

## Original Article

## Improvements in overactive bladder syndrome after polypropylene mesh surgery for cystocele

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**Background:** The International Continence Society has defined overactive bladder syndrome (OABS) by the following set of symptoms: 'urgency, with or without urge incontinence, usually with urinary frequency and nocturia'. OABS and cystocele often coexist.

**Aim:** This study aimed to analyse the changes in the overactive bladder symptom score (OABSS) of women followed up for one year after anterior repair surgery performed using a polypropylene mesh. In this surgery, a tape with four straps designed for optimum tissue holding capacity was fixed to the obturator foramen.

**Material and methods:** Thirty-four women were operated using the abovementioned mesh. The OABSS, maximal urinary flow rate (Qmax) and postvoid residual (PVR) volume were evaluated pre- and post-surgery.

**Results:** We observed significant improvements in the OABSS and quality of life scores before and after one year of surgery. The surgery was significantly effective in improving urgency, daytime frequency, incontinence, the Qmax and the PVR volume. No significant change in nocturia was observed post-surgery.

**Conclusions:** Our study confirmed the efficacy of the propylene mesh introduction surgery for cystocele for the improvement of OABS symptoms.

**Key words:** cystocele, obturator foramen, overactive bladder symptom score, overactive bladder syndrome, polypropylene mesh.

## Introduction

Cystocele is often observed in postmenopausal women. It is caused by flaccidity of the supporting tissue in the anterior wall of the vagina.<sup>1</sup> Alterations in the endopelvic fascia are caused by a variety of factors,<sup>2</sup> including pregnancy, parturition, obesity and ageing. Kelly has suggested the method of cerclage and reinforcement of the vesicopelvic fascia in the midline region;<sup>3</sup> this method is called 'anterior repair (AP)', and is used by many urologists.<sup>4</sup> Ulmsten *et al.* have introduced an integral theory,<sup>5–7</sup> which has made a revolutionary impact on cystocele treatment. AP operations involving the use of synthetic materials that meet the standards specified by this integral theory have attracted considerable attention.

The International Continence Society (ICS) has defined overactive bladder syndrome (OABS) as the condition in which the following set of symptoms are found in the patients: 'urgency with or without incontinence, usually with frequency and nocturia'.<sup>8</sup> In the outpatient clinic, OABS can be

diagnosed without cystometric data.<sup>8,9</sup> The overactive bladder symptom score (OABSS) is the newest questionnaire that is a valid tool for assessing the symptoms characteristic to OABS patients. It integrates four symptoms (daytime frequency, nocturia, urgency and urgency incontinence) into a single score and is useful in clinical practice.<sup>9</sup>

At the Female Urology Division, we often encounter patients with symptoms of OABS concomitant with cystocele.<sup>10</sup> This may be due to obstruction of the urethra caused by vaginal prolapse<sup>11</sup> or descent of the trigone into the anterior vaginal wall.<sup>12</sup> Furthermore, OABS symptoms in these patients improved after a surgery for cystocele without using a mesh.<sup>10</sup> However, no previous studies have described changes in OABS patients' conditions after AP operations were performed using synthetic materials.

Reisenauer *et al.*<sup>13</sup> introduced a method involving the use of Gynecare Prolift\* (Ethicon, Somerville, NJ, USA), in which a tape with four 2-cm-wide straps designed for optimal tissue-holding capacity, is fixed to the obturator foramen by following the technique described by TVM Group of France.<sup>14</sup> This method allows placement of organs in their normal anatomical positions. This method provided a solution for problems associated with mesh insertion.

In this study, we examined the efficacy of the AP operation (fixing a tape with four straps to the obturator foramen (hereafter, four-strap-mesh operation)) in 20 patients with both cystocele and OABS.

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**Table 1** The overactive bladder symptom score

	Score	Frequency
How many times do you typically urinate from waking in the morning until sleeping at night?	0	7 or less
	1	8–14
	2	15 or more
How many times do you typically wake up to urinate from sleeping at night until waking in the morning?	0	0
	1	1
	2	2
	3	3 or more
How often do you have a sudden desire to urinate, which is difficult to defer?	0	Not at all
	1	Less than once a week
	2	Once a week or more
	3	About once a day
	4	2–4 times a day
	5	5 times a day or more
How often do you leak urine, because you cannot defer the sudden desire to urinate?	0	Not at all
	1	Less than once a week
	2	Once a week or more
	3	About once a day
	4	2–4 times a day
	5	5 times a day or more

## Methods

### Study design

Of the women who visited our clinic between April 2005 and June 2007, patients with grades 2–4 of pelvic organ prolapse and OABS were studied. These grades were assigned according to the Pelvic Organ Prolapse Quantitative (POP-Q) system.<sup>15</sup> Twenty-four women underwent transobturator polypropylene mesh AP that was performed by using Gynecare Prolift\*. The mesh was fixed to the obturator foramen at four points and the patients were educated on lifestyle changes necessary for recovery.<sup>16</sup> They were followed up for at least one year. Eighteen women who were not operated upon, but who were educated on lifestyle changes,<sup>16</sup> were considered as the control patients. In the education program, we educated the patients about water intake,<sup>16</sup> diet,<sup>16</sup> maintaining a 24-h urine frequency/volume chart<sup>16</sup> and Kegel's exercises.<sup>16</sup> All types of data, including those on inpatient and outpatient settings, were obtained from clinical files, hospital files, and operative records and verified by telephonic interviews.

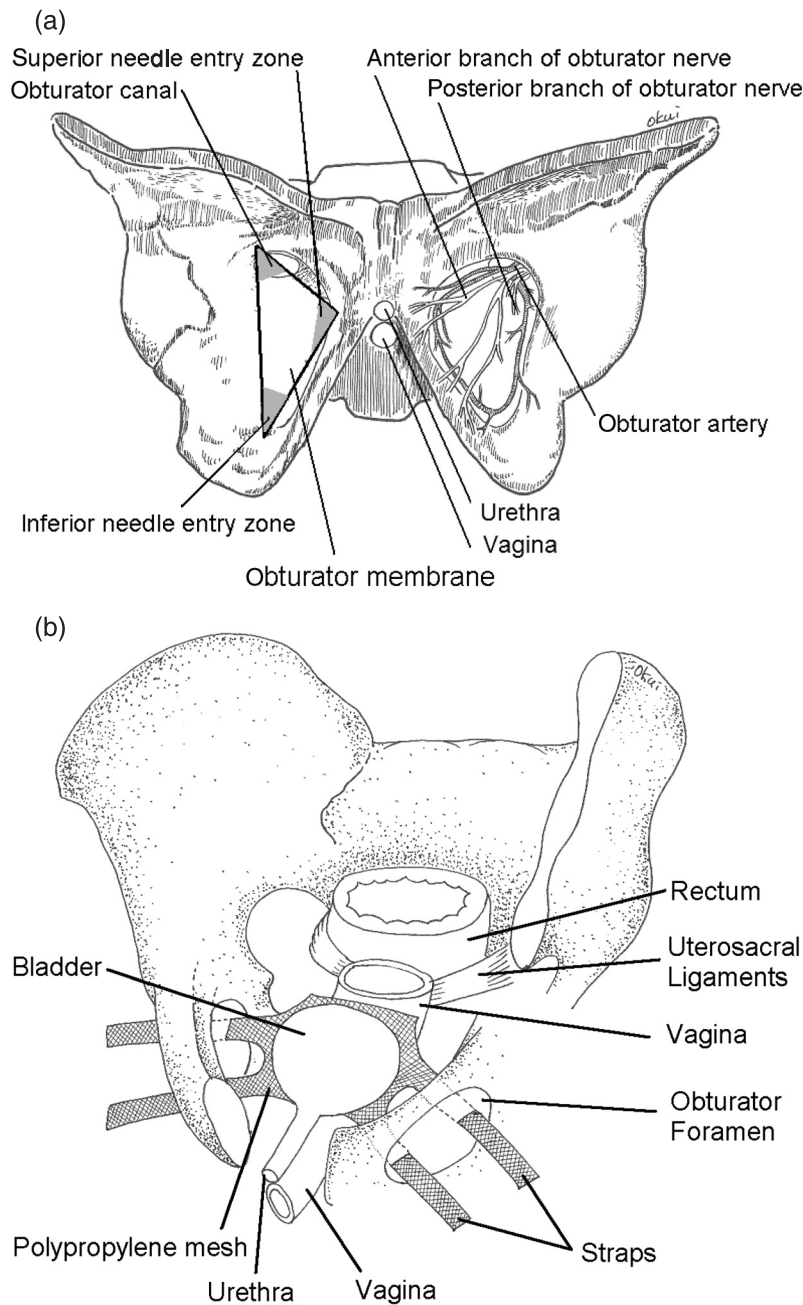
The degree and symptoms of genital prolapse were evaluated in all patients by using the POP-Q and Pelvic Floor Distress Inventory (PFDI) questionnaires,<sup>17</sup> respectively. The degree of patient satisfaction was also calculated using the Pelvic Floor Impact Questionnaire (PFIQ).<sup>17</sup> We calculated the overactive bladder symptom score (OABSS)<sup>9</sup> (Table 1), maximal urinary flow rate (Qmax),<sup>16</sup> average urinary flow rate (Qave)<sup>16</sup> and post-void residual (PVR) volume.<sup>16</sup> The patients were followed up for 1, 3, 6 and 12 months postoperatively. Statistical analyses of several parameters were performed before and after surgery. The changes in the values of several parameters before and after the operation

were statistically analysed using the Wilcoxon rank test;  $P < 0.001$  was considered statistically significant.

In this study, postoperative cure was defined as stage 0 or 1 of POP-Q at one year after the operation and an improvement or no change in all the items of the PFDI and PFDQ. Postoperative failure was defined as stage 2 or more of POP-Q at one year after the operation or as worsening of one or more items of the PFDI and PFDQ.

### Operation

In this study, a simple curved needle having a groove at its tip (length, 2 mm) was used as a tunneler to insert the mesh through the obturator foramen. The patients were in the dorsal lithotomy position during the operation. A surgical layer was established by incising the vaginal mucosa and exfoliating the pubocervical fascia. We inserted the transobturator tunnel<sup>18</sup> in two places corresponding to the two residual angles of a triangular area in the right and left obturator membranes (the obturator canal was regarded as one of the angles) (Fig. 1a,b). Gynemesh\* (Ethicon, Somerville, NJ, USA) was modified such that its shape was similar to Gynecare Prolift\* (hereafter, four-strap mesh), and so that it could fit into the vagina of the patients. It had a rectangular body (5 cm × 10 cm) with four straps (2 cm × 10 cm) (Fig. 2a,b). Each strap was inserted above the arcus tendineus into the two entry zones of the right and left obturator membranes where needle entries were previously made. As shown in Figure 1(b), the strap supporting the urethra was fixed after it was passed through the superior needle entry zone; the strap supporting the bladder was passed through the inferior needle entry zone. The extra portions of the straps that protruded from the skin and the extra length of the mesh body were cut according to the



**Figure 1** Needle entry zones of obturator membrane in four-strap-mesh operation (a). The anatomical positions of the organs in the four-strap-mesh operation (b).

bladder size. The anterior vaginal skin was closed by size 0 polyglactin sutures.

The mesh body was placed under the bladder, and the vaginal stump of patients who had undergone surgery for the cervix of the uterus was fixed to the upper part of the mesh body, while the bladder neck of those who had undergone hysterectomy was fixed to the lower part of the mesh body. By using a urethrocystoscope, we fixed the mesh, as shown in Figure 2(a), such that the bladder (neck and trigone) and urethra were positioned as in normal women. In order to prevent stress incontinence, which was previously observed after surgery, the mesh was not placed under the urethra

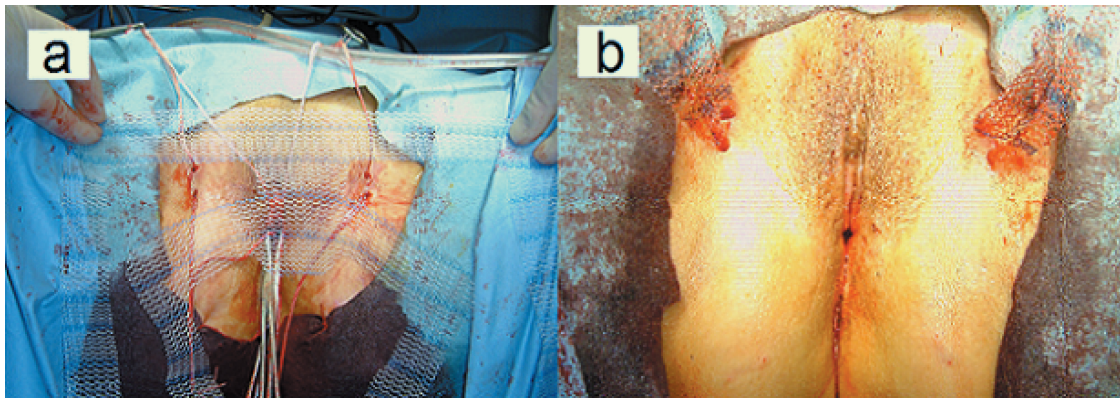
so as to prevent its adhesion to the urethra, which could necessitate reoperation.

A urethral catheter was not inserted. The patients were allowed to walk three hours after the operation and educated on lifestyle necessary for recovery.<sup>16</sup>

## Results

### Patients

The median age of the subjects was 65.5 years (ranging from 42 to 89 years), and their median body mass index was



**Figure 2** The four-strap mesh (a). The four straps from skin (b).

**Table 2** Pre- and postoperative evaluation of clinical stages according to the four-strap-mesh operation according to the Pelvic Organ Prolapse Quantitative staging system

N = 24	Before operation	1 year after operation
Stage 0	0	20 (83%)
Stage 1	0	4 (17%)
Stage 2	11 (45.8%)	0
Stage 3	12 (50%)	0
Stage 4	1 (4.2%)	0

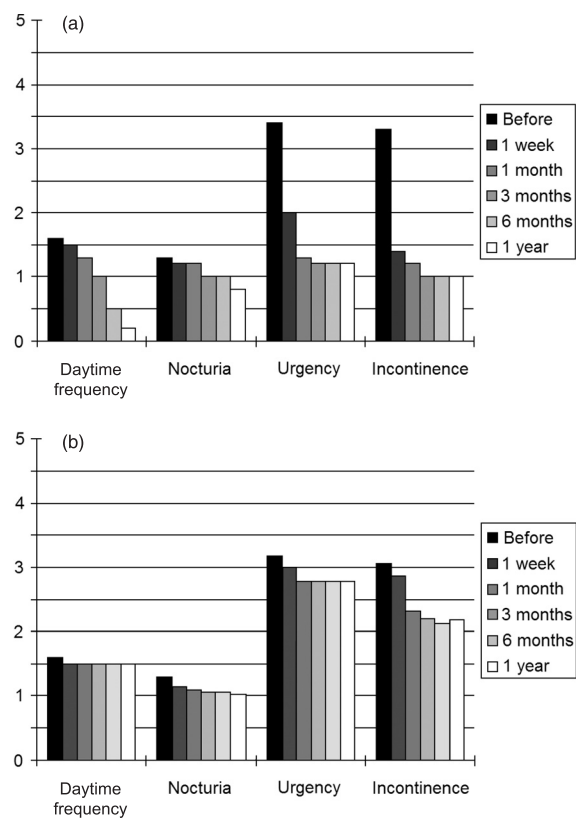
  

N = 18 (study control)	Before education	1 year after education
Stage 0	0	0
Stage 1	0	0
Stage 2	16 (88.8%)	16 (88.8%)
Stage 3	2 (11.1%)	2 (11.1%)
Stage 4	0	0

26.5 kg/cm<sup>2</sup> (ranging from 16.0 to 37.0 kg/cm<sup>2</sup>). None of the patients had undergone surgery previously.

### Operation for cystocele

The median operative time was 50 min (ranging from 25 to 75 min). The median estimated blood loss was 25 mL (ranging from 5 to 45 mL), and the median hospital stay was 13 h (ranging from six to 20 h). There were no intraoperative complications, such as bladder injury, uterine artery haemorrhage or vaginal sulcus perforation during the transobturator tape procedure. The median follow-up period for the outpatients was 24.5 months (ranging from 12 to 37 months). Table 2 shows the pre- and postoperative clinical stages determined according to the POP-Q system. During the one-year follow up, 24 patients were considered to be anatomically cured (cure rate, 95.8%). Recurrence was not observed in any patient. All patients were evaluated using the PFDI and PFIQ questionnaires; the results are shown in Table 3a. The results indicated an improvement in all parameters postoperatively.



**Figure 3** Effect of surgery on overactive bladder symptom score (OABSS). Patients after operation (3a) and control patients (3b).

### Efficacy of the four-strap-mesh operation for OABS

Our study shows significant improvements in the parameters, such as the OABSS ( $9.0 \pm 0.6$  vs  $3.2 \pm 0.5$ ,  $P < 0.0001$ ) and Qmax ( $9.2 \pm 1.4$  mL/s vs  $15.0 \pm 1.5$  mL/s,  $P < 0.0001$ ) before and at one year after the operation (Table 3b). The OABSS indicated significant improvement in daytime frequency, urgency and incontinence (Fig. 3a). In particular,

**Table 3a** Pre- (0 month) and postoperative (12 months) scores of Pelvic Floor Distress Inventory (PFDI) and the Pelvic Floor Impact Questionnaire (PFIQ)

PFDI				PFIQ			
N = 24							
Symptom scale	Before	1 year	P	Quality of life scale	Before	1 year	P
Median UDI (/300)	145.9	24.0	*	Median UIQ (/300)	140.9	19.0	*
Median CRADI (/400)	50.7	22.4	*	Median CRAIQ (/400)	34.0	10.0	*
Median POPDI (/300)	98.0	30.8	*	Median POPIQ (/300)	44.2	10.0	*

PFDI				PFIQ			
N = 18 (study control)							
Symptom scale	Before	1 year	P	Quality of life scale	Before	1 year	P
Median UDI (/300)	140.0	132.0		Median UIQ (/300)	130.0	119.0	
Median CRADI (/400)	48.5	42.5		Median CRAIQ (/400)	31.0	29.5	
Median POPDI (/300)	93.0	80.0		Median POPIQ (/300)	33.0	29.0	

No symptoms or impact; 300 or 400 maximal symptoms or impact; CRADI, Colo-Recto-Anal Distress Inventory; CRAIQ, Colo-Recto-Anal Impact Questionnaire; POPDI, Pelvic Organ Prolapse Distress Inventory; POPIQ, Pelvic Organ Prolapse Impact Questionnaire; UDI, Urinary Distress Inventory; UIQ, Urinary Impact Questionnaire. \* $P < 0.0001$ , significant difference obtained using a paired Mann & Whitney test.

**Table 3b** Storage symptoms and uroflowmetry parameters before and after one year

N = 24	Before operation	1 year after operation	P-value
OABSS	9.0 ± 0.6	3.2 ± 0.5	$P < 0.001$
Daytime frequency	1.6 ± 0.3	0.2 ± 0.2	$P < 0.001$
Nocturia	1.3 ± 0.3	0.8 ± 0.2	
Urgency	3.4 ± 0.2	1.2 ± 0.4	$P < 0.001$
Incontinence	3.3 ± 0.3	1.0 ± 0.1	$P < 0.001$
Qmax (mL/s)	9.2 ± 2.4	15.0 ± 1.5	$P < 0.001$
Qave	6.0 ± 0.6	9.8 ± 1.0	$P < 0.001$

N = 18 (study control)	Before operation	1 year after education	P-value
OABSS	9.3 ± 0.9	7.2 ± 0.5	
Daytime frequency	1.6 ± 0.8	1.5 ± 0.6	
Nocturia	1.4 ± 0.7	1.1 ± 0.5	
Urgency	3.2 ± 0.6	2.8 ± 0.7	
Incontinence	3.1 ± 0.5	2.1 ± 0.5	
Qmax (mL/sec)	9.0 ± 2.4	9.0 ± 2.5	
Qave	6.0 ± 1.0	6.0 ± 1.0	

OABSS, overactive bladder symptom score; Qave, average urinary flow rate; Qmax, maximal urinary flow rate.

urgency and incontinence improved immediately after the surgery. Urine frequency improved slowly; the patients attributed this change to an improvement in their lifestyle. However, no significant change in nocturia was observed after the operation. The mean PVR volume was  $40 \pm 15.0$  mL and  $3.2 \pm 4.0$  mL before and after the surgery respectively ( $P < 0.001$ ). No significant improvements in parameters were observed in control patients (Fig. 3b).

### Complications

Vaginal erosion was not observed in any patient. Short-term postoperative complications included vaginal haematoma and pain on movement in the obturator membrane in two and six patients respectively. All haematomas were

evacuated two days after the operation without removing the mesh. The patients experienced pain for one week; it was mainly concentrated at the obturator foramen on outward movement of the femur. No patients experienced postoperative fever or urinary retention. No long-term postoperative complications, such as erosion, were observed. In one patient, the mesh was exposed, genital prolapse recurred and prolapse of the uterus appeared six months after the operation.

### Discussion

This is the first study that evaluates AP with a mesh from the viewpoint of OABS. We have not compared our four-strap-mesh operation with other surgeries for cystocele.

However, the dramatic changes observed in the patients' conditions during this study suggested that the four-strap-mesh operation may be potentially effective in patients with both cystocele and OABS.

According to the integral theory of female urinary incontinence, effective OABS management depends on the changes in the anatomical positions of the pelvic floor organs after the four-strap-mesh operation.<sup>19</sup> According to this theory, the pelvic floor is divided into three zones: anterior, middle and posterior.<sup>19</sup> Cystocele occurs due to flaccidity of the middle zone tissues; the middle zone can be reinforced by inserting a mesh into the anterior wall. Repositioning of the organs in their normal anatomical positions could be achieved by the four-strap-mesh operation performed in this study by reinforcing both the anterior and the middle zones of the pelvic floor by inserting the four straps of the mesh into the obturator membrane.

Since the bladder was positioned near its normal anatomical area, the pressure on it was reduced. Therefore, we believe that the four-strap-mesh operation improves OABS symptoms, particularly those of urgency and incontinence. We think that postoperative improvement in urinary frequency in the patients could be attributed to patients' lifestyle changes. Thus, our results suggest that in patients with both OABS and cystocele, urinary urgency and incontinence depend on anatomical changes and frequency depends on these patients' lifestyle.

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