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Risk of adenomyosis according to the type of previous uterine surgery

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Abstract

This study aimed to ascertain whether previous uterine surgery has a role in the etiology of adenomyosis; to determine the incidence of uterine surgery in adenomyosis cases; and to assess the risk of adenomyosis according to the type of uterine surgery. The study included 1481 patients who had a hysterectomy due to any indication in a single center between January 2004 and December 2014. It was approved by the Ethical Rewiew Board of Ankara Yildirim Beyazit University Faculty of Medicine. Patients with and without adenomyosis were divided into two groups and compared according to age, parity, and history of previous uterine surgery. Previous uterine surgeries were also separately compared. A p-value less than 0.05 was considered statistically significant.We found that 63.4% of adenomyosis patients and 40.6% of non-adenomyosis patients underwent at least one uterine surgery. In patients with similar age and parity, those who underwent a uterine surgery were 2.494 times more at risk of being diagnosed with adenomyosis. A separate analysis of surgeries showed that previous myomectomy and Dilatation and Curetege were associated with an increased risk of adenomyosis while Cesarean-section had no significant effect. It was observed that previous uterine surgeries increase the risk for adenomyosis. Patients who had one more uterine surgery were more likely to develop adenomyosis.

Keywords: Adenomyosis, risk factors, dilatation and curettage, uterine myomectomy, cesarean section

Introduction

Adenomyosis is defined as the presence of ectopic endometrial glands and stroma in myometrial tissue [1,2]. In the past two decades, it was diagnosed by the pathological examination of hysterectomy, but it can now be detected through advanced imaging modalities without the need for surgery. The prevalence of adenomyosis varies in many clinics; studies have reported a prevalence of 5-70% and an average incidence of 20-30% in hysterectomy cases [3-6]. There are wide variations in incidence due to racial, ethnic, or geographical differences. However, it was not clarified whether variations stem from individual factors or from differences in diagnostic criteria [5].

None of the symptoms observed in adenomyosis are specific; symptoms can also be associated with other concomitant pathologies (leiomyoma, endometriosis, endometrial polyp, etc.). Thus, it is difficult to identify patients with adenomyosis alone and to clarify their clinical phenotype. It is generally associated with menorrhagia, abnormal uterine bleeding, chronic pelvic pain, dysmenorrhea, and dyspareunia; however, the accuracy of these associations is controversial [4,5]. The etiology of adenomyosis is still unclear; however, age, multiparity, previous uterine surgeries, smoking, tamoxifen and antidepressant use can be influential [7-10].

This study aimed to identify whether a previous uterine surgery (Cesarean-section [C-section], myomectomy, Dilatation and Curettage [D&C], and hysteroscopy) has a role in the etiology of adenomyosis; to determine the incidence of uterine surgery in adenomyosis cases; and to assess the risk of adenomyosis according to the type of surgery.

Material and Methods

The study included 1481 patients who had a hysterectomy due to any indication in a training and research hospital between January 2004 and December 2014. Patient data were obtained from the Hospital Information Management System, archive files, and through contact with patients when necessary. Patient files were routinely scanned to identify age, gravidity, parity, the number of abortion, previous uterine surgeries (C-section, myomectomy, D&C, and hysteroscopy), hysterectomy indications, and the presence or absence of adenomyosis in pathology reports. The

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patients were excluded from the study if sufficient information were not avaliable from the patient files or though contact by telephone.

The research was retrospectively conducted. The normality of the research variables was analyzed using the Shapiro-Wilk test. Continuous variables were expressed as mean ± standard deviation (mean ± SD) and median (IQR: interquartile range). Numbers (percentages) were used to show patients who underwent at least one uterine surgery, those who did not undergo uterine surgery, and patients' history of a previous myomectomy, C-section, D&C and hysteroscopy.

The Mann-Whitney U test was used to compare variables including age, parity, the number of C-section, etc. according to patients with and without adenomyosis. Chi-square tests were used for the analysis of categorical variables in diagnostic groups, such as previous uterine surgery. Logistic regression analysis was used to determine the effects of the history of uterine surgery on the diagnosis of adenomyosis. In the analysis results, the odds ratio (OR) and the 95% confidence interval (CI) of OR were explained using a Wald statistic and p-value. P<0.05 was accepted as statistically significant.

Statistical analysis and calculations were performed using IBM SPSS Statistics 21.0 (IBM Corp. Released 2012. IBM SPSS Statistics for Windows, Version 21.0. Armonk, NY: IBM Corp.).

Results

The mean age for 298 patients diagnosed with adenomyosis was calculated as 50.87 ± 7.84 years and 1183 patients diagnosed with diseases other than adenomyosis was 52.05±9.53 years. The number of previous C-sections, and the number of previous hysteroscopies were not different (p>0.05). Adenomyosis patients were found to have a significantly higher number of previous myomectomy and D&C (Table-1,p<0.05).

In terms of previous uterine surgery, 63.4% (n=189) of adenomyosis patients and 40.6% (n=480) of non-adenomyosis patients underwent at least one uterine surgery. Thus, the rates of previous uterine surgery were different between the diagnostic groups ($\chi2$=50.173, p<0.001). Similarly, a statistically significant difference was also found between the rates of previous D&C in the diagnostic groups ($\chi2$=70.051, p<0.001). The diagnostic groups were similar in terms of the history of myomectomy and C-section (p>0.05). None of the adenomyosis patients and 99.7% (n=1176) of the non-adenomyosis patients had a hysteroscopy. No statistical inference was found on the presence of a previous hysteroscopy (Table-2).

In terms of previous uterine surgery in general, age and parity had no significant effect among the factors affecting the diagnosis of adenomyosis, while the presence of previous uterine surgery had a significant effect (p<0.001) . Among patients with similar age and parity, those who underwent a uterine surgery were 2.494 times more likely to be at risk of being diagnosed with adenomyosis compared to those who did not undergo uterine surgery (Table-3). In the same group, patients who had undergone one more uterine surgery were at 47% higher risk of being diagnosed with adenomyosis (Table 4).

Considering the patients' history of previous uterine surgery in detail, age and parity again had no significant effect on the diagnosis of adenomyosis while the presence of previous myomectomy and D&C had a significant effect (p<0.05) Among the patients with similar age, parity, and previous D&C history, those who underwent a myomectomy were 2.304 times more likely to be at risk of being diagnosed with adenomyosis compared to those who did not(Table 5). Among the patients with similar age, parity, and previous myomectomy history, those who underwent D&C were 2.941 times more likely to be at risk of being diagnosed with adenomyosis compared to those who did not (p<0.001).

Table 1. Distribution of age, parity and the number of uterine surgeries according to the diagnostic groups (Adenomyosis vs. others)

		Pathology Report			
		Adenomyosis (n=298)	Other (n=1183)	Test Statistic	p
Age				1.100	0.271
	mean ± SD	50.87±7.84	52.05±9.53		
	Median (IQR)	49.00 (7.00)	49.00 (10.00)		
Parity				1.817	0.069
	mean ± SD	3.11±1.60	3.06±1.89		
	Median (IQR)	3.00 (2.00)	3.00 (2.00)		
Myomectomy				2.029	0.042
	mean ± SD	0.04±0.79	0.02±0.16		
	Median (IQR)	0.00 (0.00)	0.00 (0.00)		
C-section				1.322	0.186
	mean ± SD	0.21±0.63	0.17±0.52		
	Median (IQR)	0.00 (0.00)	0.00 (0.00)		
D&C				9.258	<0.001
	mean ± SD	1.27±1.52	0.55±1.04		
	Median (IQR)	1.00 (2.00)	0.00 (1.00)		
Hysteroscopy				1.006	0.314
	mean ± SD	-	0.01±0.11		
	Median (IQR)	0.00 (0.00)	0.00 (0.00)		

Abbreviations: C-Section: Cesarean-section; D&C: Dilatation and Curetege.

Table 1. Distribution of age, parity and the number of uterine surgeries according to the diagnostic groups (Adenomyosis vs. others)

		Pathology Report			
		Adenomyosis n (%)	Other n (%)	Test Statistic	p
Uterine surgery				50.173	**<0.001**
	-	109 (36.6)	703 (59.4)		
	+	189 (63.4)	480 (40.6)		
Myomectomy				3.277[1]	0.070
	-	287 (96.3)	1162 (98.2)		
	+	11 (3.7)	21 (1.8)		
C-section				1.811	0.178
	-	258 (86.6)	1055 (89.3)		
	+	40 (13.4)	126 (10.7)		
D&C				70.051	**<0.001**
	-	129 (43.3)	820 (69.3)		
	+	169 (56.7)	363 (30.7)		
Histerescopy				-	-
	-	298 (100.0)	1176 (99.7)		
	+	0 (0.0)	4 (0.3)		

Table 3. Factors affecting the diagnosis of adenomyosis (considering previous uterine surgery)

						% 95 CI of OR	
	B	SE	Wald	p	OR	Lower Limit	Upper Limit
Age	-0.011	0.008	1.777	0.182	0.989	0.974	1.005
Parity	0.048	0.040	1.453	0.228	1.049	0.971	1.133
Uterine Surgery (underwent)	0.914	0.135	45.513	<0.001	2.494	1.913	3.253
Constant	-1.444	0.417	12.001	0.001	0.236		

Table 4. Factors affecting the diagnosis of adenomyosis (Considering the number of uterine surgery performed)

						% 95 CI of OR	
	B	SE	Wald	p	OR	Lower Limit	Upper Limit
Age	-0.015	0.008	3.248	0.072	0.985	0.969	1.001
Parity	0.044	0.040	1.200	0.273	1.045	0.966	1.130
UterineSurgery (number)	0.385	0.046	70.395	**<0.001**	1.470	1.344	1.609
Constant	-1.164	0.409	8.090	**0.004**	0.312		

Abbreviations: CI: confidence interval; OR: odds ratio

Table 5. Factors affecting the diagnosis of adenomyosis (considering previous uterine surgery in detail)

						% 95 CI of OR	
	B	SE	Wald	p	OR	Lower Limit	Upper Limit
Age	-0.015	0.008	3.388	0.066	0.985	0.969	1.001
Parity	0.038	0.040	0.894	0.344	1.039	0.960	1.124
Myomectomy (underwent)	0.835	0.392	4.541	**0.033**	2.304	1.069	4.964
D&C (underwent)	1.079	0.133	65.289	**<0.001**	2.941	2.264	3.820
Constant	-1.198	0.414	8.357	**0.004**	0.302		

Abbreviations: CI: confidence interval; D&C: Dilatation and Curettage, OR: odds ratio

C-section had no significant effect on the diagnosis of adenomyosis.

Considering the number of all uterine surgeries that the patients underwent, age and the number of previous D&C had a significant effect on the diagnosis of adenomyosis, while parity had no significant effect . Among the patients with similar parity and a similar number of previous D&C, those who were one year older had a 2.0% (CI: 0.3% – 3.6%) lower risk of being diagnosed with adenomyosis . Among the patients with similar age and parity, those who underwent one more previous D&C were at 53.4% (CI: 69.3% – 38.9%) higher risk of being diagnosed with adenomyosis.

Age and the number of previous D&C had a significant effect on the diagnosis of adenomyosis (Table 6). Among the patients with similar age, parity, and a similar number of previous myomectomies and C-sections, those who underwent one more previous D&C were at 53.9% higher risk of being diagnosed with adenomyosis (OR=1.539).

Table 6. Factors affecting the diagnosis of adenomyosis (considering the number of all previous uterine surgeries)

						% 95 CI of OR	
	B	**SE**	**Wald**	**p**	**OR**	**Lower Limit**	**Upper Limit**
Age	-0.018	0.008	4.479	0.034	0.982	0.966	0.999
Parity	0.040	0.041	0.953	0.329	1.040	0.961	1.126
Myomectomy (number)	0.484	0.362	1.788	0.181	1.623	0.798	3.301
C-section (number)	0.176	0.114	2.367	0.124	1.192	0.953	1.491
D&C (number)	0.431	0.051	72.538	**<0.001**	1.539	1.393	1.699
Constant	-0.991	0.420	5.569	**0.018**	0.371		

Abbreviations: CI: confidence interval; C-Section: Cesarean-section; D&C: Dilatation and Curettage, OR: odds ratio

Discussion

Studies in the literature are inconsistent on whether a previous uterine surgery has an effect on the etiology of adenomyosis. The present study treated uterine surgeries both under a general category and separately under four sub-categories including myomectomy, C-section, hysteroscopy, and D&C. Considering patients ' history of uterine surgery, 63.4% of adenomyosis patients and 40.6% of non-adenomyosis patients underwent at least one uterine surgery. Considering the history of previous uterine surgery in general, the presence of previous uterine surgery was found to be significant among the factors affecting a diagnosis of adenomyosis. Additionally, the number of previous surgeries has a statistically significant correlation with an increased risk. Among the patients with similar age and parity, those who had a uterine surgery were 2.4 times more likely to be at risk of being diagnosed with adenomyosis compared to those who did not have. In the same group, patients who had one more uterine surgery were at 47% (CI: 34.4% –60.9%) higher risk of being diagnosed with adenomyosis. The literature includes research results that are parallel with the present study [5,10,11]. However, it also includes research emphasizing that there is no correlation [4,9,11].

Panganamamula et al. hypothesized that adenomyosis arises from the invasion of endometrial glands into myometrium depending on the surgical destruction of the endomyometrial border. They observed an increased risk of adenomyosis with previous uterine surgery; however, they found no statistically significant correlation when they analyzed previous surgeries individually (C-section, myomectomy, endometrial ablation, and D&C) [10]. Bergolt et al. also reported no increased risk with C-section and myomectomy [4]. In two separate studies in 2010 and 2012, Taran et al. also supported that there is no risk increase [7,8]. Considering patients' history of previous uterine surgeries in detail, the present study found that a previous myomectomy and D&C history had a significant effect on the diagnosis of adenomyosis. Among the patients with similar age, parity, and previous D&C history, those who had a myomectomy were 2.304 times more likely to be at risk of being diagnosed with adenomyosis compared to those who did not have a myomectomy. Kazemi et al. have recently reported that previous uterine surgeries increased the risk of adenomyosis and no adenomyosis patients underwent a myomectomy; thus, they did not find a specific risk related to myomectomy [11].

The present study found that the diagnostic groups (i.e. adenomyosis and non-adenomyosis patients) were similar in terms of having a C-section. C-section had no significant effect on the diagnosis of adenomyosis. The literature includes a few studies assessing the correlation between C-section and adenomyosis. Curtis et al. retrospectively surveyed 1850 patients and found no significant correlation between C-section and adenomyosis) [12]. This result was later supported by a number of studies [9,13]. There are, however, different results. Vavilis et al. (1997), Levgur et al. (2000), and Whitted et al. (2010) argued that a previous C-section is associated with an increased prevalence of adenomyosis [14-16]. Kazemi et al. (2014) have more recently reported that a previous C-section is the most common surgery that increases the risk of adenomyosis [11].

Literature studies have mostly focused on D&C when investigating risk factors for adenomyosis. The present study found that D&C increased the risk of adenomyosis. Among the patients with similar age, parity, and previous myomectomy history, those who had D&C were 2.9 times more at risk of being diagnosed with adenomyosis compared to those who did not. Among the patients with similar age and parity, those who had one more previous D&C were at 53% higher risk of being diagnosed with adenomyosis. Parazzini et al. found an increased risk of adenomyosis in D&C cases other than pregnancy and reported in a later study that patients who underwent D&C for pregnancy termination were at higher risk of adenomyosis compared to those who did not undergo D&C for pregnancy termination [3,6]. Similarly, Levgur et al. and Taran et al. also reported an increased risk [7,16]. Curtis et al. indicated an increased risk in sharp curettage cases for pregnancy termination (especially before 1975) but did not find an increased risk in D&C cases other than pregnancy [12]. The general opinion in the literature is that a previous D&C, whether for pregnancy termination or not, increases the risk of adenomyosis. The present study did not include the reasons for having D&C but considered, in general, the likelihood of disruption of the endometrial-myometrial junction.

The literature includes no research on the correlation between hysteroscopy and adenomyosis. The present study found no statistically significant difference between two diagnostic groups in terms of the number of previous hysteroscopies.

Conclusion

Although this study has some limitations, such as its retrospective, single-center design ,unknown whether uterine cavity was damaged during myomectomy and it was conducted on patients who underwent hysterectomy; it supports the notion that the presence of previous uterine surgeries increases the risk of adenomyosis. Furthermore, we identified that patients who had undergone one more uterine surgery were at 47% higher risk of being diagnosed with adenomyosis. Although; cesarean section damages entire endometrial layer, increase risk for adenomyosis was not determined.

Competing interests
The authors declare that they have no competing interest

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Ethical approval
This present research was accepted by local ethics committee and informed consent forms and permits were obtained from all participants before joining the study.

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