THE LOWER UTERINE SEGMENT AND UTERINE TENDONS.¹

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GYNÆCOLOGISTS are, or should now be, agreed that the uterus owes its stability to its connexion with the fibro-muscular bands which surround the cervix at the level of the os internum and radiate in all directions to their attachments in the pelvis. These fibro-muscular bundles show an unequal distribution, and where best developed they are indicated by distinctive names—viz., sacro-uterine ligaments, lateral ligaments of Mackenrodt, &c.

"Uterine Tendons."

The anatomists' description of this tissue is that it forms an imperfect diaphragm, stretching across the pelvic cavity, with an aperture towards its centre through which the neck of the uterus fits. This conception cannot be correct, for were it so destruction of the diaphragm would follow as a result of the first parturition. When it is remembered to how full an extent the foetal head occupies the cavity, it is inconceivable that a membrane torn to such a degree could ever renew its original continuity. Experience, however, teaches that this diaphragm remains uninjured by normal childbirth, and therefore the only inference which can reasonably be deduced from the fact is, that these fibro-muscular bands are not interwoven one with another to form a continuous membrane but pass separately into the uterus and are centred in this organ. Thus the muscle bundles at the internal os must exercise a direct control over this fibro-muscular tissue. The opening of the os permits a slackening of the fibrous diaphragm and closure of the os renews its tension.

In this respect the tissue behaves as tendons do in other parts of the body, and surely "uterine tendons" is the name that should be applied to them. From inductive reasoning I surmise that this fibro-muscular tissue is derived from the uterine muscle and not from pelvic fascia or parametrium.

The recognition of the above mechanism has made clear many obscure phenomena in obstetrics and gynæcology. It is evident that the uterus after childbirth owes its great mobility to relaxation of the uterine tendons, and the same condition permits the vaginal fornices to be pushed by vaginal plugging so far up into the abdomen as to stop the circulation in the uterine arteries. During the performance of Cæsarean section I have been able to demonstrate the latter fact to a number of experts, so that the question is no longer in doubt.

In a nulliparous woman the cervix is also closed by a certain amount of fibrous and elastic tissue which is probably derived from the pelvic fascia. This tissue is torn during childbirth, and the tearing accounts for the different behaviour of the multipara's and primipara's cervix during the process of dilatation.

The Lower Uterine Segment.

The lower uterine segment is formed by a growth and is not a mere stretching of pre-existing tissue. It is impossible to account for its presence by any other explanation, and it can be clearly shown that the cervix is the structure of all others which most readily responds by growth to a continuous pressure.

It is wrong to regard the cervix as consisting of tissue prone to stretch. It possesses this property within very narrow limits, and efforts at forcible dilatation, whether during childbirth or in the unimpregnated, are prone to be followed by extensive ruptures. On the other hand, it is capable of phenomenal growth when exposed to a continuous pressure strain. In procidentia uteri its supravaginal portion becomes enormously hypertrophied. In spite of its greater length its diameter does not diminish, which clearly shows that the process is one of hypertrophy.

The following experience well illustrates this point. During the performance of ovariectomy on an old woman with prolapse of the uterus I amputated the uterus above

the os externum and stitched the small stump to the abdominal fascia in an effort to keep up the prolapse. In a year the condition was worse than ever. The stump had held to the abdomen, but the small cervix had hypertrophied and again permitted the vagina to turn inside out. In this instance the cervix must have increased to twenty-fold its original size, and there is no other structure capable of this wonderful metamorphosis.

The cervix does not under normal conditions elongate because of the protection it receives from the taut uterine tendons. These keep the uterus in equilibrium and take up all abdominal strain. The cervix lying beneath them is thus freed from pressure.

When pregnancy occurs the internal os opens and the ovum finds room for its increasing growth in the upper region of the cervix immediately beneath the uterine tendons. In response to this stimulus the upper part of the cervix hypertrophies to form the lower uterine segment. The fact that this segment is a growth comparable to that which occurred in my case of uterine prolapse accounts for its formation without any appreciable shortening of the cervix, and satisfies the objections of those who doubt its cervical origin because of the almost undiminished change in the length of the cervix during pregnancy.

The last question to be considered is that of the true boundary line which separates the cervix from the body of the uterus. Attempts to define this boundary have been made by microscopic and macroscopic efforts, but I am not aware that anyone has before suggested that the taut uterine tendons constitute the one and only division between them. The cervix must then be defined as that portion of the uterus which normally escapes pressure by lying beneath a portion of the uterine tendons.

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ATTENUATION OF HUMAN, BOVINE, AND AVIAN TUBERCLE BACILLI.¹

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THE object of this short paper is to demonstrate the effect of long-continued and regular subculturing of pure cultures of human, bovine, and avian tubercle bacilli on artificial media containing glycerine. This process has been continued without interruption for 12 years and the cultivations are luxuriant and grow as readily as in the first year of subculturing. They retain all their characteristic and selective appearances, and can be easily identified as distinct types of tubercle bacilli.

Inoculation of rabbits and guinea-pigs by human and bovine bacilli have been made at intervals during the last 12 years (the full details of which will be published later), with the result that there has been a gradual decrease in virulence until at the present time they are almost non-pathogenic to animals.

History of Cultures.

The original culture of human bacilli was given to me by the late Professor Koch in 1906, and was prepared by him from the sputum of a case of primary pulmonary tuberculosis. The patient had suffered from phthisis for four years, and the culture was made in the last stages of the disease.

The original bovine culture was sent to me by Professor Calmette, of Lille, and was from the mesenteric glands of a cow which had been destroyed for advanced tuberculosis of the udder. The avian culture was sent to me by Professor Bang, of Copenhagen, and was from a chicken which died from epidemic tuberculosis in fowls.

Careful photographs were taken of the original cultures and at intervals up to the present time. All of these retain in a remarkable degree the exact and typical appearances of the original type, and can be easily and readily identified.

Avian bacilli being non-pathogenic to man need not be considered in this paper.

The important fact to bear in mind in the study of tuberculosis, and which has been amply demonstrated by a long-continued study of the subject is, that (1) the human body is

¹ A paper read at the Royal Academy of Medicine in Ireland (Section Obstetrics), Feb. 14th, 1919.

¹ A paper read before a Medical Society in France, at which cultivations of the organisms were shown.