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Original Research Article

A prospective randomized trial of trans cervical Foley's with extra amniotic saline infusion versus intra cervical prostaglandin E2 gel for induction of labour setting

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ABSTRACT

Background: This study evaluated the effectiveness of Extra-amniotic saline infusion (EASI) in comparison with that of intracervical Prostaglandin E2 (PGE2) gel for cervical ripening and induction of labour.

Methods: The study conducted in SDM College of Medical College Dharwad, Department of OBG, from December 2012 to November 2013. Consecutive patients with unfavorable cervixes requiring pre-induction cervical ripening and induction of labour for various indications were asked to participate in this study. 50 patients (Group A) underwent extra amniotic saline infusion and 50 patients (Group B) underwent PGE2 gel application. Post induction augmentation if required was administered. Labour profile outcomes were compared between the groups.

Results: Results were comparable in terms of maternal age, indication for induction in majority of cases, pre-induction Bishop Score, mode of delivery, complications and side effects, neonatal complications, and Apgar Score. The mean post induction Bishop Score was higher in EASI group by an average of 9. The mean duration of augmentation was more in PGE2 group by an average of 2 hrs. The induction delivery interval (IDI) was prolonged by an average of 3.5 hours in PGE2 group.

Conclusions: For pre-induction cervical ripening the extra amniotic saline infusion is valid alternative for the PGE2 gel. Both the modes of induction were equally safe and effective in terms of mode of delivery and Apgar Score. EASI, however, had rapid cervical ripening and shorter induction delivery interval.

Keywords: Bishop score, Cervical ripening, Extra amniotic saline infusion, PGE2 gel, Induction of labour

INTRODUCTION

Labour- a term that in the obstetrical context takes on several connotations from the English language. According to the New Shorter Oxford English Dictionary (1993) toil, trouble, suffering, bodily exertion, especially when painful, and an outcome of work are all characteristics of labour.¹

Induction of labour defined as stimulation of regular uterine contractions before the spontaneous onset of

labour with or without rupture of membranes after 28 weeks of gestational age using mechanical or pharmacological methods in order to generate progressive cervical dilation and subsequent delivery.²

There are various methods of induction like medical, surgical, combined and mechanical. Each one has its merits and demerits. Currently most widely recommended method of induction is Prostaglandin E2 (PGE2). It has its own limitation like hyper stimulation. There is ongoing research for less painful effective

methods of induction of labour. Search for mechanical method of induction coming closer to the above need.

The extra amniotic saline infusion with the foley's catheter has been less extensively studied. In India initial studies showed it to be more effective than intravaginal prostaglandins, with minimal side effects. The method is shown to be safe, can be well tolerated by women and should be considered in areas of limited resources. The purpose of this study is to compare the efficacy and safety of extra amniotic saline infusion with intra cervical dinoprostone gel for pre-induction cervical ripening.

Human uterine cervix is a complex heterogeneous organ that undergoes intensive changes throughout gestation and parturition.³

The external os is connected to the internal os by a slender passage called endocervical canal. Cervical mucosa is lined with tall columnar epithelium and contains many large glands, these glands are lined by columnar epithelium which ends abruptly at the level of external os, giving way to stratified squamous epithelium that covers the portio vaginalis and extends to the vagina proper.⁴

Cervix is composed of an extra cellular matrix consisting predominantly of collagen with elastin and proteoglycans and cellular portion consisting of smooth muscle and fibroblasts, epithelium and blood vessels. Abnormal remodeling of collagen contribute to dysfunctional labour.⁵

Extensive remodeling of cervix occurs from early gestation to post-partum period. Water content of cervix increases from 80% in non-active state to 86% in late pregnancy, the remodeling process is extremely complex and involves properly timed biochemical cascades, interaction between the cellular matrix and cervical stromal inflammatory cells such as neutrophils and macrophages.^{6,7} Cervical undergoes destructive procedure process through which the cervix dilates to facilitate delivery.

Extracellular matrix (ECM)

Collagen is the predominant content of the ECM. Cervical collagen consists of type II (70%) and type III (30%). These proteins are rigid and non extensible in helical state. When arranged as a triple helix, the collagen can be cross-linked into fibrils, fibers and bundles. Elastin is another important component of Extra Cellular Matrix (E.C.M) of cervix. Elastin fibers are organized in parallel to and between collagen fibers.

Cellular component

Smooth muscle cells (20%) and fibroblasts (60%) make up the cellular component of uterine cervix. Smooth

muscle cells are embedded in an ECM composed mainly of collagen fibers.⁸

Role of hormones in cervical ripening

Hormonal manipulation in an unknown way may also have a role in cervical ripening.⁹ Human cervical connective tissue contains both estrogen and progesterone receptors. As term approaches, there is a down regulation of both estrogen and progesterone receptor, which may be caused by increased turnover of the receptor proteins.

Estrogen and its precursors stimulate collagenase production in the pregnant human cervix and progesterone maintain high level of enzyme that degrade hyaluronic acid, thereby keeping its level in the cervix low until term when progesterone and progesterone receptor level decrease.¹⁰

Relaxin, an ovarian hormone released during gestation (H 1 is expressed by ovary and H2 by both deciduas and trophoblast), it softens the cervix, but the exact molecular mechanism of relaxin role is unknown.¹¹

The IL's (interleukins) have also been suggested to play an important role in the process because they are chemotactic for neutrophils. IL-8 involved in neutrophils mediated cervical ripening. IL-6 is known to stimulate the production of PGE2 by amnion and deciduas and therefore is regarded as an important factor in physiology of normal labour. Recent studies have indicated that IL-6 and TNF levels in amniotic fluid are elevated in the active phase of both preterm and term labour.¹²

Onset of labour

Uterine stretch and parturition

Fetal growth significantly increases in myometrial tensile stress and amniotic fluid pressure.¹³

With uterine activation, stretch is required for induction of specific contraction-associated proteins (CAPs). Stretch increases expression of the gap junction protein-connexin 43, as well as oxytocin receptors.¹⁴

Clinical report for a role of stretch comes from the observation that multifetal pregnancies and hydramnios are at a much greater risk for preterm labour than singletons.^{15,16}

METHODS

The subjects of the study were selected from the patients who had been admitted to labour ward SDM College of Medical Sciences and Hospital, Dharwad, from December 2012 to November 2013 as a time bound study. The study was done in 100 women counseling was done regarding both the methods of induction and the choice was given them.

50 women were assigned to extra amniotic saline infusion and 50 women assigned to PGE2 were randomly recruited.

Inclusion criteria

Eligible women who had obstetric or medical or fetal indications for induction of labour

- Singleton gestation
- Intact membranes
- Bishop score <6
- Vertex presentation
- Gestational age > 28 weeks
- NST- reactive
- USG- normal BPP.

Exclusion criteria

- Non-vertex presentation
- Uterine contractions (3 contractions lasting for 30 sec/10 min)
- Ruptured membranes
- Cephalopelvic disproportion, contracted pelvis.
- Polyhydramnios, multiple pregnancy 6. EFW: 4000g (big baby)
- Unexplained vaginal bleeding
- Placental abruption, placenta previa
- Prior LSCS/scarred uterus
- Non-reassuring fetal status
- Clinically detected vaginal infections- genital herpes
- Inability to obtain the informed consent
- Latex allergy.

A prospective study of all case of pregnant women who got admitted to labour ward requiring induction of labour were randomly assigned to EASI or PGE2 between December 2012 to November 2013.

Patients selected as per the inclusion criteria and exclusion criteria.

After obtaining informed consent from patients, a detailed history, complete physical examination, Bishop score assessment. Routine investigations were done for all patients.

- Group A- Extra amniotic saline infusion (No. 18-20) Foleys catheter for primigravida (No. 20- 22) for multigravida.
- Group B- Prostaglandin E2 group (PGE2 used according to manufacturer recommendations).

Patient with BISHOP score 0-5 and meeting inclusion and exclusion criteria were included. About 50 patients in each group were studied. The groups were compared with respect to maternal age, parity, gestational age, reason for induction and initial BISHOP scores, side effects, intrapartum complications, delivery mode, induction

delivery interval, Apgar scores and pain scoring by visual analog scale. The statistical methods used were student's compared t-test, chi-squared test.

Procedure

After informed consent was obtained, women were assigned to receive either extra amniotic normal saline or PGE2.

Group A- extra amniotic saline infusion group

All women will undergo a speculum examination. Cervix was prepared with betadine solution. Prophylactic antibiotic was given to all patients. Women assigned to extra amniotic saline infusion were inserted 18-20 F foley catheter in primigravida and 20-22 F in multigravida beyond the internal OS under direct visualization. Balloons was inflated with 30 ml normal sterile water, outlet of the catheter connected to a normal saline bottle through a drip set and the drip rate was adjusted at a rate of 0.5 ml (8 drops) I min. The catheter was placed in traction by taping it to the medial aspect of the thigh.

Monitoring pulse ½ hourly, BP 4th hourly, uterine contractions ½ hourly, FHS half hourly, bleeding p/v, drip rate. Cervix has to be assessed for Bishop score after 6 hrs or when catheter is expelled. If Bishop score remained <6 the infusion was continued for 6 more hours until the catheter is expelled, which ever occurred first. Maximum of 12 hours of induction is done. Oxytocin induction or augmentation was done as per labour induction protocol.

Group B- PGE2 gel group

Subjects assigned to Dinoprostone warmed to room temperature just before administration was injected into endocervical canal under direct visualization, subjects remain in left lateral position for 30 min after administration. Monitoring pulse ½ hourly, BP 4th hourly, uterine contractions ½ hourly, FHS half hourly bleeding p/v.

After 6 hours repeat vaginal examination is done and Bishop score reassigned, if no improvement in Bishop score second dose of PGE2 gel application is done and monitoring of maternal vitals shall be done as already mentioned, if Bishop score was found favorable oxytocin induction/augmentation was done as per protocol of labour ward.

RESULTS

The women were subjected to pre-induction cervical ripening (due to various indications) either by EASI/PGE2 according to the acceptance of pregnant women.

The groups were compared with respect to maternal age, parity, gestational age, reason for induction, pre-and post induction Bishop score, side effects, intrapartum complications, delivery mode, induction delivery interval and APGAR score.

Table 1: Comparison of maternal age distribution in the study group.

Age in years	EASI group		PGE2 group	
	No.	Percentage	No.	Percentage
18-20	2	4	3	6
21-25	26	52	30	60
26-30	18	36	13	26
31-35	4	8	4	8
Mean±SD	25.36±3.82		24.94±4.50	

P value=0.731

Table 1 shows that pregnant women with age less than 20 years were 2 (4%) in EASI group, and in PGE2 gel group were 3 (6%). The majority of women in this groups were between the age group of 21 to 30 years, constituting 44 (88%) in EASI, and 43 (86%) in PGE2 group. Only 8% of the significant. Women in each group were aged more than 30 years. The mean maternal age in EASI group was 25.36±3.82 and in PGE2 group was 24.94±4.50 (P=0.731) statistically not significant.

Indication for induction of labour

The most common indication for induction of labour was postdates constituting of 32 (64%) in EASI group and 25 (50%) in PGE2.

Table 2: Comparison of indication distribution in the study groups.

Indication	EASI group		PGE2 group	
	No.	%	No.	%
Postdates	32	64	25	50
Mild pre-eclampsia	4	8	8	16
Severe pre-eclampsia	2	4	2	4
IUGR	0	0	2	4
Oligohydroamnios	3	6	3	6
Anomaly	1	2	0	0
GDM	1	2	3	6
Gestational hypertension	5	10	5	10
Rh Negative pregnancy	2	4	2	4
	50	100.0	50	100.0

Table 2 shows that the most common indication for induction of labour was postdates. Constituting of 32 (64%) in EASI group and 25 (50%) in PGE2. The next common indication was pre-eclampsia constituting 6 (12%) in EASI group and 10 (20%) in PGE2 group.

There were 5 cases of Gestational hypertension in both the groups, constituting 10% in each group. There were 3 cases of Oligohydramnios in both the groups, constituting

6% in each group. There was one (2%) case of GDM in EASI group, and there were 3 (6%) cases in PGE2 group. RH negative pregnancy with term gestation, constituting 2 (4%) cases in each group. There was one (2%) case of anomaly in EASI group. There were 2 (4%) cases of IUGR in PGE2 group.

Table 3: Comparison of mean Bishop score in the study groups.

Bishop's score	EASI group	PGE2 group	P value
Base line	3.52±0.91	3.36±1.04	0.416
Post induction	8.68±1.22	7.16±1.76	<0.001

Table 3 shows the pre-induction Bishop score. The mean pre-induction score in EASI group is 3.52 and in PGE2 group is 3.36, P value 0.416, was statistically not significant.

Post induction Bishop's score in the study groups was varied between minimum of 5 to a maximum of 10 in EASI group and a minimum of 3 to a maximum of 11 in PGE2 group. Maximum number of women had a Bishop score of 8 constituting 36% of total cases in EASI group and a score of 8 constituting 24% in PGE2 group. P-Value <0.001 was statistically significant.

Table 4: Mode of delivery between the study group.

	EASI group (50)		PGE2 group (50)	
	No.	%	No.	%
Vaginal deliveries	33	66	32	64
LSCS	17	34	18	36

Table 4 shows that the majority of women in both the groups 33 (66%) cases in EASI group and 32 (64%) in PGE2 group had vaginal delivery, and out of the 33 cases in EASI group, primigravida constitutes 16 (32%) cases and multigravida 17 (34%) cases, and out of 32 cases in PGE2 group, primigravida constitutes 19 (38%) cases and multigravida 13 (26%) cases.

Table 5: Comparison of indications for LSCS in study groups.

LSCS indication	EASI group		PGE2 group	
Presence of indication	17	34	18	36
Failed induction	5	10	7	14
Failure to progress	7	14	3	6
Fetal distress	3	6	6	12
Hyperstimulation	0	0	1	2
Arrest of head	1	2	1	2
Cervical dystocia	1	2	0	0

Table 5 shows that 17 cases (34%) in EASI and 18 (36%) cases in PGE2 had LSCS for various indications. Indications for LSCS in EASI group was failure to

progress, failed induction and fetal distress. Where as in PGE2 group it was failed induction, fetal distress and failure to progress.

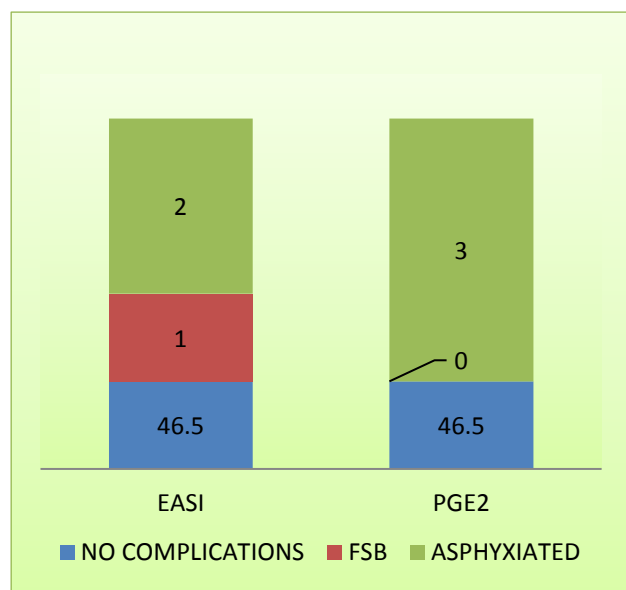


Figure 1: Comparison of complication distribution.

Figure 1 signifies the comparison of complication distribution. It is then compared with other studies as shown in Table 8. There was one case of fresh still born in EASI group, who had congenital anomaly incompatible with life. There were 2 (4%) cases of deeply asphyxiated baby in EASI group due to IUGR and preterm. There were 3 (6%) cases of deeply asphyxiated baby in PGE2 due to severe oligohydramnios and severe preeclampsia.

DISCUSSION

In this study pregnant women were subjected to pre-induction cervical ripening (due to various indications) either by EASI/PGE2 according to the acceptance of pregnant women.

Table 6: Comparison of maternal age with other studies.

Study done by	Maternal age in years	Maternal age in years
	EASI	PGE2
Guinn et al ¹⁷	23.0±5.7	23.3±5.9
Goldman et al ¹⁸	25.1±7.0	21.60±4.8
Sherman et al ²⁰	29±0.8	27±0.8
Schreyer et al ²¹	27.3±5.9	28.5±5.3
Present study	25.36±3.82	24.94±4.50

In present study as in Table 7, mean maternal age were comparable with other studies of Goldman et al and Guinn et al.¹⁷⁻¹⁹

Maternal age

In the present study number of pregnant women with age less than 20 years were 2 (4%) in EASI group, and in PGE2 gel group were 3 (6%). The majority of women in this groups were between the age group of 21 to 30 years, constituting 44 (88%) in EASI, and 43(86%) in PGE2 group. Only 8% of the women in each group were aged more than 30 years. The mean maternal age in EASI group was 25.36±3.82 and in PGE2 group was 24.94±4.50 (P = 0.731) statistically not significant.

Table 7: Comparison of mean post induction Bishop Score with other studies.

Studies	EASI	PGE2
Rouben et al ¹⁹	6.9±1.9	5.2±2.3
Schreyer et al ²¹	7.89±0.9	5.65±0.34
Present study	8.68±1.22	7.16±1.76

In present study as in Table 8 mean Bishops score was more in the EASI group compared to PGE2 showing EASI as a better inducing agent than PGE2.

Table 8: Comparison with other studies.

Studies	Complications	EASI	PGE2
Rouben et al ¹⁹	Fetal distress	5.3%	3.5%
Sherman et al ²⁰	Abnormal FHR	11%	19%
	Intrapartum fever	9%	11%
Schreyer et al ²¹	Hypertonic contractions		13%
	FHR variability		23%

Fetal outcome

There was one case of fresh still born in EASI group, who had congenital anomaly incompatible with life. There were 2 (4%) cases of deeply asphyxiated baby in EASI group due to IUGR and preterm. There were 3 (6%) cases of deeply asphyxiated baby in PGE2 due to severe oligohydramnios and severe preeclampsia.

The mean Apgar score at 1 min in EASI group was 7.76±0.59 and in PGE2 gel group was 7.74±0.44. The P value 0.886 was statistically not significant. The mean Apgar score at 5 min in EASI group was 8.79±0.53 and in PGE2 gel group was 8.80±0.45. The P value 0.967 was statistically not significant.

CONCLUSION

Vaginal delivery is considered to be the success of obstetrics. Many pregnant women requiring induction of labour come with unfavorable cervix. Achieving vaginal delivery through pre-induction cervical ripening is an obstetric challenge.

There are various methods which have their own merits and demerits. The most commonly used PGE2 gel has got its own disadvantages. There is a hope raised by mechanical methods of induction and one of them is EASI. EASI is one such mechanical method which was compared with commonly used PGE2.

EASI is as effective as PGE2 in achieving vaginal delivery. It has got other advantages like, higher post induction Bishop score, less duration of augmentation, shorter induction delivery interval, less painful, less chance failure of induction with good perinatal outcome. Hence EASI is effective, safe and economical method of induction of labour.

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Ethical approval: The study was approved by the Institutional Ethics Committee

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