

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

**Professor Name: Dr. Barnali Ghosh**

**Department Name: Multidisciplinary**

**Institute Name: IIT Kharagpur**

**Week:02**

**Lecture:02**

### **Anatomy of pelvic floor and perineum**

Hello students. Hope this finds you in good health and sound mind. We are here for yet another session of the NPTEL certified online course on the topic and overview on maternal health and antenatal, intranatal and postnatal care. I am Dr. Barnali Ghosh, MS Obstetrics and Gynecology working at B.C. Roy Medical College and Research Center, IIT Kharagpur. We have discussed the anatomy of female external genitalia, the detailed anatomy of female internal genitalia.

Today our topic of discussion will be the anatomy of pelvic floor and the perineum. Concepts to be covered in today's class anatomy of pelvic floor, the structure of the pelvic floor muscles, perineum, contents of perineal pouch and the nerve supply. Key words being female pelvic floor or pelvic diaphragm, perineum and perineal pouches. This is a pictorial representation showing the pelvic bone and within the pelvic bone is this space is called as the female pelvis.

This space is called as the female pelvis and this shows the female internal genitalia that is the uterus with the tubes and ovary inside. Now this picture we can appreciate the you know divisions, this is a transverse, I mean this is a this section, this is a longitudinal section through the female body and from anterior to posterior we can see the parts of the female pelvis. Starting from the pubic bone anteriorly then comes the bladder, then the uterus and the vagina and behind lies the bowel and the rectum. Most posteriorly is the sacrum and these structures of the pelvis are supported low down by this pelvic floor. The pelvic floor or pelvic diaphragm is a separate it separates this is a muscle layer which separates the organs of the female pelvis above and the anatomical perineum, this is anatomical perineum which is below.

It runs like a fan shaped structure, it is like a hammock and it will be separating the pelvic organs above and the perineum below. Now we see only the pelvic floor and the lateral pelvic walls from above, this is anterior with the symphysis pubis, this is the symphysis pubis and the pubic bone anteriorly. Posteriorly you see the sacrum, this is the sacral promontory. So, posteriorly is a sacral promontory and laterally or the lateral borders of the pelvic bone right.

So, the muscles of the perineum sorry the muscles of the pelvic floor, this is concave when we look from above and they you know are arranged in a fan shaped manner starting from the anterior you know originating from the anteriorly from the symphysis pubis and the pubic bone and the tendinous arch on the lateral pelvic wall.

It originates from there and it is inserted posteriorly into the coccyx and the anococcygeal raphae, this is the coccyx and this is the anococcygeal raphae. So, this is the pelvic floor, this is the pelvic floor right, this is the pelvic floor and this is the pelvic sidewalls. I hope you understand this is the pelvic sidewalls and this is anterolateral pelvic sidewall and this is the posterior lateral pelvic sidewall. Coming to the pelvic floor, the pelvic floor can be divided into two parts, this part, this part. So, this is one part which is forming approximately anterior two-third of the pelvic floor, this part is called as the levator ani, this is the levator ani and this is anteriorly anterior two-third and this posterior this posterior one-third this is the this is part of the pelvic floor, this is the coccygeus.

So, these two will together form the pelvic floor or the pelvic diaphragm right. Another thing to note is this pelvic levator ani, this levator ani is composed of three muscles. So, first is this muscle which is the medial most muscle, then comes the lateral muscle and ultimately this is the broader lateral most muscle. So, this is the three subgroups of the levator ani muscle. We will come one by one, but point to note is this pelvic diaphragm will you know have orifices for the urogenital openings.

So, this is the urogenital opening through which passes the urethra and the vagina and this is the anal opening in between and these muscles are surrounding these orifices as well as they are forming the diaphragm or the separation they are separating the pelvis above from the perineum below. So, pelvic floor is a funnel shaped muscle, funnel shaped diaphragm formed by muscles of the pelvic floor and the pelvic sidewall. It separates the pelvis above from the perineum below. Pelvic diaphragm or pelvic floor can be you know composed. We can tell that it is composed of two muscles number one is the levator ani muscle and the coccygeus muscle. We have discussed that the levator ani is composed of again three types of muscles that is the puborectalis, pubococcygeus and iliococcygeus right and this is coccygeus posterior one third which is composed of coccygeus muscle which has another name known as the ischiococcygeus.

So, coming to the levator ani. So, levator ani muscles yes this is the puborectalis which is the medial most fibers and this puborectalis originates anteriorly from the symphysis pubis and the pubic bone. It goes you know like posteriorly and in the midline it joins with the fibers of the other side as a sling known as a puborectal sling. This is the puborectalis. Last lateral to the puborectalis is the pubococcygeus muscle.

Pubococcygeus muscle also originates anteriorly from the pubic bone and then it again goes

posteriorly and will be attached to the coccyx and the anococcygeal raphae right. So, this is the pubococcygeus and ultimately the last broadest muscle of the levator ani group this is the iliococcygeus and this muscle this is originating from the lateral you know the arcus tendinus or the tendinous arch on the lateral pelvic wall and the ischial spine. This is the ischial spine and it is going posteriorly and will be attached to the coccyx and the anococcygeal raphae. So, these three muscles form the levator ani and to note is the coccygeus muscle which is posteriorly this is the coccygeus muscle this is a part of the pelvic floor, but this muscle is not a part of the levator ani. Another diagram just for the sake of understanding this is the pelvic floor where and this is anterior this is posterior and we get the urethral opening or the urethral hiatus then the vaginal opening and the anal opening.

So, from anteriorly we have the levator ani posteriorly we have the coccygeus right. So, this is posterior and this part this whole part is the levator ani and levator ani muscle is again subdivided into three types of muscles. So, they are determined by different colors right. This is number 1 puborectalis, number 2 is the pubococcygeus and number 3 is the iliococcygeus right and some fibers we see pre rectal fibers you know just in front of the rectum there are some pre rectal fibers and these fibers will encircle the urethral vaginal orifice these are the pre rectal fibers of the puborectalis right. So, coming to the individual muscles of the levator ani puborectalis which is originating from the pubic bone anteriorly and it is inserted you know posteriorly it goes posteriorly actually the pelvic floor pelvic floor is a fan shaped structure it is it is supporting the pelvic organs like a hammer and it is originating from anteriorly and the side walls of the pelvis it goes posteriorly it goes posteriorly backward and medially right and is attached posteriorly to the sacrum inferior part and the coccyx and the anococcygeal raphae.

So, this is concave from above when we see from above it is concave, but when we see from below it is convex from below and this separates the pelvis above and the perineum below right. So, now coming to the individual muscles the puborectalis yes it is originating from the pubic bone going behind forming you know it will intermingle with the fibers of the other side and it will form like a sling this is known as the puborectal sling or anorectal sling and this anal canal it will encircle it will encircle this anal canal. So, it helps in maintenance of fecal continence because when it contracts there is angulation of the anal canal and this helps in maintaining the fecal continence right. So, puborectalis we have done next is pubococcygeus which is just lateral to the puborectalis it is originating also from the pubic bone anteriorly and is inserted posteriorly into the anococcygeal raphae and the coccyx. So, posteriorly it is attached to this is the coccyx lower end this is the lower end of the coccyx and the anococcygeal raphae right and most laterally is the iliococcygeus which will be originating from the ischial spine this is the ischial spine it has originate from the ischial spine and this tendinous arch of levator anion this is also known as arcus tendinus and it goes posteriorly medially and backwards to be inserted into the coccyx and the anococcygeal raphae.

So, all these three muscles fibers will be forming the levator ani ultimately posteriorly is the coccygeus muscle which is also known as ischioanal sphincter originating from the ischial spine and it is also being inserted into the coccyx the anococcygeal raphe and inferior part of the sacrum. So, this is the sacrum. So, its fibers have attachment to the inferior portion of the sacrum and the coccyx. What is the function? It pulls the coccyx, sorry it pulls the coccyx during defecation. So, it is attached from the ischial spine and when it contracts it will pull the coccyx anteriorly during defecation.

Coming to the nerve supply of pelvic floor muscle it is supplied by the nerve to levator ani having roots from S 3, S 4 and or S 5. It innervates both the levator ani and coccygeus complex. Now we come to the pelvic sidewalls. So, pelvic sidewalls we have completed the pelvic floor. Pelvic sidewalls have an anterolateral muscle which is the obturator internus and the posterolateral muscle which is the piriformis.

So, obturator internus now in this picture in this picture we are seeing the female pelvis from behind and outside. So, we can see the sacrum, we can see the posterior surface of the sacrum and the coccyx right and this is the obturator foramen and the membrane covering the obturator foramen is the obturator membrane and the this is the bone adjoining bone. So, the obturator muscle gains its origin from the obturator membrane and the adjoining bone and it forms the anterolateral wall of the pelvis. It then goes outside the pelvis to be attached to the greater trochanter of femur. So, this is the greater trochanter of femur it is attached to the greater trochanter of femur and when it contracts when this contracts when this contracts right you can appreciate when this contracts when this contracts the femur will rotate and there will be lateral abduction and lateral rotation lateral rotation and abduction of the thigh.

Nerve supply is nerve to obturator internus. Next is the piriformis this is the muscle forming the posterolateral wall of the pelvis side wall of the pelvis. This muscle we can also see this we are seeing from behind the pelvis this is the sacrum. So, the muscle gains its origin from the anterior surface of the sacrum and it forms the posterolateral wall of the pelvis and then after forming the posterolateral wall it goes outside the pelvis and is being attached to the greater trochanter of femur. So, contraction of this muscle will also cause rotation of the femur thereby causing lateral rotation and abduction of thigh.

So, we have completed the muscles of the pelvic floor or pelvic diaphragm. What are the functions? Yes, this is a muscular you know structure and it helps to support the organs of the female pelvis that means, the bladder, the urethra, the vagina, the uterus and the cervix and the rectum and anal canal behind. They will support these structures and will prevent their descent below that means, it prevents pelvic organ prolapse. It maintains the intra abdominal pressure and these muscle fibers as it encircles the openings of the urethra of the vagina of the anal canal it encircles these openings and it has no sphincteric action. When it contracts it helps in

maintaining the continents urinary continents as well as fecal continents right.

Now coming to the perineum. So, we have known that this pelvic floor below the pelvic floor is the perineum right. So, below the pelvic floor muscle below the levator ani are the muscles of the perineum. What is the boundary of the perineum? What is the boundary of perineum? So, anteriorly anteriorly this is the lower end of symphysis pubis this is anteriorly lower end of symphysis pubis. Posteriorly this is the tip of the coccyx right. Laterally these are the two ischial tuberosities.

So, pubic symphysis this is coccyx and laterally is the ischial tuberosity. Anterolateral anterolateral this is the anterolateral part is formed by the ischiopubic rami and posterior lateral this is formed by the sacrotuberous ligament. So, we can appreciate from this picture that the perineum is a rhomboid shaped or a diamond shaped structure right and this is divided by a line passing through the ischial tuberosity into urogenital triangle anteriorly and anal triangle posteriorly. So, we can write here that this is the pelvic floor just for your understanding and you know better remembrance. So, first comes the pelvic floor and this is the female pelvis with the different you know pelvic organs.

Now this is the pelvic floor or the pelvic diaphragm which we have already read it is composed of number 1 levator ani and number 2 is the coccygeus and we know that levator ani has again three types of muscles we have read it. Next we can say that now this is the perineum this part below the pelvic floor is the perineum, but what is to be remembered is perineum has two triangles anteriorly the urogenital and posteriorly the anal triangle. Coming to the anterior part the urogenital triangle it is divided by a membrane this is known as the perineal membrane. This membrane divides the urogenital triangle into two parts right. So, this is the deep perineal pouch above is the deep perineal pouch and below is the superficial perineal pouch right.

So, here is the skin this is you know this is the skin. So, superficial means it is more closer to the skin and this is this I will use another color this is a membrane this is the membranous layer of superficial fascia also known as the colles fascia. And behind above is the superior layer of the superior layer of urogenital diaphragm. So, these spaces are actually closed space these membranes posteriorly they are attached or they are not they are attached to one another and this making these spaces closed space and this is the deep perineal pouch this is the superficial perineal pouch perineal membrane is nothing, but the inferior layer of the urogenital diaphragm. So, this is the urogenital diaphragm we can appreciate from here.

This is the superior fascia we have already told this is the pelvic floor muscle this is the pelvic diaphragm or the pelvic floor muscle and that is the levator anion and this membrane which covers the levator anion above this is the pelvic fascia right and above this is the pelvis right we have seen we know this, but below the pelvic floor is the perineum. Now perineum this is the

urogenital space or urogenital triangle we have these membranes from above it is the superior fascia of the urogenital diaphragm. Then comes the perineal membrane perineal membrane or the inferior fascia of the urogenital diaphragm and lowermost is the membranous layer of superficial fascia also called as colles fascia and in between these two is the deep perineal pouch and in between this two in between superior layer of urogenital diaphragm and perineal membrane is the deep perineal pouch and in between perineal membrane and the colles fascia is the superficial perineal pouch. So, this is divided by actually by the perineal membrane right and now coming to the contents of these pouches superficial and deep perineal pouch. So, this is know deep perineal pouch and superficial perineal pouch right.

So, I will write it here superficial perineal pouch and deep perineal pouch. So, I will mark it like deep perineal pouch 1, superficial perineal pouch 2. Deep perineal pouch will be having some muscles right there are two muscles we will come to it and the superficial perineal pouch has three muscles and one gland. Other blood vessels fatty tissue nerves are present in these pouches, but the most important are the muscles of the perineum. Deep perineal pouch has two muscles yes the deep transverse perinei paired which is present on both sides and the external urethral sphincter whereas, the superficial perineal pouch has three muscles the superficial transverse perinei, the bulbospongiosus and the ischial cavernosis.

These three together are called as the muscles of vulva. Also the Bartholin glands which is a paired gland on two sides they also are present in the superficial perineal pouch. Behind the line joining the ischial tuberosity is the anal triangle and muscles of the anal triangle are external anal sphincter. Now this is a pictorial representation where we can see the alignment of the muscle from below we are seeing from below from below the perineum. So, first comes the superficial perineal pouch and this superficial perineal pouch these are the muscles the ischial cavernosis, bulbospongiosus and the transverse superficial perinei.

These three are the muscles of the superficial perineal pouch and they are you know present in this manner. So, ischial cavernosis is a lateral muscle and it is paired it is laterally and other two superficial transverse perinei and the bulbospongiosus are attached you know in the medial part this is the perineal body they have attachment to the perineal body right. Now, what we have done we have cut the superficial muscles of the superficial perineal pouch. So, now we see the deep perineal pouch coming to the right side this is the deep perineal pouch right this is the deep perineal pouch and there we can appreciate this is the external urethral sphincter around the u membranous urethra and the deep transverse perinei. These two are the deep perineal pouch contents right and ultimately if we cut the muscles of the deep perineal pouch we will hit or we will reach the pelvic floor this is the pelvic floor muscle these are the pelvic floor muscle these are the pubococcygeus the ilio we have already discussed pubococcygeus, iliococcygeus, levator ani muscle posteriorly is the coccygeus muscle these are the pelvic floor muscle which will which are deep inside right.

Next the superficial perineal pouch we have the three muscles the bulbospongiosus, the ischiocavernosus and the superficial transverse perinei. Coming to their origin and insertion the superficial transverse perinei are at originates from the ischial tuberosity on two sides and they traverse medially and are inserted into the perineal body it helps to strengthen the perineal body nerve supplies by the deep perineal nerve. Coming next to the bulbospongiosus this is also this muscle this is a single muscle and it is on either side of the urethra form the vestibular bulbs originate from the perineal body and insertion into the perineal membrane and body of clitoris and ultimately is the ischiocavernosus muscle which is also paired and lateral it is attached to the cross of the clitoris it helps in erection of clitoris. So, we have completed the superficial perineal pouch muscles now the deep perineal pouch deep perineal pouch we have two muscles yes they are the deep transverse perinei this we have cut the superficial muscles and now we see the muscles of the deep perineal pouch. So, this is the deep transverse perinei it is originating from the ramus of the ischium it is originating from the ramus of the ischium and are attached to the walls of the vagina function is support of the pelvic floor and stabilize the perineal body and supply is also from deep perineal nerve.

Another muscle is the external urethral sphincter this external urethral sphincter is around the membranous urethra it is supplied by the deep perineal nerve. Now ultimately coming posteriorly to the anal triangle where the muscle is the external anal sphincter it originates from the fascia around the anus. So, this is the external anal sphincter sorry this is the external anal sphincter right it is originating around the fascia around the anus and is inserted this is the perineal body is inserted into the perineal body and anococcygeal ligament right. So, this is the anal triangle which we have already seen posteriorly and this is the urogenital triangle anteriorly right supply by the inferior rectal nerve and this around the anus it is forming a sphincter and thus support the anal canal and prevent fecal incontinence. So, coming to this picture we will recapitulate yes from below from superficial from the skin we are seeing.

So, we will mark this is the superficial. So, superficial perineal pouch this is anterior this is posterior. So, this is the urogenital diaphragm right anteriorly and anteriorly is a superficial perineal pouch. So, the superficial perineal pouch muscles number 1 is superficial transverse perinei number 2 number 2 is your this is the bulbospongiosus and this is the ischiocavernosus. So, these 3 muscles form the muscles of the superficial perineal pouch. Now going deep inside is the deep perineal pouch muscle where we have number 1 is the external urethral sphincter and number 2 is the deep transverse perinei this is the deep transverse perinei this muscle.

So, this will be the deep transverse perinei right and in the anal triangle this is the anal triangle and the anal triangle the muscle is external anal sphincter and deep to this deep to this perineum is the pelvic floor where the muscles are not seen here. We can say this muscle is actually the pi form is the lateral postural lateral and this is actually the obturator internus right and we can also

see the coccygeus this is the coccygeus muscle. So, these are deep inside ok. Now, going to last part of the class which is the perineal body. Perineal body is actually you know this is a fibromuscular structure it is very important to maintain the strength of the perineal body thereby maintaining the strength of the pelvic floor.

It is the central tendon of the perineum a fibromuscular body placed in the medial plane between the two triangles that is the anal triangle anal triangle behind and the urogenital triangle in front. So, in between them is the perineal body it has attachment from different muscles firstly the levator and eye muscle above from above below we are going. So, levator and eye muscle yes it is attached to the midline that is the perineal body. Next the muscles of the perineum deep transverse perinei yes it is coming from the lateral side medially.

So, it has attachment to the perineal body. The external urethral sphincter external urethral sphincter has some twigs going to the perineal body. Next the superficial perineal pouch the superficial transverse perinei is also attached from the lateral ischial tuberosity. It goes medially to be attached to the perineal body. Bulbospongiosis in front forming the vestibular bulbs it has attachment to the perineal body and external anal sphincter some fibers have attachment to the perineal body. What does not have attachment is the ischiocavernosus this muscle has no attachment to the perineal body.

Right. Now, coming to some of the MCQs we will rush through them ok. All are contents of the urogenital triangle except the urogenital triangle which is in front. So, all are contents except the anus, anus is in the anal triangle posteriorly. Which one of the following structures forms the center point of the perineum? Yes, just now we read it is the perineal body. Which one of the following structures lie anterior to the urogenital triangle? Anterior to the urogenital triangle it is symphysis pubis from the boundaries of the urogenital triangle we have noted that anteriorly is the symphysis pubis laterally is the ischiopubic ramus and lateral is the ischial tuberosity and the posteriorly is the line drawn imaginary line drawn through the ischial tuberosity.

So, this part is the urogenital triangle right. Next which one of the following is a lateral boundary to deep perineal pouch? Deep perineal pouch is actually a part of the urogenital triangle. So, the lateral boundary of the urogenital triangle is the ischiopubic ramus. Vaginal branch originates from which of the following arteries? Vaginal branch you derive is originating from uterine artery. Uterine artery originates from the internal iliac artery anterior branch.

Uterine artery direct branch of abdominal aorta. Inferior mesenteric artery is also branch of abdominal aorta. All of the following muscles are attached to the perineal body except yes levator an eye is attached, bulbospongiosus is attached, external anal sphincter is attached which is not attached is the ischiocavernosus which is lateral you know along the ischiopubic ramus. Now, supply to the perineum is pudendal nerve. Pudendal nerve block abolishes sprain from.

Pudendal nerve supplies the vulva or the perineum and the lower part of vagina.

So, blocking this nerve will cause loss of sensation from the lower vagina given during episiotomy. Which of the following muscle is attached to the perineal body? Which of the following muscle is attached right? So, pubocervical no it is attached to the cervix which is higher up no above the pelvic floor it has no connection with the perineal body. Perineal body is below the pelvic floor bulbospongiosus muscle is attached to the perineal body. Ischiocavernosus is not attached to the perineal body we have read and ischiococcygeus is another name for coccygeus muscle and coccygeus muscle is posteriorly and it has no attachment to the perineal body.

So, answer is bulbospongiosus. So, this is the end of the class reference has been taken from D.C. Dutta Gray's Anatomy Novak's Gynecology and Williams's Gynecology. Thank you all. .