Course Name :An Overview on Maternal Health Antenatal, Intranatal and Postnatal Care

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Intrapartum Fetal Monitoring – Cardiotocography (CTG) (contd.)

Good morning students. Hope you are all doing good. I welcome you all to today's session for the NPTEL online certified course on the topic and overview on maternal health, the antenatal, intranatal and postnatal care. I am Dr. Barnali Ghosh, an obstetrician and gynecologist working at B.C.Roy Medical College and Medical Research Centre, IIT Kharagpur.

Today, we are going to continue our discussion regarding cardiotocography that is intrapartum fetal monitoring. So, we have already discussed where we should do CTG tracing and it is done in the labour right during the intrapartum period during the process of labour done in only high risk cases, low risk cases without any complication, CTG is not recommended because no CTG when done in low risk cases, it will result in unnecessary interventions which is not needed. In case during the intrapartum period there is any complication in the fetus or in the mother or you find any abnormality in the fetal heart rate auscultation, then you convert it to a continuous electronic fetal monitoring and you know we continue that till the delivery. Now, we have discussed the parts of the CTG tracing, how we document the different parameters starting right from your identification in the form of name, age, hospital number of the mother, then the maternal vitals that is the pulse and blood pressure also very very important is the date and time of CTG tracing and ultimately we also document the you know uterine contraction, the perception of fetal movements by the mother and the fetal heart rate right.

So, fetal heart rate what are the 4 very very important parameters which we look into number one is the fetal baseline fetal heart rate right. So, baseline fetal heart rate normally should be within 110 to 160 beats per minute and should be calculated over a period of 10 minutes before we say any case of fetal bradycardia or fetal tachycardia. Number 2 is baseline fetal heart rate variability. Variability is actually you know it depicts or detects the fetal well being because you know it is due to the interaction between the sympathetic, the parasympathetic, the chemoreceptors, the baroreceptors and the cardiac receptors responsiveness taken as a whole. So, when the variability is present that means, the fetus is in good condition.

Reduced variability is a signifying that there is some abnormality right sometimes in cases of

fetal sleep right it can so happen. So, we also see variability over a period of 10 minutes right before we you know infer that there is reduced variability and what is the normal bit to bit fetal heart rate variability it is between 5 to 25 beats per minute. Third we have discussed the fetal acceleration heart rate acceleration and you know acceleration is defined as increase in fetal heart rate by 15 beats per minute and it persists for 15 seconds at least 15 seconds. And this fetal heart rate acceleration may or may not be present in a CTG tracing in the intrapartum period presence of acceleration is reassuring, but absence of acceleration you know is of uncertain significance. If rest all are normal in a CTG tracing only absence of acceleration does not hold any significance.

Now, next we are coming to fetal heart rate deceleration. So, these coming to the fetal heart rate deceleration what is fetal heart rate deceleration? So, fetal heart rate deceleration is fall right. So, it is a fall in fetal heart rate from the baseline by at least 15 beats per minute or more for a period of 15 seconds or more right. So, fetal heart rate decreases from the baseline by 15 beats per minute. Now, you have different types right you have different types of deceleration number 1 is early deceleration, number 2 is late deceleration, number 3 is variable deceleration, number 4 is prolonged deceleration.

Early deceleration meaning now I will just give you a idea in this slide and we will discuss them separately in our subsequent slides. So, what is early deceleration? In early deceleration is say this is the fetal heart rate tracing and here you find a deceleration and say this is the uterine contraction and this is the fetal heart rate. So, in early deceleration meaning there are fetal heart rate and the uterine contraction they are as mirror image. What that means, mirror image meaning that means, that the it coincides the start of the fetal the start of the deceleration coincides with the start of the uterine contraction. The peak of deceleration or the nadir of fetal heart rate will coincide with the peak of uterine contraction and you know when it reverts back when the heart rate reverts back to the normal baseline that also coincides with the end of the uterine contraction.

So, actually it is uniform in shape it is a mirror image of contraction and this amplitude is you know 40, 40 bits per minute or less right. So, that is early deceleration early deceleration as such signifies head compression of the fetus. Now, during the process of labor there can be head compression right. So, you know early deceleration a fewer number of early deceleration in a CTG tracing is normal it can happen right and also say if there is repeated early deceleration then you should suspect that there is no more head compression during this process of labor. It can so happen that it is a cause of CPD, cephalopelvic disproportion because when the fetus is trying to descend there is head compression.

So, it is not able to go down and this repeated head compression will lead to early deceleration tracings on the CTG. According to late deceleration what are late deceleration? Late

deceleration is actually a tracing will be like this right. So, here the uterine contraction is preceded uterine contraction precedes the deceleration and you know the peak of the uterine contraction is before right it is before and there should be a gap of 15 to 20 seconds between these 2 peaks right. So, fetal heart rate decrease is after the contraction is going off. So, it starts this actually this start of the fetal heart rate may sometimes coincide with the peak of the uterine contraction, but as the contraction goes away then the fetal heart rate nadir is reached.

So, it is late deceleration and this is notorious presence of late deceleration signifies uteroplacental insufficiency and if it is present then you must be very cautious and be more vigilant. Variable deceleration it does not have any you know any relation with uterine contraction that is variable right it mostly occurs due to cord compression and prolonged deceleration is when the deceleration is prolonged right it stays there this is no more than 30 beats per minute and it remains this deceleration remains for a period of more than 2 minutes that is prolonged deceleration. So, these are the types of deceleration coming to early deceleration here you see this is the uterine contraction and see this contraction and the peak or nadir of the fetal heart rate deceleration are coinciding it is starting with the contraction the heart rate starts to decline and it comes to the baseline as the contraction ends. So, this is due to I have already told this is due to head compression and these are early deceleration. So, early deceleration start when uterine contraction begins and recover when the uterine contraction stops right and this is due to head compression.

So, if 1 or 2 are present it is normal right no need to worry, but if repeated early deceleration decelerations are present then suspect cephalopelvic disproportion right. Next coming to late deceleration told that yes late deceleration begin at the peak of the uterine contraction. So, uterine contraction peak has attained then the fetal heart rate starts to decrease right starts to decline. So, it begins at the peak of the uterine contraction and recover after the contraction has ended. So, it is no delayed the deceleration occurs after the contraction.

So, that is late deceleration and this is mostly due to uteroplacental insufficiency right. So, why in what are the cases where there is uteroplacental insufficiency? So, if you draw this diagram. So, this is the fetus this is the placenta. So, it may so happen number 1 case that there is hypertonus uterus is more contracting hypertonus. That means, a hypertonus or hyperstimulated that means, you know the single uterine contraction is persisting for more than 2 minutes.

So, hypertonic uterus or tachysystole, tachysystole meaning there is more than 5 contractions occurring in a 10 minute duration both these will decrease the uteroplacental blood supply. Number 2 so, this is due to uterus now placenta coming to the placental cause it may so happen that placenta getting separated from the uterine wall as in case of placental abruption. Then also there will be decrease in utero placental supply other causes it may be in case of placental aging

there is placental calcification it is in case of post dated pregnancy. So, more placental aging more placental calcification right these are the different placental causes coming to the fetal causes. So, what fetal causes meaning it can be due to preterm or FGR fetus there is fetal growth restriction right.

So, previously the fetus is compromised right and also sometimes say in placental thrombosis in case it the mother is having any APLA syndrome any autoimmune disorder right preeclampsia or diabetes. So, in that case placental thrombosis can also decrease or there will be decreased placental blood flow. So, all these leads to late deceleration and if late deceleration is present that means, that it is not good for the fetus and you know sometimes you need to rule out the uterine hyper stimulation and if say you know it requires it requires what to do what you need to intervene you need to stop oxytocin. If oxytocin was being given stop oxytocin give plane fluid to correct any dehydration change the position to left lateral position give nasal oxygen and say if there is very hypertonic uterus sometimes we give uterolytic or terbutaline right subcutaneous terbutaline 0.25 milligram this is a tocolytic that will cause or decrease the uterine hyper stimulation.

So, these are regarding the late deceleration here see this is the uterine contraction this is the uterine contraction and see here as the uterine contraction is at its peak the fetal heart rate starts to decrease and the nadir is actually after the peak of the uterine contraction and it comes to the baseline again when the contraction has already ended. So, this is a late deceleration here also this is a late deceleration right uterine contraction is preceding the deceleration. Now causes I have told that it is due to reduced utero placental blood flow and it can be due to uterine hypertonicity or hyper stimulation it can be due to placental causes or it can be due to fetal causes. Now coming to variable deceleration variable deceleration there are different variable deceleration variable first to note that these decelerations have no connection with the uterine contraction right they are inconsistent it does not have variable deceleration and observed as a rapid fall in the baseline fetal heart rate with a variable recovery phase and they are variable in duration in frequency and may not have any relation to the uterine contraction right. So, this is the picture of variable deceleration.

Now there are two types of variable deceleration number 1 is typical and number 2 is atypical variable deceleration right. So, just now why variable deceleration occurring because of umbilical cord compression right. Now why umbilical cord compression is occurring it can be in case of oligohydramnios during the process of labor there is cord compression or it can so happen that there is a true knot or cord around the neck of the fetus right or you know in some cases in of cord collapse it can lead to cord compression. So, all these are causes of cord compression and that will be elicited or that will be depicted as variable deceleration in the CTG tracing. Now coming to another important criteria which I have told that yes typical and atypical.

So, what is typical? Typical is say this is the tracing and just before the fall before the abrupt fall of FHR there is a increase in fetal heart rate and again when it reverts back there is increase in fetal heart rate. So, these two just before the your deceleration there is increase in fetal heart rate on two sides this is called as shouldering. So, presence of shouldering presence of shouldering is a welcome feature right even if there is variable deceleration even if there is cord compression we infer from that tracing, but presence of shouldering will say that yes the fetus is still surviving this cord compression and the fetal the fetal condition is still normal shouldering is a welcome sign. But no in case in case there is absence of shouldering like this no shouldering here. So, absence of shouldering number 2 it can so happen that this tracing there is a fall and then it know the fetal heart rate has you know gone up this is called as rebound tachycardia.

Number 3 it can so happen that say this is the tracing and then no variable these are variable deceleration, but no delayed return to the baseline here it is delayed return to the baseline this is number 3. Number 4 so here also there will be beat to beat variability in the deceleration curve also there will be beat to beat variability, but see in the deceleration curve there is no beat to beat variability this is completely there is no beat to beat variability in this deceleration phase right. So, reduced variability in the deceleration phase that is number 4 and number 5 number 5 if say this deceleration is a biphasic. So, this is a biphasic pattern biphasic or W pattern. So, what are these 5 features? These are features if present in variable deceleration they will be called as atypical and presence of atypical variable deceleration hints towards no fetal compromise right.

So, these are all non reassuring features right and if they are present then the CTG tracing is suspicious it is not normal it is suspicious or it is pathological and then we need to intervene early. So, these were about the variable deceleration and lastly coming to the prolonged deceleration I have told that prolonged deceleration in this prolonged deceleration here it persists for at least 2 minutes it persists for at least 2 minutes more than equal to 2 minutes and the fall or fall in fetal heart rate is by 30 beats per minute or more. Right this fall is more than 30 beats per minute right. So, that is a case of prolonged deceleration prolonged deceleration is also non reassuring right or abnormal and you know taken together the CTG is called as pathological or suspicious if this is present right. So, if you know actually more than 2 minutes is prolonged deceleration if you find that the deceleration is more than persisting for more than 3 minutes then you should always expedite the delivery by caesarean section.

If no normal delivery still has some time it you know it is not fully dilated cervix then you must go for caesarean section. So, prolonged deceleration defined as deceleration that lasts for 2 minutes if it is between 2 to 3 minutes it is classified or told as non reassuring and if more than 3 minutes then it is abnormal and in that case we need to expedite the delivery. So, that was regarding the deceleration. So, we have talked about 4 criteria. So, in a nutshell I will again give you.

So, these are the 4 criteria the fetal heart rate, baseline fetal heart rate, the beat to beat baseline fetal heart rate variability, presence of acceleration and deceleration and the type of deceleration and also the duration for what for the duration for what time they are being present right. So, all these you know you can categorize all these 4 criteria as normal or reassuring, non reassuring and abnormal right. So, these 4 criteria can be grouped under these 3 headings and taken these 3 headings we actually interpret the CTG we interpret the CTG as normal, as suspicious or it is pathological. So, that is how you interpret a CTG. So, next coming to another topic that is you know this is also a CTG tracing which is called as the sinusoidal pattern.

See this is like a sine wave it is continuous smooth wave like right continuous smooth and it is you know 2 to 5 cycles per minute right. So, per minute it is 2 to 5 cycles and you know smoothly sine wave pattern without any variability and in between say 10 to 20 the it is you know the fetal heart rate is variability is between 10 to 20 beats per minute and you know it is regular pattern. So, this type of CTG tracing is called as sinusoidal pattern and where it is seen it is seen. So, these are the criteria for sinusoidal pattern and where it is seen these is seen in case of fetal anemia fetal anemia right very important. So, where is fetal anemia seen in case of vasa previa where the fetal blood vessels are overlying the internal os right.

So, the fetal blood vessels which will pass through the you know membranes they will over lie the internal os and in case of any injury to these vessels it will lead to fetal hemorrhage fetal hemorrhage that will cause fetal anemia leading to sinusoidal pattern in the CTG tracing. In case of RH incompatibility right RH incompatibility leading to fetal anemia will also give this type of tracing and sometimes in cases of maternal hemorrhage maternal hemorrhage causing maternal anemia leading to fetal anemia can also lead a sinusoidal CTG tracing and if you see a sinusoidal pattern you always always keep in mind that you know delivery delivery is only treatment or we will lose the fetus as soon as possible. So, mostly it is by caesarean section or we will we are going to lose the fetus due to exsanguination of blood from the fetus. Now, say if the CTG tracing is abnormal right CTG tracing is pathological or suspicious then what to do next step is fetal scalp pH monitoring or fetal blood sampling right. So, we actually assess here the fetal hypoxia which will cause fetal acidosis right.

So, see before that to note here that before you go for fetal scalp pH you will have to it is an invasive procedure and in the cervix should be dilated the cervix the patient should be or the mother should be in labor cervix should be dilated it is cephalic presentation and with the needle you go inside you take the fetal blood you know for sampling right from the sinuses right. And so, this is the cervix dilated cervix and this is the fetal scalp and blood droplets are collected right from for analysis and here you should note that if there is any bleeding disorder in the fetus if there is you know the fetus is preterm then fetal blood sampling should not be done if there is presence of infection it should not be done right. So, actually fetal blood sampling will help to

assess the level of fetal acidosis. So, if pH is more than if pH is more than 7.25 that means, within 7.25 to 7.35 then it is normal right it is normal if the pH is say 7.2. So, 7.25 to 7.2 this period in this if the pH lies between 7.2 and 7.25 then you can wait for another 30 minutes and repeat fetal blood sampling, but if you see that it is less than 7.2 then you know it is a case of acidosis fetal hypoxia and you need to deliver the fetus as soon as possible expedite delivery by mostly cesarean section. So, that was regarding the intrapartum fetal monitoring we have discussed the CTG tracing the continuous CTG tracing the various parameters of the fetal heart rate monitoring and how from these parameters we again segregate as the four criteria into reassuring, non reassuring and abnormal and depending upon the findings of these four parameters of the fetal heart rate tracing right as reassuring or non reassuring or abnormal we will actually know tell the CTG whether it is normal whether it is suspicious or whether it is pathological and in case of suspicious or pathological CTG we can go for fetal blood sampling to note the fetal pH level and if it happens that there is fetal acidosis in the form that it is less than 7.2 then we need to deliver it as soon as possible or if it is from 7.2 to 7.25 we can wait for another half an hour and repeat the fetal blood sampling and if it is more than 7.25 we can wait and you know but be more vigilant and you know try to deliver it vaginally. So, that was regarding the intrapartum fetal monitoring references has been taken from this is that the book of obstetrics the Williams obstetrics the James book on high risk pregnancy. So, that was all for today's class it is very important intrapartum fetal monitoring we have discussed only the fetal part right. So, the fetal well being which is to be assessed during the active first stage of labour as well as the second stage of labour and this will help right this CTG monitoring these will help for decision making during the labour process right and these are also useful for litigation purpose.

See after the delivery after the delivery there is any you know evidence of fetal asphyxia or there is no any need for the admission of the baby in the NICU or there is you know any incidence or mishap in the form of still birth or a sorry still yes still birth or neonatal death right. So, if all these things happen then no we have this CTG tracing with us to record as a record right to show it in the court that yes the CTG's tracing was all normal and thus we have progressed or we have continued with the vaginal delivery. So, this is also important and as such CTG tracings are preserved for next 10 years now it is recommended to preserve for the 25 years for next 25 years and say if there is any neonatal death any you know evidence of still birth or say admission in NICU or any chance or evidence of asphyxia then in that case CTG paper should be preserved lifelong right and it will it can be produced in the court and it will help to you know safeguard the doctor right regarding his or her decisions during the process of labour. So, thank you all for your patient hearing and I think that you know some of the doubts had been cleared regarding this topic. Thank you.