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

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Week:11

Lecture:01

Instrumental Vaginal Delivery

Good morning students. 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 Multispeciality Hospital and Medical Research Center, IIT Kharagpur. Today we are going to have discussion regarding instrumental vaginal delivery which includes two most important instruments which assist in the vaginal delivery that is the forceps and the vacuums. The keywords for today's class are as given.

So, coming to instrumental vaginal delivery which can also be called as operative vaginal delivery. So, what is the definition? It is the vaginal birth which is accomplished with the assistance of some instruments that is forceps or vacuum cup device, right. So, they are actually applied to the fetal head and an outward traction with these instruments with the forceps or with vacuum, we generate an outward traction force that augments, right, that is added up together with the maternal pushing or bearing down effects and these together they help in the delivery of the fetus. So, actually operative vaginal delivery is you know assisting the delivery of the fetal head with certain instruments that is the forceps and the vacuum and they augment the maternal bearing down or pushing down effects in the second stage of labour.

And here in this class we will discuss the forceps delivery, what are the indications, what are the types of forceps, when to apply forceps, what are the precautions to be taken and what are the advantages and disadvantages of forceps as well as vacuum. And, coming to this very important line, valsalva manoeuvre during pushing, during the maternal bearing down or pushing effect in the second stage of labour, you know there is increase in the intra abdominal pressure, right. The mother pushes down, there is increase in the contraction of the abdominal muscles, increase in the intra abdominal pressure that helps the baby to get expelled out, but also during this period there is increase in negative intrathoracic pressure. So, the intrathoracic pressure decreases, there is development of negative intrathoracic pressure. So, what happens when the intrathoracic pressure is you know negative, it falls.So, what happens there is increase of venous return, right that will increase the venous return. And, as a result here is the heart,

here is the heart as a result as the venous return increases, venous return increases. So, what happens there is increase in cardiac overload, right. So, cardiac output increases and say if the mother is having any heart disease, mother with heart disease when she goes in second stage of labour there is increase in cardiac output that can cause cardiac failure. So, we go for forceps delivery in mothers of heart disease to cut short the second stage of labour, right.

So, to cut short the second stage of labour so that there is no cardiac overload, no chance of or less chance of cardiac failure we go for forceps delivery that is an indication for forceps delivery. Now, other indications what know where to use forceps or vacuum, they are the conditions that threatens the mother or the fetus. And, those conditions that are detrimental to the that are detrimental to the your health of the mother or the fetus both the mother and fetus are in jeopardy and that is likely to be relieved by delivery, right. In those conditions where we need to expedite the delivery or we need to cut short the second stage of labour we go for forceps or vacuum delivery. So, what are the indications? Maternal indications in cases of maternal exhaustion.

So, mother cannot push anymore. So, in that case the instrumental vaginal delivery will help to you know expel out the fetus also in prolonged second stage. So, second stage is getting prolonged. So, we can cut short that second stage by forceps delivery. In case of fetal distress, fetal distress in second stage, in second stage so the you know the earlier the fetus is delivered the more better prognosis for the fetus.

So, we go for instrumental delivery. So, these are the indications. So, this is the picture where you are applying the forceps. So, these are the blades of the forceps and you can see the fetal head. So, this is you know outlet forceps where the fetal head can be seen coming out through the vaginal introitus you know and you know the labia majora without separating the labia majora you can see the fetal head and also you see here that yes the direction of the pull right.

So, here this is the examiner's hand. The examiner is holding the forceps and the direction of pull is forwards and upwards. So, this direction this pull this pull is actually forwards and upwards. So, this is the pull direction is forwards forwards and upwards right. So, why such because this will help in causing extension of the head.

The head is delivered by extension and this pull of the forceps will help in delivery of the head by fetal head extension right. So, what are the prerequisites? What we need to check before application of the forceps? The bladder is to be emptied by a rubber catheter. No need to put a Foley's catheter just temporarily emptying the bladder by a rubber catheter. Adequate analgesia pudendal block most commonly used before forceps delivery. Very very important point fully dilated cervix these are for forceps delivery.

So, fully dilated cervix membranes should be ruptured no cephalopelvic disproportion. So, no CPD right. So, no contraindications of vaginal delivery. If vaginal delivery is contraindicated we are not going to put a forceps in that mother. If you are suspecting a cephalopelvic disproportion you are not going for forceps delivery you will straight away go for caesarean section right.

Also important prerequisite is vertex presentation. In vertex presentation with head engaged right we apply forceps. Some cases apart from vertex presentation number 1 in after coming head of breech in after coming head of breech we use forceps that forceps is called as Piper's forceps. And number 2 is in persistent occiputoposterior position we can use forceps for face to pubis delivery. So, in these 2 specific conditions apart from vertex presentation we can use forceps.

Also the fetal head position to be known right. So, what is what should be the fetal head position? It should be occiputoposterior right direct occiputoposterior or left occiputoposterior or right occiputoposterior. No fetal coagulopathy, no bleeding disorder of the fetus because you know when you are putting a vacuum cup over the fetal head or you are putting the forceps blade over the fetal head all these cases there should not be any bleeding disorder of the fetus. Because it can cause fetal hemorrhage in the form of cephalohematoma and if there is any bleeding disorder it can also lead to intraventricular hemorrhage that will jeopardize the health of the fetus. So, that will be detrimental.

So, that is a contraindication. No fetal demineralization disorder, no bone disorder of the fetus because that can lead to skull fracture right. So, these should be excluded and also in case in case your operative vaginal delivery is you know failure there is a failure the even after pull of the forceps you know even after pull of the forceps for twice and pull of the vacuum three times if there is no delivery of the head then you should abandon the operative vaginal delivery. So, this is called as trial of forceps. In that case you need to go for caesarean section right and always the operator should be very experienced to apply forceps or vacuum and there should always always be a verbal as well not or as well as a written consent of the mother as well as the patient party.

So, you need to get the consent from the mother as well as from the husband or you know any anyone from her family. So, these are the prerequisites. Now coming to the different types of forceps application, you know according to the station right and rotation of the head. So, what are they? They are low forceps, mid forceps and high forceps. Another one is your outlet forceps right.

So, depending upon the station. So, this is the ischial spines, this is the level of the ischial spines right. So, this is the ischial spine and the level of the ischial spine this level is station 0

right. So, above is minus 1, minus 2, minus 3, minus 4, minus 5, minus 5 station is the level of pelvic brim and below if you go down it is plus 1, plus 2, plus 3, plus 4, plus 5 and this is the level of pelvic outlet I mean the perineum right.

So, this is the perineum. Now, where in which station to apply forceps? Forceps should be applied no prerequisite is the fetal head should be engaged. So, fetal head is engaged at station 0. So, it should be station 0 or more right. So, what is the outlet forceps? Outlet forceps is when the station is plus 5, this is outlet forceps.

Next is your low forceps. Low forceps meaning the station should be at least plus 2 right. So, station should be at least plus 2, plus 2 and below. So, plus 2 and below meaning 2 to 4. So, plus 2 and below. So, this is your low forceps and 0 to plus 2 if it if the station is above plus 2, but is engaged that is station at least it is station 0 that is your mid forceps right mid forceps.

And higher up if this fetal head is not engaged you know in that case we apply we go for high forceps. So, high forceps in modern day practice it is contraindicated we not we do not apply high forceps nowadays right. So, coming to one by one outlet forceps outlet forceps is when the scalp of the fetus is visible at the introitus without separating the labia majora. That means, station is plus 5 station is plus 5 the fetal scalp has already reached the pelvic floor. And the sagittal suture the sagittal suture will be in the anterior posterior diameter right or you know at least in the right or left occiput anterior position.

So, what is that if say this is your symphysis pubis. So, this is anterior and this is the sacrum right. So, where should be the occiput? Say this is the fetal head this is the fetal head and this is the posterior fontanelle. So, this is direct occiput anterior or it may so happen that the occiput is right or left right. So, in these two positions this is the left occiput anterior and this is the right occiput anterior.

So, in these two positions also you can apply the outlet forceps so that means, this rotation this rotation is less than 45 degrees. So, rotation does not exceed if it is more than 45 degrees then we cannot apply outlet forceps right. So, rotation should be less than 45 degrees in that case the outlet forceps when applied This rotation this less than 45 degree rotation will you know get corrected automatically and the occiput comes in alignment just behind the symphysis pubis with the sagittal suture in the anteroposterior diameter and then when you give the traction with outlet forceps the fetal head will get delivered by extension. Fetal head is at the perineum right. Now outlet forceps we have already talked so this is the outlet forceps at the perineum.

Then comes the low forceps low forceps meaning it is above it is no station should be plus 2 plus 2 or greater that is plus 3 or plus 4 right. So, and the fetal head is not on the pelvic floor right. So, this forceps a little bit longer and the rotation here also should be 45 degrees or less

less if it is you know slightly rotated to the left left occiput anterior or right occiput anterior that gets corrected automatically after application of the low forceps. Mid forceps is your station above plus 1, but I have already told that the head should be engaged that means, station should be at least plus 0. So, it should be at least 0 or more than 0.

So, 0 plus 1 plus 2 this is also called as mid cavity forceps and high forceps this is not used in modern day obstetrics. So, this is the you know society of maternal and fetal medicine SMFM checklist you know the checklist which we need to go through before the start of any forceps delivery. What is it? Operative vaginal delivery, operative vaginal delivery what are the checklist? You know preparation and prerequisite what is the primary indication of your operative vaginal delivery? Why you are going to do? Whether it is due to second stage prolongation or due to any fetal distress or for maternal benefit in the form of medical problems say mother is having heart disease or there is maternal exhaustion. So, you have to write it here right. Next is the estimated fetal weight whether it is reasonable for vaginal delivery whether the cervix is fully dilated it is a prerequisite for forceps delivery cervix should be fully dilated that means, it is given in the second stage of labour.

The maternal pelvis dimension should be judged by parvaginal examination we go for clinical pelvimetry and we rule out any type of cephalopelvic disproportion whether the fetal head is engaged station is 0 or more than 0. Fetal head position for example, whether it is direct oxy puto anterior or left or right oxy puto anterior are the membranes ruptured whether there is any known or suspected fetal contraindication in the form of fetal bleeding disorder or any you know bone mineralization disorder as in case of osteogenesis imperfecta right. And what are the you know whether the benefits and risks have been discussed with the mother and she has agreed she has given consent and lastly you need to know right again whether you are going to do this forceps delivery in the labour room or in the operation theater right and say in case there is a failure right in case the trial you know you are going for trial of forceps and this there is a you know failed forceps the delivery of the head could not be done with forceps or vacuum right whichever you have started with then you need to have know all the supporting staffs ready so that you can go for a caesarean section. So before doing a forceps delivery who are to be notified the labour room and the OT nursing staff the obstetrics attending right the obstetrician attending the anesthesiologist very important he or she must be ready for you know for as forgiving pudendal block as well as for spinal anesthesia if it gets converted to a caesarean section and always always the pediatrician the NICU or the pediatrician in the NICU should be you know informed beforehand before the application of forceps delivery and so that immediately after forceps delivery the baby is handed over to the pediatrician right and then the last minute checkout point is the pre procedure timeout these all should be written in this sheet of paper right because these are very important to maintain the record as well as for you know legal procedures which can be you know which can be required in your future. So whether all the team members were present or not know does the patient identify identity match the chart so

need to know correlate yes this is the patient who has been put for forceps application and if vacuum extraction is being done whether the gestational age is at least 34 weeks so gestational age should be more than 34 weeks in case of vacuum extraction what pressure to be used maximum pressure is 0.8 kg /centimeter square and whether we are following the usual stopping rules so if three pop-offs right so we stop if there is three pop-offs so after application of that vacuum cup so if it is not fitting we try thrice and then we stop stop if not progress with each pull right so when you are pulling with the vacuum if there is no descent of the fetal head then you should stop stop after 15 minutes right so even after 15 minutes of vacuum application if the fetal head is not delivered you need to stop no changing to forceps if vacuum is unsuccessful we are not going to again try with forceps but we will directly go for caesarean section and if so that was regarding vacuum application if forceps is being applied then we should also follow the stopping rules what are they that stop if no progress with each pull same when you are pulling with forceps if there is no descent of the fetal head at all so that will indicate that there is a chance of cephalopelvic disproportion so you will stop the procedure stop after 15 minutes no changing to vacuum is if forceps is unsuccessful right so these are all the no checklist which you need to go before the application of forceps our content is in place contingencies in place for caesarean delivery if there is a failure we need to go for caesarean delivery if anesthetist is available if the bladder of the patient is emptied now then the indications of a episiotomy episiotomy should be given in a case of operative vaginal delivery what preparations have been made for possible postpartum hemorrhage so there is a prolonged second stage you are going for instrumental vaginal delivery there is a high risk for postpartum hemorrhage so you need to be very cautious and beforehand you need to know be ready to combat if there is an episode of postpartum hemorrhage prophylactic antibiotic after the procedure is routinely given in our center so we give an antibiotic prophylaxis to prevent any infection and also very important is time of placement of the instrument when that instrument has been no placed or when is the time for application of the instrument so that we note that when the delivery of the baby has occurred and it should not be more than 15 minutes right so these are the checklist now we will discuss what are the indications of forceps delivery and what are the prerequisites to be ascertained before the forceps delivery.

Next is what does the forceps look like forceps has two blades say this is one blade and this is another blade so these are called as branches right and left right and left blade or branches they are named according to the blade which is placed in the right pelvis right side of the pelvis of the mother and the left blade is placed in the left side of the pelvis of the mother and each branch has four components this is the blade so this is the blade this is the shank this is the lock and this is the handle so in the handle you hold the forceps and the lock helps to you know keep the two blades in position shank will give a little bit you know distance you know from the perineum to apply right so this maintains a little bit of distance you know that will help to give the traction and the blades are fitting on the fetal head and these blades have two curves see this is the caephalic curve the inside where the fetal head will fit in so this is the caephalic curve and the outside this is the pelvic curve right so the pelvic curve will you know this outside curve will be

over the maternal pelvis and the inside curve will fit the fetal head right so you will see this so this blade having two curves have told pelvic curve which is outside and it is you know going and fitting into the maternal pelvis and the inside curve that is the caephalic curve which will protect or guard the fetal head the fetal caephalic end the caephalic curve confirms the shape of the fetal head and the pelvic curve confirms the shape of the birth canal or the maternal pelvis

now coming to the varieties of the obstetric forceps there are different you know types of obstetric forceps you know very importantly is the Wrigley's forceps Wrigley's forceps is nothing but the outlet forceps and these outlet forceps are you know they are used in station 5 plus 5 that means the head is being seen in the perineum and just to cut short the second stage of labor or you know to give a protective cage right to give a protective cage to the fetal head during the delivery to prevent sudden decompression in case of preterm delivery where there is a risk of you know intraventicular hemorrhage in case of sudden decompression there you can apply the forceps to prevent or to protect the fetal head from intraventicular hemorrhage in preterm delivery number one number two Wrigley's forceps are also used in caesarean section you know just to help in the to and fro movement of the fetal head to take the fetal head out of the incision from the uterine cavity outside the abdomen that will that is by ventus right so just up and down movement with that forceps will help in delivery of the fetal head right in caesarean section that is also by Wrigley's forceps I will show you the pictures right and also say you know in caesarean section when the you cannot hold the fetal head by your hand in case of floating floating aid or high up head or polyhydramnios in that case you can apply the Wrigley's forceps right so this is outlet forceps number two is the Simpson's forceps Simpson's forceps is a little bit no larger than the Wrigley's forceps and it has a lock English lock and this is no forceps not outlet but low forceps that means no station plus three or plus four here it is station +5 right outlet for we have already read outlet forceps low forceps. Then is coming your Kielland's forceps Kielland's forceps is a very you know specialized forceps and it helps in rotation I have been telling that rotation should be less than 45 degrees in tie in forceps application but in Kielland's forceps say even if the rotation is more than 45 degrees then also man that means the rotation is still not complete it is more than 45 degrees deviated from the midline the occiput then with kielland forceps it helps in rotation in correction in correction of rotation correction of rotation also in asynclitism. kielland forceps can be used what is the no main criteria of this forceps it has a sliding lock and sliding lock this sliding lock helps to slide right helps to slide and helps in rotation of the fetal head before the pull of the forceps after the rotation is complete then you pull the you give traction to this forceps so it has a sliding lock and the shanks are long right so in kielland’s forceps these are the two specialized criteria and you know it is almost straight kielland’s forceps well I will show you the picture next is the Piper's forceps this also is being used this is actually used in after coming head of breech and this pipers forceps you know they also have very long shank and that will help to know support the fetal body right so that is called as perineal curve I will show you and number 5 is your milne murray forceps so these have attraction these have another traction device that will help to give the traction force in alignment with the fetal spine so that there is no help that will help to you know extract the fetus

in alignment with the fetal spine right so this is also called as axis traction forceps and it is used in as low or mid forceps that is station 0 plus 1 plus 2 right so these are the varieties so now coming to the pictures this is wrigley's forceps or outlet forceps see this is short this have the lock this is the you know the handle and these are the blades this is the shank shank is short and these are the blades right next is the Simpsons forceps is just a slight longer than the wrigley's forceps it is a low forceps and here also same the lock this is the handle this is the shank and these are the blades so this is Simpsons forceps now coming to the kielland's forceps very important to note is the sliding lock the sliding lock will help know after application when you go for this lock to know when you go for the application of the lock there will be sliding of the blades and this sliding will help to correct the rotation or asynclitism in the fetal head also see this as a long shank right so that is kielland's forceps and it is no can be given when the rotation is still not complete.

this is Das's long forceps here this we have in our Institute and this can be used as a low forceps right so this is also very very useful here this is the no handle where you hold and this is the lock right and this is the shank and the two blades right and this is your Piper's forceps which is for the aftercoming head of breech see here you can see so this this part see how long is the shank this is the perennial curve right so this actually will rest the fetal body right this this long part will rest the fetal body and then the blade will get attached to the aftercoming head of breech and then you will pull so that there is smooth extraction of the fetal head right in case of breech delivery and Milne Murray say this is the axis traction device so this device helps to you know give know the traction along the axis of the fetal spine right and this can be used as low or mid forceps so these are the different types of forceps which can be used which we use in our day to day practice.

now coming to the morbidity what are the maternal difficulties or maternal morbidity there will be more lacerations more operative delivery meaning more perineal lacerations third or fourth degree perineal tear there is very very high chance of PPH atonic uterus right there is increased chance of postpartum urinary retention and lastly there is more chance of infection more time is required for delivery more intervention more chance of infection so we always give a prophylactic antibiotic dose after the application of any forceps or vacuum in case of fetus what are the complications there can be you know fetal cephalhematoma now due to application of that forceps there will be some compression and can lead to cephalohematoma or subgaleal hematoma and you know sometimes it can also lead to intraventricular hemorrhage there can be skull fracture improper application of the forceps can lead to skull fracture and sometimes due to inadvertent use there can be cord compression the cord can come in between the fetal head and the blades and there can be cord compression so these are the disadvantages of forceps delivery.

Now coming to vacuum application so vacuum is actually you know this has some advantages what are they it can be used even if the cervix is not fully dilated right this is number one it can be used even if the rotation is not complete in forceps the rotation should be complete or it

should be less than 45 degree right so rotation not complete vacuum application help and also causes rotation of the fetal head or correction of the rotation as well as traction right number three what is the advantage the cup you know this cup see this is the cup so the cup is not occupying the whole of the pelvis right so cup does not occupy does not occupy whole of pelvic space and there is less compression on the fetal head so from the part of the fetus there is less chance of your cephal hematoma or hemorrhage so these are the advantage but what is the disadvantage it takes more time so in case of fetal distress we cannot use not to be used in fetal distress right so these are regarding vacuum and see these has three parts this is the cup this is the rubber tubing right and this is the vacuum apparatus to create that negative suction pressure so this is your application of vacuum where you can see the vacuum cup is applied on the fetal head right and with the other hand you guard the fetal head and you give traction and counter traction and this traction this traction should be perpendicular to the cup. so these things you should know and also it can be given this traction can be given during maternal pushing during maternal pushing you can give the traction right and also how many how many times you can pull right so three times maximum three pulls during descent and three pulls during crowning so during descent so this is descent this is this is not at no crowning has not yet taken place here in this picture so when during the descent maximum three pulls after three pulls the the fetal head should be you know should be seen through the perineum without separating the labia that means crowning should happen and after crowning we can again go for maximum three pulls if then also the fetal head is not delivered then we will stop the procedure right so this is the where to place the cup so this is the placement of the cup this is called as the flexion point which is three centimeter anterior to the posterior posterior fontanelle anterior to posterior fontanelle three centimeter anterior to the posterior fontanelle and from here this total distance is your uh nine centimeter so from here from the anterior fontanelle it is six centimeter right so this is the flexion point if the cup is properly placed at the flexion point then the traction will be maximum and it will be very smooth and you know with rotation there will be also traction on the fetal head helping in fetal descent right and what is the negative pressure negative suction pressure which is to be started with to start with is 0.2 kg per centimeter square and then gradually it can be increased maximum up to 0.8 kg per centimeter square right so these are regarding the placement of the cup and your traction which is perpendicular to the cup and it can be given during the periods of maternal pushing and what is the negative pressure to start with is 0.2 and slowly slowly we can raise maximum up to 0.8 and maximum three pulls can be given while fetal descent and after crowning maximum three pulls can be applied still if it is not delivered then it is unsuccessful and then we need to go for cesarean section and lastly coming to the contraindications of vacuum delivery I have told that yes the gestational age should be at least 34 weeks before 34 weeks we will not use vacuum because that can lead to you know hematoma the blood vessels are more fragile and lead to hemorrhage right Malpresentation in case of breech in case of brow the vacuum cannot be used only it can be used in case of vertex presentation only here it can be used you know we have discussed in forceps that in two cases two special cases that is number one in case of after coming head of breech and number two in

case of persistent occiputoposterior we can apply forceps but in vacuum it should be always in vertex position right cephalopelvic disproportion is a contraindication which must be ruled out before application of vacuum fetal bleeding disorder in the form of thrombocytopenia platelet disorder thalassemia any bleeding disorder it should not be used vacuum should not be used right also fetal blood sampling fetal blood sampling should not be used just prior to the application of vacuum delivery also in case of HIV positive mother we refrain from your instrumental delivery so that was the contraindications of vacuum delivery so that was all for the instrumental delivery and more you know in our institute we are more using the forceps the outlet forceps or the wrigley's forceps also the das's long blade forceps and you know if the prerequisites are carefully seen and you know they are all the prerequisites are met then forceps will be successful there is very little chance for unsuccessful forceps and provided it is applied you know properly and the traction is given properly forwards and upwards so as to make the head help in head extension then it will be a successful forceps and it helps to cut short the second stage of labor and very importantly episiotomy should be given to prevent you know third and fourth degree perineal tear or other perineal lacerations in the mother so that was all references have been taken from DC dutta textbook of obstetrics the Williams obstetrics and James book on high-risk pregnancy so thank you all for your patient hearing thank you.