Original Article

Vaginal Axis After Abdominal, Vaginal and Laparoscopic Hysterectomy: A Preliminary Study with Perineal Ultrasonography Using Contrast Medium

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Abstract: Fifteen consecutive women (mean age 44.5 years) without pelvic relaxation underwent total abdominal (5), vaginal (5) and laparoscopic (5) hysterectomy for benign disease. The vaginal axes of the patients were examined prior to and on average 7 weeks (range 3–10) after the operation with perineal ultrasonography enhanced with an ultrasound contrast medium (SHU454/Echovist®_300). Transabdominal and vaginal hysterectomies were performed in the classic manner, i.e. the round as well as cardinal and sacrouterine ligaments were attached to the vaginal vault, followed by peritonealization. In laparoscopic hysterectomy the round, broad and outer parts of the uterosacral and the upper parts of the cardinal ligaments were desiccated by bipolar electrocoagulation and cut with laparoscopic scissors. The vagina was closed by interrupted sutures with no specific fixation of the round, cardinal or uterosacral ligaments. Preoperative ultrasound findings showed that in all women the vagina was an angulated organ. The mean preoperative angle between the upper and lower vaginal portions was 108°, in both the supine and the standing positions. Postoperatively this angulated shape remained almost unchanged after vaginal (mean angle 117°) and laparoscopic hysterectomy (mean angle 130°), whereas after transabdominal hysterectomy the vaginal axis rotated anteriorly and became an almost straight tube (mean angle 158°). We conclude that the vaginal axis, at least at an early stage after vaginal and laparoscopic hysterectomy remained in almost the same position as preoperatively, in contrast to that after abdominal hysterectomy. A tight attachment of the round ligaments to the vaginal vault in the abdominal approach could explain the outcome of transabdominal hysterectomy, and should be called into question.

Keywords: Hysterectomy; Perineal ultrasonography; Ultrasound contrast medium; Vaginal axis

Introduction

The goals of any pelvic surgery include removal of the disease, relief of symptoms, restoration of normal pelvic anatomic relations and preservation of coital function. These are particularly important as regards hysterectomy, a commonly performed gynecologic procedure. Previous investigators have demonstrated that the levator diaphragm is mainly responsible for maintaining the vagina in its inclined position [1], and the upper part of the normal vagina lies in an axis pointing into the hollow of the sacrum [2]. There are, however, no studies on the effect of hysterectomy on vaginal axis. The aim of this study was to examine the vaginal axis prior to and after hysterectomy performed via various approaches, using perineal ultrasonography enhanced by a novel ultrasound contrast medium SHU 454/Echovist®_300 (Schering AG, Berlin, Germany). This is a suspension of soluble galactose microparticles in an aqueous galactose solution.
Patients and Methods

The study population consisted of 15 women with a mean age of 44.5 years (range 33–53; SD ±4.6), 5 of whom underwent consecutively total abdominal (TAH), 5 laparoscopic (LH) and 5 vaginal hysterectomy (VH) for benign disease (uterine myomas 53%, hypermenorrhea 33%, dysmenorrhea 14%) at the Department of Obstetrics and Gynecology of Turku University Central Hospital between January and April 1994. Patients with pelvic relaxation, galactosemia, signs of acute genital inflammation, endometriosis, urinary incontinence or previous pelvic surgery were excluded from the study. Galactosemia was an exclusion criterion because our ultrasonography contrast medium was galactose based, and acute inflammation and endometriosis patients were excluded because possible postoperative adhesions would make the results unreliable. The patient characteristics of each group are presented in Table 1. No statistical differences were seen preoperatively between the various groups as regards mean age, parity or body mass index.

TAH was performed using a conventional technique as described by Thompson [3], i.e. the round as well as the cardinal and uterosacral ligaments were attached to the vaginal vault, followed by peritonealization. VH involved extraperitoneal fixation of the uterosacral, cardinal and round ligaments to the posterior lateral vaginal fornices. Because there was no pelvic relaxation, no anteroposterior repairs of the vaginal walls had to be carried out. In LH, the adnexal vascular pedicles, round and broad ligaments, as well as the uterine vessels and the outer parts of the uterosacral and the upper parts of the cardinal ligaments were desiccated by bipolar electrocoagulation and cut with laparoscopic scissors. The vagina was opened laparoscopically, and surgery was completed vaginally by simple removal of the uterus. The vagina was closed by interrupted sutures with no specific fixation of the round, cardinal or uterosacral ligaments. Polyglycolic acid sutures were used in all operations.

In order to study the shape and position of the vagina the patients were examined by the first author ultrasonographically both preoperatively and on average 7 weeks postoperatively (range 3–10 weeks) with a symptomatically full bladder in the supine position at rest using a modification of the perineal scanning method described by Kohorn et al. [4]; additional standing ultrasound examinations were taken on 2 patients, 1 undergoing VH and the other TAH. The ultrasound equipment used was a linear-array real-time scanning machine with sector scanner. A frequency of 3.5 MHz was used for the Toshiba transducer. After 10 ml contrast medium had been instilled through a narrow silicone catheter into the vagina the transducer was placed on the vulva in a sagittal orientation and positioned to obtain a precise view of the urethra, bladder, bladder base, urethrovessical junction, pubis and vagina for illustrations taken with a Polaroid camera system attached to the Toshiba unit (Toshiba SSA-270A, Toshiba Corporation 1989). The contrast medium (SHU 454/Echovist®-300) [5], was supplied by Schering Corporation and prepared immediately before each instillation.

Figure 1 shows detailed measurements between the upper and lower vaginal axes and the reference points used. Distances were measured between the following points: the vaginal posterior fornix and the introitus (AB); the greater perpendicular distance (CD) measured from the line between the posterior fornix and the introitus to the vaginal contrast line, i.e. the enhanced view of the curved vagina filled with contrast medium; the posterior fornix and the urethrovessical junction (BE); the posterior fornix and the inferior border of the symphysis (BF); and the urethrovessical junction and the inferior border of the symphysis (EF). A change in distance from the vaginal posterior fornix to the introitus indirectly reflected a change in vaginal length, and a change in the greatest perpendicular distance from the vaginal contrast line to the line between the posterior fornix and the introitus indicated a change in the central vaginal axis, i.e. in the angle between lower and upper vagina. The preoperative anatomical pattern of the pelvic relations was considered to be the norm for each individual.

No antibiotics were given to the patients before or after the ultrasound examination. Verbal informed consent was obtained from all the women and the study design was approved by the Joint Ethics Committee of Turku University and Turku University Central Hospital.

Table 1. Characteristics of the 15 patients who underwent either transabdominal (5), vaginal (5) or laparoscopic (5) hysterectomy

<table>
<thead>
<tr>
<th></th>
<th>TAH</th>
<th>VH</th>
<th>LH</th>
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<tbody>
<tr>
<td>Age (year, mean; range)</td>
<td>44 (33–53)</td>
<td>44 (41–49)</td>
<td>45 (40–48)</td>
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<tr>
<td>Parity (mean; range)</td>
<td>1.6 (1–3)</td>
<td>2.6 (2–4)</td>
<td>1.6 (0–3)</td>
</tr>
<tr>
<td>Body mass index (kg/m², mean; range)</td>
<td>25 (20–29)</td>
<td>21 (17–28)</td>
<td>23 (21–26)</td>
</tr>
</tbody>
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Fig. 1. Schematic illustration of upper and lower vaginal axes and reference points for the measurements used in the study.