

ATMOSPHERIC PRESSURE AS A SUPPORT TO THE UTERUS.¹

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AFTER a perusal of the literature on the subject of atmospheric pressure as a support to the uterus, I find that most of the writers consider atmospheric pressure in its various forms as the chief support.

For as Dudley says, "The idea that the uterus is supported by the vaginal wall, or by the perineum, or by the uterine ligaments is obsolete. They are important parts of the pelvic floor and as such contribute their share."

The term atmospheric pressure is too indefinite to describe the force tending to hold the uterus in place, so that one of the forms of this pressure, as intra-abdominal pressure, the density or specific gravity of the structures, etc., will be more appropriate. There are no definite facts set forth on this subject so far as I am able to discover, and as each author has a different view I shall quote in preference to using my own words.

We must remember, as Penrose says, "When the woman is erect the insertion and origin 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."

As for the relation of the surrounding structures to the uterus. Galabin of Cambridge notes that: "It is most correct to regard the floor of the abdominal cavity as formed by the plane of cellular tissue, nearly parallel to the pelvic brim, including the anterior vaginal wall and the utero-sacral ligaments of which the supra-vaginal cervix uteri is the center," and he continues, "This most directly receives the effect of the intra-abdominal pressure. The diaphragm at a lower level made up of strong muscular tissue of which the levator ani is the chief, and which is commonly described as the pelvic floor, does not directly receive the impact of intra-abdominal pressure, but has an important function in supporting the upper diaphragm or abdominal floor or as it is sometimes called the pelvic 'roof.'"

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Now Dudley states that the pelvic floor is the chief support of the uterus; for as Penrose says "The uterus floats in a closed vessel at a level which is consistent with its own specific gravity." With regard to the intra-abdominal pressure Dr. Skene thought "There is very little abdominal pressure." Montgomery of Philadelphia believes "so long as the intra-abdominal pressure continues upon the posterior surface of the uterus it is held forward against the bladder." For as Hirst says: "In the erect position the bladder affords the uterus considerable support in a moderately distended condition and the intra-abdominal pressure with the weight of the abdominal contents upon the posterior uterine wall is a most important factor in maintaining a normal position of the uterus."

The vitality and tonicity of the structures composing the pelvis must be considered. As Pozzi remarks, "The tonicity of the pelvic floor, of which the only weak point is occluded by the normal contraction of the vagina, prevents the abdominal contents from acting in the direction of their weight; the pressure is distributed over the whole surface and the uterus floats as if it were suspended in the midst of the organs of the lower pelvis which act as a cushion for it. When the uterus is artificially drawn downward, this state of the pelvic contents becomes apparent, for up to the moment when the utero-sacral ligaments are stretched and oppose further descent the organ yields with but gentle resistance, as of a floating body which is slowly drawn downward."

Dr. Emmet, speaking of the support of the uterus, quotes Savage as follows: "A plane passing horizontally backwards from just below the sub-pubic ligament to the attachment of the utero-sacral ligaments at the sacrum would indicate the level where the utero-sacral peritoneal folds pass from the pelvic organs to the pelvic wall. It follows a slightly curved line from the vestibule to the uterus and through the utero-sacral ligaments it is attached to the sacrum."

"When these structures are intact they constitute an important line of mutual support for the vagina, uterus and bladder."

If we acknowledge then that the uterus rests on this plane, it is shown by hydrostatics that a floating body is acted on by two equal forces in opposite directions, one vertically down through the center of gravity of the body itself, the uterus in this case, the other vertically up through the center of gravity of the volume which is occupied by, in this case, the pelvic floor in which the uterus rests. If the body is at rest then these two forces must

lie in the same vertical line, but the question of stability of this equilibrium depends upon what happens when the floating body is tipped slightly. If the forces bring it back to its former position, the equilibrium is stable, if they make it tip still further the equilibrium is unstable. But as Dr. Skene has said, "The axis of the pelvis is backward and downward, while that of the abdomen is perpendicular, so that the pressure is indirect from above," then it is evident that the uterus, if it does float, is in unstable equilibrium, and as each author varies as to the degree of decline to the normal uterus the amount of stability varies according to the tonicity and condition of the guy ropes, the ligaments, the pelvic floor and the uterus itself.

That this condition is not Nature's primary method of supporting the uterus, but the result and outcome of evolution, a study of the lower animals will show. To quote Pozzi, "There is then but one point of attachment where the uterus is at all firmly fixed, namely, that of the posterior ligaments, and as they are inserted where the organ is thinnest, evidently its position may be compared to that of a pyramid balanced on a point. This paradoxical condition does not exist in the lower animals, but is an anomaly in the animal kingdom, explained by the upright position of the human species."

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