A COMPARATIVE EVALUATION OF ELECTRONIC FOETAL MONITORING VS INTERMITTENT AUSCULTATION AFTER AN INITIAL SCREENING ADMISSION TEST AND ITS IMPACT ON NEONATAL OUTCOME

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ABSTRACT

BACKGROUND

Continuous electronic foetal monitoring is presumably a superior method of screening for foetal hypoxia as it detects subtle changes in the foetal heart, which can be missed on auscultation. However, in developing countries like India, with limited number of cardiotocography machines available, it was endeavoured to find out if after an initial 20 minutes electronic recording of the foetal heart auscultation could be substituted for electronic foetal monitoring for intrapartum foetal surveillance even in women with category II admission test who were considered to be at high risk for intrapartum foetal hypoxia.

Aim: To comparatively study, in women with category II admission test, the neonatal outcome with electronic foetal monitoring and intermittent auscultation.

MATERIALS AND METHODS

42 women with category II admission test were randomly divided into two groups: Group I was monitored with intermittent auscultation and Group II received continuous electronic foetal monitoring.

RESULTS

Operative vaginal delivery for foetal distress was used in 14.28% cases in Group I as compared to 19% in Group II, but the difference was not statistically significant ($p = 0.67$). Caesarean section for the indication of foetal distress was performed in 47.62% cases in the intermittent auscultation group and 52.38% cases in Group II ($p = 0.54$). There was no statistically significant difference in the neonatal morbidity and mortality in the two groups.

CONCLUSION

An admission test followed by intermittent auscultation with stethoscope during and after uterine contractions should be the mainstay of foetal monitoring in labour and is the best way of using the limited number of foetal monitors available in developing countries with economic constraints.

KEY WORDS

Electronic Foetal Monitoring, Intermittent Auscultation, Admission Test.

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BACKGROUND

Foetal evaluation in the intrapartum period is increasing in our quest to improve neonatal morbidity and mortality rates. Birth asphyxia is one of the major causes of neonatal deaths in India.¹ Reduction in neonatal mortality will be a major contributory factor in bringing down the infant mortality rate and will aid in mission 20/20 to accelerate the reduction in IMR with a target to achieve an IMR of 20 by the year 2020.² Continuous CTG is generally recommended for women who are regarded as being at increased risk of neonatal morbidity and mortality (NICE 2014).³ It is presumed to be a superior

method of screening for foetal hypoxia as it detects subtle changes in the foetal heart, which can be missed on auscultation. It has been found that under clinical conditions, the overwhelming majority of compromised fetuses will reflect their status during labour by some abnormality in the FHR pattern. Assessment of possible benefits of continuous electronic foetal monitoring is pertinent since this technique requires capital expenditure, educational programs for its correct interpretation and decision making and increased patient surveillance. In countries like India where only a few cardiotocography machines are available, even in the tertiary level hospitals, it is imperative to select patients who require intensive intrapartum foetal surveillance and also to study the benefits if any of continuous electronic foetal monitoring over intensive intermittent auscultation with stethoscope during labour. Foetal Heart Rate (FHR) changes and foetal acidosis may occur in the low as well as in the high-risk pregnancies. There is no such thing as 'no risk' in obstetrics. There is 'low risk' and 'high risk' with a common phenomenon being a change in risk with time from the former to the latter.⁴ So it is imperative to select fetuses at

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risk of developing foetal distress for intensive intrapartum monitoring, not only from the high risk but also in the low risk pregnancies. Hence, some form of risk assessment at the beginning of labour or an admission test⁴ might detect intrauterine foetal hypoxia already present at admission and might have some predictive value for foetal hypoxia that may develop in labour. The admission test is a screening test for detecting patients at risk of developing intrapartum foetal hypoxia. It is a short 20 minutes external electronic recording of the foetal heart and uterine contractions on the electronic cardiotocography machine at admission in labour. To meet the optimal utilisation of the few cardiotocography monitors available, we performed an admission test and endeavoured to find out if after an initial 20 minutes electronic recording of the foetal heart, auscultation could be substituted for electronic foetal monitoring for intrapartum foetal surveillance even in the high-risk group by comparing the neonatal morbidity and mortality and operative intervention for foetal distress in the two groups. In the literature searched, no study had compared intermittent auscultation with electronic foetal monitoring in women at high risk of foetal asphyxia after an initial admission test.

MATERIALS AND METHODS

At admission in early labour in the labour room of a medical college hospital in Delhi, 358 patients were subjected to electronic foetal monitoring for 20 minutes using electronic cardiotocographic machine. These consisted of cases from both low and high-risk pregnancy. The high-risk pregnancies included PIH (BP > 140/90 at admission with or without proteinuria), prolonged pregnancy (40 - 42 weeks) and unexplained Intrauterine Growth Retardation (IUGR). All the patients included in the study were primigravidae, between 20 to 30 years of age, with gestational age between 37 and 42 weeks and with cephalic presentation. Patients with complications- Antepartum haemorrhage, previous bad obstetric history, malpresentations, premature rupture of membranes, multiple pregnancies, Rh negative pregnancy, diabetes mellitus, hypertension, heart disease, moderate or severe anaemia, UTI and collagen vascular disease were excluded from the study.

All the patients were subjected to a detailed history, physical examination and routine investigations. All patients were subjected to an Admission Test: a twenty minutes recording of foetal heart and uterine contractions using electronic cardiotocographic machine at admission in labour. The FHR tracing was categorised according to the classification proposed in ACOG practice bulletin 2009.⁵

Following the admission test, women with category I admission test were considered low risk for development of intrapartum hypoxia and monitored with routine auscultation. Women with category III admission test were considered as foetal distress, at admission in early labour in the labour room of a medical college hospital in Delhi.

In the present randomised controlled study, sample size was 42 for convenience and included women with category II admission test considered at high risk for development of intrapartum hypoxia. These women were randomly divided into two groups. Randomisation was performed with a

computer-generated random number table. Assignments were placed in sealed, serially numbered opaque envelopes. Women were allowed through randomisation to either electronic foetal monitoring or intermittent auscultation group. It was a non-blinded open study. Investigators and subjects both knew the group assigned after random allocation-

Group I- Women were subjected to intrapartum foetal surveillance by intensive intermittent auscultation with stethoscope.

Group II- Women were subjected to intrapartum foetal surveillance by continuous electronic foetal monitoring. Intermittent auscultation of the foetal heart was performed during and 30 seconds after contractions in accordance with ACOG recommendations, which are as follows:

Stage of Labour	High Risk Patients
First stage of labour	Every 15 minutes
Second stage of labour	Every 5 minutes

The details of progress of labour were recorded. The mode of delivery whether spontaneous vaginal or any operative intervention- LSCS, forceps or vacuum and the indication for its use was noted. Every delivery was attended by a paediatrician. The condition of the neonate at birth was recorded in detail. Any need for resuscitation- endotracheal suction, oxygen, bag and mask ventilation, intubation and intermittent positive pressure ventilation was recorded. Admission to neonatal nursery or neonatal intensive care unit, indication for admission, duration of stay and condition at discharge were also recorded.

Foetal Indicators of Intrapartum Asphyxia

1. Abnormal foetal heart pattern as detected by EFM and auscultation with stethoscope.
2. Meconium stained liquor.
3. Low Apgar score at 1 and 5 minutes.
4. Umbilical cord blood gas analysis indicating acidaemia.
5. Neonatal morbidity and mortality due to foetal asphyxia.

The detection of intrapartum foetal hypoxia was comparatively evaluated in the two groups.

The SPSS software package version 10.0 was used for all calculations. Continuous data such as age, height, weight etc. were described by mean and standard deviation and these were compared by student's t-test. Categorical data such as FHR pattern, type of delivery etc. were described by frequency and percentage. These were compared with Chi-square test. P value < 0.05 was considered as significant.

RESULTS

Women with category II admission test were considered as high risk for development of intrapartum hypoxia were recruited in the present study to evaluate if intermittent auscultation can be used as efficaciously as continuous EFM after an initial admission test. They were randomly divided into two groups and monitored with intermittent auscultation and EFM respectively.

Sr. No.	Parameter	Group I (n= 21) Intermittent Auscultation		Group II (n= 21) Continuous EFM		Statistical Analysis
		Mean	SD	Mean	SD	
1	Parity	Primigravida		Primigravida		
2	Age (in years)	22.524 (20-28)	2.71	22.74 (20-29)	2.22	P= 0.81
3	Height (in cm)	158.4 (144-165)	6.21	157.30 (145-164)	6.10	P= 0.26
4	Weight (in kgs)	53.64 (48-63)	4.10	53.90 (47-63)	7.4	P= 0.62
5	Mean POG (in days)	278.33 (265-289)	6.89	277.19(265-287)	6.04	P= 0.57
6	Hb (in gm%)	10.38(8.4-12.3)	1.02	9.83(8-13)	1.22	P= 0.91
7	Booked: Unbooked patients	9:12		7:14		P= 0.57

Table I. Comparative Evaluation of the Clinical and Laboratory Parameters in the Two Groups

The two study groups are comparable to each other with respect to parity, age, height, weight, mean period of gestation, haemoglobin and registration status.

Parameters	Group I (n=21)		Group II (n=21)		Statistical Analysis
	IA		Continuous EFM		
	No	%	No	%	
Spontaneous labour	16	76.19	15	71.43	P=0.73
Induced labour	5	23.81	6	28.57	P=0.73
Oxytocin Augmentation	3	14.29	1	4.76	P=0.29
	Mean	SD	Mean	SD	
Duration of 1st stage of labour (hrs.)	13:0 (11-15)	1:25	12:4 (9:45-15:30)	2:14	P=0.79
Duration of 2nd stage of labour (min)	31 (10-45)	30:15	21 (10-35)	8:39	P=0.73
Admission delivery interval	3:30 (1:45-13:35)	6:12	6:55 (1:15-15:19)	3:51	P=0.59
Mean birth weight (in kgs)	2.58 (1.98-3.1)	0.342	2.76 (1.42-3.420)	0.523	P=0.54
Table II. Comparative Evaluation of the Labour Parameters					

The two study groups showed no statistically significant difference as regards to various labour parameters.

Sr. No.	Parameter	Group I (n= 21)		Group II (n= 21)		Statistical Analysis
		IA		Continuous EFM		
		No	%	No	%	
1	Abnormal FHR pattern in 1st stage	6	28.57	12	57.14	0.06
2	Abnormal FHR pattern in 2nd stage	3	14.28	5	23.80	0.43
3	MSL	12	57.14	9	42.86	0.35
4	Abnormal FHR pattern and MSL	5	23.80	6	42.86	0.91
Table III. Indicators of Intrapartum Foetal Hypoxia in the Two Groups						

- The detection of abnormal FHR pattern in the first stage was higher in the EFM Group 12 (57.14%) as compared to the IA Group 6 (28.57%), the difference almost reaching statistical significance (p= 0.06).
- 12 (57.14%) of IA group patients showed meconium stained liquor at rupture of membranes compared to 9 (42.86%) of EFM group. The difference was statistically insignificant (p= 0.35).

Mode of Delivery	Group I (n= 21)		Group II (n= 21)		Statistical Analysis
	IA		Continuous EFM		
	No	%	No	%	
Spontaneous	9	42.86	6	28.57	P= 0.34
Foetal distress	3	14.28	1	4.76	P= 0.29
No foetal distress	8	38.10	5	23.80	P= 0.31
Forceps and Vacuum	3	14.28	4	19.05	P= 0.67
Foetal distress	3	14.28	4	19.05	P= 0.67
Other indications	0	0.00	0	0.00	
Caesarean section	9	42.86	11	52.38	P= 0.54
Foetal distress	9	42.86	11	52.38	P= 0.54
Other indicators	0	0.00	0	0.00	
Total (N) (%)	44		42		

Table IV. Mode of Delivery in the Two Groups

Operative vaginal delivery for the indication of foetal distress was used in 3 (14.28%) cases in the intermittent auscultation group and in 4 (19.05%) cases in the continuous electronic foetal monitoring group ($P= 0.67$).

Caesarean section for the indication of foetal distress was performed in 9 (47.62%) cases in the intermittent auscultation group and 11 (52.38%) cases in the continuous electronic foetal monitoring group ($P= 0.54$).

Sr. No.	Parameter	Group I (n= 21)		Group II (n= 21)		Statistical Analysis
		IA		Continuous EFM		
		No	%	No	%	
1	Apgar Score < 7 a - at 1 m b - at 5 m	6 2	28.57 9.52	4	19.04 0.00	$P= 0.12$ $P= 0.15$
2	Resuscitation a) Endotracheal suction b) Oxygen c) Bag and Mask d) Intubation and IPPV e) Cardiac massage	12 8 3 4 1	57.14 38.10 14.28 19.05 4.76	9 5 3 1 0	42.86 23.80 14.28 4.76 0	$P= 0.35$ $P= 0.32$ $P= 1.0$ $P= 0.15$ $P= 0.31$
3	Neonatal death a- Asphyxia b- Other causes	1 0	0.91 0.00	1 0	0.91 0.00	$P= 1.0$
4	Neonatal morbidity due to birth asphyxia a) MAS b) Neonatal seizures	2 1	9.52 0.91	2 0	9.52 0.00	$P= 1.0$ $P= 0.31$
5	Admission to nursery/ NICU a- asphyxia b- other causes	5 0	23.81 0.00	3 0	14.29 0.00	0.43
6	Cord blood (venous) PH < 7.20 Base excess > 8 Bicarbonate < 19 PO ₂ < 22 PCO ₂ > 40	5 9 10 0 15	23.81 42.86 47.62 0 71.43	3 6 8 0 11	14.29 28.57 38.10 0 52.38	0.43 0.34 0.53 1.0 0.20

Table V. Neonatal Outcome in the Two Groups

There was no statistically significant difference in the neonatal outcome in the intermittent auscultation and the continuous electronic foetal monitoring groups as shown in Table VI. However, the only case of neonatal seizure was reported in the intermittent auscultation group.

DISCUSSION

Electronic foetal monitoring brought hope that there could be a way of detecting in utero, an already compromised foetus as well as a foetus in the process of deterioration during labour and delivery. Presumed to be a superior method of screening for foetal asphyxia as compared with intensive intermittent auscultation, electronic foetal monitoring provided continuous data with written documentation on the foetal response to labour and was considered especially helpful in the management of labour with attendant risk factors. Even for the most experienced healthcare professionals, it is impossible to recognise subtle features of the FHR, such as variability. Performing regular intermittent auscultation ensures frequent contact between healthcare professionals and the labouring women, offering the opportunity for social and clinical support. It facilitates the assessment of other physical parameters such as maternal skin tone, temperature, breathing patterns, direct palpation of foetal movements and maternal contractions.⁶ Intermittent auscultation permits the foetal heart to be monitored in various positions and locations and favours the mobility of labouring women, which has been shown to benefit the progress of labour.⁷

Continuous CTG is generally recommended for women who are regarded as being at increased risk of neonatal morbidity and mortality (NICE 2014).³ In spite of the several limitations of auscultation, the results of several clinical trials of electronic foetal monitoring purportedly support the notion that auscultation is comparable to electronic foetal monitoring. To meet the optimal utilisation of the few cardiotocography monitors available, we performed an admission test and endeavoured to find out if after an initial 20 min. electronic recording of the foetal heart, auscultation could be substituted for electronic foetal monitoring for intrapartum foetal surveillance even in the high-risk group.

Our study population had women from both high and low risk pregnancies who showed a category II admission test result. A higher number of women in the electronic foetal monitoring group showed abnormal foetal heart rate pattern in the first and second stage- 12 (57.14%) and 6 (28.57%) respectively as against 6 (28.57%) and 3 (14.28%) in the intensive intermittent auscultation group respectively. The difference in the abnormal FHR pattern detection in first stage almost reached statistical significance ($P= 0.06$ respectively). This may have been because electronic foetal monitoring can detect subtle abnormalities in foetal heart

pattern, which are missed by auscultation (Schiffrin et al 1992).⁸

Chen et al 2011 compared EFM to no EFM in labour using data from US birth certificates from 2004.⁹ The primary finding was that EFM during labour significantly lowered early neonatal (within the first 6 days of birth) and infant mortality (Deaths within the first year) (RR 0.50, $p < .001$) with the greatest benefit observed in preterm births: 28 – 31 weeks' gestation (14.9 vs. 28.6, $p < .001$); 32 – 33 weeks' gestation (2.4 vs. 6.3, $p = .001$); and 34 – 36 weeks' gestation (0.5 vs. 1.3, $p < .001$). There was no benefit of EFM on newborn mortality in the late neonatal period (7 - 27 days after birth) (0.5 vs. 0.6, $p = .402$) and post-neonatal period (28 - 364 days after birth) (1.7 vs. 1.8, $p = .296$). Although, continuous EFM did have a beneficial effect on preventing neonatal mortality in preterm births, the benefit decreased as the foetus got closer to a term birth. Our study was conducted on women with term pregnancy and no statistically significant difference was observed in the neonatal mortality and morbidity in the two groups.

Kumari et al 2015 in their similar study of neonatal outcome in low-risk pregnancies found that incidence of LSCS was 23% in CTG group as against 9% in IA group (P value of 0.02).¹⁰ The incidence of MSL, Apgar scores at 1, 5 and 10 minutes and NICU admissions were comparable in both the groups in their study. In the present study, the incidence of caesarean section for foetal distress was higher in EFM (52.38%) as compared to IA (42.86%) group, but the difference was not statistically significant. Apgar score was less than 7 at 1 min in 6 (28.57%) and 4 (19.04%) patients and in the intermittent auscultation and electronic foetal monitoring groups respectively. 12 (57.14%) of II Group patients showed meconium stained liquor at rupture of membranes compared to 9 (42.86%) of EFM group. The difference was not statistically significant for both parameters. The incidence of MSL, Apgar scores at 1, 5 and 10 minutes and NICU admissions were comparable in both the groups in their study.

Alfirevic et al 2017 in a review of Cochrane trials concluded that compared with intermittent auscultation, continuous cardiotocography showed no significant improvement in overall neonatal death rate (Risk Ratio (RR) 0.86), but was associated with halving neonatal seizure rates (RR 0.50).¹¹ However, there was no difference in cerebral palsy rates (RR 1.7). There was an increase in caesarean sections associated with continuous CTG (RR 1.63). Women were also more likely to have instrumental vaginal births (RR 1.15). The only case of neonatal seizures in our study was in the IA group, but the difference was not statistically significant. Only two neonatal deaths occurred, one each in both the groups. There were no stillbirths in our study and both the neonatal deaths were early neonatal deaths. There was no difference in the incidence of cord blood acidosis (RR 0.92) in the study by Alfirevic et al. In our study, a total of 8 (19.05%) cases with category II admission test showed umbilical cord (venous) acidemia at birth. Of these a higher number, 5 (23.81%) belonged to EFM group and 3 (14.29%) belonged to the IA group, but the difference was not statistically significant. All of them showed metabolic acidosis. MSL was present in 5 (62.5%) of babies with acidemia. Operative intervention for foetal distress (Caesarean section or forceps) was required in all these

cases. 6 (75%) of these babies required admission to Nursery/NICU for birth asphyxia.

Devane et al 2017 compared the effects of admission CTG with intermittent auscultation of the FHR on maternal and infant outcomes for pregnant women without risk factors on their admission to the labour ward.¹² They reviewed four trials involving more than 13,000 women. Although not statistically significant using a strict $P < 0.05$ criterion, data are consistent with women allocated to admission CTG having on average a higher probability of an increase in incidence of caesarean section than women allocated to intermittent auscultation (Risk ratio (RR) 1.20. There was no significant difference among women allocated to admission CTG or intermittent auscultation in instrumental vaginal birth (RR 1.10 and foetal and neonatal deaths (RR 1.01, women allocated to admission CTG had, on average, significantly higher rates of continuous electronic foetal monitoring during labour (RR 1.30, and foetal blood sampling (RR 1.28). They concluded that there is no evidence of benefit for the use of the admission CTG for low-risk women. Furthermore, the probability is that admission CTG increases the caesarean section rate by approximately 20%. However, the data lacked power to detect possible important differences in neonatal mortality.

Martis et al 2017 reviewed 6241 women from Cochrane Pregnancy and Childbirth Group's Trials Register and found that there was no clear difference between women monitored with continuous CTG or intermittent auscultation with regard to low Apgar scores at five minutes (risk ratio of 0.66).¹³ There were no clear differences for neonatal mortality (RR 0.88. Neonatal seizures were reduced in the EFM group (RR 0.05). Long-term outcomes for the baby (including neurodevelopmental disability and cerebral palsy) were not reported. For maternal outcomes, women allocated to intermittent electronic foetal monitoring (EFM) (CTG) had higher rates of caesarean section for foetal distress (RR 2.92) compared with women allocated to routine auscultation. There was no clear difference between groups in instrumental vaginal births (RR 1.46), a finding corroborated in our study.

CONCLUSION

Effective intrapartum foetal surveillance is critical to improve early neonatal mortality and morbidity. An admission test followed by intermittent auscultation with stethoscope during and after uterine contractions should be the mainstay of foetal monitoring in labour and is the best way of using the limited number of foetal monitors available in developing countries with economic constraints.

REFERENCES

- [1] Lahariya C, Sudfeld CR, Lahariya D, et al. Causes of child deaths in India, 1985-2008: a systematic review of literature. *Indian J Pediatr* 2010;77(11):1303-11.
- [2] Kamath SS. Reducing the infant mortality rate of India to 20 by 2020: together we can do. *Indian Pediatr* 2015;52:193-4.
- [3] NICE clinical guideline CG 190: intra-partum care of healthy women and their babies during childbirth. National Institute for Health and Clinical Excellence. Dec 2014. www.nice.org.uk

- [4] Gibb D, Arulkumaran S. Medico-legal issues. Chap – 15. Fetal monitoring in practice. 3rd edn. Elsevier Ltd., 2008.
- [5] American College of Obstetricians and Gynaecologists. Intra-partum fetal heart rate monitoring: nomenclature, interpretation and general management principles. Practice Bulletin No 106, July 2009.
- [6] Lawrence A, Lewis L, Hofmeyr GJ, et al. Maternal positions and mobility during first stage labour. Cochrane Database Syst Rev 2013;(10):CD003934.
- [7] Lewis D, Downe S, FIGO Intrapartum Fetal Monitoring Expert Consensus Panel. FIGO consensus guidelines on intrapartum fetal monitoring: Intermittent auscultation Int J Gynecol Obstet 2015;131(1):9-12.
- [8] Schiffrin BS, Amsel J, Burdorf G. The accuracy of auscultatory detection of fetal cardiac decelerations: a computer simulation. Am J Obstet Gynecol 1992;166(2):566-76.
- [9] Chen HY, Chauhan SP, Ananth CV, et al. Electronic fetal heart rate monitoring and its relationship to neonatal and infant mortality in the United States. American Journal of Obstetrics & Gynecology 2011;204(6):491.e1-e10.
- [10] Kumari VR, Indiramani, Chakravarthy K, et al. A Comparative study of neonatal outcome in low risk pregnancies with CTG monitoring and intermittent auscultation. Journal of Evolution of Medical and Dental Sciences 2015;4(105):17038-42.
- [11] Alfirevic Z, Devane D, Gyte GML, et al. Continuous cardiotocography (CTG) as a form of electronic fetal monitoring (EFM) for fetal assessment during labour. Cochrane Database of Systematic Reviews 2017;2:CD006066.
- [12] Martis R, Emilia O, Nurdianti DS, et al. Intermittent auscultation (IA) of fetal heart rate in labour for fetal well-being. Cochrane Database Syst Rev 2017;2:CD008680.
- [13] Devane D, Lalor JG, Daly S, et al. Cardiotocography versus intermittent auscultation of fetal heart on admission to labour ward for assessment of fetal wellbeing. Cochrane Database Syst Rev 2017;1:CD005122.