CHARACTERIZATION OF CHANGES IN MAXIMUM URETHRAL CLOSURE PRESSURE DURING REST AND VOLUNTARY PELVIC MUSCLE CONTRACTION IN WOMEN WITH PELVIC FLOOR DYSFUNCTION.

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Abstract

This study was cross-sectional, observational, descriptive, and retrospective in nature. Observations were made on 69 patients with pelvic floor dysfunction, the majority of whom were postmenopausal women (78.3%), with an age range of 51 to 60 years. Only 46.38% of the patients were able to effectively contract their pelvic floor muscles voluntarily, which was determined by a 20% increase in baseline MUCP. Concluding message: The maximum urethral closure pressure (MUCP) at rest was found to have a positive correlation with age, but not with other risk factors such as obesity or obstetric events.

Introduction

Women affected by pelvic floor dysfunction undergo significant changes in maximum urethral closure pressure (MUCP) during rest and voluntary contraction of pelvic muscles, which vary depending on their clinical features. The primary aim of this study is to elucidate the variations in MUCP during both rest and voluntary contraction of pelvic floor muscles among affected women.

Methods and Materials

•A study was conducted on patients with pelvic floor dysfunction who underwent a multichannel urodynamic study to measure maximum urethral closure pressure both at rest and during voluntary contraction. This study was cross-sectional, observational, descriptive, and retrospective in nature. To determine the sample size, it was assumed that up to 46% of women would experience pelvic floor dysfunction in their lifetime. Using a formula for proportions with an effect size of 0.80 and a type I error of 0.05, a sample size of 69 patients was determined.

•Categorical variables were analyzed using Pearson's Chi-square test, while quantitative variables were analyzed using Student's t-test. Statistical significance was considered at a p-value of less than 0.05. The statistical software used for analysis was SPSS version 29.0 for the Windows operating system.

Table 1. Correlation of variables in MUCP at rest and voluntary contraction.

Characteristic	Range	N=69 (%)	p (Correlation of MUCP at rest)	p (Correlation of MUCP at voluntary contraction)
Age	20-30	1 (1.4)	0.05	0.15
	31-40	4 (5.8)		
	41-50	13 (18.8)		
	51-59	19 (27.5)		
	61-69	25 (36.2)		
	70 o more	7 (10.1)		
Menopausal status	Premenopausal	15 (21.7)	0.04	0.26
	Postmenopausal	54 (78.2)		
Vaginal delivery	0	17 (24.6)	0.08	0.04
	1	10 (14.5)		
	2	15 (21.7)		
	3 or more	27 (39.1)		
BMI (kg/ m²)	<18.5	0 (0)	0.08	0.21
	18.5 -24.9	21 (30.5)		
	25-29.9	30 (43.5)		
	30-34.9	14 (20.2)		
	35-39.9	4 (5.8)		
Neurogenic pathology	Yes	16 (23.3)	0.29	0.16
	No	53 (76.8)		

Note: Multiple tests (Pearson's chi-square, likelihood ratio, linear association) were used for these values.

Table 2. MUCP at rest and voluntary contraction

		MUCP at rest	MUCP at voluntary contraction (46.38% successful rate)
N		69	
Normal parameters	Mean	76.28	86.36
	Ranges	39-158 cmH2O	25-182 cmH2O

Results

•Observations were made on 69 patients with pelvic floor dysfunction, the majority of whom were postmenopausal women (78.3%), with an age range of 51 to 60 years. Only 46.38% of the patients were able to effectively contract their pelvic floor muscles voluntarily, which was determined by a 20% increase in baseline MUCP.

•The patients' MUCP at rest ranged from 39 cmH2O to 158 cmH2O, with a mean of 76.28 cmH2O and a mode of 47 cmH2O (Table 1). During voluntary contraction, the mode of MUCP was 42 cmH2O.

•A statistically significant association was found between menopausal status and MUCP at rest, indicating that postmenopausal patients had a lower MUCP at rest (p=0.04). Additionally, the study identified a correlation between MUCP at rest and age, indicating that MUCP decreases as age increases (p=0.05).

•Pearson's chi-square test, likelihood ratio, and linear association tests were employed to investigate the relationship between MUCP at rest and variables such as BMI, neurogenic pathology, and obstetric history. However, none of these variables demonstrated a significant correlation with MUCP at rest (Table 1). Similarly, no statistically significant correlation was found between MUCP during voluntary contraction and any of the variables examined.

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Discussion

Aging is a well-known risk factor for pelvic floor disorders. Studies have found that as women age, there is a decrease in the function of the female urethral sphincter (1), along with an increase in conjunctive tissue and a decrease in striated muscular fibers in the urethra. Our study found that age has an inverse relationship with the MUCP at rest and in voluntary contraction of the pelvic floor muscles. The study also revealed that postmenopausal women have low MUCP at rest, which could be due to the hypoestrogenic state.

Multiple studies have discussed the role of estrogen in pelvic floor disorders, particularly in postmenopausal women. Recent research suggests that estrogen deficiency caused by aging can weaken the continence mechanism, leading to urethral dysfunction (2). This highlights the relationship between urethral function and estrogen.

There is currently no definitive urodynamic value to measure the effectiveness of voluntary contractions of the pelvic floor muscles. Therefore, we adopted the value of a 20% or greater increase in the MUCP, as described by Van Loenen et al in 1997 (3). In their study, they observed an effective contraction in 39% of patients, while in our study, we found a 46% effectiveness rate. Although various risk factors have been identified to be associated with pelvic floor disorders such as childbirth, obesity, and previous surgeries, which can weaken the elevator anus muscle, affecting contraction capacity and leading to a lower MUCP level, we were unable to demonstrate a relationship in our investigation. Our study was limited by its observational nature, but in the future, it may be interesting to analyze the MUCP in different regions or ethnicities.

Figure 1. Label in 12pt Calibri. **Figure 2.** Label in 12pt Calibri. **Figure 3.** Label in 12pt Calibri.

Conclusions

The maximum urethral closure pressure (MUCP) at rest was found to have a positive correlation with age, but not with other risk factors such as obesity or obstetric events. However, no correlation was found between MUCP at voluntary contraction and age or other risk factors. Therefore, we can conclude that MUCP at rest has an inversely proportional relationship with age. Although there was an increase in MUCP during voluntary contraction, a statistically significant difference was not observed.

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