The anatomy of the uterus is defined with the angles of the vagina, cervix and uterine corpus. Hereunder there are angles of version and flexion. The cervical position observed during the vaginal speculum examination, may give information about the uterine anatomy. In this study, we investigated the place of the cervical position in the estimation of the uterine anatomy observed during the cervical examination. We enrolled 240 patients in our study, who applied to our routine gynecology outpatient clinic with various complaints. We divided these patients into two groups according to the cervical position (anterior cervical position and posterior cervical position) observed during the speculum examination. We recorded the uterine anatomy also with the transvaginal ultrasonography. During the speculum examination, we determined that 90% of the cases with posterior fornix position were anteverted and 10% retroverted; 64.2% of the cases with anterior fornix position were anteverted and 35.8% retroverted. According to these findings, cervical position observed during the speculum examination might be useful in the estimation of the uterine anatomy regarding the angles of the version. However, the ultrasonographic examination is essential for a definitive determination of the uterine anatomy. Clin. Anat. 30:404–408, 2017. © 2017 The Authors. Clinical Anatomy published by Wiley Periodicals, Inc. on behalf of American Association of Clinical Anatomists

Key words: uterine anatomy; vaginal examination; cervical position; ultrasonography

INTRODUCTION

The anatomical position of the uterus is described with reference to the angles between the vaginal axis, cervical axis and axis of the uterine body. The positional relationship between the vaginal and cervical axes is referred to as version and the angle between the cervical axis and the axis of the uterine corpus is referred to as flexion (Anderson et al., 2002). If the angle between the vaginal and cervical axes is directed ventrally, it is defined as anteversion; if it is directed backward, it is defined as retroversion. If the angle between the cervical axis and the axis of the uterine corpus is directed ventrally, it is defined as anteflexion; if directed backward, it is defined as retroflexion (Fig. 1).

The position of the cervix observed during vaginal examination could help in estimating the position of the uterus regarding version and flexion. In a study focused on the ultrasonographic determination of uterine position, it was reported that the most common position was anteversion/anteflexion and the least common was retroversion/retroflexion (Nizić et al., 2014).

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However, a study using magnetic resonance imaging reported ethnic differences regarding the position of the uterus (Rizk et al., 2005).

The determination of the exact anatomical position of the uterus is important for many gynecological surgeries as it affects the success rate of the intervention. Examples include the proper insertion of the cannula during intrauterine insemination; proper insertion of the uterine manipulator during laparoscopic and robotic hysterectomy (to decrease the risk of perforation); determination of the position of the embryo during curettage; and proper forwarding of the transfer catheter into the uterine fundus when the embryo is transferred during in vitro fertilization.

If the cervical position of the patient during vaginal speculum examination on the gynecological examination/intervention table is toward the posterior fornix, the uterus could be anteverted/anteflexed. If the position is toward the anterior fornix, the uterus could be retroverted/retroflexed. Taking anatomical structure into consideration, if the cervix is in the anterior position in the vagina then the uterine axis should be in the posterior position, and if it is in the posterior position in the vagina then the uterine axis should be in the anterior position.

In this study, we assessed the accuracy of estimation of uterine anatomy by the observed cervical position during cervical examination.

**MATERIALS AND METHODS**

We obtained the local ethics committee’s approval for our study (Gülnale Military Medical Academy Ethics Committee, 25 February 2014, Registration Number: 32). We enrolled patients who applied to our gynecology and obstetrics outpatient clinic in the tertiary healthcare services center between August 2014 and January 2015, with the following inclusion criteria: women of reproductive age, a regular menstruation cycle, at least 12 months since last delivery, no history of uterine or pelvic surgery (except cesarean delivery), no findings of endometriosis in the anamnesis and gynecological examination, and no mass affecting the anatomy of the uterus (leiomyoma, adenomyosis, other pelvic organ disorders). A total of 240 patients fulfilling these inclusion criteria were included in our study and 630 were excluded.

All gynecological examinations were carried out with an empty bladder. All patients were assessed by vaginal examination and ultrasonography on the gynecological table.

The position of the cervix was recorded during the vaginal speculum examination. Patients with a cervical position toward the anterior fornix were assigned to...
Retroversion/retroflexion 30% (n = 36) and a rate of retroflexion of 73.3% (88/120) and the rate of retroflexion 26.7% (32/120). There was no statistically significant difference between these rates (Table 3).

DISCUSSION

The anatomical structure of the uterus is important for clinicians in respect of many gynecological interventions. Correct judgment of the version, which shows the relationship between the vaginal and cervical axes, and of the flexion, which shows the relationship between the isthmic region and the uterine corpus, is the most important step toward success in gynecological interventions. For this purpose, the cervical position observed during vaginal examination is partly reliable for estimating the anatomical structure of the uterus, on which several studies have focused.

Nizic et al. reported that the position of the uterus was affected by several etiological factors. They emphasized the importance of ultrasonography in the pelvic examination (Nizić et al., 2014).

Rizk et al. (2005) used magnetic resonance imaging and revealed differences in the anatomical position of the uterus among different ethnic groups. According to this study, the angle of version was significantly less common in European/Caucasian women than in other ethnic groups (especially in India and Pakistan). Haylen et al. (2007) investigated whether the anatomical position of the uterus was affected by a full or empty bladder. Their study included 480 cases and revealed that the rate of retroversion in the ultrasonographic examination, which was 18% with the empty bladder, declined to 13% with the full bladder. This difference was reported as statistically significant. To exclude this interference in our study, we investigated the uterine anatomy of our patients after ensuring that they had voided their bladder before the examination. Since these data indicate that uterine anatomy can change depending on the bladder’s fullness, ultrasonography provides a more reliable means of assessment.

Fauconnier et al. (2006) investigated the relationship between the retroverted uterus and pelvic pain. They found a significant correlation between the retroverted uterus and dyspareunia and dysmenorrhea.

Cagnacci et al. (2014) investigated the relationship between the intensity of menstrual pain measured with the Visual Analog Score and the estimated angle of uterine flexion. The results showed that more
**Fig. 3.** Different uterine anatomical positions (except rare positions). **a.** Anteversion/anteflexion, **b.** anteversion/retroflexion, **c.** retroversion/anteflexion, **d.** retroversion/retroflexion. [Color figure can be viewed at wileyonlinelibrary.com]

**TABLE 3. Relationship of the Angles of Uterine Version and Flexion to the Vaginal Cervical Position**

| Anterior cervical position | Group 1 (n = 120) | Posterior cervical position | Group 2 (n = 120) | P     |
|----------------------------|-------------------|-----------------------------|-------------------|-------|
| Anteversion                | 64.2% (n = 77)    |                             | 90% (n = 108)     | <0.001|
| Retroversion               | 35.8% (n = 43)    |                             | 10% (n = 12)      | <0.001|
| Anteflexion                | 62.5% (n = 75)    |                             | 73.3% (n = 88)    | 0.097 |
| Retroflexion               | 37.5% (n = 45)    |                             | 26.7% (n = 32)    | 0.097 |

*P* < 0.05 indicates significant difference (independent two-sample *t* test).
intense menstrual pain was experienced when the angle of uterine flexion was smaller.

Nevertheless, we considered the value of cervical position observed in the cervicovaginal examination in estimating the uterus. We designed our study to be descriptive rather than directed toward an etiological cause of a disorder or the effects of certain disorders on uterine anatomy. We found that the uterus was anteverted in 90% of cases if the cervix was in the posterior position, and anteverted in 64.2% if it was in the anterior position. For the same positions, the rates of the anteverted uterus were 73.3 and 62.5%, respectively. A cervicovaginal examination could help to estimate the anatomical angle of version from these rates. However, although there was a statistically significant difference, the rate of the anteversion was 64.2% while the cervix was in the position of the anterior fornix. Our study excluded cases with histories of surgery except caesarean delivery, with leiomyoma, and with clinically manifested endometriosis. These disorders are common among women of reproductive age. Therefore, studies including these cases could be scientifically more informative.

After grouping the patients according to their menstrual cycle phases, i.e., proliferative and secretory, we found that the angles of version (anteversion/retroversion) differed significantly between these two groups. However, as we did not design our study accordingly, this difference did not answer the question: what kind of uterine features we will encounter during different phases of the menstrual cycle after the cohort follow-up of the patients enrolled in our study? Large-scale studies designed accordingly will be much more informative about this topic and will clarify how the menstrual cycle affects uterine anatomy.

An overall assessment of all these data shows that ultrasonography is essential for the definitive determination of uterine anatomy. Cervical position observed only during cervicovaginal examination will not provide reliable information on the anatomical structure of the uterus. However, in a patient group with no disorder, as selected in our study, the uterus is anteverted in 90% of cases if the cervix is in the position of the anterior fornix; other possibilities are less common. Therefore, we recommend ultrasonographic examination before endometrial biopsy (Pipelle, etc.), hysterosalpingography, intrauterine insemination, embryo transfer, and uterine manipulation in laparoscopic or robotic surgery, as there could be adverse consequences if the exact uterine anatomy is not known in advance.

CONFLICT OF INTEREST

The authors declare no conflicts of interest or any financial association with any company or manufacturer regarding the subject matter or materials discussed in this article.

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