

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

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Normal Labour - Stages and cause of onset

Hello students. 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 as assistant professor at B.C.Roy Medical College and Medical Research Center, IIT, Kharagpur. So today we are going to discuss regarding normal labor, its stages as well as the cause of onset, right. So in the previous classes we have been dealing with the antenatal part, antenatal assessment, antenatal care.

We have started right from your anatomy of the female reproductive tract, then the concept of gametogenesis, then the various steps of conception, right, embryo formation, implantation and then the periodic antenatal care of the pregnant mother in the antenatal clinic and also the discussion regarding antenatal fetal assessment during the period of pregnancy. We have also dealt with all the prenatal diagnostic tests as well as the genetic screening to be done for the fetus in utero. From today we are going to deal with the intranatal part that is the period of giving birth to the child, right that is the process of labor. So in today's class the concepts covered will be normal labor, parturition, stages of labor and the causes of onset of labor, right.

So these are the keywords for today's class as given. So coming to the definition, definition of labor. Labor can be defined as a series of events that take place in the genital organs in an effort to expel the viable products of conception, right that is the fetus, the placenta and the placental membranes or the after birth out of the womb of the mother to the vagina into the outer world, right. So labor is a process where it you know it includes a series of events that take place within the female reproductive tract in an attempt to expel out the fetus, the placenta and the membranes through the vagina to the outside world. So it is associated with both, it is associated with both uterine contraction as well as cervical dilatation, right.

So cervix needs to dilate or open up and get effaced, right along with the uterine contractions which will lead to expulsion of the fetus and placenta through the vagina into the outside world. So this too will be associated with fetal descent, descent through the reproductive tract into the vagina and then out into the outside world. So that is regarding labor. Now what is parturient?

It is the patient or the mother in labor is called as parturient and the process of giving birth is called as parturition. So these are the terminologies which we will be continuously using in the later parts of the lecture.

Now coming to delivery, delivery is defined as the expulsion or the extraction of a viable fetus out of the womb. Say if the fetus is not you know you know you know it is expelled before term or before being viable, pre-viable fetus, then this labor is actually the events that take place in the reproductive organ, they will come under the heading of mini labor, right. So that occurs before the period of viability. Now delivery is the expulsion of a viable fetus outside the mother's womb and to note that it is not synonymous with labor because every delivery is not associated with uterine contraction, cervical dilatation, effacement and delivery of the baby through the vagina because we have lower segment cesarean section, right, where there is no labor. The delivery take place can take place without the onset of labor, right.

So delivery is not synonymous with labor and delivery can take place without labor as in case of LUCS and delivery can be vaginal either spontaneous or aided, right. So it can be a spontaneous vaginal delivery or aided in the form of instrumental delivery where we use different instruments in the form of forceps or vacuum to help in the extraction of the fetus through the vagina or it may be abdominal as in case of LUCS. Now we have read about labor. Now coming to normal labor. Normal labor has certain criteria.

Normal labor is actually the labor which is spontaneous in onset. The onset has to be spontaneous in nature, right, and it occurs the labor starts at term that is after 37 weeks of gestation and necessarily it should be the fetus should be in vertex presentation without undue prolongation leading to natural termination of pregnancy with minimal aids. What do you mean by minimal aids? That means only say episiotomy scissors is required. Episiotomy scissors and you know cord clamps. For clamping the cord we can use kochers.

So two cord clamps are used, one episiotomy seizure is used and you know some swab, some gorge pieces and you know that is the minimal aid. No forceps, no vacuum, no instrumental delivery is associated in normal labor. So normal labor leading to natural termination with minimal aids without any complication resulting in good health of both the mother and the baby at the end. So all these criteria when fulfilled we say that it is a case of normal labor. What is abnormal labor or labor dystocia? Any definition from the definition of normal labor is called as abnormal labor.

So labor, you know that process of vaginal delivery in case of breech presentation is an abnormal labor. If say there is no prolongation in the duration of labor or in the progress of labor or say there has been some arrest in the labor where you need to cut short the stage of labor by the help of forceps or vacuum then it is a case of abnormal labor. If it is associated with any type

of complication of the mother like the mother is in a eclampsia or mother is having gestational diabetes or mother is having PIH right. So all these comorbidities of the mother or the fetus will lead to abnormal labor. So any deviation from the criteria of normal labor is called as abnormal labor or labor dystocia.

Now coming to the date of onset of labor, it is very very much unpredictable when the mother will go into labor when is the exact date that the labor onset will occur that is very much unpredictable and it varies from case to case. For every pregnant individual the duration you know the gestational age at which labor onset starts. So that varies and even for a single mother say she has delivered vaginally by normal vaginal you know normal labor by the process of normal labor around 39 weeks in her first pregnancy and now she is having her second pregnancy then also it will vary she may deliver at 40 weeks or at 38 weeks not necessarily at 39 weeks. So it varies from case to case. Now based on the Naegele's formula labor we have calculated the expected date of delivery or the EDD from the LMP as per Naegele's rule which is 9 calendar months plus 7 days we have already read.

Now labor starts approximately on this expected date of delivery for only 4 percent of cases right. So 4 % of female will be delivering their baby on the expected date of delivery. Say one week earlier than the expected date of delivery and one week later. So if you take this period one week earlier and one week later the expected date of delivery around 50 percent of females will deliver in this period. Two weeks earlier the expected date of delivery and one week later the expected date of delivery in this period 80 percent of the females will deliver and after 42 weeks that is post term or at 42 weeks only 10 percent delivers 43 weeks plus this is post term 4 percent only 4 percent will deliver after 43 weeks.

So these are a tentative percentage of females who are delivering on the expected date and plus minus the expected date of delivery. Now coming to the stages of labor and the phase of parturition. Parturition is actually the process of giving birth, but the phases of parturition which there are 4 phase right. We have see we have written here it is phase 1 that is the prelude right. So this starts right from conception from the period of conception up to the whole of the pregnancy period that is the antepartum period.

This is the prelude when the uterus is quiescent right. There is no contraction of the uterus. The uterus is completely quiet nonresponsive to any uterotonics right. So this phase is called as the prelude and this is associated with cervical softening. We have seen in the signs of pregnancy the Hegar's sign.

Hegar's sign can be elicited at 4 to 6 weeks of pregnancy and this is due to cervical softening that occurs in pregnancy right. As such in the cervix of a non pregnant mother is like the know that consistency is like the tip of the nose, the cartilage of the nose that is the consistency of the

cervix in a non pregnant mother. But in pregnancy there are certain changes in the known characteristics of the cervix, in the extracellular matrix of the cervix, in the collagen composition of the cervix which leads to cervical softening and the cervical lips are like that of the lips of the mouth they are so much soft. So that one first phase is the prelude phase which is the phase of uterine quiescence and cervical softening. Phase 2 is the preparation phase, preparation for labor. This is the last few weeks, last 4 weeks say 36 weeks to 40 weeks. This is the last 4 weeks of pregnancy when the uterus, the cervix, every reproductive tract organ now goes into the phase of preparation for the process of labor. Phase 3 is actually the process of labor and phase 4 is the recovery phase or the puerperium right. So taking single you know one by one phase 1 prelude which is the phase of uterine quiescence, uterine quiescence and cervical softening right. So there are different changes we will read about them in the physiology of labor where there increases the glycosaminoglycans, there is increase in the hyaluronic acid, there is increase in the you know various metalloproteinases right.

All these will increase and they will cause you know changes in the uterus, changes in the uterus which causes hyperplasia, hypertrophy because it needs to accommodate the growing fetus. So there will be hyperplasia, hypertrophy, secretion from the uterus in the form of some substances which will prevent the formation of prostaglandins right. So different secretions will be there and absent contractility uterus will be in relaxed state. Similarly sometimes there may be you know certain rhythmic contraction which are painless which are not associated with cervical dilatation and which goes away by itself right. So these non rhythmic you know irregular uterine contractions which are called as the Braxton-Hicks contraction may occur during the period of pregnancy in the uterus and it increases as the pregnancy period increases right.

So in the later part of the pregnancy the Braxton-Hicks contraction perceived by the mother is more. So changes in uterus, changes in cervix. In the cervix there is cervical competency to be maintained right. So number 1 is cervical competency. It forms an epithelial barrier, epithelial barrier and it prevents in passage of infection from the vagina into the uterine cavity thereby preventing any fetal infection or fetal insult right and also you know tissue compliance of the cervix is increased there is cervical softening right. So tissue compliance will also increase. So these were regarding the prelude stage. There are various you know various paracrine endocrine hormones which play a role in maintaining this prelude phase of parturition. Phase 2 is the phase of preparation where what occurs it occurs cervical ripening cervical ripening what does that mean cervical ripening meaning lower uterine segment formation right. Lower uterine segment how do you know what is the lower uterine segment say this is the uterus and I have already taught you.

So this is the cervix and internal os. So this is the external os and this is the internal os. Now so this is the internal os right. Now we have two definitions the anatomical internal os which is

actually the constriction no no sorry yes no from the from outside when you look the constriction the constriction between the uterine cavity and the cervix.

So this is looked from outside. So this is the your say this is the uterus and so this here there is constricting and it is going into the cervix. So this is the anatomical internal os and the epithelial lining will you know will continue further downwards and for a little for a you know small distance right. So and then it will get converted to the epithelial lining of the cervix. So this point is the histological internal os right. So the distance between the anatomical internal os and the histological internal os this part is called as the isthmus and this isthmus is 0.5 centimeter in a non pregnant uterus and this forms actually the lower uterine segment during the last phase of pregnancy that is in phase 2 of parturition where there is you know the preparedness for labor and what happens what is the length then 5 centimeter right. So in phase 2 the lower uterine segment formation you know will be of distance 5 centimeter. So it is increased in length right and in labor in labor it becomes 10 centimeter this lower uterine segment. So you can know you can assume now you can very well you know imagine that this 0.5 centimeter isthmus will actually hypertrophy will actually stretch hypertrophy hyperplasia will occur and it will become a 10 centimeter segment which will form the lower uterine segment which is less contractile compared to the upper uterine segment.

This is the upper uterine segment and this upper uterine segment is covered by a peritoneum which is firmly adhered, but the lower uterine segment actually forming from the isthmus has less contractility. So it will help to know it as the upper uterine segment contracts the lower uterine segment having less contractility it will expand and it will help to know help to get the fetus get the fetus down or help in fetal descent during the process of labor and it is identified by the loose fold of peritoneum in front of the lower uterine segment which is called as the vesicouterine fold of peritoneum right. So that was regarding the lower uterine segment formation. So here also here also you have the lower sorry here also you have the lower uterine segment formation right. So cervical ripening lower uterine segment formation and also your various you know features which will help you know to prepare the uterus for the process of labor.

So uterine contractility you know factors uterine contractility factors will also increase during this phase 2 right and that is occurring. So this is from the period of conception prelude is from the period of conception right up to the third trimester preparation is just you know last 4 weeks of pregnancy then the process of labor that is phase 3 this is the process of labor. So the labor process actually occurs in phase 3 where there is fetal expulsion outside the womb of the mother right through vagina into the outside world. So the stages of labor will come in the phase 3 of parturition right. So phases of labor will come in the phase 3 of parturition where there is uterine actual uterine contraction plus cervical dilatation plus cervical effacement plus fetal descent right.

So everything occurs in this phase 3 of parturition and ultimately leading to fetal delivery vaginal delivery. So that was regarding phase 3 and phase 4 is the recovery phase or the puerperium phase which starts after 1 hour of delivery and continuing till 4 to 6 weeks following delivery right. So this 4 to 6 weeks why it is 4 to 6 weeks because this is the time taken for the ovulation to resume. So till fertility is restored right. So still the ovulation is resumed this is the recovery phase when all the uterus the reproductive organ will revert back to their pre pregnancy stage right and this fertility or recovery period that depends on the lactation or whether the mother is breastfeeding her baby or not.

So these were the phases of parturition this is a direct screenshot from Williams obstetrics 26th edition where it shows that yes phase 1 that is prelude. Prelude phase or phase 1 is the phase of uterine quiescence which starts from the period of conception and continues till the initiation of parturition right. So till third trimester where the uterus is contractile unresponsive and also there is cervical softening. Phase 2 is actually preparation for labor and the uterus is getting prepared for labor and also associated with cervical ripening that is formation of the lower uterine segment.

And this ends with the onset of labor right. What is onset of labor? Onset of labor is associated with cervical dilatation uterine contraction and phase 3 which is the process of labor is actually resulting in fetal and placental expulsion right. So all the three stages of labor all the three stages of labor will come under the phase 3 of parturition and the end will be your end result will be delivery of the conceptus and phase 4 is the involution period or the recovery period of the parturient where there is uterine involution cervical repair and breastfeeding of the neonate and this ends with the know period ends after 4 to 6 weeks where or when the fertility is restored that is ovulation is resumed. So these were the phases of parturition. Now coming to the phases of labor not phases it is stages of labor. We have seen that phase 3 of parturition is actually the process of labor.

So under this phase 3 we are studying the labor process which can be divided into 4 stages. What are the stages? First stage is the onset of true labor pain. Onset of true labor pain till the full dilatation of the cervix right. So that means, 10 centimeter cervical dilatation. So from the onset from the start of cervical dilatation till the full dilatation this period is the first stage of labor and duration in case of primary gravida maximum duration is 12 hours whereas, in multigravida it is 6 hours.

If more than this time period is taken by the first stage then it is called as prolonged first stage of labor and you know this first stage can again be divided into your 2 parts that is the latent phase and the active phase which we will discuss in our subsequent classes. Now coming to first stage completed full dilatation of the cervix has already taken place. Now in the second stage

what happens from the full dilatation of the cervix there is up to the expulsion of the fetus from the birth canal that is delivery of the fetus. So from full dilatation to the delivery of the fetus is the second stage and duration of this stage is 2 hours in case of primary and 30 minutes in case of multi gravida right. Next is the third stage what happens from after the delivery of the fetus till the delivery of the placenta and the membranes that is the after birth.

So delivery of the placenta after the delivery of the fetus up to the delivery of the placenta and the membrane is the third stage duration of the third stage is 15 minutes, but in active management of third stage of labor it becomes 5 minutes duration right. So lastly is the fourth stage which is the observation period after the expulsion of the fetus right after the expulsion sorry this will be after the expulsion of the placenta. From the birth canal at least 1 hour is at least for 1 hour there is you know the mother is kept under observation right. So this 1 hour of observation of the mother whether there is any bleeding any type of you know difficulty intake of the mother in the form of pulse blood pressure urine output or vaginal bleeding any type of abnormality during this 1 hour period. So this fourth stage is also you know included in the stages of labor where we go for observation of the mother as well as the neonate.

So there is where the four stages of labor and this is the graphical representation see this is the cervical dilatation. So cervical dilatation actually have started with the onset of labor and this is the maximum dilatation of the cervix. So this is the maximum dilatation of the cervix. So start of the dilatation to the maximum full dilatation of the cervix is the first stage and say this is the fetal station right. So there will occur fetal descent sorry so there will occur fetal descent along with the cervical dilatation and this descent maximum occurs here.

So descent and here it is delivered. So this is the second stage where there is both fetal descent and delivery of the fetus and the third stage is the placental delivery where after the delivery of the fetus only the placenta and the membranes are delivered. And after that this is the fourth stage which is for one hour of observation following the delivery of the placenta this is the fourth stage right. So this was in a nutshell regarding the stages of labor. So labor if you start with it starts with regular uterine contraction leading to effacement as well as dilatation of the cervix associated with fetal descent which ultimately cause delivery of the fetus and followed by the delivery of the fetus there is delivery of the placenta through the vagina. So this whole process is called as the process of labor and we need to know so here just a pictorial presentation first stage mother having uterine contraction with cervical dilatation second stage full dilatation mother now bearing down this way mother bearing down she is trying to expel out the fetus right.

So this also has two parts propulsive phase where the mother bears down and the expulsive phase where the fetus is getting expelled from the vagina into the outside world and leading to the birth of the baby. So in the second stage it ends with the birth of the baby and third stage it

results in the expulsion of placenta after the birth of the baby and fourth stage is the postpartum period which is of duration one hour for observation of both the mother as well as the fetus. So these were regarding the stages of labor and parturition. Now So, now coming to labor initiation theories right. Why labor is getting initiated I have already told that the time or the date of onset of labor is very very unpredictable and what are the factors that is causing initiation of labor there are three factors number one one is the functional loss of pregnancy maintenance factor what does that mean that means the factors which were actually maintaining the pregnancy right like progesterone.

Progesterone is a hormone which is increased due in the maternal circulation that helps to maintain the pregnancy and this you know progesterone withdrawal right. So progesterone withdrawal or decrease in progesterone receptors these will all you know cause the onset of labor that will lead to uterine contractility that is number one theory. Number two theory it states that yes there are some synthesis of certain factors it may be endocrine factors it may be paracrine factors which are you know being synthesized inside the uterus within the decidua and the myometrium which are initiating parturition. Yes that mean you know there are different factors we you know it has been studied like the release of prostaglandins release of say contraction associated proteins right. So, then increase in gap junctions increase in oxytocin release.

So, these different parameters will help you know will cause the onset of labor and third theory it is stating that yes the mature fetus when the fetus is mature at term it will you know secrete or it will give some signal it will give it is the source of the initial signal for parturition commencement right. So, these three theories have been deduced and now it is you know it is it is being elicited that all these theories are true they hold true all these theories three theories will act together to cause the initiation of labor. How the fetus is doing it is by the release of fetal cortisol right from the fetal adrenal gland at term right and this fetal cortisol will increase the placental CRH corticotropin releasing hormone and this is leading to onset of labor. So, everything the fetus as well as the mother both are you know doing their part in the onset of labor. So, that is you know in a pictorial representation that yes the uterine there is uterine at term there is uterine distension there is stretching effect on the myometrium which will lead to you know uterine contractility this is known as mechanotransduction.

It will lead to release of prostaglandins it will lead to release of you know increase in gap junctions it will cause certain release of certain factors right. So, all this stretch you know calcium it will cause increase in calcium complexes right. So, that will cause actin myosin filament more activation causing the uterine muscle to contract. So, that was first one that is the mechanical stretching on the myometrium leading to uterine you know distension that is caused due to uterine distension by the growing fetus inside. Number 2 is the fetoplacental contribution what is that you know the estrogen, estrogen will actually increase during the process of labor,

progesterone will decrease, prostaglandins will increase right.

So, from here the progesterone is to estrogen ratio this ratio decreases with and that signifies the onset of labor. Next is the oxytocin, oxytocin myometrial oxytocin receptor, oxytocin receptor also increases the receptivity of the myometrium or the responsiveness of the myometrium to oxytocin increases and thus you know oxytocin release from the mother into the circulation will cause uterine contraction. And lastly the neurological factor you know the alpha and beta receptor, estrogen acting through alpha receptor and progesterone acting through beta receptor. So, these alpha receptors are actually present in the cervix and the lower uterine segment. So, during the onset of labor this estrogen via the alpha receptor will lead to the cervical dilatation, cervical effacement and uterine contraction leading to the onset of labor.

So, that was you know this picture also says the same that means, that in the say starting with the mother, mother is secreting oxytocin from the posterior pituitary and then the myometrial receptor then the uterus. In the uterus the myometrial receptors that will increase and there will be more prostaglandin, more oxytocin, more gap junctions, more prostaglandin F₂ alpha which is released from the decidua and the stretch receptors which are activated due to the uterine muscular stretch due to uterine distension by the growing fetus that will increase in number and sensitivity. All these will lead to uterine contraction thereby leading to you know fetal descent as well as cervical dilatation right, uterine contraction and labor. Next is your placenta, placenta in the placenta see at during the you know process at the at term or you know at just before the onset of labor the placenta will release oxytocin, it will release prostaglandin, it will release estrogen and it will release some inflammatory mediators which will help in onset of labor. And the fetus I have told the hypothalamo pituitary adrenal axis of the fetus what it does the CTH or the CRH from the hypothalamus activating the pituitary causing release of CTH which will activate the adrenal gland to release fetal cortisol this is the most important.

This cortisol will act on the placenta and from the placenta placental CRH is being released and this placental CRH, placental CRH is actually causing onset of labor right. And also from fetal liver DHEAS is secreted which will lead to conversion of estrogen within the placenta which will also help in onset of labor. So, just in a nutshell in the you know same thing it is being said that in the mother uterus is being stretched. So, stretching effect on the myometrium by the growing fetus and amniotic fluid causing uterine distension that will lead to increase in gap junction receptor for oxytocin and contraction associated proteins all this will increase leading to onset of labor. In the fetus this is the fetus this is the hypothalamus this is the pituitary.

So, hypothalamus releasing CRH to the pituitary and the pituitary will release a CTH right. This pituitary will release a CTH which will activate the fetal adrenal gland this is the adrenal gland which will secrete which will secrete fetal cortisol right. And this fetal cortisol in the

placenta will lead to release of placental CRH and fetal liver fetal liver this will release DHEAS which will convert to estrogen in the placenta. So, these two will together lead to onset of labor and so that was the onset of labor.

Just a quick you know discussion regarding false pain and true pain. Before false pain I want to say what is true labor pain. True labor pain is you know rhythmic regular regular rhythmic uterine contraction right which is increasing in intensity it will increase in intensity as well as increase in frequency right and is associated with cervical dilatation is associated with show or blood tinged mucus secretion right. And this pain contraction leading to pain and this pain is not subsided by enema or sedatives. So, this is the criteria for true labor pain and false labor pain which occurs a few weeks before few weeks before right before the onset of true labor pain in false labor pain there is irregular contraction irregular uterine contraction and irregular pain. So, this is the criteria for true labor pain and false labor pain which occurs a few weeks before few weeks before right before the onset of true labor pain in false labor pain there is irregular contraction irregular uterine contraction and you know there is no hardening of the uterus and this pain is only in the lower abdomen it is not being radiated to the groins it is not associated with cervical dilatation it is not associated with show or blood tinged mucus secretion it is not associated with any type of you know increase in intensity or frequency of contraction and it will be decreased or alleviated by sedatives or enema.

So, that was false labor pain which occurs a few weeks before the onset of true labor pain and if the patient comes with false labor pain you need to assure her that yes this is not true labor pain you go back home take this medication and you will be fine and after the onset of true labor pain you come back again for admission. Now coming to pre labor pre labor is actually the phase 2 of parturition which is characterized by 3 you know things that is the lightening lightening is just the when the fetus goes into the pelvis. So, fetus is going inside the pelvis. So, this is the welcome sign see the fetus is going inside the pelvis right. So, the compression over the diaphragm is released and mother is relieved of respiratory distress of relieved of certain distress right there was respiratory distress gastric distress.

So, all these distresses are relieved and there is sudden going down going down of the fetus inside the pelvis there will be change in the height of the uterus the height of the uterus will decrease right and also the shape of the uterus right. So, this is called as lightening and this also occurs in the phase 2 of parturition which is the preparedness of labor right. So, these are pre labor events and this is a welcome sign this you know excludes the possibility of cephalopelvic disproportion. So, that was lightening I have already discussed.

Next is appearance of false labor pain right. So, I have discussed what is false labor pain and it may be present in the pre labor events just before the onset of true labor pain and some associated cervical changes that is cervical ripening where there will be you know cervical

effacement will be present and one finger can go inside the cervix the cervix is dilatable with the examining fingers. So, these are the cervical changes occurring in the pre labor period right. So, that were the cervical changes I have already discussed you go into the book and read them they are very easy, but you need to have a clear concept regarding these pre labor events the true labor pain. True labor pain I have told yes it is associated with the onset of labor it signifies cervical dilatation is taking place cervical effacement is taking place uterine contractions are gradually radiating. Now, the pain is radiating towards the groin and the uterine contraction are increasing in their intensity in their frequency it is associated with show show meaning expulsion of the cervical mucus plug mixed with blood.

So, there will be some blood mixed mucus cervical mucus secretion per vagina. So, these all and also per vaginal examination there will be dilatation of the internal os. So, these all will hint towards the onset of labor. Now, so, true labor pain is actually you know giving the idea or that is the clinical determination of phase 3 of parturition that is the process of labor begins right. And another thing is bag of water formation this bag of water formation right this is fore water fore water this bag of water formation helps in gradual dilatation of the cervix it will also help in gradual dilatation of the cervix as well as it gives a you know uniform pressure over the cervix for no helping it to go for effacement and dilatation and thereby helping the fetus to descend down right. So, this formation of bag of waters this also occurs along with the true labor pain and this is also indicator that the labor process has begun right.

So, that was regarding labor the onset of labor the stages of labor and the phases of parturition we have started with the intranatal period and we will continue our discussion on labor mechanism in our further classes. References have been taken from Williams obstetrics 26th edition, the D.C. Dutta book of obstetrics and James book on high risk pregnancy. So, that was all for today. Thank you all.