

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

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Anatomy of Vagina

Welcome students. Today we are going to discuss on the topic an overview on maternal health, the antenatal, intranatal and postnatal care. I am Dr. Barnali Ghosh, an obstetrician and gynecologist. Presently working as an assistant professor at B.C.Roy Medical College and Research Center, IIT Kharagpur. Today we are going to deal with a very important topic that is the anatomy of vagina.

Coming straight to the topic, the concepts covered are anatomy, the relationships of vagina with the adjoining pelvic structures, detailed structure of vagina, the cytology of vagina and its clinical importance, the pH maintenance of the vaginal epithelium, the vaginal fluid, the flora or the commensals, the bacteria which reside in vagina thereby helping in vaginal defense and ultimately we will touch upon little bit on vaginal cancer. This is a pictorial representation of the female internal as well as external genitalia, shows the uterus, the ovary, the fallopian tubes and the cervix and from here is the starting point of vagina. Vagina is actually a cylindrical structure, anteriorly is the urinary bladder with the urethra. This is the ureter, this is the urinary bladder, this is the urethra, this is the ovary, the fallopian tubes, the uterus, the vagina and this is the vaginal opening and behind will be the rectum, ultimately opening as the anus.

So, what is vagina? Vagina is a fibromuscular organ, vagina is a fibromuscular hollow cylinder and it is attached to the middle of the cervix. The posterior wall, this is anterior, this is posterior. So, I will draw it again for you. This is the cervix and this is the vagina. So, this is anterior, this is posterior.

The anterior wall is slightly shorter than the posterior wall, posterior wall is longer, length of the posterior wall approximately 9 centimeter. Length of the anterior wall approximately 7 centimeter and if we take a cut section, this is the vaginal epithelium and this is the vaginal lumen. If we take a cut section, it is in the form of H, this cut section, this portion, this portion is in the form of H. So, vaginal lumen actually this is showing the vaginal lumen, this is in the form of H. Now, coming to the furnaces of vagina, this is the cervix and here is the vagina.

So, from below there will be all around there will be dead spaces around the cervix. The cervix is ending and the vagina is all around. So, all through will be the dead spaces and these are known as the fornices. So, space around the cervix and the upper part of vagina is called as fornix. How many fornices are there? There are 4 fornices anterior fornix, posterior fornix and 2 lateral fornix.

What is the deepest fornix? It is the posterior fornix, deepest. Shallowest fornix is the anterior fornix and a very important question is what is what fornices are present after total hysterectomy. Total hysterectomy means removal of the uterus together with the cervix. Cervix is also removed. In that case if we remove the cervix what remains are this vaginal walls which will be sutured.

Now, after the removal of cervix number of fornices present is 0, no fornices, but in case of sub total hysterectomy. What is sub total hysterectomy? That is the cervix is present. Cervix is present from here the uterus and the uterus has been removed. Where it is done? It is done in case of atonic PPH. PPH is a very emergency situation where there is immense bleeding postpartum hemorrhage after childbirth when there is immense bleeding from the uterus and it is not being corrected with medication with different types of you know suturing with different mechanical devices compression sutures and you have to save the life of the patient then we go for the hysterectomy obstetric hysterectomy as a last resort where we remove the uterus, but because bleeding is from the uterus and it is not from the cervix and to minimize the time of operation the cervix is kept in situ in that case the number of fornices are 4 after sub total hysterectomy number of fornices is 4.

Next, the relations of vagina as I have earlier you know in that in the at first there was a picture showing the anterior relations of vagina. Again I will draw that picture this is very interesting and very important to know because during childbirth there can be vaginal injury during cesarean section you have to you go through different you need to know the anatomy very thoroughly so as to do the operation meticulously. So, anteriorly this is anterior and this is posterior. So, this is the anterior vaginal wall upper two-third is related to the urinary bladder this is the urinary bladder. So, upper two-third is related to the urinary bladder and lower one-third is related to the urethra.

This is the anterior vaginal wall. So, during you know prolapse when there is you know sagging down of the pelvic organs through the vaginal opening if the anterior two-third sags down then there is descent of the urinary bladder or if the lower one-third sags down then there is descent of urethra. The posterior vaginal wall how it is related I will use a different color this is the peritoneal covering peritoneal covering it is covering the urinary bladder and there is a very loose fold of peritoneum covering the urinary bladder and the uterus. Uterus it is uterus will

be covered anteriorly it will cover the uterus, but not the vagina anterior part of the vagina anterior vaginal wall there is no peritoneal covering then it will round go over the fundus and then to the posterior surface then the posterior aspect of cervix then the posterior vaginal wall and then it will revert back or reflect upwards into the abdomen. This is known as the pouch of Douglas or the cul de sac it is the most dependent part of the female abdomen peritoneum any pass any collection any ascites any blood will be collected in the POD.

So, posteriorly the upper one-third here are the intestines. So, posteriorly the upper one-third is covered with peritoneum and there comes in relation the pouch of Douglas upper one-third. Then middle one-third middle one-third behind is the rectum middle one-third comes in relation to rectum and lower one-third this is the anus it comes in relation to the anus, but it is separated from the anal opening by the perineal body. So, I hope it is clear upper one-third middle one-third and lower one-third any stitch any surgery any pelvic floor repair involving the posterior vaginal wall we have to be very meticulous to prevent injury to rectum and anus which comes in the posterior relation. Now, coming to the vaginal wall epithelium, vaginal wall this is the vaginal one side this is the lumen then again other side this is a hollow cylindrical structure.

So, first is the epithelium then is the muscle and the condensed endopelvic fascia. What is this epithelium? Vaginal epithelium is stratified squamous epithelium non keratinized and very importantly it does not have any glands there are no glands. So, where does the secretion of the vagina come from? They come from the transudate from the cervix the endocervical gland secretion endocervical gland secretion come to the vagina. As such vagina does not have any glands right this is what also important in I will I will discuss it in subsequent slides. Coming to the supports of vagina this is the I have already shown you the picture this is the urethra this is the vagina and behind is the anus.

So, vagina has to be you know supported it has to have some support or there will be more chance of prolapse more chance of descent of pelvic organs through the vaginal opening. What are the supports? There are three steps three layers of support Delancey's layer Delancey's layers of support. What are they? Level 1 level 1 what is it? It is the apex of vagina apex of vagina apex of vagina is supported by number 1 the cardinal ligament or the McAndrews ligament which is present in the on both sides and behind behind means here this is the cervix this is the vagina and here is the sacrum. So, there is a ligament this ligament is known as the utero sacral ligament. These two ligament forms the level 1 support level 2 is tendinous support or fascia there are two fascia arcus tendinous fascia vaginalis arcus tendinous fascia rectalis they form the level 2 support.

That means, in between here there are fascia and lastly the lower one third or level 3 support are the perineal muscles perineal muscles perineal body the muscles of the perineal body and the muscles of superficial and deep perineal pouch. Now, coming to vaginal cytology vaginal

cytology or that is the vaginal epithelium there are three layers and these three layers can I have been shown to be different or their predominance changes depending upon the predominance of the hormone present in the female body. What is it? First the superficial layer these are the superficial epithelial cells. How we describe them? It is polygonal or hexagonal cells with sharp borders with pyknotic nucleus with abundant cytoplasm and they are basophilic right they are superficial cells. Coming to the next layer next is intermediate and lastly is the basal first we will read the basal cells this is the basal cells these are basophilic.

So, we draw it by blue basal cells are mostly round or oval and they have a large nucleus almost occupying whole of the cell they are known as basal cell and in between them in between the superficial and the basal cell is somewhat you know intermediate cell. They are neither it is somewhat round or oval and no sharp borders in between basal and superficial with a nucleus both ship it nucleus or the vesicular nucleus which is pushed to the periphery these are the intermediate cells. So, we read the epithelium of vaginal wall why it is important because the superficial cells respond to estrogen, intermediate cells to progesterone and the basal cells in absence of estrogen and progesterone. In follicular phase of the menstrual cycle when the follicle is gradually increasing in size estrogen is predominant and there is predominance of superficial cells. Progesterone in the proliferative phase or during pregnancy progesterone is high in female body.

So, in vaginal psychology we will see the intermediate cells and in menopause when there is no progesterone or estrogen we will see the basal cells. This is the slide under microscope where we see the superficial cells which are you know round hexagonal in shape with the pyknotic nucleus the basal cells and the intermediate cells right. This is how we see under the microscope these are superficial cells the intermediate cells and the basal cells. Where do we get these cells? We take scrapings from the lateral wall of vagina this is the lateral wall lateral we take from the middle one-third we take scrapings from the middle one-third of lateral wall of vagina and then we see it under microscope with staining and then we will decide what is the mode type of cell, what are the predominant cell and what is the predominant hormone within the female body. Coming to vaginal pH, vaginal pH is acidic.

Why it is acidic? That has an answer the superficial cells this is the epithelium the superficial cells has abundant cytoplasm which contains glycogen and this glycogen is acted upon by lactobacilli. Lactobacilli are normal commensals of the vaginal mucous membrane and they form lactic acid. This lactic acid in the lumen will create acidic pH. So, during the reproductive age 15 years to 45 years the pH remains round about 4.

5. During pregnancy it is somewhat more acidic and becomes 4. After menopause, after menopause no superficial cells after menopause there is no estrogen or progesterone. So, more basal cells no superficial cells. So, no lactic acid.

So, pH will be alkaline. Before puberty before puberty pH is alkaline, but just after birth 10 to 14 days after birth the pH somewhat becomes acidic this is because of the maternal estrogen. Maternal estrogen will act on the female fetus and there will be secretion of lactic acid from the superficial cells of the female fetus which will lead to acidic pH of the female fetus. Coming to the vaginal flora we have already told there is no glands and this intact vagina as there is no glands it is resistant to gonorrhoea and chlamydial infection because these two bacteria mostly hide in the glands of the vagina. Intact vagina with no breach in the epithelium they are resistant to gonorrhoea and chlamydial infection. Three types of infections are more common in vagina that is trichomonas vaginalis, candida and bacterial vaginitis.

What is the shift of vaginal flora? Lactobacillus I have already told it is also known as Doderlein bacilli and they are normal common cell of the vaginal epithelium. If there is a shift to anaerobic bacteria peptostreptococcus, then mobiluncus, porphyromonas different anaerobic bacteria then there causes it causes a shift in vaginal flora and there is some difficulties, there is some symptoms what are they? They are first is increase in vaginal watery discharge right. Lactobacillus forming lactic acid no lactobacillus the bacteria has changed. So, no lactic acid pH will be more than 4.5 no it will be more alkaline no acidic.

Number 3 is if we give 10 percent KOH to the vaginal fluid there will be fishy order, it will give a fishy order this is known as amine test. And number 4 is presence of clue cells in cytology study what is clue cells? The clue cells are nothing, but the superficial cells studied with anaerobic bacteria. So, these 4 are known as the Amsler criteria Amsler criteria. Any 3 of the 4 if present we give the diagnosis as bacterial vaginosis this is a very common infection I do not say it is a infection is a shift of vaginal flora and this bacterial vaginosis patient comes with watery discharge you know watery thin watery discharge without any itching without any no other difficulties, but there is discharge. This is bacterial vaginosis we can go for this criteria we can diagnose and as a treatment we will give metronidazole or secnidazole and also lactobacillus.

It comes as sachet lactobacillus or capsule we will give as treatment and it will get cured right. Touching upon the vaginal cancer a little bit vaginal cancer we what we need to know is this where it is a lined by stratified squamous epithelium non keratinized we have already told. So, a cancer most commonly is the squamous cell epithelial cancer squamous cancer. The most common site is the posterior upper posterior wall of vagina. So, any growth in the posterior wall looking you know ugly looking irregular bleeding on touch most likely can be vaginal cancer it needs to be biopsied this is squamous most common is squamous cell cancer.

Second most common is adenocarcinoma. Adenocarcinoma now it has been due to vaginal adenosis you know this is due to DES exposure in utero. In utero if there is a female fetus and

the mother takes DES due to DES exposure there is vaginal adenosis and from this from these vaginal adenosis cells there will be development of adenocarcinoma which has now become very rare because DES we do not use nowadays previously it was used adenocarcinoma most common site most common site is anterior wall lower anterior wall of vagina right. So, that is all you know the vaginal cancer type most common site and if there is any suspicious lesion in the vagina we will go for the biopsy. Now, we will discuss some of the MCQs here I have combined both the vagina and the vulva MCQ just go through some of them about vagina which is not correct you have to be very cautious while reading which is not correct it has mucus secreting glands supply from uterine artery lined by stratified squamous epithelium pH is acidic which is not correct uterine artery supply yes vaginal artery is a branch of uterine artery lined by stratified squamous epithelium yes it is correct non keratinized pH is acidic yes it is correct 4.5 which is not correct is the mucus secreting gland vagina does not have any glands.

Next length of female urethra what is the length of very important question what is the length of female urethra it is 4 centimeter and diameter of female urethra is 6 millimeter all of the supports of vagina I have already discussed 1, 2 and 3 levels delance levels of vaginal support. So, what is all are the supports of vagina except that means, which is not the support of vagina perineal body yes it is level 3 perineal diaphragm levator ani or pelvic perineal muscles the pelvic layer muscles yes levator ani yes it is a support of vagina infundibulopelvic ligament this is not a support of vagina. It a infundibulopelvic ligament is actually the ligament which supports the ovary this is the uterus and this is the ovary this is the lateral pelvic wall the ovary is you know attached to the lateral pelvic wall by the IP ligament or infundibular ligament or suspensory ligament of ovary it has no relation with vagina. For hormonal study cytological scrapings are to be taken from dash wall of vagina which wall it is the lateral wall which wall of vagina it is the lateral wall middle one third middle one third of lateral wall of vagina scrapings are taken from here and on the slide we do hematoxylin eosin stain and then we see it under microscope and go for psychological study. Next question vaginal defense is present in newborn female 4 we have studied it the vaginal pH in newborn or before puberty it is alkaline, but for the first 10 to 15 days before puberty means 15 years this is alkaline, but for first 10 to 15 days due to the effect of maternal estrogen the pH is slightly acidic.

So, it will be first 10 to 14 days of birth. Theoretically which infection cannot be seen in vagina? Yes, vagina does not have glands no glands. So, gonococci trichomonas candida chlamydia chlamydia also both will be the answer. Gonococci and chlamydia theoretically cannot infect the vagina that is intact vagina where the epithelium there is no breach or tear on the vaginal epithelium. For with this we come to the end there are these are the different questions from different examinations references are from these books Desi Datta, Gray's Anatomy, Novak's and Williams' Kinology.

So, thank you for your patient hearing we will learn the anatomy of rest portion of the female internal genitalia in the subsequent classes. Thank you.