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Mechanism of Normal Labour

Good morning students. Hope you are all doing good. I welcome you all for our 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 Doctor Barnali Ghosh, an Obstetrician and Gynecologist working as Assistant Professor at B.C.Roy Multispeciality Hospital and Medical Research Centre, IIT Kharagpur. So, we have been already discussing the Intranatal Care. We have completed the Antenatal Care and we have been discussing the Intranatal Care which comprises the four phases of parturition, the four stages of labour, also the physiology of labour and the different theories concerned regarding the onset of labour.

In the previous class, we have a detailed discussion regarding the events taking place at each stage of labour. Today, we are going to discuss regarding the mechanism of normal labour. So, the concepts covered in today's class will be the mechanism of labour and the different normal delivery steps associated with the process of labour. The keywords for today's class are as follows.

According to the mechanism of normal labour right, so labour as such you know that is a process of the delivery of the fetus from the maternal uterine cavity right. So, through the vagina, through the vaginal outlet that is the delivery of the fetus from the uterine cavity outside into the outside world through the vagina and we today will be focusing on the normal labour right. So, what is the definition? Mechanism of labour can be defined as a series of movements that occur on the head of the fetus during the process of its adaptation right. So, during its journey through the maternal pelvis. So, in other words it is actually the sequence of movements right.

So, the different sequence of movements that are occurring within the fetus right along you know aiding all these movements that are occurring within the fetus that are helping in its adaptation in the fetal adaptation within the maternal pelvis to pass through the maternal pelvis right. So, during its journey through the pelvis and these sequence of events is called as the mechanism of labour. Now we are today focusing on normal labour. So, how to define that this

is a case of normal labour that will depend right on certain criteria. So, what will be the lie? I want every student to go through the video of maternal pelvis and fetal skull which we have already discussed in our previous video and also the video lecture on obstetrical examination then only you can know very well understand this class.

So, coming to lie of the fetus. What is lie? In normal labour it is longitudinal lie right. So, I will show you here in the demo. So, what will happen? So, this is the fetus right, this is the fetus and this is the maternal pelvis. So, what is lie? Lie is the relation between the fetal spine, this is the fetal spine the relation between the fetal spine and the maternal spine right.

So, you can see the maternal spine is here behind. So, the relation between the fetal spine with the maternal spine or the longitudinal axis of the centralized pregnant uterus right. So, when these two are parallel that is called as longitudinal lie. So, in normal labour the lie should be longitudinal. Now presentation, what is presentation? Presentation is the part of the fetus which is overlying the lower uterine segment.

So, the part of the fetus. So, it can be cephalic presentation or in longitudinal lie same longitudinal lie it can happen that the lower end that is the breech is overlying the lower uterine segment that is breech presentation. But in normal labour it is criteria should is that it should be cephalic presentation that is the fetal head is overlying the lower uterine segment right. Next is presenting part. So, what is presenting part? Presenting part is that part of the presentation which is overlying the internal os right.

So, that part of the presentation which is overlying the internal os and when we palpate by par vaginal examination during the process of labour we will be able to palpate that part that presenting part right. So, in case of normal labour the fetus is in well flexed position and the presenting part is the vertex right. So, presenting part is vertex. Number 4 is attitude of the fetus. Attitude of the fetus is in flexion well flexed position of the fetus that means, the chin of the fetus will touch the chest.

So, it is well flexed it can be partially flexed it can be you know there can be deflection or extension of the head. But in normal labour the attitude should be in complete flexion well flexed complete flexion right and then is coming to the denominator. What is denominator? Denominator is that part of the presenting you know that bony fixed bony point on the presenting part right which comes in relation with the different quadrants of the maternal pelvis. Now, here the presenting part is the vertex. In case of vertex the denominator is the occiput right.

So, the denominator is occiput and this occiput when it comes in relation with the different quadrants of the maternal pelvis. So, the occiput can be towards the left side of the maternal

pelvis or it can be towards the right side of the maternal pelvis right. But in normal labour the criteria is the occiput or sometimes it is this is anterior and this is posterior. So, sometimes the occiput can so happen that the occiput is posterior right. So, it can happen, but in normal labour the occiput should be in anterior position right and most commonly the most common position of the fetal of the fetus is the left occiput anterior right.

So, now coming back to our slide of criteria of normal labour. So, lie we have already discussed this is longitudinal lie, presentation is cephalic, reflecting part is vertex, attitude is attitude of complete flexion, denominator is occiput and position is occiputo anterior right. So, it can be we have told that it is more occiput is mostly most commonly towards the left side why? There is also reason for that it less commonly it is on the right side more commonly on the left side because the sigmoid colon and the rectum which are the non compressible structures of the you know in the within the maternal pelvis they are towards the left side right. So, due to the presence of the sigmoid colon on the left side of the maternal pelvis the transverse diameter or the biparietal diameter tends to be in the right oblique diameter. So, for this position the occiput should be on the left side of the maternal pelvis.

So, occiputo anterior is the position and it can be LOA left occipito anterior or it can be LOT that is left occiputo transverse. So, that was in case of normal labour. Now coming to the diameters of the fetal skull and the diameters of engagement of the maternal pelvis. So, in the pelvis and fetal skull chapter we have you know discussed right. So, engagement right for the diameters of engagement of the pelvis is actually the diameter of the pelvic inlet.

In case of normal labour the diameter of pelvic inlet you know diameter of engagement is the oblique diameter right and which is your 12 centimeter and for diameter of engagement. So, there are two engaging diameter of the fetal skull one is the anteroposterior engaging diameter of the fetal skull and another one is the transverse engaging diameter of the fetal skull. So, anteroposterior in case of well flexed head it is suboccipitobregmatic (SOB). So, we have already discussed it is 9.5 centimeter or it can be suboccipito frontal(SOF) which is 10 centimeter.

Suboccuprofrontal 11.5 centimeter occurs when the head is deflexed it is not fully flexed right. So, flexion helps to decrease the length of the engaging diameter. So, flexion is important right and transverse transverse engaging diameter is the biparietal diameter which is 9.5 centimeter right. So, that was the in diameters of engagement.

Now just in a nutshell to know regarding the lie, the position, the attitude and the presentation of the fetus we need to go for the 4 Leopold maneuvers which have been done during our obstetrical examination. So, from the first Leopold maneuver from the fundal grip we will palpate a soft irregular broad non-ballotable structure right. So, that you know confirms that it

is the podalic end or breech of the fetus that means, the podalic end occupies the uterine fundus and the head is low down that is it is a case of cephalic presentation. From the second Leopold grip from the lateral grip we palpate the carved you know uniform resistant curved structure which is the fetal spine. So, we can note the you know the placement or the position of the fetal spine whether it is right or left or anterior or posterior and knob like structures present which are actually the fetal limbs right.

From the third Leopold grip we or the pawlick's grip second pelvic grip what we confirm? We confirm the presentation that is you know a smooth round and hard ballotable structure that is the fetal head. So, it is a case of cephalic presentation and also we can palpate the occiput and the sinciput right. So, we can palpate the occiput and the sinciput and this occiput you know should be in line with the fetal spine right. And if you know both are mobile that means, the fetal head is still floating. So, the you know whether the fetal head is engaged or the fetal head is floating can be assessed from this third Leopold grip and the fourth Leopold grip is actually confirmation of the third you know showing that yes it is a cephalic presentation then palpating the occiput and the sinciput right.

So, say this is the fetal head and say this is the occiput and this is the sinciput. So, occiput is low down sinciput is high up that means, the head is well flexed right and also sometimes we cannot palpate the occiput if it has already engaged. So, these are the different Leopold maneuvers helping to assess the lie position attitude you know presentation of the fetus. Now coming to the different you know attitude, attitude of fetal head. So, this is a case of well flexion or complete flexion then partial flexion, deflection and extension and depending on this attitude it will change the presenting part here is vertex right here also it is vertex, but the engaging diameter this is suboccipitobregmatic engaging diameter here it will be occipitofrontal right which is increased it is 11.5 occipitofrontal in deflection in deflection it is brow presentation. So, then the engaging diameter becomes mento vertical which is 14 centimeter right and in complete extension that is face presentation this is face presentation the engaging diameter is submentobregmatic. So, differing you know depending on the attitude of the fetal head the presentation or the presenting part will vary also the engaging diameters will vary, but in case of normal labor we take that the fetus is in well flexed or complete flexion attitude thereby making it the presenting part as the vertex and the engaging anterior posterior diameter as the suboccipitobregmatic diameter which is 9.5 centimeters. Now this is the different you know position, position will be assessed by the presence of the occiput right.

So, occiput can be in the left occiput anterior, occiput can be posterior or occiput can be transverse right. So, this was regarding the fetal position and I have already told that there are various movements occurring and although these various movements are going to be described separately, but in reality the movements you know at least some will occur simultaneously right. So, along with descent there can be flexion along with flexion there will be internal rotation.

So, they are going on simultaneously and that will help to negotiate the fetus through the maternal pelvis during the process of labor. So, what are the different you know steps of labor I will write it here for you E D F I E R E engagement, descent, flexion, internal rotation, then E for extension, R for rotation, R for restitution and last E for external rotation.

So, these are 7 cardinal movements in mechanism of labor right E D F I E R E is the mnemonic. So, 7 cardinal movements now we will discuss one by one. So, first is engagement. So, what is engagement? Engagement is defined as when the maximum transverse diameter of the presenting part of the fetus crosses the pelvic brim right. So, in case of cephalic presentation, in case of cephalic presentation the transverse maximum transverse diameter is the biparietal diameter.

In case of breech presentation what is the maximum biparietal maximum transverse diameter? It is the bitrochanteric diameter right. Then in case of shoulder presentation the maximum transverse diameter is the bis acromial diameter right. So, in normal labor we know it is cephalic presentation. So, the biparietal diameter is taken into account. So, what is happening I will show it here for your convenience.

So, what is happening? This is the cephalic end right. Now, see this is the cephalic presentation and what is you know this is the fetus is in well flexed condition. So, that means, the transverse diameter the maximum transverse diameter of the fetal skull we have already read is the biparietal diameter. And in case of well flexed head the engaging anteroposterior diameter is the suboccipitobregmatic this right. So, when it goes when this biparietal diameter will pass the pelvic brim this is the pelvic brim or the pelvic inlet.

So, when it passes the pelvic inlet that means, engagement has occurred right. So, and what is the position of the biparietal diameter? A biparietal diameter in case of left occiputo anterior position the biparietal diameter this is the biparietal diameter. The biparietal diameter occupies the right oblique diameter of the maternal pelvis whereas, the engaging anteroposterior diameter or the suboccipitobregmatic diameter occupies the left oblique diameter of the maternal pelvis right I presume you are understanding. So, this is the process of engagement. Now in priming gravida engagement actually occurs before the onset of labour in the last few weeks say after 38 weeks of pregnancy before the onset of labour, but in multi gravida this engagement will occur after the onset of labour in the late first stage of labour right.

So, engagement you know sometimes it is not a part of process of labour as in priming gravida where engagement occurs before the onset of labour. Now, another point to note here is this sagittal suture. So, this is the sagittal suture you already have you know seen in the fetal skull chapter this is the sagittal suture and this is the coronal suture. So, now if the fetal head goes no you know perpendicularly inside the maternal pelvis if it goes perpendicularly. So, what

happens the by the plane of the biparietal diameter is parallel this plane of the biparietal diameter is parallel to the plane of the pelvic inlet it is going straight and this sagittal suture will lie midway between the pubic symphysis and the sacral promontory behind.

So, it is going just you know perpendicular, but this does not happen in reality why because the biparietal diameter you know is 9.5 centimeter and sometimes the anteroposterior diameter of the maternal pelvis is short right it is no less or as in platypelloid pelvis in flat pelvis where the anteroposterior diameter is short. So, the biparietal diameter cannot negotiate between this short anteroposterior diameter. So, what happens there is certain flexion lateral flexion of the fetal head. So, no the that means, no due to lateral flexion no it happens that the sagittal suture may be closer to the pubic symphysis this is anterior.

So, this is the pubic symphysis. So, the sagittal suture may be towards the pubic symphysis thus making the posterior parietal bone as the more dependent parietal bone. This is the anterior parietal bone, this is the posterior parietal bone and if the head no rotates like this, this is the posterior parietal bone goes down it is more dependent and the sagittal suture is towards the pubic symphysis. This is called as posterior asynclitism because it is not perpendicular the sagittal suture is not midway between the pubic symphysis and the sacral promontory. So, it is a case of asynclitism and this is case of posterior asynclitism where the fetal head moves in such a way that the posterior parietal bone is low down right and this is more common this occurs more in prima gravida with good abdominal muscle tone right. But it is may so happen that it goes you know this movement is the other way round where the sagittal suture goes behind towards the sacral promontory and the anterior parietal bone now comes low down.

This is the case of anterior asynclitism and it occurs when the abdominal muscles are lax the tone is less as in case of multipara. So, this asynclitism helps in negotiating the fetal head through the pelvic brim right in case the anteroposterior diameter of the maternal pelvic brim is less or short right. So, asynclitism more common is the posterior asynclitism and here the posterior parietal bone comes low down. And see after the engagement has taken place in this asynclitism position right. So, it has taken place it has gone inside the pelvic cavity then again it will go lateral rotation the head due to continuous contraction of the uterine muscles contraction and retraction.

So, the head will negotiate and ultimately within the pelvic cavity it will attain the synclitism position right. So, that was regarding the asynclitism. So, again coming to our slides.

So, this engagement part. So, I have discussed. So, engagement is actually say this is the pubic symphysis, this is the sacrum, this is the sacrum. So, this level is the pelvic brim right. So, when the maximum biparietal diameter crosses the pelvic brim it is said that it is the engagement has taken place. Also clinically we can note from the crichton's manoeuvre which

we have also discussed in the obstetrical examination that when less than two-fifth of the fetal head is palpable per abdomen it depicts that that engagement has taken place is palpable right.

So, we have discussed. So, engagement mostly you know can occurs in asynclitism where the you know the this is the picture the sagittal suture may be you know may move right. So, sometimes the sagittal suture will move posteriorly this and sometimes it will move anteriorly right. So, when it moves posteriorly the anterior parietal bone comes low down. So, it is anterior parietal or anterior asynclitism and this name is also you know there is a name for it, it is Nageles obliquity. And posterior asynclitism is when the posterior parietal bone is low down.

So, it is the presenting part. So, the posterior parietal bone is low down and the sagittal suture is towards the pubic symphysis right. So, this is the pelvic brim right. So, this also has a name it is called as Lidsman's obliquity. And from the picture itself you can assess here the abdominal tone muscles are tight as occurs in case of primipara, but here the abdomen is lax right. It is more lax it is going you know in front there is no tone.

So, this is more seen in case of multipara. And in this picture this picture this is a case of synclitism there is no asynclitism because the sagittal suture is midway between the sacral promontory and the symphysis pubis right. So, what is the advantage of this asynclitism? Why asynclitism occurs? Because see in asynclitism the engaging diameter the engaging diameter is not the biparietal diameter, but it is the supero subparietal diameter. Engaging diameter this biparietal diameter is the engaging diameter in case of synclitism, but if there is slight flexion right the supero subparietal one side above the parietal bone other side below the parietal bone supero. So, this is the supero subparietal diameter right which is 8.5. So, lesser diameter has to negotiate through the pelvic brim right. So, this lesser diameter negotiation is helping the fetal head to get engaged. So, what is the advantage engagement in of head in asynclitism what is the advantage? These two parietal eminences cross the brim one at a time due to this flexion of the head the one parietal eminence will cross you know first then the next parietal eminence will cross and this helps lesser diameter. The supero subparietal diameter which is 8.5 to cross the pelvic brim instead of biparietal diameter which is 9.5 for engagement right. So, asynclitism is beneficial in the mechanism of labour and as the labour progresses with more uterine contraction this asynclitism gets corrected, but say there is persistent asynclitism or marked asynclitism. So, that is normal and this marked asynclitism indicates scaphalo pelvic disproportion. So, that means, the there is some scaphalo pelvic disproportion which is preventing the asynclitism to get corrected even in presence of uterine contraction. And, if in the mid pelvis when the fetal head has reached the mid pelvis if the asynclitism is not corrected then it will know lead to difficulty in the progression of labour right.

So, that was regarding engagement. So, first engagement has taken place now coming to descent. Descent you know we have already discussed descent this you know continues right

from the beginning and you know it will go on continuing throughout the process of labour. It is a continuous process and this descent will help to you know for the fetus to pass through the lower uterine segment then through the maternal pelvis right. So, this descent also has certain factors which facilitate the descent number one is the uterine contractions and retractions right in the first stage of labour. In second stage mostly descent is brought about by the bearing down effects of the mother.

That means, the bearing down effects due to abdominal muscle contraction voluntarily done by the mother by increasing the intra abdominal pressure you know by forced full expiration through a closed glottis or you know in squatting position right in squatting position trying to defecate that will also increase the abdominal pressure. So, bearing down effect help in descent in the second stage also straightening of the uterine you know the fetal ovoid. So, the first the uterus was also ovoid structure and the fetus was in all say flexion like this, but as the labour progresses the uterus becomes longitudinal it is straightened and the fetal spine is also straightened right. So, the fetal spine is also straightened and this straightening of the fetal spine will help in descent of the fetus and number 4 is the rupture of membranes. So, in last class we have drawn the bag of membranes and this bag of membranes gets ruptured.

So, there is release of liqour amne and this rupture of membrane results in release of prostaglandins, oxytocin which increase the uterine contraction and retraction and thereby also facilitating the fetal descent. So, that was regarding fetal descent. Now coming to the third step that is flexion. Flexion why flexion is occurring as the fetal head is descending at one point the fetal head will you know will get resistance from the pelvic floor right. So, that will get resistance from the pelvic floor and this know this resistance because pelvic floor is low down and it has a shape it is going posteriorly backwards and towards the midline right.

So, it is like a gutter shaped in the pelvic cavity and when the fetal head will come against this pelvic floor muscles the maternal bony pelvis it will apply a resistance and this resistance will help in more flexion of the fetal head right. So, this flexion is important more and more flexion along with descent is required for the internal rotation of the fetal head. So, flexion is achieved either due to resistance offered by the pelvic floor muscles or the unfolding cervix or the walls of the pelvis right. So, these resistance will lead to flexion of the fetus. There is one theory behind this flexion which says that when the fetal head say this is the pelvic floor muscles right.

So, that this is oriented like this in a gutter shape and it is going from this is the lateral pelvic wall right. You have we have discussed the pelvic floor muscles in the anatomy chapter and it is going like this and when this fetal head touches this pelvic floor what happens the this you know the shorter limb the shorter limb will go down the shorter limb will go down and the longer limb the longer arm will go up. So, this will further help in flexion of the fetal head and this flexion is required for further descent as well as internal rotation. So, next is the internal

rotation. Internal rotation is a movement of great importance without which further descent is arrested.

So, if there is no internal rotation then it can cause arrest of labour though there will be no progression of labour, no vaginal delivery and it may lead to caesarean section. Internal rotation arrest right. So, no further descent meaning arrest and this type of arrest is more common in case of androids pelvis right. So, the in that case the delivery is only by caesarean section.

Now coming to the different theories for this internal rotation. Number one is the slope of the pelvic floor. So, I have already drawn it for you slope of the pelvic floor meaning that it is a fan shaped muscle right. It is a fan shaped muscle and this muscle is originating from the lateral pelvic wall. This is the lateral pelvic wall it is originating from the lateral pelvic wall and going towards the midline. The direction is downwards, backwards and towards the center forming a gutter like structure right.

And when the fetal head so, these are the say muscles on the left side of the pelvic floor. So, when the fetal head is also descending and when the fetal head will you know when the occiput or the most leading part of the fetal head touches the pelvic floor right. So, by rule by rule the point or the leading part will rotate will rotate in such a way will rotate in such a way that it know it moves along the orientation of the muscles. So, this pelvic floor slope helps in internal rotation.

Number two is the pelvic shape. So, I have already told that in the inlet the inlet the transverse diameter is 13 centimeter the inlet transverse diameter is 13 centimeter. So, it is transversely it is larger this is the inlet and the outlet is just the opposite. That means, it is anteroposteriorly larger. So, this same this oval which was say this is the inlet and this becomes the outlet. The transverse diameter here is 13 centimeter the anteroposterior diameter of the outlet this is the transverse diameter this is the anteroposterior diameter which is 13 centimeter.

Whereas, the AP diameter which was around your 11 centimeter this now becomes the transverse diameter. So, see the head if it needs to accommodate in the maternal pelvis this head know it has gone through this and it needs to rotate it needs to rotate right it needs to rotate to accommodate through the outlet. So, this pelvic shape will also cause internal rotation. And number three is the law of unequal flexibility given by Sellheim and Moir which also says that you know the other soft parts of the fetal body can undergo a flexion or can adjust itself, but the head which is less compressible which is made of fetal skull bones need to you know adjust or adapt according to the fetal shape. You know it is less flexible there is you know unequal flexibility between the different parts of the fetus which leads to internal rotation.

So, these are the different you know theories behind internal rotation. So, the next part of the

normal labor process will be discussed in our next class up till this you have completed the engagement the points for asynclitism advantage of asynclitism and this asynclitism being corrected as the labor progresses with uterine contraction. Then number two cardinal movement is descent then your flexion flexion and internal rotation. So, we have completed the first four steps of normal labor rest will be discussed in our next class. Thank you. .