This is the Accepted Manuscript version of the following article:


which has been published in final form at http://doi.org/10.1016/j.ajog.2015.12.057

This paper is made available in Western Sydney University ResearchDirect in accordance with publisher policies.

Please cite the published version when available.

Access to the published version may require a subscription.

© 2016. This manuscript version is made available under the Creative Commons Attribution-NonCommercial-NoDerivatives 4.0 International License. To view a copy of this license, visit http://creativecommons.org/licenses/by-nc-nd/4.0/
Does Denonvilliers’ fascia exist in women?

Ming Zhang, MB, MMed, PhD, Anu Kaw, BS, Pierre H. Chapuis, MB, BS, FRACS, DS, Les Bokey, MB, BS, FRACS, MS

PII: S0002-9378(15)02661-7
DOI: 10.1016/j.ajog.2015.12.057
Reference: YMOB 10865


Received Date: 2 December 2015
Revised Date: 27 December 2015
Accepted Date: 29 December 2015


This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.
Does Denovilliers’ fascia exist in women?

Ming Zhang MB, MMed, PhD.
Department of Anatomy, Otago School of Medical Sciences,
University of Otago, Dunedin, New Zealand
ming.zhang@anatomy.ac.nz

Anu Kaw, BS.
Department of Anatomy, Otago School of Medical Sciences,
University of Otago, Dunedin, New Zealand
kawan518@student.otago.ac.nz

Pierre H. Chapuis, MB, BS, FRACS, DS
Department of Colorectal Surgery, Concord Hospital and Discipline of Surgery,
Sydney Medical School, The University of Sydney,
NSW, Australia
pierre.chapuis@sydney.edu.au

Les Bokey, MB, BS, FRACS, MS
Department of Colorectal Surgery,
Liverpool Hospital and School of Medicine,
University of Western Sydney, NSW, Australia
L.Bokey@uws.edu.au

The project was funded by the grant from the Colorectal Surgical Society of Australia and New Zealand (2015-2016).
The authors report no conflict of interest.

Corresponding Author:
Ming Zhang MB, MMed, PhD.
Department of Anatomy, Otago School of Medical Sciences,
University of Otago, Dunedin, New Zealand
ming.zhang@anatomy.ac.nz
OBJECTIVE: The presence or absence of Denonvilliers’ fascia in either sex has been debated for over 100 years\(^1\). The original description of the fascia was based exclusively on findings observed in 12 male cadavers though Denonvilliers gave no account of its existence in women\(^1\). Not surprisingly, its clinical significance in women remains controversial. Kleeman reports no similar fascia present between the rectum and vagina\(^2\) whilst Kraima supports its presence\(^3\). In women, it is considered important in the treatment of rectocoele or when mobilising the rectum in the correct avascular plane avoiding injury to the anterior rectal wall and associated adjacent neurovascular structures. The aim of this study was to investigate the in situ detailed architecture of Denonvilliers’ fascia in female cadavers using a novel epoxy sheet plastination technique.

STUDY DESIGN: Three sets of serial frozen sections (two transverse, one sagittal) from three adult female cadavers (age range 58-86 years) were studied. Two of the three sets were plastinated and examined by microscopy. None of the cadavers showed signs indicative of previous surgical intervention, injury, physical abnormalities or unknown previous pathologies within the pelvis. Their history of vaginal birth was unknown. The cadavers were bequeathed for medical education and research purposes under the Human Tissues Act. Generally, the study of fascia in cadavers is complex because of the difficulty dissecting out fine fibrous structures meticulously. Histology may overcome the problem though there are difficulties encountered with sample size, alteration of tissue architecture during decalcification and in tracing the origin of a fibrous structure. Alternatively, epoxy sheet plastination technology, in which water and lipid of a specimen are replaced by curable transparent epoxy resin, not only preserves the in situ orientation and morphology of tissues but also allows examination at both the macroscopic and microscopic levels\(^4\).

RESULTS: The upper border of the external anal sphincter was a key landmark for orientation of Denonvilliers’ fascia (Figure 1A). At the level of the sphincter, the muscular and tendinous fibres from the rectal and vaginal walls intermingled with each other and no distinct fascial layer was
identified (Figure 1A). Above the sphincter was mainly adipose tissue. Several membrane-like fascial fragments were visible within the adipose tissue. Superiorly, the peritoneal fold extended as far as the posterior vaginal wall inferiorly to blend imperceptibly (the insert of Figure 1A) and not necessarily in the sagittal plane (Figure 1B). Fascial projections were blended with rectal longitudinal fibro-muscular fibres (Figure 1C and 1D) and projected along vessels in various directions (Figure 1A and 1E).

**Conclusion**

There is no clearly identified membranous layer consistent with Denonvilliers’ fascia present interposed between the posterior vaginal and the anterior rectal walls. Previous studies may have misidentified the fragmented membrane-like structures as Denonvilliers’ fascia. However, further studies that support these findings are warranted because of the number and age of the specimens examined in this study.

**References**

Figure legend

Figure 1 Configuration of the rectovaginal septum. A: A sagittal epoxy sheet plastinated slice showing the rectovaginal septum. The insert is the higher magnification view of the dashed-line box, indicating the peritoneal fold (arrows). Arrowheads point to the membrane-like structures in the septum. The thin upper and lower red lines indicate the levels of transverse sections of B and C. B: A transverse epoxy sheet plastinated slice at the upper level of the septum. Arrows indicate a peritoneal fold in the septum (refer to the insert of A). The double arrows point to the longitudinal rectal muscular and tendinous fibres. The thin red line indicates the level of the sagittal section of A. C: A transverse epoxy sheet plastinated slice at the level just above the external anal sphincter (E). Arrowheads and double arrows point to a membrane-like structure and the longitudinal rectal muscular and tendinous fibres. D: A higher magnification view of the line box in C, showing direct continuation of the membrane-like structure (arrowheads) to the longitudinal rectal muscular and tendinous fibres (double arrows). E: A slice 2.5mm adjacent to the line box of A, indicating the membrane-like structures in A are the vascular sheath (arrowheads).

E: External anal sphincter; G: gluteal muscle; L: levator ani; R: rectum; S: rectovaginal septum; U: uterus; V: vagina; Bars = 2 mm.
The authors report no conflict of interest.

Author contributions:
MZ designed the study. AK and MZ were responsible for data acquisition. All authors contributed to the interpretation of data and writing and reviewing the manuscript.