

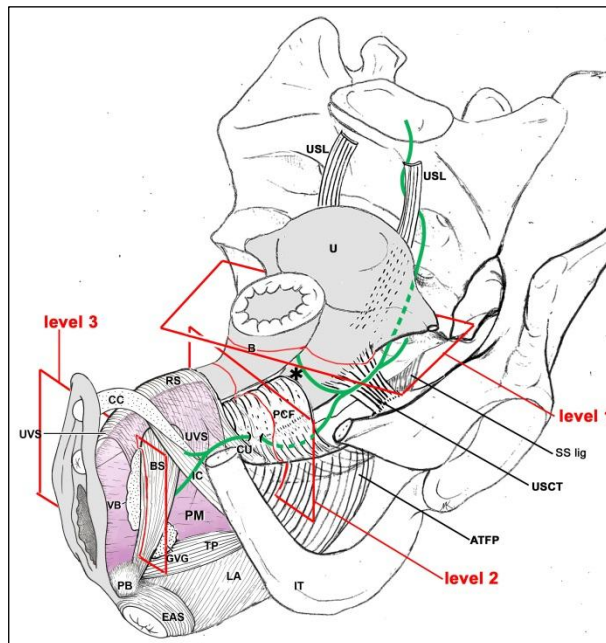
ANATOMICAL EVALUATION OF THE CONNECTIVE TISSUE BETWEEN UTERINE CERVIX AND ISCHIAL SPINE DISTINCT FROM TRADITIONAL UTEROSACRAL LIGAMENTS (LEVEL 1 SUPPORT)

Hypothesis / aims of study

For DeLancey's level 1 pelvic floor supporting mechanism, the elastic ligamentous tissues attaching the uterine cervix and the vaginal apex may play an important and crucial role. In addition to the classical uterosacral ligament beneath the uterosacral peritoneal fold, gynecologists have noted a connective tissue structure between the uterine cervix and the ischial spine/coccygeus complex (herein tentatively termed the uterospinous connective tissue; USCT) as a critical supportive structure of the uterine cervix and proximal vagina. We hypothesized that the USCT changes its histological architecture by vaginal delivery more drastically than the DeLancey's levels 2 and 3 supportive tissues because the USCT is likely to receive a direct mechanical stress from the uterus. The aim of study is to reveal 1) topographical relationships among the structures and their entire architecture at lower magnification, 2) directions of fibers in the structures, and 3) the kinds of fibrous structures (i.e., collagenous, elastic, or smooth muscle fibers).

Study design, materials and methods

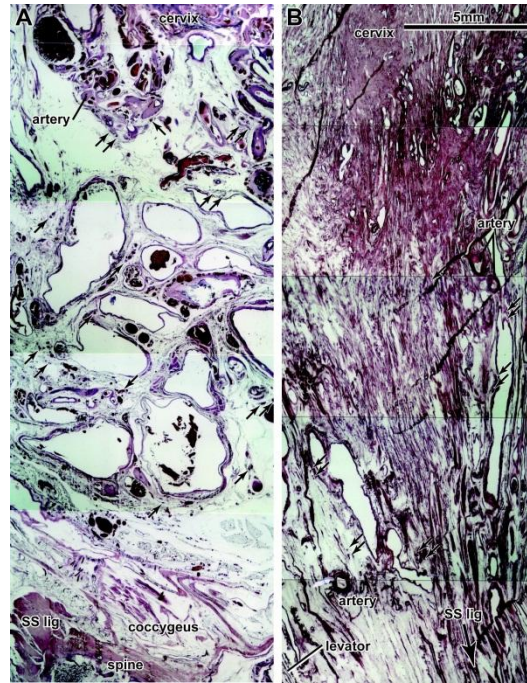
Pelvic floor specimens including the entire uterus and vagina were obtained from 17 donated female cadavers without macroscopic evidence of prolapse (8 nulliparous and 9 multiparous women (all vaginal delivery)). We prepared paraffin blocks at three sites: 1) a level 1 block containing the ischial spine, uterine cervix and bladder neck in a single flat plane; 2) a level 2 block in which the arcus tendineus fasciae pelvis (ATFP) was cut transversely at the midportion between the pubic attachment and the ischial spine; 3) a level 3 block in which one of the surfaces showed a longitudinal section of the perineal membrane fibers extending alongside the distalmost vagina (Fig 1). Semiserial sections 10 microns thick were cut at 1-2-mm intervals. All sections were stained with hematoxylin and eosin, although some were used for immunohistochemistry (tyrosine hydroxylase, S100 protein, peptide histidine isoleucine, and alpha smooth muscle actin), Masson-trichrome staining (collagenous fibers) or aldehyde-fuchsin staining. The protocol for the present research project did not include any specific issue that required approval by the Ethics Committees of our institutions. The present work conformed to the provisions of the Declaration of Helsinki, 1995 (as revised in Edinburgh, 2000).



(Fig 1: Location of USCT)

Results

The USCT displayed a spectrum of morphology ranging from simple, loose tissue to an organized structure: loose fatty tissue (3 cadavers including the aforementioned specimen), a loose mesh-like architecture of collagenous fibers (6 cadavers), an extended thin mesh or a long string of collagenous fiber bundles (8 cadavers), a tight and thick mesh or fragmented fibers with many dilated vessels (3 cadavers). The USCT was evident as a string-like tissue structure in multiparous women or a thick mesh in nulliparous women. It consistently contained fewer elastic and smooth muscle fibers than other levels. In contrast, the ATFP usually contained abundant elastic fibers and smooth muscle. Likewise, the perineal membrane also displayed a constant morphology in both of nulliparous and multiparous female cadavers.



(Fig 2, A: multiparous, B: nulliparous)

Interpretation of results

The present histologic study demonstrated a tight mesh-like architecture of the USCT in nulliparous elderly women, in contrast to a long string-like or fragmented architecture in multiparous women. Most gynecologists may consider the uterosacral ligament to be the core of the peritoneal fold running superiorly, attaching to the upper sacral vertebrae and containing the hypogastric nerves. However, even in the classical description, the uterosacral ligament was considered to be attached to the fascia covering the levator ani, coccygeus, and obturator internus muscles, as well as the presacral fascia. The uterosacral ligament was inserted onto the ischial spine/coccygeus muscle complex. The dorsal supportive tissue has been traditionally referred to as the uterosacral ligament. However, we were not in favour with this nomenclature because the major mass of the posterior compartment does not correspond to supportive tissues of the uterus, but to those of the rectum. Our view appears to be consistent with the figures shown by DeLancey. Therefore, to avoid confusion, we tentatively used a common term, the uterospinous connective tissue, or USCT.

Concluding message

The Uterospinous connective tissue (USCT) was anatomically demonstrated by female cadaveric pelvic floor specimens. The USCT seemed to be distinct from traditional uterosacral ligament and more severely damaged and/or more difficult to be recovered than the ATFP and perineal membrane.

References

1. Hirata-E, Koyama-M, Murakami-G et al. A comparative histological study of the level 1-3 supportive tissues using pelvic floor semiserial sections from elderly nulliparous and multiparous women. J Obstet Gynecol Res, 2010 in press

Specify source of funding or grant	none
Is this a clinical trial?	No
What were the subjects in the study?	HUMAN
Was this study approved by an ethics committee?	Yes
Specify Name of Ethics Committee	he Ethics Committees of Iwamizawa Kojin-kai Hospital
Was the Declaration of Helsinki followed?	Yes
Was informed consent obtained from the patients?	Yes