

THE POSITION OF THE UTERUS AND THE MECHANISM OF ITS SUPPORT.

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THE uterus normally lies with its anterior surface in contact with the posterior aspect of the bladder,—no intestines intervening. The absolute and the relative positions of the uterus depend upon the degree of distention of the bladder and the position of the woman. The uterus is pushed backward and the fundus is turned upward by distention of the bladder. When the woman is erect the uterus lies at a slightly lower level than when in the recumbent position, and the intra-abdominal pressure acting upon the posterior surface of the fundus turns the uterus more forward, so that the fundus lies nearer the symphysis pubis.

It may be said that in the normal woman the long axis of the uterus is approximately perpendicular to the long axis of the vagina.

The uterus does not surmount the vagina with the axes of the two structures in the same line, as is shown in some anatomical plates.

The cervix looks backward towards the coccyx. It is placed from .6 to 1.2 inches from the tip of the coccyx. The uterus is maintained in position by a variety of factors. The ligaments which have been described are eight in number,—broad ligaments, round ligaments, utero-sacral and utero-vesical ligaments.

With the exception of the round ligaments, which are muscular structures, the uterine ligaments are formed by peritoneal folds, including connective tissue, blood-vessels, lymphatics, and a small amount of unstriped muscle. When the woman is erect, the insertions and origins of the various uterine ligaments lie in the same horizontal plane. The insertion of no ligament is higher than its origin in the uterus. Therefore these ligaments do not act as suspensory ligaments when the uterus is in its normal position.

The truth of this fact is repeatedly demonstrated at operations. If the cervix be caught with a tenaculum when the woman is on her back, it may with but very little force be drawn downward towards the ostium vaginæ to the extent of one or two inches; and similarly the uterus may be pushed upward by slight digital pressure on the cervix from one to two inches above its normal position.

The ligaments of the uterus act as stays or guys. They steady it, and prevent too great lateral and fore and aft movement; they do not, when the uterus is in its normal position or at its normal level, sustain it against the force of gravity. When, however, the uterus, for any reason, falls an inch or more below its normal level, then the uterine ligaments may become, to a limited degree, suspensory in character.

In the normal woman the vagina is always closed, it is a slit in the pelvic floor, valvular in character. Consequently the abdominal and the pelvic viscera may be considered to be contained in a closed vessel, in woman as well as in man. The uterus floats in this closed vessel at a level which is consistent with its own specific gravity. If for any reason the specific gravity of the uterus is increased it sinks below the level at which it is normally situated.

Since, normally, there is no tendency in the uterus to change its position, the pressure upon it must be equal in all directions. The subject may, perhaps, be better understood by referring to a few simple facts in hydrostatics. If a fluid contained in a closed vessel is in a condition of equilibrium so that its various particles are at rest,

then the pressures upon any particle are equal and opposite in all directions. Otherwise the particles would not be in equilibrium, but would move. The bottom of such a vessel, however, is not, like the particles of the fluid, surrounded on all sides by the fluid; above it is the fluid, and below it is the atmospheric air. Any point upon the bottom of the vessel is subjected to a downward pressure equal to the weight of the column of fluid above the point, and this downward pressure is resisted by the strength of the material composing the vessel. If this material be yielding or elastic in character the pressure above may make the bottom protrude to a certain extent. A particle within the fluid immediately above the bottom of the vessel will be subjected to a downward pressure equal to the weight of the column of fluid above it, but this pressure will be counterbalanced not by any strength in the particle, but by a counter-force acting from below, equal and opposite to that acting from above.

A similar state of things exists in the female pelvis. The uterus floats at a certain level, and the intra-abdominal pressure acting from above is counterbalanced by an equal force acting from below, while the floor or bottom of this vessel (part of which is the perineum) is subjected to a force from above equal to the intra-abdominal pressure, and this force is opposed only by the strength of the perineum. If the vagina were an open tube, admitting air, so that the uterus above was in contact with the contents of the pelvis, and below with atmospheric air, then this condition of things would be altered. In this case the uterus would in reality become part of the floor of the vessel and would be subjected to a pressure from above equal to the intra-abdominal pressure, and to this pressure would be opposed only the strength of the uterus and its attachments. Such a state of things occurs when the perineum is torn and the vagina becomes a patulous open canal, and not a closed slit.

Therefore, when the opening of the vagina is torn and air constantly enters the vaginal canal, the hydrostatic equilibrium of the pelvic contents is destroyed, and the resultant of the forces acting upon the uterus is downward, and the organ has a tendency to fall or to prolapse.

The normal perineum and vagina do not sustain the uterus by furnishing a mechanical support from below any more than the bottom of a vessel sustains any single particle of fluid floating in it.

When the uterus tends to fall down or to prolapse its progress is opposed at a certain level by its various attachments. The ligaments become suspensory in character as soon as their uterine attachments are below their pelvic attachments. The cellular tissue,

fat, blood-vessels, etc., connected with the uterus restrain its downward motion. And, finally, this motion is restrained by what has been called the "retentive power of the abdomen," which is merely the atmospheric pressure acting from below on the contents of a vessel the top and sides of which are closed.

Refer again to a simple physical example. If a glass tube be filled with water, a finger placed over one end and the tube inverted the water will not run out. It is sustained by atmospheric pressure acting from below. If the finger be removed, atmospheric pressure also acts from above and the water will fall. If a hole be made in the side of the tube, atmospheric pressure will act through it, and the water below the hole will fall.

In order that the column of water be sustained, the side of the tube must be rigid or unyielding. If the sides of the tube yielded slightly to atmospheric pressure, they would sink in and a certain amount of water would escape.

The abdominal and pelvic cavities in the erect woman may be considered as a tube filled with fluid contents. The top of the tube is closed by the diaphragm, the sides are the more or less rigid abdominal walls and the back. The floor is the perineum. When the floor is destroyed, a hole is made in the bottom of the tube; the contents tend to fall, but the fall is resisted by atmospheric pressure acting from below. If the diaphragm and the parietes were rigid as glass, there would be no prolapse any more than there is prolapse of the water in the glass tube. If the parietes yield somewhat, the amount of fall or prolapse is proportional. Thus the retentive power of the abdomen is dependent upon the strength or rigidity of the abdominal walls.