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ORIGINAL CONTRIBUTIONS

Urinary Incontinence and Surgery for Obesity and Weight-Related Diseases: Are There Predictors of Improvement?

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Abstract

Purpose The aim of this study was to evaluate changes in urinary incontinence (UI) before and after surgery for obesity in female patients and to identify factors related to the remission of symptoms.

Materials and Methods This was a prospective cohort study with female patients over 18 years old who underwent surgery for obesity and weight-related diseases between June 2016 and September 2017. Urinary symptoms and quality of life related to UI were assessed based on a structured interview and the results of the validated questionnaires.

Results Two hundred twenty-one patients were assessed pre-operatively, and 118 (53.3%) reported UI. Eighty-eight patients (74.6%) completed the pre- and postoperative questionnaires. After 6 to 12 months, patients were revaluated, and 50 (56.8%) were considered to be in remission of urinary symptoms. Women who had only a cesarean birth had a 117% increase in the probability of achieving remission of UI compared with women who had both vaginal and cesarean deliveries, and patients with an additional point in the International Consultation on Incontinence Questionnaire-Short Form (ICIQ-SF) score at the beginning had a 4% lower probability of having remission of symptoms.

Conclusions Improvement in UI may be an important outcome of surgery for obesity and weight-related diseases. In this study, previous cesarean section was only associated with the highest rate of remission of symptoms, and patients with higher scores in the ICIQ-UI-SF had a lower probability of remission.

Keywords Urinary incontinence · Surgery for obesity · Quality of life

Introduction/Purpose

The prevalence of obesity is increasing considerably in developed and low-income countries [1]. Obesity is known to contribute to many chronic medical diseases, including cardiovascular and cerebrovascular diseases, diabetes, dyslipidemia, sleep apnea, and urinary incontinence (UI) [2].

Surgery for obesity and weight-related diseases is known to be one of the most effective and durable treatments for obesity [3]. In addition to the significant weight loss and consequent esthetic changes that occur following surgery, patient benefits include resolution of various comorbidities related to obesity [4]. A previous study with patients undergoing surgery for obesity and weight-related diseases revealed that UI and hypertension were the primary causes of dissatisfaction with health status [5], and such dissatisfaction could provide substantial motivation to undergo the procedure [4, 6].

Epidemiological studies have demonstrated that obesity is a strong independent risk factor for urinary incontinence [7]. Excess weight is a well-established, potentially modifiable factor associated with UI [8]; it could aggravate previous pelvic floor disorders or cause these disorders by either increasing intra-abdominal pressure or compressing ligaments and nerves [9, 10].

The aim of this study was to evaluate changes in urinary symptoms before and after surgery for obesity in female patients and to identify factors related to the remission of symptoms.

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Materials and Methods

Participants were recruited between June 2016 and September 2017. Female patients over 18 years of age who underwent bariatric surgery were investigated for urinary symptoms. Eligible women were invited to participate in the study. Women with urinary incontinence were prospectively enrolled in a cohort study.

Urinary symptoms and quality of life related to urinary incontinence were assessed based on a structured interview and the results of the validated Portuguese versions of the International Consultation on Incontinence Questionnaire-Short Form (ICIQ-SF) and King's Health Questionnaire (KHQ) [11, 12]. The presence of incontinence was ascertained using question 3 of the ICIQ-SF. A positive answer to the question "How often do you leak urine?" was used to define the presence or absence of UI and therefore to include them in the cohort study. Patients with a history of previous surgery or medication for UI were excluded from the sample. Incontinence was further classified as stress urinary incontinence (SUI), urgency urinary incontinence (UUI), or mixed urinary incontinence (MUI). The definitions conformed to the standards proposed by the International Urogynecology Association (IUGA) and the International Continence Society (ICS) joint report on terminology for female pelvic floor dysfunction [13]. Eligible women were invited to respond to questionnaires before surgery and 6 months to 1 year later. Anthropometric data and medical histories were obtained from medical records.

Sample size calculation was performed in the WinPEPI program (Programs for Epidemiologists for Windows) version 11.43. Assuming a difference of 30% in the prevalence of urinary incontinence before and after bariatric surgery and considering a level of significance of 5% and a power of 90%, a minimum of 82 patients were required [14]. Statistical analyses were performed using SPSS v21. Descriptive statistics (mean, median, standard deviation and range) were used to present numerical variable values. Numbers and absolute and relative percentages were used to present categorical variables. The Mann-Whitney *U* test was used to assess the statistical significance of differences between median values. Continuous data were analyzed using Student's *t* test for related samples, and categorical variables were compared using chi-square tests. A *p* value of 0.05 indicated statistical significance. The difference between the mean pre-operative ICIQ-UI SF score and the mean post-operative ICIQ-UI SF score was used to evaluate the impact of bariatric surgery on incontinence symptoms. Patients who scored zero on the question 'How often do you leak urine?" on the ICIQ-SF questionnaire were considered to be in completed remission, and based on this response, they were divided in two groups to compare baseline characteristics.

A Poisson regression was performed to identify independent risk factors related to the improvement of urinary incontinence. In the model, variables with a *p* value less than 0.20 were included, and those with *p* less than 0.10 were maintained.

Patients who satisfied the study criteria completed an informed consent form. Ethics and research approvals were obtained from the applicable local committee.

Results

Two hundred twenty-one patients were assessed pre-operatively, and 118 (53.3%) reported urinary incontinence and were eligible for the cohort study. Eighty-eight patients (74.6%) completed the pre- and postoperative questionnaires. All patients underwent gastric bypass surgery. None of the patients had a history of previous surgery for urinary incontinence or were taking medications for urinary symptoms. At baseline, the median age was 41.1 ± 12.1 years and the median body mass index (BMI) was 45.9 ± 7.6 kg/m^2. Regarding urinary symptoms, before surgery, 45 patients (51.1%) had MUI, 29 (33.0%) had SUI, and 14 (15.9%) had UUI. When questioned, 58 (65.9%) patients expressed a desire for specific treatment for UI. Eighty-one (81/116, 69.8%) of the patients were sexually active. Postoperatively, 50 patients reported no episodes of urinary incontinence (56.8%), while 38 patients (43.2%) continued to complain of UI. Among these, 14 (36.8%) had MUI, 9 (23.7%) had SUI, and 15 (39.5%) had UUI. Mean daily frequency and nocturia significantly decreased (6.61 ± 0.27 to 5.67 and 2.12 ± 0.19 to 1.06 times/day, respectively). These data are presented in Table 1. The mean ICIQ-SF decreased from 9.34 ± 0.51 to 3.74 ± 0.54, and the

Table 1 Data related to urinary incontinence before and after surgery

	Pre-op	Post-op	*p* value
UI	88 (100)	38 (43.2)	< 0.001
Type of UI			
SUI only	29 (33.0)	9 (23.7)	0.593
UUI only	14 (15.9)	15 (39.5)	
MUI	45 (51.1)	14 (36.8)	
Daily frequency[a]	6.61 ± 0.27	5.67 ± 0.21	< 0.001
Nocturia[a]	2.12 ± 0.19	1.06 ± 0.13	< 0.001
Incontinence pads	26 (29.5)	15 (39.5)	0.272
Wants treatment	58 (65.9)	–	–

Generalized motion equalization (GHG) model with the Bonferroni correction

[a] Data are presented as the mean ± standard error or *n* (%)

Table 2 Results of ICIQ-SF before and after surgery

	Pre-op	Post-op	*p* value
Mean score[a]	9.34 ± 0.51	3.74 ± 0.54	< 0.001
Frequency of UI			
None	0 (0.0)	50 (56.8)	< 0.001
1× a week or less	30 (34.1)	14 (15.9)	
2 or 3× a week	19 (21.6)	10 (11.4)	
1× a day	12 (13.6)	3 (3.4)	
Several times a day	22 (25.0)	9 (10.2)	
All the time	5 (5.7)	2 (2.3)	
Amount			
None	0 (0.0)	50 (56.8)	< 0.001
Small amount	62 (70.5)	29 (33.0)	
Moderate amount	21 (23.9)	7 (8.0)	
A large amount	5 (5.7)	2 (2.3)	
Interference everyday	4.57 ± 0.33	1.73 ± 0.29	< 0.001

Generalized motion equalization (GHG) model with the Bonferroni correction

[a] Total score = sum of questions 1, 2, and 3

assessment of how much leaking urine interfered with daily life decreased from 4.57 ± 0.33 to 1.73 ± 0.29. Date from the ICIQ-SF questionnaire before and after surgery are presented in Table 2. The scores of nine domains of KHQ are presented in Table 3. All the domains, except for personal relationships, had statistically significant decreases, suggesting an improvement in the quality of life related to urinary incontinence.

Patients were further divided in two groups: those with complete remission of urinary symptoms and those who were still leaking. Baseline characteristics and changes in anthropometric data were compared between the groups (Table 4). The initial ICIQ-SF scores were significantly lower in the group that had remission of symptoms. There were no statistically significant differences among other characteristics. These data were used to construct the Poisson regression model (Table 5). After adjustment, cesarean delivery ($p = 0.030$) and ICIQ-SF score ($p = 0.040$) remained associated with improvement in UI. Women who had only a cesarean birth had a 117% increase in the probability of having remission of UI compared with women who had both vaginal and cesarean deliveries. In addition, those with an additional point in the ICIQ SF score at the beginning had a 4% lower probability of achieving remission of symptoms (Table 5).

Table 3 Mean scores of the nine domains of the King's Health Questionnaire

	Pre-op	Post-op	*p* value
General health perception	43.2 ± 2.15	16.3 ± 2.07	< 0.001
Incontinence impact	44.3 ± 3.33	18.2 ± 3.16	< 0.001
Role limitations	34.7 ± 3.60	11.6 ± 2.47	< 0.001
Physical limitations	31.6 ± 3.45	10.6 ± 2.24	< 0.001
Social limitations	26.7 ± 4.47	13.4 ± 2.05	< 0.001
Personal relationships	21.6 ± 3.28	15.5 ± 2.21	0.076
Emotions	22.9 ± 2.47	7.70 ± 1.87	< 0.001
Sleep/energy	31.0 ± 2,83	12.7 ± 2.55	< 0.001
Severity measures	41.5 ± 2.69	16.9 ± 2.39	< 0.001

Data are presented as the mean and standard deviation

There was no statistically significant association between the percentage of excess weight loss (% EWL) and the reduction of symptoms ($r = -0.058$; $p = 0.596$). In addition, the mean percentage of EWL in patients who achieved remission (64.4 ± 22.9) was similar to that of patients who did not achieve remission (62.3 ± 19.2), with $p = 0.646$.

Discussion

Among women with obesity who underwent surgery for obesity and weight-related diseases, slightly more than half (53.3%) reported urinary incontinence. This percentage was similar to that of reported in other studies that analyzed urinary symptoms in patients who were planning to undergo the procedure [14–16]. Even though none of the patients had previous treatment for UI, most expressed a desire for a specific treatment for the symptoms.

During follow-up, substantial improvements in symptoms and in quality of life were demonstrated, and most of the women achieved remission of urinary incontinence, in accordance with the results of previous studies [17]. Before surgery, MUI (51.1%) was the most prevalent type of incontinence, followed by SUI (33.0%) and UUI 14 (15.9%). MUI and SUI improved after the procedure, though UUI did not. We speculate that this could be due to diet and fluid intake changes that are recommended postoperatively and could impact overactive bladder symptoms [16].

A large multicenter study associated the presence of pregnancy in the past year with a smaller chance of improving urinary symptoms [14]. Parity is a known risk factor for pelvic organ prolapse and stress urinary incontinence [18]. Compared with women who had a cesarean section, women who had a vaginal delivery were at higher risk for urinary incontinence [19]. However, cesarean delivery did not appear to protect women from urinary incontinence [20]. In our study, women that had only cesarean delivery demonstrated a greater improvement in symptoms after surgery compared with women that had a previous vaginal delivery.

The results of the QOL questionnaires were greatly impacted by the surgery as well. A higher pre-operative score in the

Table 4 Baseline characteristics of patients with complete remission of symptoms and with UI

	Remission ($N = 50$)	Still with UI ($N = 38$)	p value
Age (year (mean ± SD))	41.1 ± 12.4	42.3 ± 13.2	0.658
Menopause (n (%))	10 (20.4)	8 (21.1)	1.000
Initial BMI (kg/m^2 (mean ± SD)	45.4 ± 8.0	45.7 ± 8.1	0.859
Change in BMI (kg/m^2 (mean ± SD)	11.6 ± 8.3	11.5 ± 2.5	0.921
Initial WC (cm (mean ± SD))	126.0 ± 14.5	125.5 ± 12.4	0.883
Change WC (cm (mean ± SD))	23.1 ± 9.7	20.6 ± 7.8	0.197
Parity (n (%))			
0	11 (23.9)	11 (29.7)	0.337
1–3	34 (73.9)	23 (62.2)	
4–7	1 (2.2)	3 (8.1)	
Mode of delivery (n (%))			
Vaginal	10 (20.0)	10 (26.3)	0.071
Cesarean section	20 (40.0)	7 (18.4)	
None	15 (30.0)	11 (28.9)	
Both	5 (10.0)	10 (26.3)	
Smoking history (n (%))	13 (27.1)	10 (26.3)	1000
Diabetes (n (%))	12 (24.0)	5 (13.2)	0.316
Dyslipidemia (n (%))	6 (12.0)	9 (23.7)	0.247
Sexual activity (n (%))	39 (79.6)	24 (63.2)	0.145
Initial ICIQ SF score (mean ± SD)	8.34 ± 4.44	10.7 ± 5.00	0.024
Type of UI (n (%))			
SUI	20 (40.0)	9 (23.7)	0.214
UUI	6 (12.0)	8 (21.1)	
MUI	24 (48.0)	21 (55.3)	

ICQ-SF was associated with a lower chance of improving symptoms. Patients who were more affected by the symptoms were less likely to achieve remission subsequently. However, no association was found between the %EWL and remission or reduction of urinary symptoms.

The only domain that did not change was personal relationships. The majority of the patients in this sample were sexually active. Bariatric surgery and weight loss were not associated with an improvement in sexual function in other studies [17].

One of the strengths of this study was the use of validated incontinence questionnaires that allow the differentiation of the type, frequency, and severity of the symptoms based on patient reports. Moreover, the questionnaires enabled a refined interpretation of the impact that symptoms have on quality of life. The study also benefited from prospective data collection.

Among the study limitations were the patients who were lost to follow-up. This is a shortcoming of most studies that rely on patients returning for follow-up. Moreover, there was a short-term follow-up that represented the period where massive weight loss occurs. However, in the medium to long term, some patients gain weight again, and we were not able to investigate this impact. Urodynamics was not performed, as it was not clinically indicated because no patient had previous treatment. Nevertheless, this could have added some objective parameters related to urinary symptoms.

Table 5 Poisson regression model

Variables	RP (95% CI)	p value
Type of delivery		
Vaginal	1.62 (0.76–3.46)	0.216
Cesarean	2.17 (1.08–4.36)	0.030
None	1.77 (0.84–3.74)	0.135
Both	1.00	
Initial ICIQ SF score	0.96 (0.92–0.99)	0.040

Conclusion

Improvement in urinary incontinence may be an important outcome of surgery for obesity and weight-related diseases. In this study, previous cesarean section was only associated with the highest rate of remission of symptoms, and patients with higher scores in the ICIQ-UI-SF had a lower probability of remission.

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Compliance with ethical standards

Conflict of interest The authors declare that they have no conflict of interest..

Statements Regarding Ethics and Consent An informed consent form was offered to patients who satisfied the study criteria. Ethics and research approvals were obtained from the applicable local committees.

Justification Statement Only women were enrolled in the study to avoid bias related to gender.

Ethics All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Declaration of Helsinki and its later amendments or comparable ethical standards.

Informed Consent Informed consent was obtained from all individual participants included in the study.

References

1. Deitel M. Overweight and obesity worldwide now estimated to involve 1.7 billion people. Obes Surg. 2003;13(3):329–30.
2. Ul-Haq Z, Mackay DF, Fenwick E, et al. Meta-analysis of the association between body mass index and health-related quality of life among adults, assessed by the SF-36. Obesity (Silver Spring). 2013;21(3):E322–7.
3. Dumon K, Savulionyte G. Bariatric surgery produces greater weight loss and improvements in medical conditions than non-surgical treatment of obesity. Evid Based Med. 2014;19(4):138.
4. Courcoulas AP, King WC, Belle SH, et al. Seven-year weight trajectories and health outcomes in the longitudinal assessment of bariatric surgery (LABS) study. JAMA Surg. 2018;153(5):427–34.
5. Karmali S, Kadikoy H, Brandt ML, et al. What is my goal? Expected weight loss and comorbidity outcomes among bariatric surgery patients. Obes Surg. 2011;21(5):595–603.
6. Ahroni JH, Montgomery KF, Watkins BM. Laparoscopic adjustable gastric banding: weight loss, co-morbidities, medication usage and quality of life at one year. Obes Surg. 2005;15(5):641–7.
7. Subak LL, Richter HE, Hunskaar S. Obesity and urinary incontinence: epidemiology and clinical research update. J Urol. 2009;182(6 Suppl):S2–7.
8. Hunskaar S. A systematic review of overweight and obesity as risk factors and targets for clinical intervention for urinary incontinence in women. Neurourol Urodyn. 2008;27(8):749–57.
9. Swenson CW, Kolenic GE, Trowbridge ER, et al. Obesity and stress urinary incontinence in women: compromised continence mechanism or excess bladder pressure during cough? Int Urogynecol J. 2017;28(9):1377–85.
10. Richter HE, Creasman JM, Myers DL, et al. Urodynamic characterization of obese women with urinary incontinence undergoing a weight loss program: the program to reduce incontinence by diet and exercise (PRIDE) trial. Int Urogynecol J Pelvic Floor Dysfunct. 2008;19(12):1653–8.
11. Tamanini JT et al. Validation of the "International Consultation on Incontinence Questionnaire-Short Form" (ICIQ-SF) for Portuguese. Rev Saude Publica. 2004;38(3):438–44.
12. Tamanini JT et al. Validation of the Portuguese version of the King's Health Questionnaire for urinary incontinent women. Rev Saude Publica. 2003;37(2):203–11.
13. Haylen BT, Freeman RM, Swift SE, et al. An International Urogynecological Association (IUGA)/International Continence Society (ICS) joint terminology and classification of the complications related directly to the insertion of prostheses (meshes, implants, tapes) & grafts in female pelvic floor surgery. Int Urogynecol J. 2011;22(1):3–15.
14. Subak LL, King WC, Belle SH, et al. Urinary incontinence before and after bariatric surgery. JAMA Intern Med. 2015;175(8):1378–87.
15. Burgio KL, Richter HE, Clements RH, et al. Changes in urinary and fecal incontinence symptoms with weight loss surgery in morbidly obese women. Obstet Gynecol. 2007;110(5):1034–40.
16. O'Boyle CJ et al. The effect of bariatric surgery on urinary incontinence in women. Obes Surg. 2016;26(7):1471–8.
17. Lian W, Zheng Y, Huang H, et al. Effects of bariatric surgery on pelvic floor disorders in obese women: a meta-analysis. Arch Gynecol Obstet. 2017;296(2):181–9.
18. Rortveit G, Hannestad YS, Daltveit AK, et al. Age- and type-dependent effects of parity on urinary incontinence: the Norwegian EPINCONT study. Obstet Gynecol. 2001;98(6):1004–10.
19. Lukacz ES, Lawrence JM, Contreras R, et al. Parity, mode of delivery, and pelvic floor disorders. Obstet Gynecol. 2006;107(6):1253–60.
20. Volloyhaug I et al. Pelvic organ prolapse and incontinence 15-23 years after first delivery: a cross-sectional study. BJOG. 2015;122(7):964–71.