Int Urogynecol J (2015) 26:1361–1367
DOI 10.1007/s00192-015-2715-8

ORIGINAL ARTICLE

Does anesthetic method influence vaginal bulge symptoms and patient satisfaction after vaginal wall repair surgery?

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Received: 30 December 2014 / Accepted: 2 April 2015 / Published online: 5 May 2015

Abstract
Introduction and hypothesis Surgery for pelvic organ prolapse (POP) under local anesthesia has been advocated for several reasons such as lower costs and application in multimorbid patients. The aim of this study was to investigate how the anesthetic method influences the rate of recurrent prolapse and patient satisfaction with POP surgery.
Methods In this retrospective study 4,936 women operated for single-compartment prolapse between 2006 and 2011 were included from the Swedish National Register for Gynecological Surgery. The feeling of vaginal bulge 1 year after surgery indicated presence of recurrent prolapse. Multivariate logistic regression analyses were used to identify independent factors affecting the outcomes, presented as adjusted odds ratios (aOR) with 95 % confidence interval (CI).
Results After surgery for single-compartment prolapse patients with cystocele were at a higher risk of feeling a vaginal bulge than patients with rectocele (1.62, CI 1.28–2.06). Applied anesthesia was no independent predictor of bulge symptoms in the cystocele/rectocele population. In the cystocele group local anesthesia compared with general or regional anesthesia implied an increased risk of vaginal bulge symptoms (1.32, CI 1.03–1.68) as well as POP-Q-stage III–IV (1.30, CI 1.09–1.55), and a higher BMI class (1.22, CI 1.03–1.46), while a higher age class decreased the risk (0.79, CI 0.70–0.89). Choice of anesthesia had no impact on bulge symptoms in the rectocele group and no influence on patient satisfaction in any of the groups.
Conclusion Patients operated for cystocele under local anesthesia were at a higher risk of experiencing vaginal bulge symptoms 1 year after surgery compared with general or regional anesthesia.

Keywords Anesthesia · Cystocele · Rectocele · Patient satisfaction · Pelvic organ prolapse · Vaginal bulge

Introduction

Pelvic organ prolapse (POP) is a common postmenopausal disorder affecting 30–50 % of women over 50 years of age. Along with increasing life expectancy, the prevalence of this disease increases [1].

The lifetime risk of undergoing surgery for POP or urinary incontinence has been estimated to be 9.5 % with a 19 % risk of reoperation [2], although these numbers vary in different studies. Ageing women with POP might not be suitable for surgery under general anesthesia (GA) because of severe comorbidities. In such cases surgery under local anesthesia (LA) could be a preferable alternative. Younger women who wish a less invasive anesthesia and a shorter hospital stay [3] might benefit as well. In addition, the need for a postoperative indwelling catheter, and hence a risk of urinary tract infections, can be reduced [3]. Studies on vaginal wall repair under LA have shown satisfying results [4, 5] and local infiltration anesthesia and sedation have been cited to have an additional advantage of reduced cost [5–7].

However, there are no studies comparing prolapse surgery under LA with other forms of anesthesia concerning subjective long-term outcome. The presence of a "feeling of a vaginal bulge" is shown to be a key symptom for having a bothersome prolapse [8]. Likewise, Barber et al. demonstrated the absence of vaginal bulge symptoms to be the strongest

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relationship with the patients' assessment of overall improvement and treatment success after prolapse surgery [9].

Based upon these results, this study aimed to analyze whether anesthetic method had an influence on vaginal bulge symptoms and patient satisfaction 1 year after prolapse surgery.

Materials and methods

The Swedish National Register for Gynecological Surgery

The Swedish National Register for Gynecological Surgery, Gynop (http://www.gynop.org), was established in 1997. It records pre-, peri- and postoperative information on gynecological surgery to assess complications and contributes to the continuous evaluation of surgical results [10]. Prolapse surgery has been included since 2006. The register covers 90 % of all prolapse surgeries in Sweden. The questionnaires use validated questions concerning symptoms of prolapse [11].

Before surgery, the patient receives written information about the register and has the opportunity to decline participation. The patient completes a preoperative form on subjective symptoms and a health declaration. The gynecological surgeon registers data on preoperative findings, the surgical procedure and the postoperative events. Eight weeks after surgery the patient receives a questionnaire, with questions on the patient's well-being and treatment-related complications. Another form is sent 1 year after surgery, focusing on potential complications and satisfaction with the results of surgery.

Study design

The study is based on data from Gynop concerning prolapse surgery between 2006 and 2011. The study and the use of register data were approved by the Central Ethical Review Board, University of Gothenburg, Sweden (Dnr 145–13). Data from the register were collected retrospectively. To be included in the study the patients had to be registered in Gynop for simple anterior or posterior prolapse surgery performed in LA, general anesthesia (GA) or regional anesthesia (RA). Only patients without any other disease or a well-controlled mild disease (ASA I-II) were enrolled (n=4, 936). Surgical exclusion criteria were operations including more than one compartment or if any concurrent gynecological procedure was performed.

The following questions were used in the questionnaire 1 year after surgery: a) "Do you feel a vaginal bulge?" and b) "Are you satisfied with the result of the surgery?".

Factors that may contribute to the development of POP and the recurrence of POP were extracted from the preoperative form; age, body mass index, parity (cesarean and vaginal birth) and POP-Q stage, and the patient-reported variables: physically demanding work, chronic constipation, chronic cough and smoking. These factors were handled as possible confounders in the statistical analysis.

Statistical analysis

Categorical data were analyzed by Pearson's Chi-squared or Fisher's exact test and continuous variables were analyzed using Student's t test.

Before a logistic regression analysis could be conducted, independent variables were transformed. Age was encoded in 10-year steps and parity was encoded into three groups (women with no birth, one birth, or two or more births). The register includes information on the extent of the prolapse during maximal straining. These measures were transformed to POP-Q-stages 1–4 [12] and subsequently dichotomized into patients with stage 1–2 and stage 3–4 prolapse. This dichotomization is based on the study by Salvatore et al., which showed that stage 3–4 prolapse is the only risk factor for recurrent prolapse [13]. Anesthetic methods were dichotomized into either surgery in LA or in GA/RA. BMI was encoded as groups according to the WHO classification [14].

Logistic regression analyses were performed with a "positive answer for vaginal bulge" and patient satisfaction as the dependent variables. In the 1-year follow-up questionnaire the question "do you feel something bulge from the vagina?" could be answered with "never", "almost never", which were interpreted to be no feeling of a vaginal bulge. "One to three times per month", "one to three times per week", or "daily", were considered to be positive answers. The answers from the question "Are you satisfied with the result of the surgery?" were dichotomized into satisfied ("very satisfied" and "satisfied") and not satisfied ("neither satisfied nor unsatisfied", "unsatisfied" and "very unsatisfied"). In an univariate analysis the crude odds ratio (OR) and the 95 % confidence interval (CI) for possible confounders were calculated. Variables demonstrating an association with the dependent variables (p value <0.10) were included in a multivariate analysis. A regression model was performed for all single prolapses including both cystoceles and rectoceles. Previous studies have reported a difference in recurrence comparing cystoceles with rectoceles [15, 16]. The single prolapses were therefore analyzed separately and grouped as a cystocele group and a rectocele group. A logistic regression analysis was performed for the separate groups as well. Adjusted odds ratio (aOR) and 95 % CI were calculated. A p value<0.05 was considered statistically significant. The variables in the final models are presented with β, standard error, p value, OR, and 95 % CI.

All statistical analyses were performed using SPSS version 20 or 21.

Results

Among the 4,936 patients having undergone prolapse surgery, 3,288 had an anterior and 1,648 a posterior colporrhaphy. Demographic data for the study population are displayed in Table 1. Figure 1 illustrates the distribution of patients in each group. In total, 24.5 % experienced vaginal bulge symptoms at 12 months after surgery and 77.4 % were satisfied with the result.

In the first set-up of analyses both single cystoceles and rectoceles were included. Patients with anterior prolapse surgery were at a higher risk of feeling a vaginal bulge 1 year after surgery than those operated on for rectocele (26.0 % vs 21.3 %, p value 0.001). Local anesthesia was more frequently used in cystocele surgery (46.7 %) in comparison with rectocele surgery (30.0 %; p value<0.001). In the univariate analysis age, BMI, POP-Q stage, physically demanding work, the compartment affected (Fig 2), and anesthesia were associated with vaginal bulge symptoms and were subsequently included in a multivariate analysis, except for "physically demanding work." This variable was excluded owing to the high rate of missing cases. The logistic regression model included 2,027 patients (Table 2). Choice of anesthetic method (LA versus GA/RA) was not an independent predictor for the feeling of a vaginal bulge.

Only POP-Q-stage (aOR 0.83, 95 % CI 0.70–0.99) and the feeling of a vaginal bulge (aOR 0.11, 95 % CI 0.08–0.14) were associated with patient satisfaction..

In the second set-up, the cystocele group was analyzed separately. Of those operated on under LA 28.6 % suffered from vaginal bulge symptoms in comparison to 24.6 % in the GA/RA group (p value 0.03). Age, BMI, POP-Q stage, anesthesia, and physically demanding work were associated with vaginal globus sensations in a univariate analysis (Fig. 3). Again, "physically demanding work" was excluded from the

Table 1 Demographic and clinical characteristics of patients undergoing single-compartment prolapse surgery

Variables	All (n=4,936)	LA (n=1,188)	GA/RA (n=2,708)	p value
Mean age in years (SD)	62.7 (11.5)	63.3 (11.4)	62.3 (11.5)	0.004*
Parity				0.550**
Nulliparous % (n)	0.5 (22)	0.5(8)	0.6 (14)	
Parous, one child % (n)	10.4 (437)	10.2 (177)	10.6 (260)	
Multiparous % (n)	89.1 (3,741)	89.4 (1556)	88.9 (2185)	
Mean BMI	26.24	26.13	26.31	0.153*
BMI classes				0.002***; 0.837**
<18.5 % (n)	0.5 (20)	0.9 (15)	0.2 (5)	
18.5–24.9 % (n)	35.8 (1,471)	34.3 (583)	36.8 (888)	
25–29.9 % (n)	46.0 (1,893)	48.0 (815)	44.7 (1078)	
>30 % (n)	17.7 (728)	16.8 (285)	18.4 (443)	
ASA I , % (n)	62.6 (2,875)	61.1 (1154)	63.6 (1721)	0.094***
ASA II, % (n)	37.4 (1,721)	38.9 (734)	36.4 (987)	
Concomitant diseases				
Hypertension, % (n)	72.5 (1,506)	75.1 (641)	70.7 (865)	0.032****
Diabetes, % (n)	13.3 (269)	13.0 (108)	13.5 (161)	0.79****
Precipitating factors				
Smoking, % (n)	11.0 (468)	9.9 (174)	11.7 (294)	0.054****
Physically demanding work, % (n)	54.7 (203)	48.7 (75)	42.9 (93)	0.265***
Chronic cough, % (n)	34.7 (147)	33.5 (63)	35.6 (84)	0.682****
Obstipation, % (n)	58.1 (571)	58.5 (235)	57.8 (336)	0.895****

LA local anesthesia, *GA/RA* general anesthesia/regional anesthesia

*t test

**Mantel–Haenszel Chi-squared test

***Chi-squared test

****Fisher's exact test

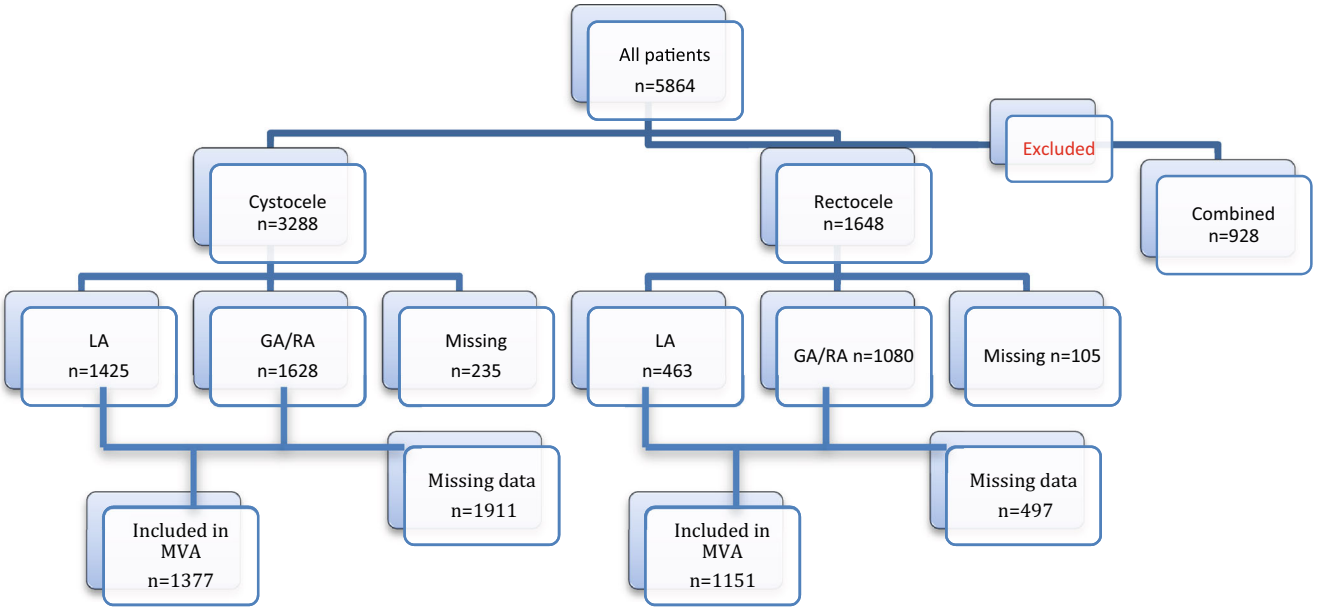

Fig. 1 Flow chart of the distribution of anesthetic method applied for surgery in patients with single-compartment prolapses and the number of patients included in the multivariate analysis (*MVA*)

subsequent multivariate regression analysis. A total of 1,377 patients were included in the logistic regression model for cystocele surgery (Table 3). Patients who had undergone cystocele surgery under LA had a statistically significantly higher risk of vaginal bulge symptoms in comparison with surgery in GA/RA (aOR 1.32, 95 % CI 1.03–1.68). Other independent predictors of vaginal bulge symptoms were POP-Q stage 3–4 (aOR 1.30; 95 % CI 1.09–1.55), lower age (aOR 0.79, 95 % CI 0.70–0.89), and higher BMI class (aOR 1.22, 95 % CI 1.03–1.46; Fig. 4). Figure 4 displays how the different risk factors add to the probability of feeling of a vaginal bulge.

Predictors for patient satisfaction in the cystocele group were lower BMI (aOR 0.96, 95 % CI 0.93–0.99) and the feeling of a vaginal bulge (aOR 0.08, 95 % CI 0.07–0.12).

Finally, we analyzed the rectocele group, in which the choice of anesthesia did not affect the development of bulge symptoms 1 year after prolapse surgery (OR 0.80, 95 % CI 0.59–1.09). Only lower age group (aOR 0.81, 95 % CI 0.72–0.91) and higher BMI class (aOR 1.22, 95 % CI 1.01–1.47) were associated with bulge symptoms. The total regression model is displayed in Table 4 and included 1,151 patients.

The only independent predictor of patient's satisfaction in the rectocele croup was the feeling of a vaginal bulge (aOR 0.16, 95 % CI 0.12–0.22).

Discussion

This retrospective register study was designed to analyze whether choice of anesthesia had an influence on the development of vaginal bulge symptoms 1 year after prolapse surgery. Based on previous research [8, 9] vaginal bulge symptoms were interpreted as symptoms of recurrent prolapse.

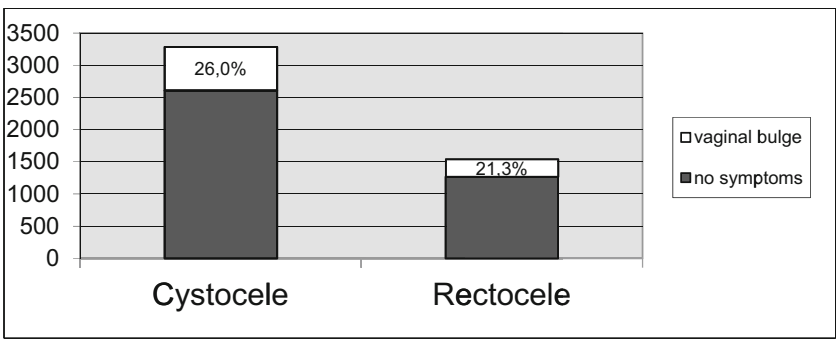

Fig. 2 Frequency distribution of vaginal bulge symptoms among patients 1 year after prolapse surgery according to compartment

Table 2 Final logistic regression model for vaginal bulge symptoms 1 year after surgery for cystocele or rectocele

	β	SE	*p*	OR	95 % CI
Age class	−0.201	0.049	0.000	0.818	0.743–0.901
BMI class	0.186	0.074	0.012	1.204	1.041–1.393
POP-Q	0.176	0.073	0.016	1.193	1.034–1.376
Rectocele vs cystocele	−0.483	0.121	0.000	0.617	0.486–0.783
Intercept	0.035	0.564	–	–	–

SE standard error

When comparing the different surgical groups the patients with anterior prolapse surgery were at a higher risk of feeling a vaginal bulge 1 year after surgery compared with posterior prolapse surgery. Significantly more patients operated for single anterior prolapse under LA suffered from feeling of a vaginal bulge 1 year after surgery (28.6 % vs 24.6 %) than those operated on under GA/RA. Other identified risk factors for prolapse recurrence symptoms were BMI>30, younger age, and high-grade prolapse.

The anterior wall in general seems to be more prone to recurrence than the posterior wall [15, 16]. Possible reasons for this might be the relatively greater exposure to intra-abdominal strain, greater dependence on intact innervation and connective tissue support, and potentially greater injury during childbirth [17]. The damage to the anterior vaginal wall might be associated with injuries in the apical support of the vagina; hence, anterior colporrhaphy will only repair part of the injury [18]. However, this reasoning cannot explain why there is a difference in vaginal bulge symptoms between LA and GA/RA in cystoceles.

The impact of the anesthetic method on vaginal bulge symptoms in the cystocele group might be due to the surgeon's way of operating in the different compartments. The limited anesthetic field could yield a narrower surgical area and reduced muscular relaxation of the vagina. This in turn might cause a change in surgical technique, such as avoiding vulvar sutures or the lone star retractor for better access, and the time-wise limited effect of the local anesthesia could influence the necessity to keep the operating time short. On the other hand, surgery for rectocele under LA did not imply an increased risk of vaginal globus sensations in comparison with those operated under GA/RA. Perhaps the surgical factors mentioned affect the anterior wall more than the posterior wall. There might be additional factors associated with local anesthesia that more likely contribute to bulge sensations, such as when women undergoing surgery under LA become physically active too early or different postoperative information is provided depending on choice of anesthesia.

As in previous studies we found that younger women are more prone to feeling a vaginal bulge after surgery. Miedel et al. suggested that this might be due to less extensive surgery in younger women to avoid sexual dysfunction. In addition, these women might be more physically active and thus more prone to recognizing bulge symptoms than older women [15, 17].

Observational studies in general are limited owing to difficulties in assessing and avoiding bias. By correcting our results for possible confounders, we tried to minimize this risk, but the possibility of hidden confounding factors cannot be fully eliminated. As all single compartment surgeries from the database were included and

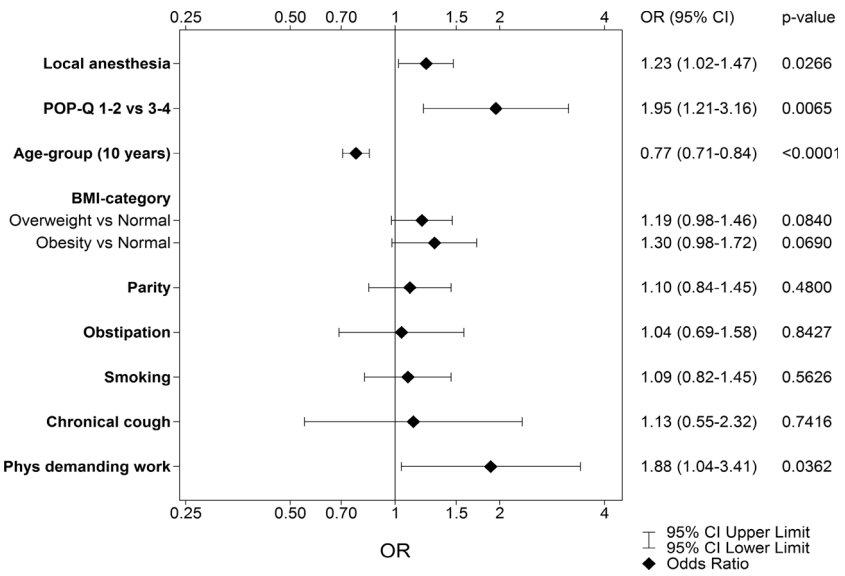

Fig. 3 Univariate analysis of possible predictors for vaginal bulge symptoms in patients with cystoceles

Table 3 Final logistic regression model for vaginal bulge symptoms 1 year after surgery for cystocele

	β	SE	*p*	OR	95 % CI
LA vs RA/GA	0.277	0.125	0.026	1.319	1.033–1.683
POP-Q	0.260	0.091	0.004	1.297	1.086–1.550
Age class	−0.237	0.063	0.000	0.789	0.698–0.893
BMI class	0.202	0.090	0.025	1.223	1.026–1.459
Intercept	−1.208	0.584	–	–	–

LA local anesthesia, *RA* regional anesthesia, *GA* general anesthesia

the register covers the majority of all prolapse surgeries in Sweden, bias related to individual non-participating surgeons is less likely. There are few surgeons who are not represented in the register and non-participation is typically based on clinics/departments and not on individual surgeons. Among all the surgeons included, it is unlikely that only the more experienced would prefer general and regional anesthesia and thus bias the results toward a less favorable outcome for local anesthesia.

The patients with symptoms 1 year after surgery were not examined, which is a limitation of the study. Although previous studies have shown that a simple question regarding the feeling of a vaginal bulge can accurately screen for advanced POP without a physical examination [19, 20], there is still no information on whether the bulging feeling is due to a recurrent prolapse or a prolapse in another compartment. Further investigations could add more reliability to the results.

Another limitation of the study was the large number of patients excluded in the regression analyses. A multivariate analysis requires all patients' values for each variable to be available; thus, any missing value would exclude patients from the analysis.

Finally, what needs to be considered is whether the statistical difference concerning anesthesia in the cystocele group is of clinical relevance or if the positive effects of LA outweigh the increased risk of recurrent bulge symptoms. As always, a confidence interval close to one (95 % CI 1.03–1.68) has to be interpreted with caution. The crude difference in bulge symptoms between LA and GA/RA was only 4 % (28.6 % vs 24.6 %), which may be of no clinical relevance. However, the multivariate analysis points out important risk factors for bulge symptoms. It is of clinical importance to consider these risk factors when deciding upon the anesthetic method, implying that elderly women might benefit from surgery under LA, while younger women, particularly with high BMI and a high-grade prolapse, might profit from other types of anesthesia.

Surgery under LA appears to have many advantages, such as elimination of the adverse effects of general or spinal anesthesia for some patients [21], a reduction of admission time and a faster return to daily activity [1]. Furthermore, there is a financial advantage, since it is not mandatory to have an anesthesiologist supervising surgery under LA and sedation in the Nordic countries. The use of LA also facilitates the performance of this kind of surgery in day care units [22].

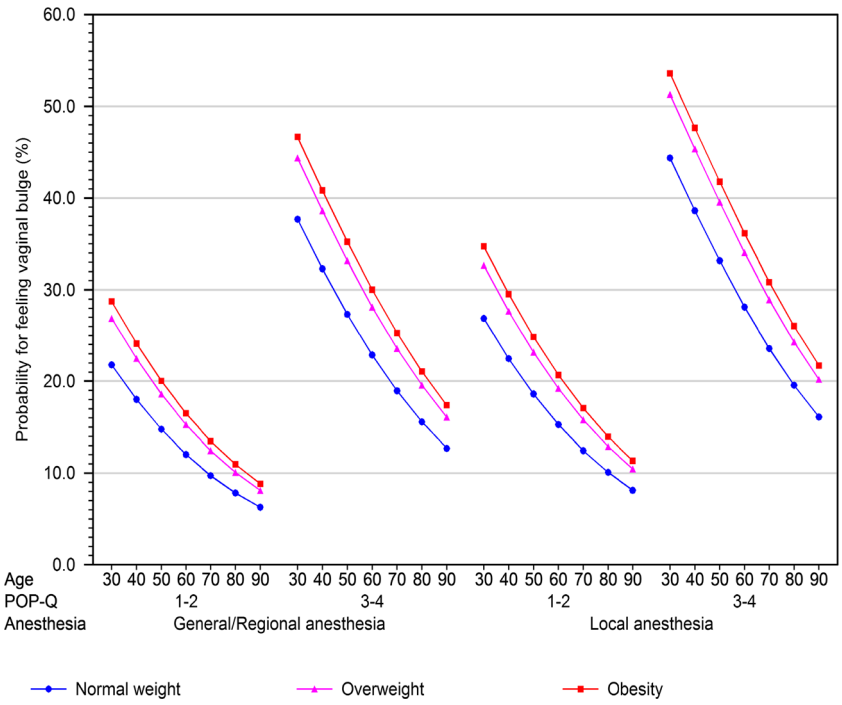

Fig. 4 Multivariate analysis of predictors for the possibility of vaginal bulge symptoms in patients who underwent surgery for cystocele

Table 4 Final logistic regression model for vaginal bulge symptoms 1 year after surgery for rectocele

	β	SE	*p*	OR	95 % CI
Age class	−0.215	0.060	0.000	0.806	0.717–0.906
BMI class	0.197	0.097	0.043	1.217	1.006–1.472
Intercept	−0.646	0.427	–	–	–

Conclusion

Patients undergoing surgery for cystocele under local anesthesia were at a higher risk of experiencing vaginal bulge symptoms 1 year after surgery compared with general or regional anesthesia. It might be advisable to consider all individual risk factors for vaginal bulging, such as lower age, higher BMI, and high-grade vaginal prolapse, before deciding which anesthetic method is most appropriate.

Acknowledgements We would like to thank Mattias Molin and Nils-Gunnar Pehrsson for statistical advice and Emil Nüssler for providing data from the Swedish National Register for Gynecological Surgery.

Sponsors: the Swedish Government, the Swedish Society, and the Federation of Swedish County Councils.

Conflicts of interest None.

Authors' contribution J. Pong: project development, data collection and management, data analysis, manuscript writing and editing; K. Stenström Bohlin: project development, manuscript writing and editing; C. Pedroletti: project development, manuscript writing and editing; A. Strandell: project development, data analysis, manuscript writing and editing.

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