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Normal Puerperal changes

Good morning students. I welcome you all to the NPTEL online certified course on the topic An Overview on Maternal Health, the Antenatal, Intranatal and Postnatal Care. I am Dr. Barnali Ghosh, an Obstetrician and Gynecologist working as Assistant Professor at Biseroy Multispeciality and Medical Research Centre, IIT, Kharagpur. Today we are going to discuss regarding the puerperium. So we have already dealt with the antenatal care, the intrapartum or the intranatal care of both the mother and the baby and now we will be discussing regarding the postnatal care which is after the delivery of the postpartum or puerperium, right.

So what are the changes that occurs during the period of puerperium? So we will be discussing regarding the changes, the normal puerperal changes that occur in the woman's body after the delivery, right. So keywords for today's class are as given. Coming to puerperium, what do you mean by the word puerperium? puerperium is actually the period following child birth. So after the delivery, the different changes that occur, right within the body tissues, this is the time period during which the body tissues, especially the pelvic organs or the reproductive organs revert back to their pre-pregnancy state.

So during pregnancy, different changes has taken place in the reproductive organs to facilitate the growth of the fetus as well as for the well-being of the fetus. Now after childbirth, all these organs, the pelvic organs, the reproductive organs, they revert back to their pre-pregnancy state both anatomically and physiologically. And these retrogressive changes occur mostly in the reproductive organs that is the uterus, the cervix, the vagina with exception of the mammary glands. The breasts or the mammary glands, they continue to function after childbirth for lactation of the baby. So what is this time period or duration which we call as the puerperium? It is 6 weeks or 42 days, right.

So 6 weeks if we take this as childbirth or delivery of the baby. So now you can divide this as immediate, early and remote, right. The period is divided as immediate, early and remote. What is immediate puerperium? It is a period from childbirth up to 24 hours. So this is the immediate puerperium.

From 24 hours up to 1 week, this is your early puerperium and from 1 week to 6 weeks, this is the remote puerperium. And this whole period from childbirth up to 6 weeks or 42 days is called as the puerperal period, right. So coming to one by one what happens in the different reproductive organs of which the main importance is on the uterus. So involution is nothing but you know the changes or both anatomical as well as physiological changes that occur inside the uterus to revert back to its pre-pregnancy state. So this change is called as involution.

So involution of uterus coming to the size of the uterus. The size has increased in pregnancy and now just after delivery, if you see just after delivery, if say this is the maternal abdomen, this is the umbilicus and this is your symphysis pubis, right. So this is the abdomen, this is the symphysis pubis, this is the umbilicus. So immediately after birth, the uterus, height of the uterus is at just below the level of umbilicus. So say this is the height of the uterus.

This is just after. This is the xiphisternum. So the uterus was large enough and it was at the level of the xiphisternum at 36 weeks. And then after the birth, just after the delivery, the fundus of the uterus is just below the umbilicus that is 22 weeks size. And this is approximately 13 to 13.5 centimeter from symphysis pubis. And for the first 48 hours, for the first 48 hours there is no involution. The uterus remains at this position just below the umbilicus. For the first 48 hours and then involution starts after 48 hours at the rate of 1.25 to 1.5 centimeter per day that is half inch per day. So the height gradually gradually decreases, right. It will gradually gradually decrease in height at the rate of 1.5 centimeter per day. And this height it becomes the pelvic organ, right.

So the uterus now which was which had become an umbilical I mean abdominal organ, it becomes a pelvic organ. Fungus becomes a pelvic organ by 2 weeks after delivery, right. So this is very important to note that 2 weeks are following delivery you will not be able to palpate the fundus per abdominally. So if there is normal involution in the normal rate, right, if all is normal in the puerperal period then the uterus will gradually decrease in size and it will become a pelvic organ or the fundus will remain just at the level of symphysis pubis by 2 weeks following delivery. And to note that this uterus it will further go decrease in size and it reaches the pre-pregnant size by 6 weeks.

So uterus becomes the pelvic organ that is the level of the fundus reaches the symphysis pubis by 2 weeks and it reaches its pre-pregnant size by 6 weeks postpartum, right. So that was regarding the size. Now coming to the weight of the uterus, weight of uterus at term we know it is 1000 gram. So if this is the uterus with the baby inside, right, so say this is the placenta, this is the baby, right and this is the umbilical cord and say this is your amniotic membrane, right. So this was at term, this uterus is at term and this uterus at term the weight of the uterus is 1000 gram, weight of the fetus at term say it is 2.8 to 3 kgs, weight of placenta is 500 gram, weight of

liquor this is filled with liquor. So weight of liquor it is around 800 to 1000 ml, right. So all these after delivery they get expelled out. So immediately after delivery weight of the uterus this is 1000 gram this remains immediately after delivery. After 1 week there is decrease in weight by 50 percent that means it becomes 500 gram and after 6 weeks it reaches the pre-pregnancy weight which is we have already discussed in the anatomy it is 60 to 80 gram, right.

So it reaches by 6 weeks the uterus weight it decreases and reaches the pre-pregnancy weight that is 60 to 80 gram. Now coming to the endometrial lining, so if you see here this is the uterus, this is the vagina, this is the cervix, right. So the placenta was attached here, right and this total endometrial lining is called as the decidua. Now immediately after delivery the placenta has got expelled along with the decidua that is why the placenta is called as your chorio decidual. So the during separation of placenta the placenta also gets separated together with the part of the decidua.

So this endometrial lining which has been shaded during the delivery of the fetus it needs to regenerate and regeneration starts within 1 week and it is completed by 16 days, right. So the endometrial regeneration and how does it occur following delivery the major part of decidua is cast off, right and this needs to get you know again regenerated and it occurs from the epithelium. So this regeneration, this I will take another color, so this regeneration will occur from the epithelium of the uterine glands. So there are many uterine glands here, right under the endometrium and these uterine glands epithelium they will grow on both the directions and that will help to cover the endometrial lining and this occurs from the epithelium of the endometrial gland mouth and the inter glandular stromal cells. So that will help in regeneration of the endometrium which starts after 1 week of delivery and gets completed by 16 days following delivery.

To note that this placental site, placental site regeneration is slower, it takes a longer time that is completed by 6 weeks following delivery, right. So this is placental site involution, after the delivery this placental site will be raw, placenta has got detached and this placental site will be you know that size will be like that of a palm, palm size. This is the placental attachment site that will be palm size after delivery, right. Then it becomes 3 to 4 centimeter in diameter, right. There will be regeneration and it becomes 3 to 4 centimeter in diameter in 2 weeks following delivery.

So, after the end of second week there will be regeneration from this side, there will be regeneration from this side and this will decrease and that will decrease to 3 to 4 centimeter. What happens? So, placental site involution what happens? There is exfoliation of the placental site, right. So that placental site those decidua that will get exfoliated and the endometrial downgrowth of the endometrium from the margins, right. So there are glands I have told, here are glands. So these endometrial in the endometrium lining the glands that will grow downward,

that will grow downward and will help to regenerate the placental site.

So growth from the endometrium lining the glands as well as the stroma as well as from the decidua basalis. So we have 3 parts decidua basalis, decidua compactum that is stratum, right. So we know. So decidua basalis is innermost that is not separated that does that is persistent and that does not get separated during placental separation. So this decidua basalis, this decidua basalis which is slow down that will again help in growth of endometrium endometrial lining the placental site.

So that is what is written here. So both this process help in placental site involution and it gets completed by 6 weeks of puerperium. So that is all regarding uterus. Coming to cervix, cervix will gradually gradually contract, right. Cervix will gradually gradually contract.

First this is the external os that allows the entry of 2 fingers for few days after delivery, but then gradually it gets narrowed down and there is just an entry of tip of the finger only. And it takes the total contour, this total contour of the cervix to revert back to the prepregnant state, it takes 6 weeks. Another point is the external os never reverts back to the nulliparous state. So we have already told that external os is your pinhole in case of nulliparous woman. Those women who have no vaginal delivery previously here the external os is pinhole and if the female has at least one previous vaginal delivery then the external os is slit like.

So it remains like that, remains like that. So it never reverts back to the nulliparous state. It will not become pinhole, it will remain like a slit, right. So that is regarding the cervix. Now coming to a very important concept in the puerperium that is lochia.

What is lochia? lochia is vaginal discharge which occurs in the first fortnight that is the first 14 to 15 days during puerperium and this discharge actually originates from the uterine body, the cervix and the vagina, right. So duration ranges between 24 to 36 days, right. So approximately your 3 to 5 weeks. So not more than that, mostly it will go away, the lochial discharge decreases or stops by 3 weeks, right. So we need to note the lochial discharge.

It is important because depending you know this lochial discharge is normal as such in pregnancy but if there is excessive discharge, if there is malorder from the lochial discharge or it is associated with you know other unnecessary complaints, right from the mother then it suspects any type of infection inside the uterine cavity or in the lower pelvic organs, right. So what are the contents of the lochia? These are actually the decidual cells which are being shaded, which are being shaded and they are mixed with RBC, cervical mucus, vaginal epithelial cells and bacteria, right. So there are 3 types of lochia, lochia rubra, lochia serosa and lochia alba depending upon the color. From the name itself we know that rubra meaning red color. This is first to appear and it remains for the first 4 days, right 1, 2, 3, 4, first 4 days of

puerperium, right.

So first 4 days of puerperium and it contains more number of RBCs. So consider the 4th day from the 5th day, 5th, 6th, 7th, 8th and 9th day of puerperium, right. So from 5th day up to the 9th day these are 9th or you can say next 4 days just to remember. The next 4 days the color changes which was red in color now it becomes light yellow, light yellow to brownish, right brownish in color and it contains more WBCs with cervical mucus.

After the 8th day it becomes lochia alba. lochia alba persist for the next you know up to 15 days postpartum and this is more or less white in color there is less blood less blood, but it contains more of mucus secretion. So that is regarding your lochia alba. So gradually so lochia rubra first you note that there is certain vaginal discharge which is red in color for the first 4 days and you need to you know counsel the mother that it is normal. Then coming to after from 5th day the color becomes gradually gradually brownish and it remains or persists for the next 4 days and then this discharge will ultimately become white in color more of mucus like secretions from the vagina which may persist for another you know up to 15 days of postpartum. So that is regarding the lochial discharge for vagina, ok.

So average amount of lochial discharge is 250 ml in the first 5 to 6 days, right. So that is the average amount. Now if you say that if there is excessive lochial discharge, excessive or you know more profuse that is more than normal what are what can be the causes in case of multiple pregnancy where there is large you know placenta. So placental site that will raw placental site will also be larger. So you know the decidual cells which are getting shredded off that will also be more and it will continue for a longer period of time.

So there is chance of excessive lochial formation. In case of over distended uterus same case the decidua getting shredded you know in case of over due distended uterus there will be more decidual cells that will get shed off. In case of sub involution, so involution I have told that it is gradually change for to the pre pregnant state, right. So the uterus will gradually gradually become smaller. Now say there is sub involution that means that the uterus is not getting to the pre pregnant state at the normal rate that is you know that is normal.

So there is you know delayed involution or say that is not appropriate involution of the uterus. So that is called as sub involution. Sub involution can occur in different conditions, right and also in case there is any retained bits of conceptus or retained bits of placenta inside the uterus. Mostly in caesarean section there is no chance because the obstetrician himself or herself will take out the placenta and inspect the inside of the uterine cavity to note for any after membranes. But in case it is a vaginal delivery sometimes some membranes or placental bits may get retained and if not searched properly or if overlooked then these retained bits of conceptus can lead to infection, can lead to sub involution and that will lead to excessive lochial discharge in the

postpartum period, right.

Now coming to WBC. WBC I have told that lochia serosa contains WBC. So WBC is a normal content of lochial discharge. So if say from the lochial discharge you go for a saline preparation, saline preparation of lochia and you see it under the microscope. So if WBCs are seen that does not does not diagnose infection because it is a normal content of the lochia and WBC if present it does not signify that there is whether there is any infection or not, right. So now coming to the clinical importance I have been talking about lochia.

Why lochia is so much of important because by looking at the character itself and the volume the vulval pads we can note whether there is any abnormality. So the nature of the lochia if malodorous then it indicates infection. Say infection in case why infection because it can be that there is any retained plug or cotton piece inside the vagina. So that has gotten got infected and leading to malodorous lochial discharge.

So you need to inspect and take out the cotton plug. Amount if there is very less amount of lochial discharge it signifies sometimes any type of obstruction or lochia metro. So the cervix you know due to sometimes curettage following delivery which is not to be done due to curettage there can be cervical stenosis and that will hinder the lochial flow, right. And if the amount is excessive then obviously it detects infection. Color of the lochia red color, persistent red color for the first 4 days red color is normal, but if it is persistent for next 10 days or 15 days then it is suggestive of sub involution or there may be certain retained bits of conceptors. Duration of lochia beyond your 3 weeks that suggests local genital infection.

It can be cervical infection, it can be vaginal infection. So this we need to know investigate or evaluate and if present if infection is present treat it. If cotton piece has got retained then you have to immediately remove it, right. So these all retained bits of conceptors if there is present inside the uterine cavity then you need to explore the uterine cavity under USG, under vision and take out the retained products of conception.

So that was regarding lochia. Coming to the hematological changes in puerperium hemoglobin decreases, right. Due to blood loss hemoglobin decreases, but to note WBC increases there is leukocytosis and relative, relative lymphocytopenia, right. So relative lymphopenia or eosinopenia. So lymphocytes eosinophils decreases, but preferentially the neutrophils sorry lymphocytes eosinophils decreases and the neutrophils preferentially increase in the puerperal period.

Platelets also increase in the puerperal period. This too fibrinogen and ESR you know fibrinogen ESR during pregnancy it is increasing all the clotting factors in pregnancy increase, increase by 50 percent in pregnancy which was 300 to 400 nanogram per ml it becomes 600 to

800 nanogram per ml, right. And ESR also increase fourfold in pregnancy, but to note that after the delivery of the baby all clotting factors return to pre-pregnant state, pre-pregnant levels or to normal levels within 2 weeks of postpartum period, right. So in 2 weeks all the clotting factors will revert to normal. Now coming to hypervolemia that there is increased volume during pregnancy which immediately after delivery there is decrease in blood volume due to number 1 blood loss and number 2 dehydration and it decreases to normal by 1 week, right.

So that was regarding the blood volume. In the cardiovascular system the cardiac output increases in pregnancy and after delivery after delivery it reverts to pre-labor values. We have discussed in the physiological changes of pregnancy that the cardiac output increases maximum at 30 to 32 weeks and then there is again a increase during the labor period, right. So, after delivery it will revert to the pre-labor values within 1 hour of delivery, right within 1 hour of delivery. And for the next 24 to 48 hours it remains elevated and then it will again you know gradually gradually return to the pre-pregnant values. So return to pre-pregnant values and that occurs by 10 to 14 days after delivery.

So that is regarding the cardiac output, right. Heart rate also follows the same pattern as that of cardiac output. Systemic vascular resistance it decreases in pregnancy, right. It decreases in pregnancy and it decreases or remains low for the first 2 days for first 2 days postpartum and then gradually gradually it returns to pre-pregnant values. It remains low the vascular resistance for the first 2 days and then it gradually increases and you know it attains the pre-pregnant values in the postpartum period.

So that was regarding the cardiovascular system. Now coming to the postpartum diuresis we know during pregnancy there is increase in the sodium plus water space. There is hypervolemia, there is increase in sodium retention. In the first week there is 2 liter decrease in the sodium space, right. That will lead to weight loss. Weight loss after delivery if you say after delivery know first 2 liter weight water loss due to diuresis so approximately 2 kg.

Baby's weight 3 kg, placental 1 kg, liquor 1 kg. So from this if you take this only the baby, placenta and liquor it is approximately 5 to 6 kg of weight, weight loss after delivery and then gradually gradually the weight continues to get decrease, right, due to diuresis, due to loss of water and sodium from the body. There is decrease in the weight and weight loss at the end of second week of postpartum is maximum. After second week the weight loss is maximum and it attains the pre-pregnancy weight by 6 months. The after second week then from second week to 6 months this is actually the loss of fat, right. The weight increase due to fat deposition it then gets gradually decreased, right.

So that will be a slow decrease and that will continue for the next 6 months. But at the end of 6 months there is still a surplus of 1.4 kg after the first after one episode of pregnancy and this 1.4

kg will gradually get decreased with exercise, with diet, with active lifestyle, right.

So that was regarding your postpartum diuresis. Now coming to the bladder function very very important because there can be bladder over distension and urinary retention in the puerperal period that will cause increase in uterine bleeding. So, we do not want bladder retention. What can be the causes of bladder over retention? IV fluid. During delivery we give IV fluid and immediate postpartum say if there is excess amount of IV fluid infusion can lead to bladder over distension.

Then oxytocin. Oxytocin has ADH like property, right. So it has an ADH effect that will lead to fluid retention. Oxytocin infusion which is given both during labor and in the postpartum period. Decreased bladder sensation. Bladder sensation gets decreased due to any trauma to the bladder plexus.

So that will also lead to urinary retention. Also reflects urethral spasm. Why because if there is an episiotomy wound repair done or say any vulval hematoma has occurred there will be urethral spasm that also will lead to urinary retention. All these can be causes and what are the risk factors in case of primigravida? In case there is perineal laceration, in case there is operative vaginal delivery as in case of forceps or your vacuum. If catheter was you know catheterization was done during labor that also can lead to your bladder distension or urinary retention, right. Oxytocin I have already told, oxytocin infusion it is antidiuretic hormone leading to water retention.

Also in case of prolonged labor. So all these can cause your urinary retention and if that happens we need to intervene very early because that will lead to increase in uterine bleeding. This bladder distended bladder will prevent the uterus to contract and there will be excessive uterine bleeding in the postpartum period. So if the female is not voiding for the next 4 hours after vaginal delivery what is to be done? Number 1 you have to inspect and rule out any vulval or vaginal hematoma. Number 2 you then catheterize the patient for the next 24 hours and you intermittently clamp the catheter and allow intermittent voiding. Then if you see now just remove the catheter after 24 hours and look whether she can now urinate on her own or not for the next 4 hours.

Say she cannot then you have to again re-catheterize, right. And if now after re-catheterization you see that the urine being drained in the urine bag is more than 200 ml that denotes that there is decreased bladder sensation and so in that case you need to keep the catheter for the next 48 hours for the bladder sensation to return back, right. So that is what we do in our postoperative round. We always ask the patient in the postpartum ward whether she has urinated or not, right.

Very very important the bladder care. Coming to menstruation and ovulation. Menstruation

ovulation these are very variable. When it will occur it is different for different women. If the woman does not breastfeed, does not breastfeed then menstruation returns by 6th week following delivery, right in 40% and by 12th week in 80% of cases. And for ovulation also in non-lactating mother who are not breastfeeding ovulation occurs as early as 4 weeks and if the mother is lactating it will occur by 10 weeks after delivery, right. But that is also very you know this ovulation is also not so much you know precise and sometimes a female before she has started menstruation following delivery there can be ovulation and if she is not using protection then there you know she sometimes comes with another pregnancy.

So, a woman who is exclusively breastfeeding the contraceptive protection is about 90% up to 6 months of postpartum. If the patient is exclusively breastfeeding then there will be lactational amenorrhea and this lactation is a natural method of contraception for the 6 months of postpartum period. But still we advice to use contraceptive measures if the mother is not breastfeeding she should start contraceptive measures in the form of OC pills by 3rd postpartum week and if she is lactating then she should you know lactating and also it is exclusive breastfeeding then she can start it by 3rd postpartum month that is 3rd postpartum week and this is 3rd postpartum month. So, that was regarding the puerperal the normal puerperal changes and you know what is the normal rate of involution of the different reproductive organs and most importantly we should check the lochial discharge the nature of lochial discharge the amount of lochial discharge the order of lochial discharge and if any suspicion we need to evaluate and according to our inference or diagnosis we need to treat the mother. So, that very very important this puerperal period and you know breast examination is also a important part because during this period the mother will be breastfeeding her baby and whether she is you know properly breastfeeding or not whether there is proper milk secretion or not and to educate the mother about breastfeeding is also a very important concept during the puerperal period.

So, the references has been taken from D.C Dutta book of obstetrics the Williams 26th edition on obstetrics and the James book on high risk pregnancy. So, thank you all for your patient hearing and in the next class we will read regarding the management of the different conditions that may occur in the puerperal period. Thank you.