VBAC.

- Sepsis- Common cause of maternal deaths especially in low resource settings. This can progress to septic shock with signs of hypotension, low platelet count, hypoperfusion . UTI and chorio-amnionitis are common infections associated with septic shock. Risk factors for maternal sepsis - obesity, diabetes or IGT, impaired immunity, immunosuppressive medications, anaemia, prolonged rupture of membranes, amniocentesis, history of pelvic infection, group B streptococcal infection in women or close contacts. Most common organisms involved - group A betahaemolytic Streptococcus, E.coli.
- Anal sphincter injuries and cervical lacerations were more in the vaginal delivery group which is comparable to our results in which cervical laceration was seen in 0.44% cases of the VBAC group.

Table 6-Analysis of APGAR score at 5 minutes

In present study 3.88% babies had apgar <7. In TOL group 8 babies were compromised, out of which 4 (1.76%) delivered by VBAC, 4 (3.41%) by emergency LSCS and rest 30(4.71%) by ERCS . Remaining 941/979 (95.13%) babies were healthy with Apgar >7 at 5 min.

Study by Annibale *et al* also found more incidence of neonatal morbidity following birth asphyxia in cases with ERCS than VBAC (Annibale *et al*, 1995). Mechanical ventilation was required in 1.6% cases delivered by LSCS as compared to 0.3% cases of VBAC and oxygen therapy was required in 4.9% cases of LSCS as compared to 1.4% cases of VBAC.

The result could be attributed to the fact that during a vaginal delivery, muscles involved in the process are more likely to squeeze out the fluid found in a newborn's lungs, which is beneficial because it makes babies less likely to suffer from breathing problems at birth like transient tachypnea of the newborn.

Conclusion

With the increasing trend of cesarean sections, there has been a general awareness to reduce the cesarean section rate in view of the associated increased maternal morbidity, duration of hospital stay and the associated expenditures. Since the commonest indication for all cesarean sections is repeat cesarean section, there have been various arguments against elective repeat cesarean section for previous LSCS. In the management of patient with previous caesarean section, regular and intensive antenatal surveillance is required. Proper selection, appropriate timing and suitable methods of induction with close supervision by competent staff are necessary. There is no doubt that a trial of labour is a relatively safe procedure but it is not risk free. Considering the fact that fetal morbidity and mortality due to trial of labor is comparable with the women laboring without a scar, trial of labour may be encouraged. We have to analyse and compare the overall benefits and risks of TOL vs. ERCS. Women decided for TOL must be thoroughly assessed before allowing for TOL. It is concluded from study that after proper selection and counseling about clinically significant risks, benefits and alternatives in an understandable and unbiased form and consent, women given trial of labour with careful monitoring and taken for emergency LSCS on minimal indication is the best answer to management of previous one or two CS .

Acknowledgement

The authors would like to thank the patients and the staff of S.S.Medical college for their cooperation

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