Original Article

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Impact of Intrapartum Cardiotocographic Monitoring On Neonatal Outcome in High Risk Pregnancies: Our Experience

Arul Anne Rose S.*, Ganitha G.*

Abstract

Aim: To evaluate the impact of intrapartum Cardiotocographic (CTG) monitoring on neonatal outcome in high risk pregnancies in our setup. The basic principle of intrapartum fetal monitoring is to identify the developing fetal hypoxia and to intervene appropriately, thereby decreasing the perinatal morbidity and mortality. *Methods*: It was a hospital based prospective study over a period of one year. Admission CTG was done for the study population, trace was interpreted. The following parameters like color of the liquor, Mode of delivery, Appearance, Pulse, Grimace, Activity and Respiration (APGAR) and Neonatal Intensive Care Unit (NICU) admission were noted and recorded. The results were analysed using SPSS Software version 20. *Results*: Among the study population 80% had normal trace, 8.7% had suspicious trace and 11.3% had pathological trace. Meconium stained liquor was present in 24.2%, 30.8%, 70.6% of normal, suspicious and pathological traces respectively. 15% of normal trace, 61.5% of suspicious and 88.2% of pathological trace groups were delivered by Lower Segment Caesarean Section (LSCS). APGAR score at 5 minutes of birth was <7 in 3.3%, 38.5% and 82.4% of normal, suspicious and pathological trace groups respectively. When NICU admission was analysed 0.8%, 23.1% and 76.5% of normal, suspicious and pathological trace groups were admitted in NICU respectively. Sensitivity, specificity, positive predictive value and negative predictive value of CTG towards 5min APGAR and NICU admission were calculated based on the results of the normal and pathological trace groups. *Conclusion*: Our study concluded that the admission CTG can be used as an important non invasive tool to diagnose fetal compromise at the time of admission and during the course of labour in high risk cases especially in the era of potential litigations in Obstetrics.

Keywords: Cardiotocogram; High Risk Pregnancy; Neonatal Outcome.

*Associate Professor, Department of Obstetrics and Gynaecology, Tagore Medical College and Hospital (affiliated to The Tamilnadu Dr. MGR Medical University), Rathinamangalam, Chennai, Tamil Nadu-600 127, India.

Corresponding Author:
Arul Anne Rose S.,
Associate Professor, Department of Obstetrics and Gynaecology, Tagore Medical College and Hospital (affiliated to The Tamilnadu Dr. MGR Medical University), Rathinamangalam, Chennai, Tamil Nadu-600 127, India.
E-mail: annejoan04@gmail.com

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Introduction

Intrapartum CTG is a test which is used to monitor the fetal heart rate and maternal uterine contractions that can be recorded electronically on a paper trace. It is done using a Doppler ultrasound transducer and a pressure transducer[1]. In present day obstetrics use of continuous electronic fetal heart monitoring is increased rapidly[2,3]. The National Institute of Clinical Excellence(NICE) and Royal College of Obstetrics and Gynaecology(RCOG) have classified the fetal heart rate features and traces as normal, suspicious and pathological [4] (Table 1,2).

Settings on CTG machines should be standardised, so that:

- Paper speed is set to 1 cm/min
- Sensitivity displays are set to 20 bpm/cm
- FHR range displays of 50–210 bpm are used.

Continuous CTG is generally recommended for pregnant mothers who are considered as being at risk of increased perinatal morbidity and mortality [5,6]. The basic principle of intrapartum fetal monitoring is to identify the developing fetal hypoxia in order to prevent subsequent acidaemia and cell damage[7]. A number of observational studies have evaluated the potential risk factors for occurrence of fetal hypoxia and fetal acidosis which finally end up in the development of cerebral palsy, perinatal death and neonatal encephalopathy[8,9]. Recent evidence has confirmed a strong association between low APGAR(5 min after birth)and cerebral palsy in both low and normal birth weight infants [10]. Certain risk factors are being identified as indicators for continuous CTG monitoring in labour [11].

The aim of our study is to evaluate the impact of intrapartum Cardiotocographic monitoring on neonatal outcome in high risk pregnancies in our setup.

Aim

To evaluate the impact of intrapartum Cardiotocographic monitoring on neonatal outcome in high risk pregnancies in our setup.

Methods

The study was a hospital based prospective study conducted in Dept of OB-GYN in our teaching medical college and hospital over a period of one year. After getting informed consent, study population was selected as per our inclusion and exclusion criteria.

Inclusion Criteria

All high risk cases at term in spontaneous labour

Exclusion Criteria

- Preterm Labour
- Anomalous Baby
- Acute obstetric emergencies which need immediate delivery or intervention (massive abruption, cord prolapse, uterine rupture)
- Multiple pregnancy, malpresentations
- Patients planned for elective LSCS.

Admission CTG was done for the study population, trace was interpreted. Patients with normal CTG were further monitored by intermittent auscultation of FHR.Patients with abnormal CTG were monitored by continuous CTG. All patients were delivered within 24 hours after the onset of true labour pains.

The following parameters were noted and recorded.

Color of the liquor

Mode of delivery

APGAR

NICU admission

The results were analysed using SPSS Software version 20

Results

150 patients were included in this study. Distribution of the risk factors was shown in Table 3.

Among these 150 patients 80% had normal trace, 8.7% had suspicious trace and 11.3% had pathological trace (Table 4). Meconium stained liquor was present in 24.2%, 30.8% and 70.6% of normal, suspicious and pathological traces respectively (Table 5). 15% of normal trace, 61.5% of suspicious and 88.2% of pathological trace groups were delivered by LSCS (Table 6).

APGAR score at 5minutes of birth was <7 in 3.3%, 38.5% and 82.4% of normal, suspicious and pathological trace groups respectively (Table 7). When NICU admission was analysed 0.8%, 23.1% and 76.5% of normal, suspicious and pathological trace groups were admitted in NICU respectively (Table 8).

Sensitivity, specificity, positive predictive value and negative predictive value of CTG towards 5min

Table 1: Categorisation of fetal heart rate traces

Category	Definition
Normal	A cardiotocograph where all four features fall into the reassuring category
Suspicious	A cardiotocograph whose features fall into one of the nonreassuring categories and the remainder of the features are reassuring
Pathological	A cardiotocograph whose features fall into two or more nonreassuring categories or one or more abnormal categories

Table 2: Categorisation of fetal heart rate (FHR) features

Feature	Baseline(bpm)	Variability(bpm)	Decelerations	Accelerations
Reassuring	110–160	≥ 5	None	Present
Non-reassuring	100–109 161–180	< 5 for ≥ 40 but less than 90 minutes	Early deceleration Variable deceleration Single prolonged deceleration up to 3 minutes	
Abnormal	< 100 > 180 Sinusoidal pattern ≥ 10 minutes	< 5 for ≥ 90 minutes	Atypical variable decelerations Late decelerations Single prolonged deceleration > 3 minutes	

The absence of accelerations with an otherwise normal cardiotocograph is of uncertain Significance

Table 3: Distribution of High Risk Cases

Diagnosis	No of cases	Percentage (%)
Post dated	23	15.3%
Pregnancy induced hypertension	59	39.3%
Bad obstetric history	10	6.7%
Oligohydramnios	11	7.4%
Anemia	18	12%
Previous LSCS for VBAC	10	6.7%
Decreased fetal movements	5	3.3%
IUGR	8	5.3%
Placenta previa	2	1.3%
Abruptio placenta Gr I	4	2.7%

Table 4: CTG Interpretation

CTG Trace	Number	Percentage
Normal	120	80%
Suspicious	13	8.7%
Pathological	17	11.3%

Table 5 CTG and Colour of the Liquor

CTG Trace	Clear	Meconium
Normal	91(75.8%)	29(24.2%)
Suspicious	9(69.2%)	4(30.8%)
Pathological	5(29.4%)	12(70.6%)

Table 6: CTG and Mode of Delivery

CTG Trace	Vaginal Delivery	LSCS
Normal	102(85%)	18(15%)
Suspicious	5(38.5%)	8(61.5%)
Pathological	2(11.8%)	15(88.2%)

Table 7: CTG and APGAR Score (5min)

CTG Trace	>7-Good	<7-Poor
Normal	116(96.7%)	4(3.3%)
Suspicious	8(61.5%)	5(38.5%)
Pathological	3(17.6%)	14(82.4%)

Table 8: CTG and Neonatal Admissions

CTG Trace	No	Yes
Normal	119(99.2%)	1(0.8%)
Suspicious	10(76.9%)	3(23.1%)
Pathological	4(23.5%)	13(76.5%)

Table 9: Sensitivity and Specificity of CTG for Fetal Outcome

Outcome	Sensitivity	Specificity	PPV	NPV
5Min APGAR	77.8%	97.5%	82.4%	96.7%
NICU Admission	92.9%	96.7%	76.5%	99.2%

APGAR and NICU admission were calculated based on the results of the normal and pathological trace groups and shown in Table 9.

Discussion

There are a number of antenatal and intrapartum risk factors which are associated with the development of neonatal encephalopathy, cerebral palsy or perinatal death. Most experts believe that continuous CTG monitoring should be considered in all situations where there is a risk for fetal hypoxia-acidosis[12,13]. But however the routine use of admission CTG for low risk women has been associated with increased caesarean delivery and no improvement in perinatal outcomes[14]. Admission CTG is a 20minutes continuous CTG recording immediately after admission to the labour room, thereby segregating the high risk women into normal, suspicious and pathological groups. The pathological group is more vulnerable to adverse fetal outcomes [15,16].

In our study population 80% had normal, 8.7% had suspicious and 11.3% had pathological traces. Similar study by Sandhu et al reported that in high risk pregnancies 67% had normal, 23% had equivocal and 10% had abnormal traces [17]. In another study by Rahman et al in high risk pregnancies admission CTG showed reactive trace in 77%, equivocal in 14.4% and ominous in 8.7%. Meconium stained liquor was present in 30.8% of suspicious and 70.6% of pathological traces in our study which was similar to few other studies. In present study 15% of normal trace, 61.5% of suspicious and 88.2% of pathological trace groups were delivered by LSCS.Number of LSCS was increased in pathological trace patients which was similar to many other studies [18,19].

In present study, 3.3% of normal, 38.5% of suspicious and 82.4% of pathological trace babies had poor APGAR at 5 minutes(<7). Libiran et al reported fetal asphyxia in 6.5% of reactive group and 50% of the ominous group where fetal asphyxia was measured by APGAR and/umbilical cord blood pH [20]. In a study by Rahman et al, 4.1% of reactive trace and 57% of ominous group babies developed intrapartum fetal hypoxia which was measured by APGAR and/cord blood pH <7.2 [18]. Thacker et al also revealed that 1.6% of reactive and 8.7% of abnormal admission test showed APGAR <7 at 5 minutes [13]. In our study 0.8% of normal, 23.1% of suspicious and 76.5% of pathological trace babies were admitted in NICU. In a similar study by Trupti et al also reported that 9% of normal, 50% of suspicious and 75%of abnormal trace babies were admitted in NICU[19]. A study by Sharbaf et al in high risk pregnancies also revealed that the risk of low birth weight and NICU admission increased with abnormal CTG [21].

Sensitivity, specificity,positive predictive value and negative predictive value of CTG towards 5min APGAR and NICU admission were calculated based on the results of the normal and pathological trace groups and shown in Table 9. Behuria et al reported that the sensitivity, specificity and positive predictive value of CTG for 5 min APGAR were 44.4%,95% and 50% respectively[22]. Negative predictive value of CTG for NICU admission in our study corroborated with results reported by Trupti et al [19]. Positive predictive value of CTG towards NICU admission in our study was similar to a study by Behuria et al [22] whereas 33% in a study reported by Sandhu et al [17]. Altogether, CTG had a good negative predictive value towards APGAR and NICU admission.

Possible advantages of CTG are more measurable parameters related to FHR patterns and the CTG trace gives a continuous recording of the FHR and uterine activity. It is a physical record, which can be examined at any time in labour, or subsequently, if required. The examples where physical records may be useful include clinical audits, counselling parents if there have been an adverse outcome, and medico-legal

situations. Possible disadvantages of CTG are the complexity of FHR patterns makes standardisation difficult. CTG prevents mobility and restricts the use of massage, different positions, control and coping strategies during labour. Shifting staff focus and resources away from the mother may encourage a belief that all perinatal mortality and neurological injury can be prevented [1].

Conclusion

The admission CTG can be used as an important non invasive tool to diagnose fetal compromise at the time of admission and during the course of labour in high risk cases especially in the era of potential litigations in Obstetrics. But CTG monitoring should never be regarded as a substitute for good clinical observation and decision or as an excuse for leaving the pregnant mother unattended in labour.

Abbreviations

CTG-Cardiotocogram, NICU-Neonatal Intensive Care Unit,APGAR-Appearance, Pulse, Grimace, Activity and Respiration, LSCS-Lower Segment Caesarean Section, NICE-National Institute of Clinical Excellence, RCOG -Royal College of Obstetrics and Gynaecology, VBAC-Vaginal Birth After Caesarean, FHR-Fetal Heart Rate, IUGR-Intra Uterine Growth Restriction.

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