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Correlation of intrapartum cardiotocography with meconium staining of liquor and newborn admissions in primary caesarean cases

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Abstract
Objective: To determine the predictability of intrapartum cardiotocography with meconium staining of liquor and the subsequent requirement for newborn admissions.
Methods: This cross sectional study was conducted at obstetrics and gynaecology department, KAP Viswanatham Medical College, Tiruchirapalli from September 2018 to February 2019 and consisted of women in labor taken up for primary caesarean section with various indications. Their cardiotocographic findings were analysed and was correlated with colour of liquor and the need for newborn admissions. Intrapartum cardiotocography was performed and the findings were recorded. The colour of liquor was observed. Cardiotocography was performed for 20 minutes in left lateral position during labor.
Inclusion Criteria: 1) Primary caesarean section patients. 2) Gestational age greater than 37 weeks.
Exclusion criteria: 1) Preterm, intrauterine death and congenital anomalies. 2) Antepartum haemorrhage. 3) Cord prolapse.
Results: Among the total 212 patients, 117 (55%) CTGs were reactive and 95 (45%) CTGs were non reactive and abnormal. The most common indication for primary caesarean section during this period was fetal distress 93 (43.8%). Out of the 117 reactive CTGs, 108 (50.9%) had clear liquor and 9 (4.2%) had meconium stained liquor. Of the 95 non reactive CTGs, 53 (25%) had clear liquor and 42 (19.9%) had meconium stained liquor. Of the 117 normal CTGs, 17 (8.1%) babies required newborn admissions. Of the 95 abnormal CTG, 55 (25.9%) babies required newborn admissions. Of the high risk patients, premature rupture of membranes (PROM) patients had the highest percentage of pathological CTGs. Among the patterns of pathological CTG, late decelerations 28 (29.4%) were the commonest finding.
Conclusion: Cardiotocography is an important tool for monitoring of fetal well-being during pregnancy and labor. Pathological CTG implicates higher probability of perinatal asphyxia. Unfortunately, CTG also has large number of false positive findings. Significant CTG changes were seen in clear liquor patients also. Hence additional evaluation for ongoing hypoxia like ultrasound, Doppler examination and pH monitoring should be cautiously used. Both abnormal CTG and meconium stained liquor are a definitive sign of fetal distress but not in all patients.

Keywords: cardiotocography, intrapartum, meconium stained liquor, newborn admissions

Introduction

Cardiotocography is an electronic fetal monitoring tool that records the fetal heart rate and its variations during uterine contractions [1]. As per FIGO guidelines, CTG can be interpreted as normal, suspected and pathological [2]. There is a significant relationship between pathological CTG and newborn outcome determined by apgarscore, the existence of acidosis, hypoxic ischemic encephalopathy[2] and subsequent neuromotor development [3].

Meconium passage is a normal event in a term fetus and in the absence of CTG abnormalities it is not considered as a sign of fetal distress. Combination of meconium and pathological CTG leads to a poor neonatal outcome. Meconium stained liquor is an area of concern as it increases meconium aspiration syndrome, birth asphyxia, operative delivery and neonatal intensive care unit admissions [4].

Cardiotocography is a non invasive tool and has no contraindications for its application. Meconium staining conventionally signifies fetal distress, but CTG is the current practical method for fetal surveillance during pregnancy and labor [5]. It has also been postulated that CTG may lead to an unnecessary increase in the number of caesarean sections being performed [6].

The present study was conducted to identify the correlation between abnormal CTGs and the color of liquor and the subsequent need for newborn admissions.

Operational Definition

Reassuring or Reactive CTG

- A baseline fetal heart rate of 110-160 bpm
- Good fetal heart rate variability (6-25 bpm)
- Fetal heart rate accelerations – present or absent (Presence of accelerations rule out fetal hypoxia)
- Absence of late or variable decelerations

A cardiotocograph was considered pathological if one or more of the following features were observed

- Baseline fetal heart rate above 170 beat per minute.
- Variability of the fetal heart rate less than five beats per minute.
- Early deceleration that is a drop in baseline fetal heart rate of >15 beats per minute for >15 seconds occurring with uterine contractions.
- Prolonged decelerations that is a drop in the baseline fetal heart of 15 beats per minute lasting for at least two minutes but less than 10 minutes.
- Late decelerations that is a drop in the baseline fetal heart rate of >15 beats per minute for >15 seconds, occurring after uterine contractions.

As per the FIGO guidelines

- Fundamental frequency of heart (normal 120-160/min)
- Mild tachycardia (160-180/ min)
- Severe tachycardia (180/min)
- Bradycardia (120-100/min)
- Severe bradycardia (100/min)
- Type of variability
- Fundamental frequency (undulation 10-25/min, saltatory 25/min, narrowed undulation 5-10/min, silent 5/min)
- Decelerations (early, late, variable)
- Rapid frequency oscillations in one minute (normal 2-5, abnormal 2)

Non reassuring or abnormal tracings

1. Absent baseline fetal heart rate variability with any of the following
   - Recurrent late decelerations
   - Recurrent variable decelerations
   - Bradycardia
   - Tachycardia
   - Occurrence of variable decelerations 80/min for at least 60 seconds
2. Sinusoidal pattern-smooth undulating pattern lasting atleast 10 minutes with a fixed period of 3 to 5 cycles per minute with an amplitude of 5 to 15 bpm.

Materials and methods

A cross sectional study was conducted at the labor ward of Obstetrics and Gynaecology department, KAP Viswanatham medical college, Tiruchirapalli from September 2018 to February 2019.

Inclusion criteria

1. Patients taken up for primary caesarean section.
2. Gestational age greater than 37 weeks.

Exclusion criteria

1. Preterm, intrauterine death and congenital anomalies
2. Antepartum haemorrhage
3. Cord prolapse

Result

Of the 212 mothers, 117 (55%) CTGs were reactive and 95 (45%) CTGs were non reactive (figure 1).

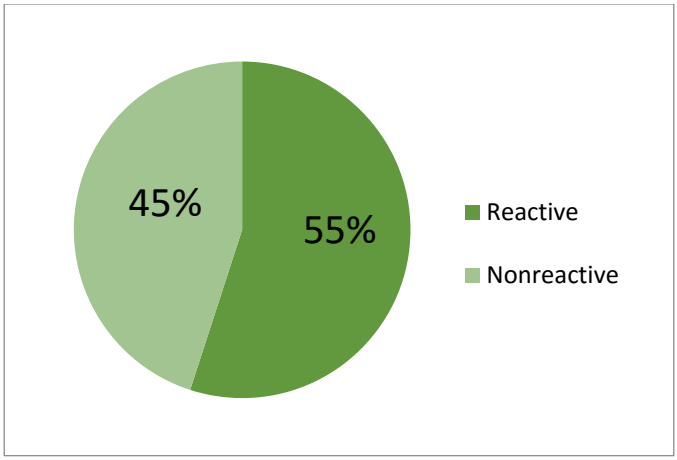

Fig 1: CTGs – Reactive and nonreactive

The most common indication for primary caesarean section during this period is fetal distress.

Table 1: Indications for caesarean section

S. No.	Indication	Numbers	Percentage
1	Fetal Distress	93	43.9%
2	Failed Induction	35	16.5%
3	Severe Oligohydramnios	12	5.6%
4	Mal Presentations	17	8.1%
5	Cephalo Pelvic Disproportion	37	17.4%
6	Antepartum Haemorrhage	5	2.3%
7	Others (Failure to progress, Obstructed Labor, Deep transverse arrest)	13	6.2%
Total		212	100 %

Of the 117 reactive CTGs, 108 (50.9%) had clear liquor and 9 (4.2%) had meconium stained liquor. Of the 95 non reactive CTGs, 53 (25%) had clear liquor and 42 (19.9%) had meconium stained liquor.

Table 2: Meconium staining of amniotic fluid

S. No.	CTG	Color of Liquor	Numbers	Percentage
1	Reactive CTG	Clear Liquor	108	50.9%
2	Reactive CTG	Meconium Stained Liquor	9	4.2%
3	Nonreactive CTG	Clear Liquor	53	25%
4	Nonreactive CTG	Meconium Stained Liquor	42	19.9%
Total			212	100%

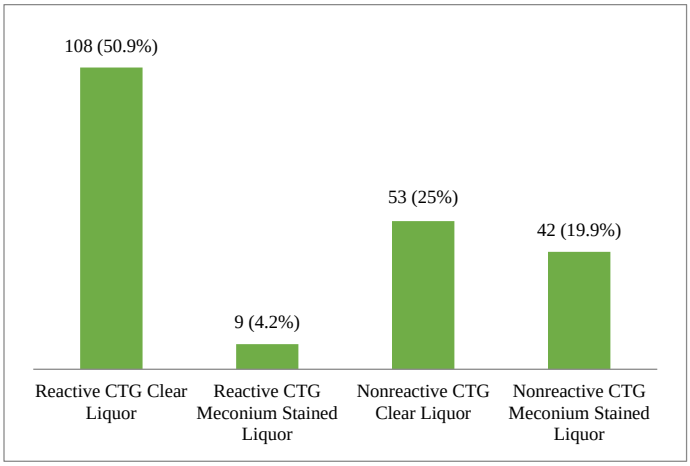

Fig 2: Meconium staining of Amniotic Fluid

Of the 117 reactive CTGs, 17 babies (8.1%) required newborn admissions and 100 (47.1%) babies did not require any admission. Of the 95 non reactive CTGs, 40 (18.9%) babies required newborn admissions and 55 (25.9%) babies were given to the mothers.

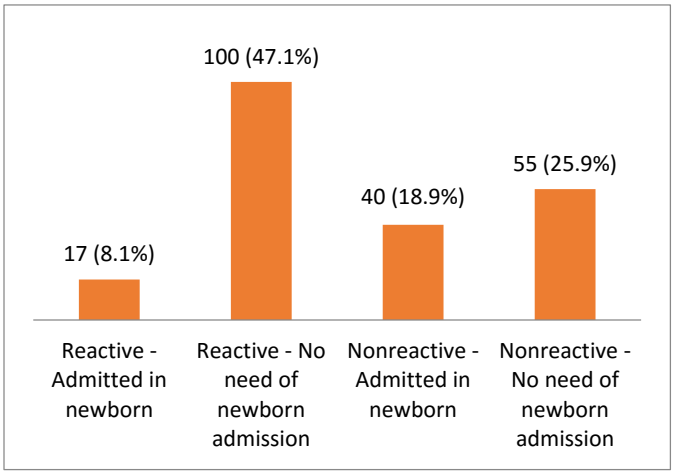

Fig 3: Newborn Admissions

Table 3: Newborn admissions

S. No.	CTG	Newborn Admissions	Numbers	Percentage
1	Reactive CTG	Admitted in newborn	17	8.1%
2	Reactive CTG	No need of newborn admission	100	47.1%
3	Nonreactive CTG	Admitted in newborn	40	18.9%
4	Nonreactive CTG	No need of newborn admission	55	25.9%

Among the nonreactive CTGs, both meconium staining and newborn admission were seen in 28 cases (13.2%) which indicates significant foetal hypoxia.

Among the high risk pregnancies, abnormal CTGs were found most commonly in premature rupture of membrane patients (30 → 31.5%) followed by gestational hypertension patients (12 → 12.6%).

Table 4: Abnormal CTG in High Risk Pregnancies

S. No.	High Risk Pregnancy	Numbers	Percentage
1	Gestational Hypertension (GHTN)	12	12.6%
2	Post dated	8	8.4%
3	Oligohydramnios	12	12.6%
4	Gestational Diabetes	2	2.1%
5	Bad obstetric history	3	3.1%
6	Premature Rupture of membrane (PROM)	30	31.5%
7	Low Risk	28	29.8%
Total		95	100%

Among the various CTG patterns observed late decelerations (28 → 29.4%) were the commonest followed by absent baseline variability (16 → 16.8%).

Table 5: CTG patterns in Abnormal CTGs

Sl. No.	Pattern	Numbers	Percentage
1	Tachycardia	19	20.1%
2	Bradycardia	15	15.8%
3	Absent baseline variability	16	16.8%
4	Early decelerations	3	3.1%
5	Late decelerations	28	29.4%
6	Variable decelerations	8	8.5%
7	Sinusoidal Patterns	6	6.3%
Total		95	100%

Discussion

The analysis of the results of this study shows the higher prevalence of clear liquor in reactive CTG patients. In this study, meconium staining of liquor was found in a significant number of patients in the non reactive group. Also clear liquor

was also found in a significant number of patients in the nonreactive group. A small proportion of patients with reactive CTG also had meconium staining of liquor.

The study had concluded that newborn admissions were highest in the abnormal CTG group. Also a significant number of babies in the abnormal CTG group did not require admissions. A small number of newborns in the normal CTG group also needed neonatal admissions.

The above observations signify that not all nonreactive CTGs lead to fetal distress. Also all non reactive CTGs need not be taken up for caesarean section immediately but they have to be cautiously monitored.

It has been concluded through various studies that CTG is a screening tool for fetal wellbeing in labor and it can detect possible fetal compromise that can lead to permanent neurological damage and fetal demise in utero [7].

The CTG is most predictive when normal or reactive. The false negative rate is approximately 0.2 - 0.8% [8]. When the pattern is reassuring there is almost always normal oxygenation. FHR patterns have poor specificity in predicting fetal hypoxia and acidosis. The false positive rates for a non stress test can be anywhere between 55-90% [8]. This means that half the fetuses showing a nonreactive pattern may actually be well oxygenated.

The importance of meconium stained amniotic fluid is that it is one of the oldest and definite sign of fetal distress in utero due to foetal hypoxia [9]. On the other hand, meconium passage is a normal physiological event after 37 weeks and cannot be considered as foetal distress in the absence of foetal heart rate abnormalities. Combination of meconium and abnormal CTG enhances the rate of poor neonatal outcome.

Vagal stimulation produced by cord or head compression may cause meconium staining in the absence of fetal distress. The most important clinical significance of meconium staining is to alert the obstetrician to cautiously monitor for further signs of fetal compromise [10].

Both abnormal CTG and meconium staining of liquor lead to an increase in the number of primary caesarean sections. CTG findings and colour of liquor have to be assessed carefully and additional methods of intrapartum fetal surveillance can be used along with prompt intervention in the form of instrumental deliveries to reduce the primary caesarean section.

Other methods of intrapartum fetal surveillance are intrapartum scalp stimulation test, fetal scalp pH, fetal scalp lactate measurements, fetal pulseoximeter, fetal ECG waveform analysis, doppler study.

In the high risk group, premature rupture of membranes (PROM) patients showed the highest number of abnormal CTGs. Also late decelerations were the commonest abnormality in the pathological CTG group.

Conclusion

Cardiotocography is a simple and reliable method of non invasive fetal monitoring. Abnormal CTG indicates higher and definitive possibility of fetal asphyxia. CTG sometimes gives false positive findings. Also significant changes were seen in CTG of clear liquor group which stresses the need for more evaluation to rule out ongoing hypoxia. With respect to colour of liquor, thin meconium stained liquor is not an indicator of fetal distress. Continuous intrapartum CTG monitoring, gradation of meconium and monitoring of progress of labor should be done in meconium stained liquor patients. Admission to delivery interval as well as stage of labour is very important in deciding mode of delivery and prevention of perinatal morbidity. With this study we conclude that abnormal CTG findings and meconium staining of liquor indicate foetal distress in most situations but not in all patients. Hence abnormal CTG and meconium staining can be additionally and cautiously evaluated with other methods of intrapartum fetal surveillance along with clinical assessment of progress of labor to reduce the primary caesarean rate.

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