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Uterine Junctional Zone Thickness, Cervical Length and Bioelectrical Impedance Analysis of Body Composition in Women with Endometriosis

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ABSTRACT

Objective: We aimed to evaluate uterine junctional zone thickness, cervical length and bioelectrical impedance analysis of body composition in women with endometriosis.

Material and Methods: This is a prospective study conducted in a tertiary teaching hospital. A total of 73 patients were included in the study. Endometriosis was surgically diagnosed in 36 patients (study group). The control group included 37 patients. Main outcome measure(s): Bioelectrical impedance analysis was used to measure body composition. Uterine junctional zone thickness and cervical length were measured by transvaginal ultrasonography.

Results: Patients' characteristics (age, gravida, parity, live baby, age of menarche, lengths of menstrual cycle , percentage of patients with dysmenorrhea, positive family history), body mass index (BMI) (kg/m^2), amount of body fat (kg), percentage of body fat were not statistically different between the two groups ($p>0.05$). The length of menstruation and cervical length were longer in women with endometriosis. Similarly, the inner myometrium was thicker in women with endometriosis than the control group.

Conclusion: The relation between endometriosis and demographic features such as age, gravida, parity, gravida, BMI, lengths of the menstrual cycle, age of menarche are controversial. Longer cervical length and thicker inner myometrial layer may be important in the etiopathogenesis of endometriosis.

Key Words: Bioelectrical impedance analysis, cervix, endometriosis, inner myometrium

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Introduction

Endometriosis is one of the most common problems encountered in gynaecology. It affects women in the reproductive years, is associated with pelvic pain and infertility and can seriously impair health.

As a result of the growing amount of knowledge about the novel adipose tissue product, adipokines, adipose tissue has become to be considered one of the main endocrine organs in the human body, with effects on reproductive function, and glucose homeostasis, steroid production, the immune system and hematopoesis (1). It has long been known that obesity, especially the distribution of adipose tissue has an important impact on the reproductive system (1). Besides, the association between body mass index (BMI) and endometriosis has also been studied and concluded that women with endometriosis tend to be thinner (2-4). Similarly, it has been argued that the severity of the disease is associated with BMI. Women with advanced-stage endometriosis in the study had lower BMI than those with minimal or mild disease (5).

Although it has been stated that the changes in uterine internal ostium after vaginal parturition play a protective role in the recurrence of endometriosis and dysmenorrheal, the association between cervical length and endometriosis has not been studied before (6). Similarly, the relation between inner myometrial architectural changes and adenomyosis has been shown, but the inner myometrial changes in women with endometriosis need to be studied (7).

Material and Methods

Study design

This study is a prospective study.

Subjects

From January 2008 through October 2010, patients who underwent surgery (laparoscopy or laparotomy) at the department of obstetrics and gynecology and diagnosed to have endometriosis were included. Ethic committee approval and patients' informed consents were obtained.

Patients were staged according to the American Society for Reproductive Medicine Revised Classification of Endometriosis (8). Patients in the control group were recruited among women who were proved not to have endometriosis by surgery in the same period of time. Indications for surgery for the patients in the control group were unexplained infertility, suspicious tubal patency on hysterosalpingography,

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persistent ovarian cysts, tubal ligation request and ectopic pregnancy. Patients who had uterine reconstructive surgery, uterine mass (for example; myoma uteri), uterine anomalyand immune deficiency were excluded.

Patients' detailed history and measurements were obtained during a planned interview, of which the latest one was two and half months after surgery by the same doctor who knew the patient groups. All measurements were performed between the 4th and 10th days of the menstrual cycle. Inner myometrium and cervical length were carefully measured by using Voluson 730 Expert Ultrasoun Machine (GE Medical Systems Kretz Ultrasound, Software Version 5.0.X, Austria) and a RIC 5-9H mHz transvaginal probe with an empty bladder and patient permission. The ınner myometrium was measured from a point near the uterine fundus at a sagital plane while 2/3 of the uterus was placed on the screen. Cervical length was measured at the same magnification from the point of the internal os to the distal end of the cervical canal on screen by using the short-cut mode of the ultrasound. Eight candidate patients for the study group and 1 candidate patient for the control group whose inner myometrium (halo formation) could not be identified were excluded from the study.

Anthropometric measurements (weight, body mass index, percentage of body fat) were performed by using TANITA body composition analyzer BC-420MA (foot to foot) (Japan) with an empty bladder after 8 hours fasting without dehydration. The reliability of bioimpedance analysis in measuring body fat composition has been shown in many studies (9-13).

Statistical analysis

SPSS for Windows 11.5 (Chi., IL., USA) statistics package program was used for statistical analysis. Descriptive statistics were presented as mean, standard deviation, median, minimum, maximum, frequencies and percentages. The Kolmogorov-Simirnov test was used to determine normal distribution of the continuous data. Continuous variables were analysed with independent samples t test (age, age of menarche, lengths of menstrual cycle, and body mass index) or Mann-Whitney U test (gravida, parity, live baby, percentage of patients with dysmenorrhea, positive family history (1st degree), amount of body fat, percentage of body fat, cervical length, inner myometrium, and the length of menstruation) as appropriate. Pearson chi-square test and Fisher's exact test were used to compare categorical variables. A p value <0.05 was considered statistically significant.

Results

A total of 73 patients were included in the study. All patients in the study group were in advanced stage endometriosis (24 patients with stage 4 and 12 patients with stage 3). Patient characteristics are shown in Table 1. The mean of the lengths of the menstrual cycle and the age of menarche in the control group was 29.19±5.76 and 13.65±1.23 respectively. However, the median of the length of menstruation was statistically different between study and control groups (p=0.025). The percentage of women who have dysmenorrhea was 66.6% in the study group and 45.9% in the control group. Endometriosis was present in the family history (1st degree) of 2.77% of patients in the study group. None of the patients in the control group had a family history of endometriosis (Table 1). Body mass index and percentage of body fat data were not statistically different (p>0.05). Mean BMI was 25.68±5.34, and percentage of fat mass 20.78% in the study group. Mean BMI was 24.37±3.52, and percentage of fat mass 23.70% in control group. The median of the lengths of uterine cervix were statistically different in the groups (p=0.001). The mean cervical length in the study group was 36.30±8.25 mm, but it was 29.33±7.11 mm in the control group. The median inner myometrial thicknesses were statistically different in the groups (p=0.001). The mean inner myometrial thicknesses in the study and in the control group were 5.67±2.22 mm and 4.16±1.92 mm respectively (Table 2).

Discussion

A study with a large prospective cohort showed that patients with a family history of endometriosis were more likely to have endometriosis. However, the mode of inheritance is still uncertain. It is also stated that the age of menarche and lengths of the menstrual cycle and BMI are not risk factors for endometriosis and that the risk decreases when regular menses begin after 12-23 months after menarche (14). Similarly, in our study, we could not find a difference in age of menarche and the lengths of the menstrual cycle in the groups with and without endometriosis. However, the median length of menstruation was longer in women with endometriosis. Also the family history was positive in 2.8% of patients in group with endometriosis.

We have not determined statistically significant differences in the amount of body fat or percentage of body fat by using the Bioelectrical Impedance Analysis between the groups. Mean Body Mass Index of both groups were also not statistically different. In the literature, although we have not encountered any study that searches the relation between endometriosis and the amount of body fat or percentage of body fat by using Bioelectrical Impedance Analysis, it is concluded in a study searching the relation between BMI and endometriosis that women with advanced-stage endometriosis had lower BMIs than those with minimal or mild disease, and BMI was significantly associated with disease severity (15). Likewise, in another study including 32 patients with endometriosis and 52 healthy women, a lower BMI was detected in the study group. It is stated that for every unit increase in BMI, there was an approximate 12-14% decrease in the likelihood of being diagnosed with endometriosis (16). A more recent study by Vitonis AF et al showed a persistent inverse association between childhood and early adulthood body size and incidence of laparoscopically confirmed endometriosis. This was independent of adult BMI and menstrual cycle characteristics (17). However, our study did not show such a relation in BMI and advanced staged endometriosis. This might result from ethnic reasons.

Transvaginal ultrasonography is a proper method for measuring the cervical length. Although there are many studies about cervical length in pregnancy in the literature,

Table 1. Patient characteristics

Groups		Study group (n=36)	Control group (n=37)	*p
Age[a]	Mean±SD	32.39±5.67	30.54±5.83	0.175
	Median (Min-Max)	31 (18-42)	30 (20-42)	
Gravida[b]	Mean±SD	1.17±1.13	1.76±1.92	
	Median (Min-Max)	1 (0-4)	1 (0-7)	0.361
Parity[b]	Mean±SD	1±0.98	0.86±1.08	
	Median (Min-Max)	1 (0-3)	1 (0-4)	0.411
Live baby[b]	Mean±SD	1±0.98	0.81±1.02	
	Median (Min-Max)	1 (0-3)	0. (0-3)	0.323
Age of menarche[a]	Mean±SD	13.81±1.3	13.65±1.23	0.605
	Median (Min-Max)	14 (11-17)	13 (12-16)	
Length of menstruation[b]	Mean±SD	5.97±2.21	5±1.97	
	Median (Min-Max)	6 (1-15)	5 (2-11)	0.025†
Length of menstrual cycle[a]	Mean±SD	28.11±6.20	29.19±5.76	0.444
	Median (Min-Max)	28 (17-60)	28 (20-60)	
Patients with dysmenorrhea[c]	(%)	(24/36) 66.6%	(14/37) 45.9%	0.100
Positive family history[c]	(%)	(1/36) 2.77%	(0/37) 0.00%	0.493

*p-values of the independent samples t test or Mann-Whitney U test as appropriate.
†There is a significant difference between groups.
[a]Values are expressed as mean±standard deviation
[b]Values are expressed as median (minimum–maximum)
[c]Values are expressed as numbers and percentages
SD: standard deviation

Table 2. Comparison of Body Mass Index, amount of body fat, percentage of body fat, cervical length and thickness of inner myometrium in study and control group

Groups		Study group (n=36)	Control group (n=37)	*p
BMI (kg/m^2)[a]	Mean±SD	25.68±5.34	24.37±3.52	0.218
	Median (Min-Max)	25.20 (16.7-36.9)	23.70 (18.5-33)	
Cervical length (mm)[b]	Mean±SD	36.30±8.25	29.33±7.11	
	Median (Min-Max)	35.45 (17.2-54.1)	28.20 (17.6-43)	0.001†
Inner myometrium (mm)[b]	Mean±SD	5.67±2.22	4.16±1.92	
	Median (Min-Max)	5.30 (1.6-11.6)	4 (1.4-11)	0.001†
Amount of body fat (kg)[b]	Mean±SD	29.95±8.02	26.87±7.55	
	Median (Min-Max)	29.90 (10.6-43.3)	28.50 (9.9-39.6)	0.141
Percentage of body fat (%)[b]	Mean±SD	20.78±9.19	17.35±7.1	
	Median (Min-Max)	18.70 (4.7-41.4)	18.40 (3.9-31.3)	0.184

* p-values of the independent samples t test or Mann-Whitney U test as appropriate
† There is a significant difference between groups.
[a]Values are expressed as mean±standard deviation
[b]Values are expressed as median (minimum-maximum)
BMI: body mass index, SD: standard deviation

we could not find a study related to cervical length in non-pregnant women with endometriosis. In our study, mean cervical length in the study group (36.30±8.25 mm) was longer than in the control group (29.33±7.11 mm). Similarly median cervical length was longer in the study group and this was also statistically significant between both groups. We think that this difference may potentiate retrograde menstruation and/or inner myometrial dyssynergia that may

have a possible role in the etiopathogenesis of endometriosis.

The shown relation between inner myometrial architectural changes and adenomyosis can also be present between endometriosis and inner myometrium because endometriosis and adenomyosis result from the same physiological mechanism of "tissue injury and repair" involving local estrogen production in an estrogen-sensitive environment normally controlled by the ovary (7, 18).

In the literature there is evidence that support the possible role of uterine junctional zone dysfunction in subfertility and etiopathogenesis of endometriosis (19-21). Dysperistaltism was also proposed to be responsible for the higher incidence of endometriosis in patients with a septate uterus in another study (22). Inner myometrial thickness of ≤5 mm is accepted as normal (23). In our control group, the mean inner myometrial thickness was 4.16±1.92 mm which was consistent with the literature. We think that statistically higher inner myometrial thickness in our study group could be related to inner myometrial hyperplasia or dysperistaltism that may have a role in developing endometriosis.

Conclusion

The relation between endometriosis and demographic features such as age, gravida, parity, gravida, BMI, lengths of the menstrual cycle and age of menarche are controversial. Longer cervical length and thicker inner myometrial layer may be important in the etiopathogenesis of endometriosis.

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Conflict of Interest

No conflict of interest was declared by the authors.

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