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A COMPARISON OF FOUR METHODS OF RIPENING THE UNFAVORABLE CERVIX

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Abstract

This study aimed to compare the efficacy of four clinical methods used for ripening unfavorable cervix in Basra Maternity Hospital.

A prospective study was conducted to compare four methods of ripening the unfavourable cervix : Foley's catheter with extraamniotic saline infusion, Foley's catheter alone, Oxytocin, and Sweeping of membranes.

The clinical trial involved a total of (121) pregnant women (47 primigravidae and 74 multiparae). The success rates in achieving cervical ripening were (100%, 84.6%, 75%, and 54.5% for primigravidae) and (100%, 91.3%, 88.8%, and 64.7% for multiparae) for method I-IV respectively. Post-ripening Bishop's score was 6.9, 5.6, 4.6 and 4.1 for primigravidae &7.3, 6.05, 5.6 and 4.4 for multiparae, for method I-IV respectively.

The mean priming time was shortest in method-I (6.1 in primigravidae and 5.7 in multiparae) and longest in method-IV (21.6 in primigravidae and 17.8 in multiparae). The induction delivery internal was longer as we move from method-I toward IV. The caesarean section rate was highest in method-III and the lowest rate was in method-I. In conclusion, Foley's catheter with extraamniotic saline infusion was found to be the best method in comparison to the other three methods as it was safe, rapid, effective, inexpensive and requires little training for application.

Introduction

The active approach taken to the management of maternal and fetal problems in modern obstetrics has increased the frequency of induction of labour[1].

In order to be successful, induction of labour must result in what is defined as "labour", namely adequate uterine contractions and progressive dilatation of the cervix, the amount of uterine contractility required to achieved cervical dilatation is very dependent on the state of the cervix[2]. It was not until 1955, however, that Cocks first classified cervices prior to induction of labour as ripe (soft and more yielding) and unripe (firm and rigid)[3].

The application of local prostaglandin before induction of labour in women with unripe cervix is standard procedure in the world. The unavailability of prostaglandin in Iraq, besides being a very expensive drug, led us to conduct this study. A comparison of the available methods in our hospital; (namely, Foley's catheter with extra-amniotic saline infusion, extra-amniotic Foley's catheter alone, low dose oxytocin and sweeping of fetal membranes), in order to find the best method with regard to effectiveness, safety, the ease of application and patient acceptability; which can substitute prostaglandin.

Patients and methods

This prospective study was conducted in Basra Maternity Hospital during the period from January 1998 to September 1998.

Pregnant women were unselected primigravidae and multiparae (para 1-4) with obstetric indications for induction of labour and with unfavorable (unripe) cervices (modified Bishop's score from 0-4; table I). None of them has a history of caesarean section or any major operation on the uterus or any contraindication for induction of labour. All gave informed consent to undergo the procedure and they were randomly divided into four groups using alternate week selection methods. A real-time ultrasound was performed before treatment was assigned, and patient with a low-lying placenta and malpresentation were excluded from the protocol.

The main indications for induction of labour were prolonged pregnant (gestational age of 42 weeks or more in a women having regular 28 days menstrual cycles) and hypertension in pregnancy (persistent diastolic blood pressure of 90 mmHg or more), patients with hypertension were induced at term unless added complications necessitated earlier intervention.

The cervix was assessed on the modified Bishop's score before and after the attempted ripening.

Group I (Foley's catheter with extra-amniotic saline infusion): Consisted of 29 patients. Those patients were admitted at morning. Under aseptic conditions and with the patient in lithotomy position, the cervical os was exposed with a Sim's speculum and a Foley's catheter (22 F.G.) was inserted into the extra-amniotic space and the balloon was inflated with 30 mls. of sterile normal saline and a normal saline solution was instilled at a constant rate of 1 ml/minute.

The cervical state was assessed when the patient showed sings of labour, when the inflated balloon was expelled and after 12 hours if the first two conditions didn't occurred. Amniotomy was performed if possible and intravenous oxytocin was given with increment every 30 minutes until labour established. The dose to achieve this being 2-4 units in 500 mls of 5% dextrose water, the infusion rate was set between 15-60 drops/minute.

Group II (Foley catheter alone): Consisted of 34 patients. Those patients were admitted the evening before the planned induction of labour and Foley's catheter (22 F.G.) was inserted into the extra-amniotic space as in group I, and further management was as in group I.

Group III (Oxytocin): Consisted of 30 patients, they received an escalating intravenous oxytocin infusion (the start dose was 2 units and the maximum dose was 8 units in 500 ml. of 5% dextrose water and the infusion rate was set between 15-60 drops/minute) from 9 A.M. for 12 hours.

Group IV (Sweeping of fetal membranes): Consisted of 28 patients. Those patients were admitted the evening before the planned induction of labour. Under aseptic conditions and the patient in lithotomy position, the cervix was identified and the fetal membranes were swept with the examining finger by inserting it through the cervix and the membranes were separated from the lower segment by moving the finger in a circular manner. On the following day further management was as in group I.

Those patients who didn't have labour commenced or have no increase in Bishop's score above (4), permitting induction of labour by means of amniotomy and oxytocin infusion, a further 12 hours of priming was scheduled using the same method. If no improvement occurs in Bishop's score

despite the additional period of priming either another method of priming was used or the pregnancy was terminated by caesarean section, they were regarded as failed trial and excluded from further follow up. Those patients who began labour immediately following treatment the second Bishop's score was regarded as 12. In all patients the fetal heart rate was monitored with the sonic aid machine and uterine contractions were checked manually; the progress of cervical ripening was estimated by the same investigator. The obstetric staff on duty fulfilled further management of labour.

None of the patients received prophylactic antibiotics. Patients and neonates were observed for 1st 24 hours after delivery only as the majority of them discharged home in the next day.

Data were analyzed by using Z-test, Chi-square (X^2) test and student *t*-test. In general the differences were considered significant if the P-value was below 0.05.

Results

Analysis of data after the last women had assessed revealed that group-I consisted of (primigravidae=11 and multiparae=18), group-II consisted of (primigravidae=13 and multiparae=21), group-III consisted of primigravidae=12 and multiparae=18) and for group-IV (primigravidae=11 and multiparae= 17).

Table-I presents the characteristics of the patient population the indications for induction, and the initial Bishop's score. No statistically significant differences were noted between the four groups with respect to the mean patient age, gestational age, initial Bishop's score, or indication for induction.

Table (II) This table shows two important points, the first is that the success rate in multiparae is higher than that in primigravidae in all methods except in group-I where both primigravidae and multiparae show similar success rate. The second point is that in both primigravidae and multiparae there is a gradient of success rate from highest in group-I to lowest in group-IV with the difference between group-I and group-IV being statistically significant (P value < 0.01).

Table (III). This table compares the average pre-and post-ripening Bishop's score, the time elapsed between them and the induction-delivery time. Three patients in group-I began labour immediately following treatment. The initial Bishop's scores were comparable between the four groups in both primigravidae and multiparae (P>0.05). The average post-ripening Bishop's score was higher in group-I than that in the rest groups and for group-II than that in group-III and group-IV which was the least. The differences between primigravidae in all groups and multiparae in all groups were significant and the increase in the mean Bishop's score was greater in multiparae than that in primigravidae.

In primigravidae the mean priming time (hours) was longer as we move from group-I toward group-IV, for multiparae it was shorter in group-I than the rest groups but shorter in group-III than that in group-II and group-IV which was the longest. These differences were significant except for group-II versus group-III in both primigravidae and multiparae and for group-I versus group-III in multiparae.

The mean induction to delivery interval (hours) was significantly shorter in group-I when compared with groups-II and IV; but although it was shorter than that in group-II the difference is not statistically significant; for group-II it was shorter than that in group-III and significantly shorter when compared to group-IV.

Table (IV): This table shows the mode of delivery for those women with successful cervical ripening trial, it was spontaneous in the majority of women in the four groups. The highest caesarean section rate was in group-III and the lowest was in-group I.

There was no significant genital tract infection associated with groups-I and II, 5 cases in group-III showed signs of fetal distress during the trial, 4 of them have been delivery by caesarean section and one by forceps. P.P.H. complicated one case in group-II and another one in group-III and they were treated by massage of the uterus and oxytocic drugs.

Table (V): This table shows the mean Apgar score at 5 minutes and the mean birth weight for the neonates delivered to women underwent the trial. There was no statistically significant difference between the four groups in any parameter.

Discussion

As it was shown throughout the review of literatures there are many methods for ripening the unfavorable cervix before induction of labour.

Since 1810 James Hamilton suggested simple stripping of the membranes as a mean of inducing labour[4]. We found that sweeping of membranes was successful in producing ripe cervix in (57.2%) of cases. Swann[5], although he toke labour rather than cervical ripening as the end point of the trial, reported a success rate of (69%) which is higher than our result and this could be due to the difference in the technique as Swann stripped the membranes daily for 3 days. With respect to parity the success rate was higher in multiparae, but Swann reported no definite relationship between parity and success.

Sweeping of the membranes toke the longest mean time to achieves the lowest post-ripening score when compared to the other three methods in our study, the induction delivery interval although was longer than that in the first two methods, it was similar to that oxytocin methods. Swann reported no change in duration of labour. Most of the patient in either study delivered vaginally. Swann reported increased maternal morbidity (1-day fever), whereas no such a complication reported by our study possibly because of the lower number of stripping for each patient.

Sweeping of membranes was technically difficult in those with closed cervices; although it was not reported in our study, it caries a risk of introducing infection and accidental rupture of the membranes. Patients' monitoring is not required and the patient need not be hospitalized.

Unfortunately there is no other published study that compares sweeping with other methods of ripening.

Oxytocin results in a success rate of (83.3%) whereas it was only (52%) as reported by Jackson et al[4]. The different could be due to the larger sample size (75) and shorter duration of ripening (12 hours) in Jackson's study compared to (30) and (24 hours) respectively in our study.

The mean post-ripening score for primigravidae was (4.6), which is similar to that reported by Wilson[6] (4.5) but lower than that reported by Al-Dahhan[7] (5.8) which could be due to the difference in sample size (12) in our study and (17) in Al-Dahhan study. With respect to multiparae it is similar to that reported by Al-Dahhan being (5.6) in both.

The mean priming times (hours) were (14.7 and 9.3) for primigravidae and multiparae respectively while that of Al-Dahhan was (12.3) for both primigravidae and multiparae and this

mixing could be the result of this difference in the mean time.

The mean induction delivery intervals (hours) were (12.8 and 10.5) for primigravidae and multiparae. They were shorter than those were in Al-Dahhan (13.8 and 12.4) and Wilson (13.8 for primigravidae) studies probably because larger number of patient in the last two studies required additional period of priming.

The caesarean section. rate was (36%) which approximates that of Wilson's study (33.3%) but both are higher than that reported by Al-Dahhan (19.2) According to our study the caesarean section rate in oxytocin group was higher than those in the three other groups; in Al-Dahhan study it was higher than that in the Foley catheter group and in Wilson's study it was higher than those for different routs of prostaglandin administration groups.

No episodes of uterine hyper tonus was recorded by the three studies, fetal distress has been reported in our study with oxytocin more than the other three methods as well as in Al-Dahhan study more than with Foley catheter method but not in Wilson study, Jackson reported uterine hyper-stimulation and fetal distress only with prostaglandin but not with oxytocin. The above complications of oxytocin necessitate cardio-tocographic monitoring, oxytocin also restrict patient mobility.

The mean Apgar score at 5 minutes was (9.4) for primigravidae that appro-ximates the report of Wilson (9.8).

Wilson concluded that local prostaglandin E_2 was superior to oxytocin as a method of cervical ripening while Jackson found no difference between the two; we found that oxytocin was only superior to membranes sweeping method.

Foley catheter alone achieves (91.2%) success rate which approximates (90.5%) which was reported by Ezimokhai and Nwabineli[8]; however Lewis[1] reported only (50%) success rate.

The mean post-ripening scores were (5.6 and 6.05) for primigravidae and multiparae respectively, they are less than those reported by Al-Dahhan[7] (7.2 and 7) and that reported by Ezimokhai and Nwabineli (6.17 for primigravidae). The mean priming times (hours) were (primigravidae = 10.5 & multiparae = 10.2) they are shorter than that reported by Al-Dahhan (12), for both primigravidae and multiparae, and that of Ezimokhai & Nwabineli (11.1). These differences in priming times could be due to the difference in the time when the second cervical score was assessed and this could also explain the difference in the post-ripening score, the longer the priming time the more is the post-ripening score.

The mean induction delivery intervals (hours) were (primigravidae = 9.4 & multiparae=8.4) they are midway between those reported by Al-Dahhan (primigravidae = 10.3 & multiparae = 9.7) and that of Ezimokhai & Nwabineli (8.2 for primigravidae), however in Jagani et al [9] it was (19.5).

The caesarean section rate was (16.1), which is higher than that reported by Al-Dahhan and Ezimokhai & Nwabineli (5.9%) & (14.3%) respectively. As the Main indication for caesarean section in our study was cephalo-pelvic disproportion so this difference could not be attributed to the method itself.

There was no significant maternal infection or other complication during the antepartum, intrapartum and the immediate postpartum periods reported by our study as well as by that of Al-Dahhan and Ezimokhai & Nwabineli. The neonatal outcome was favorable in the three studies.

According to our results and those reported by Al-Dahhan, Foley catheter alone was better than oxytocin but Jagani et al reported the reverse, probably because of the smaller sample size they studied (10) cases for each group compared to those in the former 2 studies (Foley catheter = 34, oxytocin = 30) and (Foley catheter = 34, oxytocin = 41) respectively.

We also found that Foley catheter alone was superior to sweeping of membranes. Ezimokhai & Nwabineli concluded that Foley catheter alone was as effective as P.G. E_2 applied intra-vaginally in a gel, in ripening the unfavorable cervix.

Foley catheter alone didn't required monitoring of patient and it didn't restrict patient's mobility.

Foley catheter with extra-amniotic saline infusion was (100%) successful a finding similar to that of Schreyer et al[1]; Barkai et al[10] mixed primigravidae and multiparae in their study and they reported a success rate of (83.3%).

The mean post-ripening score was (primigravidae=6.9±0.9 and multiparae 7.3±1.2) which approximates that reported by Schreyer et al (7.8±0.9 for multiparae).

The mean priming time (hours) was (primigravidae=6.1 and multiparae=5.7) which is longer than that reported by Schreyer et al (2.81 for multiparae), this difference could be due to the difference in sample size being (18 multiparae) in our study and (52) in Schreyer et al study. Barkai et al reported (9.9) mean priming time.

The mean induction delivery interval (hours) was (primigravidae=7.5±1.7& multiparae5.8±2.5) which is similar to that reported by Schreyer et al (First stage=5.84±3.63 and the second stage =0.5±0.3 for multiparae). Regarding caesarean section rate which was (6.9%) compared to (3.8%) by Schreyer et al, (10%) by Barkai et al and 29% by Lyndrup et al [11].

The antepartum, intrapartum and the immediate postpartum periods were uneventful, however Schreyer et al reported one case of early P.P.H. while Barkai et al reported febrile morbidity in (12.5%) and uterine hyper tonus in (7.5%).

Neither study reported any apparent adverse effect on the neonates.

In comparing Foley catheter with extra-amniotic saline infusion with the other three methods in our study it was the best method with respect to success rate, post-ripening Bishop's score, priming time and induction delivery interval, it also had the lowest caesarean section rate. Although monitoring of patients was not required it did restrict patient's mobility.

The main argument against the use of Foley catheter in the last two methods was the risk of introduction of infection and accidental rupture of fetal membranes; these risks were reduced if not eliminated by aseptic precautions and the policy of active management of labour. None of our patients had accidental rupture of the membranes antepartum, intrapartum or postpartum pyrexia attributable to the use of Foley catheter although as mentioned above Barkai et al reported that in their study.

Several studies in different countries concluded that Foley catheter with extra-amniotic saline infusion was more effective than local prostaglandin (P.G. E_2 vaginal tablet, P.G. E_2 vaginal gel and intra-cervical dinoprost) with respect to improvement in cervical score with minimal myometerial activity, shorter priming and induction delivery times, and fewer side effects [1,12,13].

In reviewing the above data, Foley catheter with extra-amniotic saline infusion is the best among the four methods, it has been shown to be safe,

rapid, effective, inexpensive as Foley catheter and normal saline are readily available, it is acceptable by the patient as it is associated with little maternal discomfort and it required little training for the untrained physician on call at the delivery room when quick and safe method is required for induction of labour.

Table-I patient's characteristics

Parameter		E.A.S.I.* (n=29)	Foley catheter (n=34)	Oxytocin (n=30)	Sweeping of membranes (n=28)
primigravidae	No. (%)	11 (37.9)	13 (38.2)	12 (40)	11 (39.3)
multiparae	No. (%)	18 (62.1)	21 (61.7)	18 (60)	17 (60.7)
mean patient Age ± S.D.	primigravidae	22.5 ±3.3	22.5 ±3.1	22.2 ±2.8	21.4 ±3.3
	multiparae	27.2 ±3.9	27.1 ±3.7	26.9 ±2.6	26.6 ±2.3
mean gestation Age ± S.D.	primigravidae	38.9 ±2.2	39.2 ±2.6	39.5 ±2.8	39.4 ±2.7
	multiparae	39.2 ±3.1	40.1 ±2.3	40.3 ±2.1	39.1 ±3.2
Indications for induction					
postdate No(%)	primigravidae	5(45.5)	6(46.1)	8(66.6)	8(72.7)
	multiparae	12(66.7)	15(71.4)	14(77.8)	10(58.9)
Hypertensive disorder No.(%)	primigravidae	4(36.3)	6(46.1)	2(16.7)	2(18.2)
	multiparae	4(22.2)	3(14.3)	3(16.7)	3(17.6)
others No(%) -IUD♣ -I.U.G.R♥	primigravidae	2(18.2)	1(7.8)	2(16.7)	1(9.1)
-congenital anomaly	multiparae	2(11.1)	3(14.3)	1(5.5)	4(23.5)
Initial Bishop's score Mean ±S.D.	primigravidae	2.2 ±0.83	2.4 ±1.05	2.2 ±0.9	2.3 ±0.79
	multiparae	2.4 ±0.9	2.5 ±0.98	2.6 ±0.8	2.4 ±0.68

*E.A.S.I. : Extra-amniotic saline infusion
♣IUD : Intrauterine death
♥I.U.G.R. : Intrauterine growth restriction

Table II-success rate by method and parity

Parameter		E.A.S.I.*		Foley catheter		Oxytocin		Sweeping	
success rate	primigravidae	100%	100%	91.2%	84.6%	83.3%	75%	57.2%	45.5%
	multiparae		100%		95.3%		88.8%		64.7%

* E.A.S.I. : Extra-amniotic saline infusion.

Table-III- Pre- and post-ripening Bishop's score and induction-delivery interval

Parameter		E.A.S.I. mean ± S.D	Foley catheter mean ± S.D.	Oxytocin mean ± S.D.	Sweeping of membranes mean ± S.D.
Initial Bishop's score	primigravidae	2.2 ±0.83	2.4 ±1.05	2.2 ±0.9	2.3 ±0.79
	multiparae	2.4 ±0.9	2.5 ±0.98	2.6 ±0.8	2.4 ±0.68
post-ripening Bishop's score	primigravidae	6.9 ±0.9	5.6 ±1.2	4.6 ±0.4	4.1 ±0.1
	multiparae	7.3 ±1.2	6.05 ±1.1	5.6 ±1.5	4.4 ±0.3
Time between pre- and post-ripening scores	primigravidae	6.1 ±2.5	10.5 ±1.9	14.7 ±2.9	21.6 ±1.3
	multiparae	5.7 ±2.3	10.2 ±1.7	9.3 ±2.7	17.8 ±2.1
Induction-delivery time after successful cervical ripening	primigravidae	7.5 ±1.7	9.4 ±2.1	12.8 ±2.1	12.7 ±0.6
	multiparae	5.8 ±2.5	8.4 ±1.8	10.5 ±2.3	10.7 ±1.2

P-value for two samples student *t*-test comparing the above data

Parameter		1VS*2	1VS3	1VS4	2VS3	2VS4	3VS4
Initial Bishop's score	primigravidae	N.S.[+]	N.S.	N.S.	N.S.	N.S.	N.S.
	multiparae	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.
post-ripening Bishop's score	primigravidae	<0.05	<0.01	<0.01	<0.05	<0.01	<0.01
	multiparae	<0.05	<0.05	<0.01	N.S.	<0.01	<0.05
Time between pre- and post-ripening scores	primigravidae	<0.05	<0.05	<0.01	N.S.	<0.01	<0.01
	multiparae	<0.01	N.S.	<0.01	N.S.	<0.01	<0.01
Induction- delivery time after successful cervical ripening	primigravidae	N.S.	<0.01	<0.01	N.S.	<0.01	N.S.
	multiparae	N.S.	<0.05	<0.01	N.S.	<0.05	N.S.

[+] N.S. : Not significant
* VS : Versus

Table-IV mode of delivery and indications for caesarian section

mode of delivery		E.A.S.I No.(%)		Foley's catheter No.(%)		Oxytocin No.(%)		Sweeping No.(%)	
spontaneous	primi-gravidae	10 (90.9)	27	8 (72.7)	26	3 (33.4)	15	4 (80)	14
	multiparae	17 (94.5)	(93.1)	18 (90)	(83.8)	12 (75)	(60)	10 (90.9)	(87.5)
Instrumental	primi-gravidae	0	0	0	0	1 (11.2)	1	0	0
	multiparae	0		0		0	(4)	0	
Caesarian section	primi-gravidae	1 (9.1)	2	3 (27.3)	5	5 (55.4)	9	1 (20)	2
	multiparae	1 (5.5)	(6.9)	2 (10)	(16.1)	4 (25)	(36)	1 (9.1)	(12.5)

Indication for caesarian section

Failure to progress in labour (CPD)*	1	4	1	1
Fetal distress	1		4	
Failure of induction		1	4	1

* CPD: cephalo - pelvic disproportion

Table-V Neonatal outcome

Neonatal outcome		E.A.S.I	Foley catheter	Oxytocin	sweeping of membranes
Apgar score at 5 minutes	primigravidae	9.0±0.9	9.4±0.6	9.4±0.4	9.1±0.5
Mean ± S.D.	multiparae	9.5±0.3	9.5±0.4	9.2±0.8	9.2±0.6
Birth weight	primigravidae	3.1±0.35	3.1±0.2	3.0±0.16	3.1±0.2
Mean ± S.D.	multiparae	3.2±0.6	3.2±0.3	3.1±0.5	3.3±0.6

References

1. Schreyer P., Sherman D.J., Ariely S. etal. Ripening the highly unfavourable cervix with extraamniotic saline instillation or vaginal prostaglandin E_2 application. *Obstetric and Gynaecology.* 1989; 73: 938.
2. Kerise M.J. and Chalmers I. *Effective care in pregnancy and childbirth*. First edition. 1989. Oxford, Oxford University press: P. 988-1057.
3. John P.E. and Flaherty J.F. The use of breast stimulation to ripen the cervix in term pregnancies. Am. J. Obstet. Gynaecol. 1983. March; 145:553.
4. Swann R.O. Induction of labour by stripping membranes. *Obstetric and Gynaecology*. 1958; 11(1): 74-78.
5. Jackson G.M., Sharp H.T., Varner M.W. Cervical ripening before induction of labour: a randamized trial of prostaglandin E_2 gel versus low-dose oxytocin. *Am. J. Obstet. Gynaecol*. 1994; 171(4): 1092-6.
6. Wilson P.D. A comparision of four methods of ripening the unfavourable cervix. *Br. J. Obstet. Gynaecol*. 1978; 85: 941-944.
7. Al-Dahhan F.H.Ripening of unfavourable cervix prior to induction of labour using Foley's catheter. *Basrah J. of surgery*; 5:
8. Ezimokhai M. and Nwabineli J.N. The use of Foley's catheter in ripening the unfavourable cervix prior to induction of labour. *Br. J. Obstet. Gynaecol*. 1980 April; 87: 281-286.
9. Jagani N., Schulman H. Fleischer A. etal. Role of the cervix in the induction of labour. *Obstet. Gynaecol*. 1982; 59(1): 21-24.
10. Uldjberg N., Ekman G., Malmstrom A., etal. Biochemical and morphological changes of human cervix after local application of prostaglandin E_2 in pregnancy. *Lancet* 1981; ii: 267-268.
11. Lyndrup J. Nickelsen C., Weber T., etal. Induction of labour by balloon catheter with extra-amniotic saline infusion: a randomised comparison with PGE_2 vaginal pessaries. *Eur. J. Obstet. Gynaecol. Reprod. Biol*. 1994 March 15; 53(3): 189-97.
12. Lyndrup J. Nickelsen C., Weber T., etal. Induction of labour by balloon catheter with extra-amniotic saline infusion: a randomised comparison with PGE_2 vaginal pessaries. *Eur. J. Obstet. Gynaecol. Reprod. Biol*. 1994 March 15; 53(3): 189-97.Olah K.S.
13. Hemlin J., Moller B. Extraamniotic saline infusion is promising in preparing the cervix for induction of labour. *Acta-Obstet. Gynaecol. - Scand.* 1998; 77(1): 45-9.