

Anatomy of a woman

By the end of this section you should:
Understand the structure (anatomy) of the female reproductive tract

The vulva: and the outside ‘down below’

The vagina:

Anatomical relationships of the vagina:

The relationship of the pelvic organs to each other

The uterus (womb):

The uterine (Fallopian) tubes

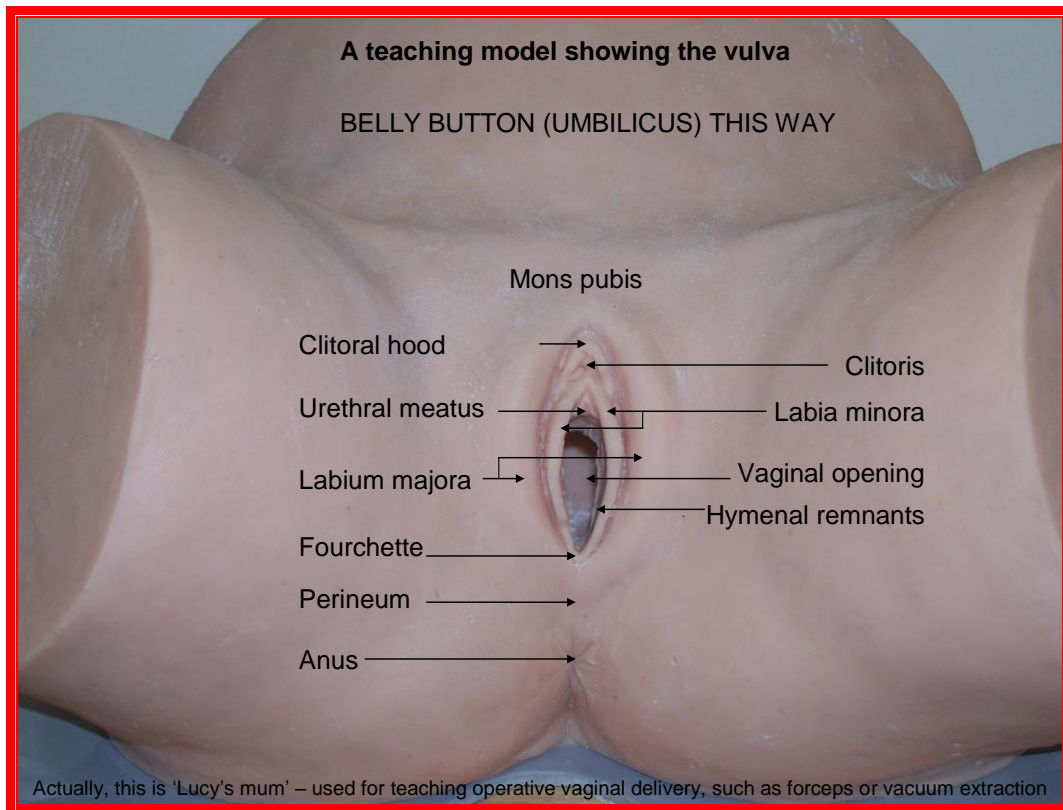
The ovaries: a brief mention prior to discussing ovarian function

How the pelvic organs are formed

Summary

The vulva

It’s a good idea to set some of the terminology sorted out at the start. The vulva is the outside bit ‘down below’ that extends from just in front of the anus (where you poo from) up and around the opening of the vagina and the urethra - the bit you wee from - and up until the fatty pad at the top (the mons, containing glands and hair). The fatty skin folds running backwards from this are the labia majora, with thinner and more recognisable skin folds inside them - the labia minora, which contain neither glands nor hair. In fact, they split at the front to go either side of a really sensitive bit - the clitoris, which is the female equivalent of the head (glans) of the penis in the male.



Posteriorly (at the back) the labia meet at the fourchette and the area of skin between this and the anus is referred to clinically as the perineum. It is this area that is sometimes cut or damaged during childbirth.

The vagina

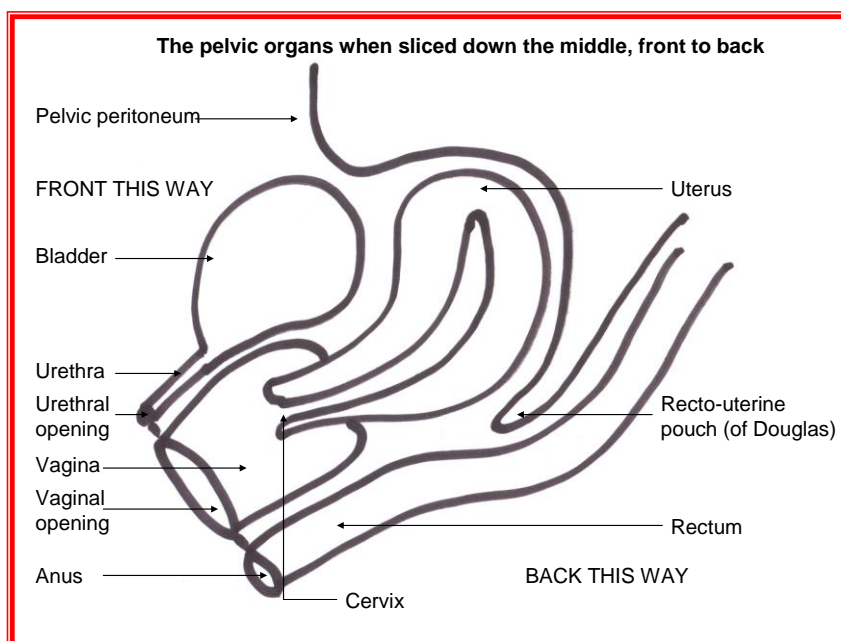
The vagina is the opening between the urethra at the front and the anus at the back i.e. neither the urethra nor the anus actually open into the vagina, although both may spill their contents under certain circumstances to contaminate it. In the developing human, the lower 1/3 of the vagina is formed from the outside in and the upper 2/3 are formed by 2 tubes on the inside merging together (the müllerian ducts if you really want to know). People who do anatomy seriously argue about the exact proportions, but the hymen - the incomplete membrane that stretches across the vaginal opening that is torn at first sexual intercourse (but a tampon can do the same) - lies

roughly at the junction. The remnants of the hymen form knobby bits or tags of vaginal lining - they are normal.

It is quite easy to think of the bits of anatomy you can see ‘from down below’. Inside the vagina, the neck of the womb (the cervix) pokes through at the top (the vaginal vault). What you can’t see is that this see-saws or pivots at this point so that the rest of the uterus is away from view. If the uterus as a whole is angled forwards, the cervix faces backwards (posteriorly) and for the 20% of women in whom the uterus is tilted backwards (retroverted) the cervix is usually angled anteriorly. Thinking about this combination of vaginal and intra-abdominal portions is best considered by slicing the body down the middle.

Anatomical relationships of the vagina

If you imagine slicing a woman in two down the middle, front to back rather than side to side (the sagittal plane), the organs of the pelvis are related to each other as below.



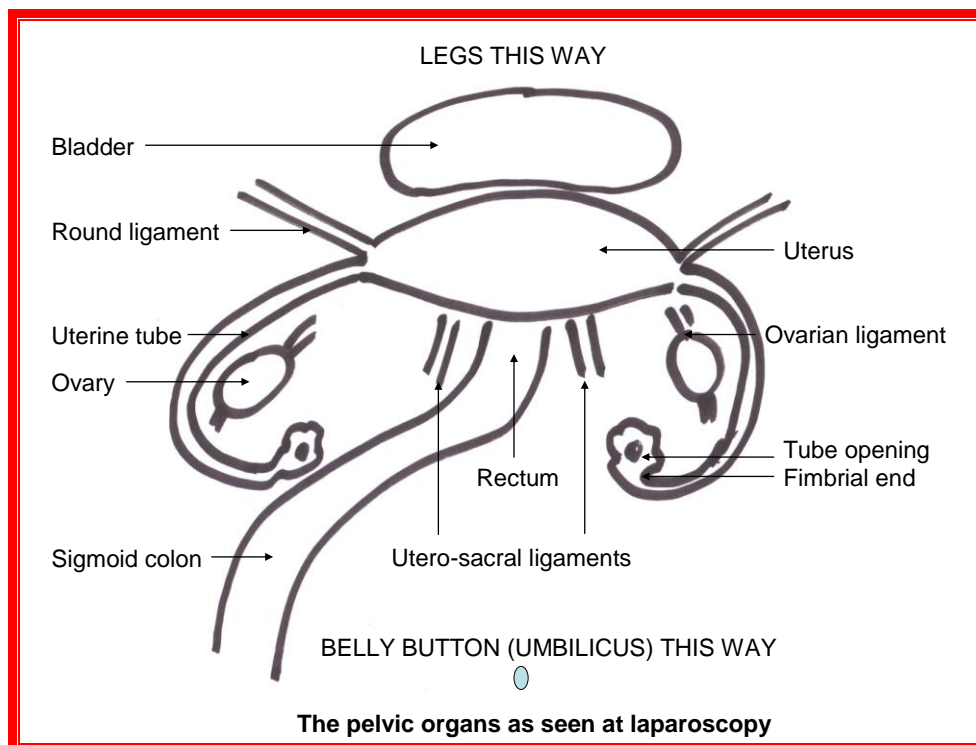
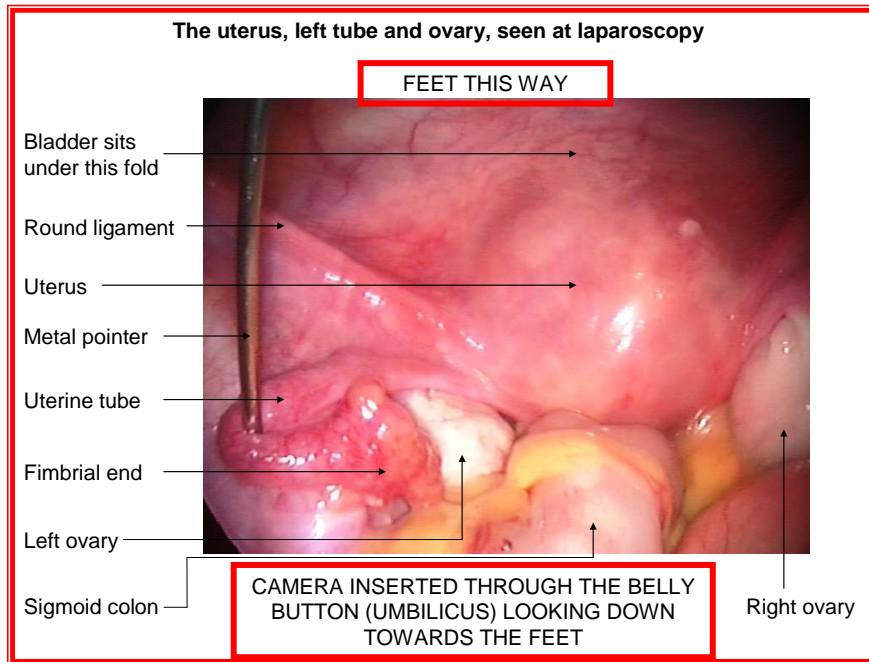


What isn't drawn in this diagram is the actual fibrous and muscular floor of the pelvis, lying within the pelvic bones, with gaps through for the urethra, vagina and anus to pass, that actually keep all our inside from falling out - the pelvic floor muscles and the overlying fibrous tissue - the endopelvic fascia. Above all of this lies the thin peritoneum, which lines the abdomen and pelvis, although there are several organs that it fuses with so it isn't always obvious. This gives a deep pouch behind the uterus, the recto-uterine pouch (of Douglas).

The relationship of the pelvic organs to each other

The relationship of the pelvic organs to each other is best considered from the view that gynaecologists get when they look with a telescope through the belly button (umbilicus) under general anaesthesia - almost everyone goes to sleep for this although it IS possible to do the procedure under local anaesthetic, but this is rare in the UK. At the front of the uterus is the bladder, which enlarges and balloons up the anterior of the abdomen as it fills with urine. This is the store that allows you to void (pee or micturate) when convenient to you, but which seems to mis-behave just when you don't want it to. Although bladder control is something that happens as we grow from being babies, loss of control is particularly distressing for many women. Because the bladder sits on the front of the uterus, making sure it is full lifts the uterus out of the pelvis with it and allows a better view using ultrasound (which travels through urine in the bladder, but not through air in bowel) for gynaecology or early pregnancy examination. Otherwise, for laparoscopy or other gynaecology surgery, the bladder must be emptied. At hysterectomy (either vaginal or abdominal) the bladder must be pushed either up from below or down from above because of this close proximity of

the bladder to the cervix and the upper part of the vagina at the front.
 (The exception to this is a sub-total hysterectomy, which leaves the cervix in place). Similarly, at caesarean section, the bladder must be emptied and pushed down because the thin part of the uterus (the lower segment) lies underneath it.



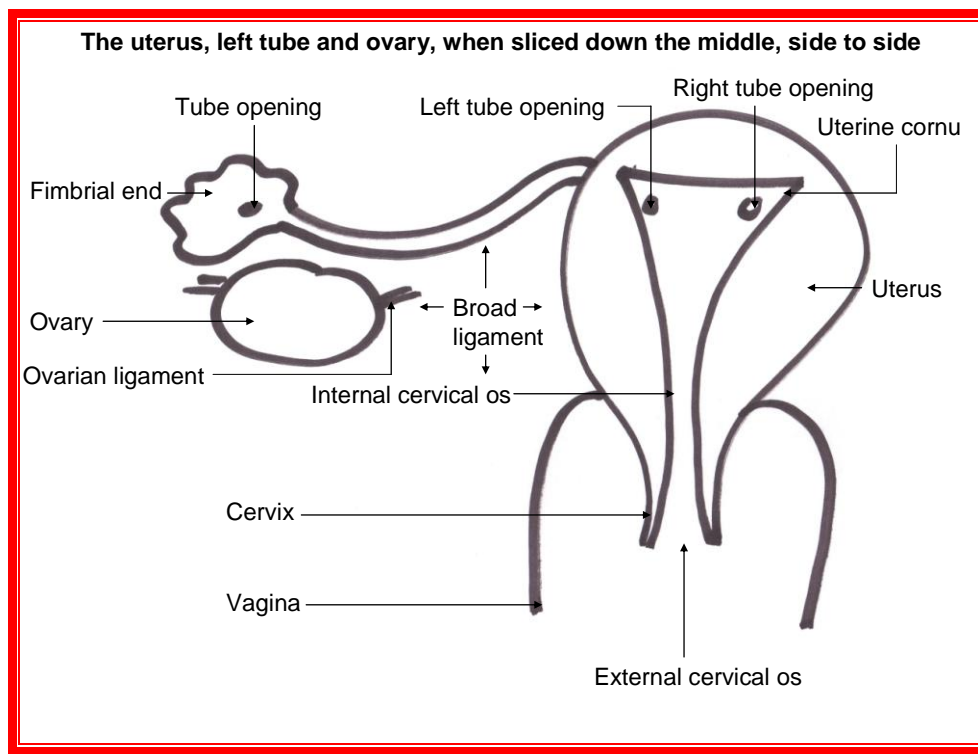
The uterus (womb)

The **uterus (womb)** is made out of smooth muscle (which means it contracts on its own, not like muscles used in motion). It is roughly the size and shape of an upside down pear, with the uterine (**Fallopian**) tubes coming out of each corner at the top, but the middle has a narrow cavity running from the narrow (bottom) end that spreads out to both corners, a bit like a flat triangle. It has a top bit (**the fundus**) a body and a neck (the cervix). The vagina allows the uterus to sit at its top with the lower 1/3 in the vagina and the top 2/3 above the vagina in the pelvis. The bit of the uterus in the vagina is the cervix . An opening in medicine is called an 'os' - hence the external cervical os is an important landmark when the cervix is looked at using an instrument (speculum). Actually, there is another cervical os about 4cm further inside - the internal os, which stays closed and keeps pregnancy in until labour ensues.

There are ligaments coming off the uterus at various levels, all helping to keep it in place. Probably the least important from this point of view are the round ligaments, arising from the fundus at the front on both sides and swinging round the broad ligament and out of the pelvis through a gap in the abdominal wall to insert into the labia majora. They are about 6 cm long normally, but are REALLY stretched in pregnancy, often giving rise to a characteristic discomfort. From a surgical point of view they are an incredibly important landmark because they enable us to divide (cut) them in order to get the other side of the peritoneal cavity (which can make otherwise impossible surgery possible) and to get access to the course of the pipework that carries urine from the kidneys to the bladder - the ureters - which are otherwise vulnerable to damage during pelvic surgery.

The uterine (Fallopian) tubes

The Fallopian (uterine) tubes start at the cornua of the uterus (single = cornu) and it is divided into 4 parts: from the middle outwards these are a part that passes through the muscle of the uterus itself - the intramural part; a narrow part - the isthmus; a wider part - the ampulla and the frond like end - the fimbrial part, that the tube itself opens out in.



The uterine tube is not really hollow as such, but folded and wrinkled when cut across and looked at down a microscope. The walls are lined by specialised cells that can contract and move the egg, before and after fertilisation, towards the uterus - this is an active process and not therefore simply like rolling a marble down a toilet roll run. This explains why a tube can appear to be open to the passage of dye when tested in gynaecology, but then pregnancy does not always happen or the fertilised egg (early embryo) gets stuck in the tube (an ectopic pregnancy) because of damage to



this active transport mechanism (the commonest site for an ectopic pregnancy is actually the ampulla and not the narrowest portion as one might otherwise think).

Hanging down from the uterine tube is a double fold of pelvic lining - the peritoneum, except with a free gap to let the fimbrial end out into the pelvis and thus the abdominal cavity. This is best pictured as a blanket hanging over a washing line, with blood vessels between the folds and the uterine vessels at the bottom. Just under this is the tube that carries urine from the kidney to the bladder - the ureter (students are taught that 'the water passes under the bridge'). Because of this close relationship, the ureter is easily damaged during gynaecological surgery and we spend a great deal of time checking it and moving it away from where we want to operate.

That the fimbrial end pokes out into the abdominal cavity is a crucial and fundamental difference between men and women, because this means that there is a continuous passage between the outside world (through the vagina, cervix, uterine cavity, uterine tube) and that cosy world of the pelvis that makes the pelvic organs infinitely more susceptible to infection tracking upwards and inwards - the relationship between a man's testes and the carrying tube for sperm - the vas deferens - is sealed and contained away from the pelvis (in the scrotum) but that is not to say that men do not get their share of infection.

The **ovaries** then lie on the back of this (broad) ligament by a double fold of peritoneum.

How the pelvic organs are formed

Actually, the top of the vagina, uterus and tubes are all made from this fusion of the müllerian ducts - the top ends stay apart - hence a Fallopian tube either side of the pelvis (diagram) but the lower parts fuse.

Furthermore, the middle bit of the middle part (forming the uterus) breaks down - hence a single uterine cavity in most humans. There are some women in whom this doesn't happen, or is incomplete, so we can see all sorts of variations - a double uterus or one with the middle still present (a muscular dividing wall - or septum). This is a bicornuate uterus and the 2 halves may not be developed the same. In animals, the degree of fusion increases as one gets more complex - the kangaroo has a double vagina (and the shortest gestation), the rabbit has a double uterus completely and the cat has a septum. Thus women with these anomalies are prone to early (preterm or premature) labour and delivery.

Importantly, the ovaries come from a different part of the developing embryo completely. Therefore, it is possible to have a big problem with the uterus and uterine tubes, but to still have fully functioning ovaries.

Summary

The vulva is the medical term for the outside area surrounding the opening of the vagina. The anus at the back is where you poo from and the urethra, at the front, is where you wee from.

The vagina also passes through the muscles of the pelvic floor. It needs some flexibility in it to accommodate sexual intercourse and having babies.

The cervix (neck of the womb), is found protruding at the top of the vagina (the vaginal vault).

The uterus (womb) consists of the cervix and a body. The top portion, lying above where the uterine tubes open into the uterine cavity, is the fundus.

The uterus above the cervix can only be seen from inside the body as it is above the pelvic floor.

The Fallopian (uterine) tubes are thin and relatively long, arising from the corners of the uterus, with finger-like fimbriae at their ends, that are found near to, but not actually joined to, the ovaries. Covering the tube, but leaving the fimbrial ends free is a double layer of peritoneum - the broad ligament.

The ovaries, containing the eggs and producing most (but not all) of the sex hormones, are found on the back of the broad ligament.

The pelvic organs are contained within the bones of the pelvis to which there is a floor made up of muscles and tough fibrous layers (the endopelvic fascia), with gaps through to allow passage of the urethra, vagina and anus - from front to back. The utero-sacral ligaments are important supports of the uterus, inserting into the back of the cervix and running around the pelvic side walls.

There is a general lining to both the pelvis and abdomen - the peritoneum - that folds in places to make various pouches. The pouch behind the uterus is the Pouch of Douglas.

Getting a feel for some of the basic anatomy of the pelvis will help you to understand your body, enabling you to engage more positively in discussions with your health professionals.



Final thoughts:

I get really funny looks when I stand up in clinic with my arms stretched out and say I'm a uterus and that my arms are the tubes. If I had a Victorian hooped skirt on (and I do invite this image) that would be the vagina and my legs would be the cervix, opening into the vagina. I find it useful to extend this analogy to say that the ligament over the tubes hangs like a blanket over my arms, but with the hands free.