

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

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Lecture:04

Anatomy of Cervix and Uterus

Good evening students welcome you all to yet another session on the NPTEL certified course on the topic and overview on maternal health, the antenatal, intranatal and postnatal care. Myself Dr. Barnali Ghosh an obstetrician and gynecologist working as assistant professor at B.C. Roy Medical College and Research Center, IIT Kharagpur. We have already dealt in the previous classes the female external genitalia that is the vulva or the pudendum. Today our topic of discussion is the female internal genitalia that is the anatomy of cervix and the uterus.

The topics to be covered on today's class are the anatomy of cervix, the transformation zone, the colposcopic view and a little bit regarding cervical incompetency. Key words for today's class are as follows female internal genitalia, cervix, transformation zone, colposcopy. Now, coming to the class proper here this is a pictorial representation of the female internal genitalia. We can see this is the uterus, this is the uterus and this part is the cervix. Uterus going down forming the cervix and the appendages of uterus which is the fallopian tube on both sides.

These are the two ovaries on both sides and the ovary is being attached to the uterus by the ovarian ligament. Below the cervix is the vagina right. So, to be precise today's discussion will mainly revolve around this cervix. Cervix starts from the internal os and it ends at the external os. Coming to the anatomy of cervix, we all know that the cervix is the lower part of the uterus and we have discussed in the previous class that vagina is attached to the cervix at its middle right.

So, this cervix is divided by the attachment of vagina on its sides into two parts. The part above the attachment of vagina is called the supra vaginal cervix and the part which is below the attachment this part, this is called as infra vaginal cervix or another name for this is portio vaginalis right. Coming to the length of the cervix, length of the cervix this is the internal os, this is the external os. This length of the cervix varies. It can be said that it comes as a range and it ranges between 2.

5 to 4 centimeters. Another point here is this is the anterior vaginal wall, posterior vaginal wall and we can see that the posterior vaginal wall is longer right. These are the fornices, anterior fornix, posterior fornix and on the sides are the two lateral fornices. Cervix is mainly composed of fibrous tissue 10 to 15 percent is made up of smooth muscle cells. Another important point regarding the cervical fluid pH is it is alkaline.

In the previous class we discussed that the vaginal pH is acidic approximately 4.5 during the reproductive age group females, but cervical pH is alkaline it remains around 7 to 7.4. So, cervical pH is alkaline vaginal pH is acidic. You need to remember this in the subsequent slides.

Now coming to the external os and the internal os. So, we have discussed that internal os is lies above and external os lies below. Shape of the external os in nulliparous, nulliparous means woman who did not have any vaginal delivery. They can have delivery by cesarean section, but they had not undergone any vaginal delivery. In those woman the external os is pinhole in shape whereas, in woman who did have vaginal delivery one or more there due to you know cervical tear or injury during the process of child birth these in the long run they get healed and these healed cervical tears will lead to the lead to the shape of the external os becoming a transverse slit.

So, in nulliparous woman who did not have vaginal birth the external os is pinhole whereas, in multiparous it is a transverse slit. This is a speculum examination which shows in nulliparous woman it is pinhole external os whereas, in multiparous woman we can see the external os as a transverse slit. Now coming to the shape of the cervical canal the external os is pinhole the internal os which is above is always closed always in the sense normally it is closed if it is open then this will result in cervical incompetency. So, in normal conditions the internal os is closed and this is the external os which is pinhole in nulliparous. So, the cervical canal is cylindrical whereas, in multiparous the internal os remains above, but the external os is transverse slit thereby making the cervical canal conical in shape.

Here we will discuss about the cytology study of cervix which is also known as the pap smear. This pap smear is taken by this IR spatula right this is the IR spatula and it has two ends this two ends have two different uses this end is blunt right. It has one end is slightly longer and this is used for multiparous this is used for multiparous. That means, this longer end will go inside the external os and the shallow end will remain in the outside the external os and now we will rotate 360 degree all around the external os to get scrapings both from the endocervix as well as the exocervix. Whereas, this end is used in case of nulliparous where the external os is pinhole that means, it looks like this is pinhole here we will use this end which goes inside this end this goes inside the internal os and this end remains outside the internal os right.

So, now again we rotate 360 degree and we get scrapings both from the endocervix as well as

the exocervix and then we place it over a slide and see it under microscope by after fixing it with ethyl alcohol. So, this is also known as pap smear and it is a cytologic study of the exocervix as well as the endocervix it is used as a screening test for cancer cervix. So, this two ends have been designed depending upon the difference in shape of the external os in multiparous and nulliparous women. Now coming to the ectocervix and the endocervix. We have already told that the ectocervix is the part of the cervix which is exposed to the vagina.

So, this part is the ectocervix and this part is the endocervix. Coming to the lining epithelium, lining epithelium of the exocervix is that of the vagina. The lining epithelium of the exocervix is that of the vagina. We have already studied in the previous class that the vaginal epithelium is stratified squamous epithelium and also it is non keratinized and does it has does it have glands? No there are no glands. So, same for ectocervix.

Another thing which we have discussed is this vaginal epithelium this is same as that of the ectocervix. So, this has three types of cells which number 1 are the superficial cells, number 2 are the basal intermediate cells and number 3 are the basal cells. And these cells have different structures superficial cells being spherical, basal cells being round with large nuclei, intermediate cells are neither spherical nor round. It is somewhat intermediate between superficial and basal and they have a nucleus at the periphery which is boat shaped or vesicular in shape and depending upon the predominance of estrogen there is increased estrogen means more superficial cells, increased progesterone means more intermediate cells and absence of estrogen or progesterone means presence of basal cells. This holds true also for the ectocervix.

Coming to the endocervix, in the endocervix I will use a different color this is the endocervix. Glance is lined by columnar cells. This is called as tall or high columnar cells. Does it have cilia? No, there is no cilia. Does it have glands? Yes, it does have glands.

Glands are present. Thus endocervix has glands and there are glandular secretions, it has glands, there are glandular secretions and the pH of cervical fluid is alkaline. Another important thing is the squamous. This is the squamous cells and below which lines the ectocervix and above is the columnar cells which lines the endocervix. So, this point is the junction of columnar cells above and squamous cells below. So, this is called as the squamous columnar junction.

This squamous columnar junction is the original squamous columnar junction which is present before puberty with changes in hormonal levels, with changes in hormones within the female body there is shift of this squamous columnar junction above or below. What happens? During puberty at puberty after the female attains puberty there are secretions from the ovarian follicles and these ovarian follicles will secrete estrogen and progesterone. So, the vaginal fluid what happens? Green is the squamous epithelium ectocervix and red is the columnar epithelium right.

Now at puberty there is predominance of estrogen. So, the superficial epithelial cells these are the superficial epithelial cells which will become predominant because there is more estrogen being produced from the ovarian follicles from the developing ovarian follicles and these superficial cells they have abundant cytoplasm which contains glycogen.

This glycogen will be acted upon by lactobacillus to form lactic acid which will convert the vaginal pH into acidic pH becomes 4.5 acidic. So, number 1 establishment of acidic pH of vagina. Number 2 another thing that happens is there is slight eversion of this ectocervix. So, there is slight eversion of this ectocervix and this eversion of this of the ectocervix leads to the exposure of the columnar cells of the endocervical canal to the acidic pH of vagina.

These columnar cells when gets exposed to the acidic pH of vagina they go undergo metaplasia. So, the vaginal cells the vaginal pH becomes acidic the cervix ectocervix gets inverted and the vaginal fluid comes in contact with the endocervical cells which are columnar. The endocervical cells in acidic pH they undergo metaplasia and they form squamous cells. So, the columnar cells are getting converted to squamous cells by a phenomenon known as metapletia this is normal and this continues for decades till the vaginal pH is acidic. That means, up to menopause it continues from 15 years of age till 45 years of age and this is normal.

What happens the columnar cells the columnar cells which are exposed to the acidic vaginal pH they undergo metaplasia and they now form squamous cells. So, this part which I have drawn in green these are the new meta plastic squamous cells these are mature squamous cells which are replacing the original columnar cells. Now the squamous columnar junction changes and it becomes comes here this is the new squamous columnar junction. Previously this was the squamous columnar junction which is known as the old squamous columnar junction or the original squamous columnar junction. This area between the new squamous columnar junction and the original squamous columnar junction this area is known as the transformation zone right.

So, I repeat that the squamous columnar junction originally was outside below, but after puberty with the onset of puberty the vaginal pH getting converted to acidic the columnar cells of the endocervix they undergo metaplasia and they get converted to squamous cells. So, the squamous columnar junction shifts it goes upwards it goes inside and it forms the new squamous columnar junction and this portion which is in between the old squamous columnar junction and new squamous columnar junction this portion is called as the transformation zone. What is the transformation zone? It is nothing, but the squamous cells which have been produced by metaplasia from the original columnar cells. This area is very sensitive it these cells are continuously undergoing metapletia it is very sensitive and it is likely to get damaged by various insult like any change in the environment any change in the organism it can be it can get

converted. So, what happens? Now so, we we will come to know that a most commonly it gets infected by human papilloma virus and it get it it infects this cells of the transformation zone and thereby it results in cervical cancer.

So, these are these are the gradual changes at birth the squamous columnar junction we have shown it is in the original squamous columnar junction. The ectocervix is lined by the squamous epithelium and the endocervix is lined by the columnar epithelium and this remains the squamous columnar junction. At the onset of puberty in young adult the vaginal pH gets becomes acidic and it gets exposed the ectocervix gets averted it is slightly averted and so, the columnar cells of the endocervix they get exposed to the acidic vaginal pH and thereby they undergo this was the original squamous columnar junction. But the columnar cells here have undergone metaplasia and they are now covered by squamous cells. So, this zone is known as the transformation zone.

This is the transformation zone here the original squamous columnar junction this is the new squamous columnar junction this is a picture in case of perimenopausal woman. In postmenopausal woman this transformation zone is drawn inside the canal drawn inside the endocervix canal it goes up and it is not visible from outside this is in case of postmenopausal woman. I have already talked about this is more prone this transformation zone the metaplasia undergoing in this transformation zone it is very sensitive zone and prone to insult by carcinogens mainly by human papilloma virus which is mostly the cause of cervical cancer. This is a pictorial diagram where we can see the this is the endocervix, this inner lining is the endocervix right. Now this red part is the ectropion this is actually the endocervix that has been averted.

So, this is columnar cells right. Now this is the squamous columnar junction, this is the new squamous columnar junction and outside this is the old squamous columnar junction and in between this pink area this is the transformation zone. This is the picture or pictorial representation of a colposcopic view of the cervix. We have pictures here this is a normal cervix this is the inside this is the new squamous columnar junction this is the external os this is the endocervix or the columnar cells this is the new squamous columnar junction and this pink line here outside this is your old squamous columnar junction. So, in between this area is the transformation zone. Any lesion any suspicious lesion in this transformation zone has to be evaluated has to be biopsied because we know that the cells of the transformation zone are more prone to insult are more prone to develop cancer right.

Here there are different types of transformation zone type 1 which where the whole of the transformation zone can be seen outside. This is the picture here when we see through the colposcopy the transformation zone whole of the 360 degree of the transformation zone is outside and so, we can see the transformation zone fully it is fully ectocervix. Type 2 type 2

means a part of the transformation zone here this is the new squamous columnar the yellow line is the new squamous columnar junction and it has gone inside the endocervix. So, a part of the transformation zone cannot be visualized fully it can be visualized only with application of endocervix speculum that kind of transformation zone is known as type 2 transformation zone. And in type 3 transformation zone the new squamous the new squamous columnar junction has gone inside we cannot see it from outside that yellow line it cannot be appreciated here it has gone inside the endocervix canal it is mostly seen in post menopausal women.

And this is type 3 where we say that colposcopy is not satisfactory it is unsatisfactory as we cannot visualize the transformation zone fully. This is type 1 where we can appreciate the transformation zone fully outside the external os it is fully ectocervix we can see the transformation zone it is normal in type 2 a part has gone inside this is the new squamous columnar junction the red part is the columnar cells outside at the squamous cells. So, this is the new squamous columnar junction with endocervix speculum we can see the type 2 transformation zone. Type 3 in post menopausal cervix it is atrophic and it has drawn inside it has gone within the endocervix canal we cannot see the whole of the transformation zone. This is type 3 where the colposcopy is unsatisfactory and it has some p-ecthial spots these are normal these are not abnormal right.

And this is cervical ectropion nothing, but the endocervix has come outside this is also normal these are the different types of transformation zone. Now coming to the cervical incompetency it is important clinically and so, I wanted to discuss what happens that cervix I have told it is cylindrical that cervix we have already discussed cervix is cylindrical that means, it is T shaped normally it is T shaped this is normal. When there is incompetency of the internal os internal os always needs to be closed, but if the internal os is incompetent in pregnancy mostly in second trimester when the uterus is enlarging it is gaining in weight and the cervix cannot hold the uterus. So, the cervix opens up and then it becomes Y shaped it becomes Y shaped the internal os partly it opens. If it opens more then it becomes V shaped and ultimately it gets converted to U shaped where the internal os has opened and there is bulging of the bag of membranes.

This cervical incompetency will lead to second trimester pregnancy loss these are these structures are pictures of your USG pictures where we can appreciate the cervical incompetency and we can make a diagnosis of incompetent cervix thereby more chance of second trimester pregnancy loss. So, this is all about the anatomy of the cervix next we will be discussing about the anatomy of the uterus the references are DC Dutta Gray's anatomy Novak's gynecology and Williams gynecology. So, thank you next we will continue with the uterine anatomy.