

COMPARISON OF SUPRAPUBIC VERSUS TRANSOBTURATOR SURGICAL TREATMENTS OF FEMALE STRESS URINARY INCONTINENCE

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SUMMARY

Objective: The aim of this study was to retrospectively compare surgical outcomes of the suprapubic arc sling (SPARC) and transobturator suburethral tape (MONARC) for treatment of stress urinary incontinence (SUI) in women.

Materials and Methods: A total of 74 women treated for SUI using MONARC were compared with 32 treated using SPARC. Postoperative evaluations were conducted at 3–6 months, including 1-hour pad test, cough stress test, uroflowmetry and residual urine volume. Subjective outcomes were evaluated using telephone interviews. Perioperative complications were investigated from chart records.

Results: No significant difference was found between the SPARC and MONARC treatment groups in terms of the objective cure rate at 3 months postoperatively (90.6% vs. 80.6%; $p=0.258$). However, a significant difference was found between the subjective cure rates of the SPARC and MONARC groups (77.4% vs. 97.3%; $p<0.05$).

Conclusion: Both MONARC and SPARC are safe and effective for surgical treatment of SUI. [*Taiwan J Obstet Gynecol* 2008;47(2):175–179]

Key Words: stress urinary incontinence, suprapubic arc sling, transobturator suburethral tape

Introduction

The tension-free vaginal tape (TVT) procedure, described by Ulmsten and Petros [1] in 1995, is a safe and effective treatment for stress urinary incontinence (SUI), offering the benefits of a minimally invasive technique with superior long-term results [2]. However, because the TVT is introduced paraurethral using a 5 × 100 mm trocar, organs and tissues near the passage of the trocar are vulnerable to injury [3]. The suprapubic arc sling

(SPARC) procedure was developed to utilize the posterior surface of the pubic symphysis as a tactile guide for the downward passage of a finer, longer needle (3 × 220 mm) in an effort to decrease bowel, lower urinary tract and vascular injuries that occasionally occurred with the upward passage of the TVT trocar [4,5]. In 2001, Delorme [6] described a new surgical approach in which the needle passage avoids the retropubic space by passing the sling through the obturator foramen. This theoretically minimizes the risk of vascular, bladder and bowel injury during passage of the needle. Since then, transobturator suburethral tape (MONARC) procedures have been shown to be a safe and effective treatment for SUI, offering the benefits of a minimally invasive technique with effective long-term results [7–9].

Differences in the mode of insertion and the angle of the sling may influence the outcomes, even if the



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materials and biomechanical properties appear similar. We designed this study to compare the clinical outcomes of the SPARC and MONARC (American Medical System, Minnetonka, MN, USA) procedures for the surgical treatment of SUI in women. In this study, we aimed to assess the differences in the approaches that may affect the cure rate and postoperative voiding functions.

Materials and Methods

From September 1, 2003 through August 22, 2005, 115 consecutive patients with SUI underwent surgery at our hospital for the placement of a suburethral sling. During the first part of the study period (September 2003–February 2004), we performed the SPARC procedure in 35 patients. MONARC was subsequently introduced to Taiwan, because the available clinical data indicated that the MONARC approach was more minimally invasive with comparable results [7–9]; our group then performed the MONARC approach in 80 patients between March 2004 and August 2005. Intraoperative and postoperative complications, cure rates, and patient satisfaction rates for SPARC and MONARC performed nonconcurrently were then retrospectively compared. Since SPARC was the first technique used, the follow-up times and observation times for the SPARC group were longer than those for the MONARC group.

All patients who required SUI treatment were candidates for this study. Patients with detrusor overreactivity, previous failed incontinence surgery or loss of follow-up were excluded. Preoperative evaluations included detailed history, physical examination, Q-tip test, cough stress test, and 1-hour pad test; preoperative urodynamic studies included uroflowmetry, static and dynamic urethral pressure profiles, urethrocystometry, and post-void residual (PVR) measured using a catheter.

Postoperative follow-up visits were scheduled at 1 week and 1, 3, 6, 12 and 24 months. Charts produced from the study were reviewed both subjectively and objectively, including the need for medication for urgency, urinary retention and other perioperative complications.

Uroflowmetry, PVR, 1-hour pad test, and cough provocation tests were performed postoperatively at 3 to 6 months in all patients. Patients were: “objectively cured” when they had both negative cough stress test and dry pad test results; “objectively improved” when they had improved SUI, a positive stress test result and a > 50% reduction of pad weight from preoperative values; and “objectively failed” for the remaining patients. Subjective outcomes were collected by an experienced nurse. At the most recent telephone interview in January

2006, the mean follow-up period was 13.1 months for the MONARC group and 23.9 months for the SPARC group. Since the follow-up period was long, all answers from the telephone interviews were based on the patients’ own perceptions. The patients were questioned on persistent SUI, voiding difficulties, and urgent need to empty the bladder (i.e. urgency). “Subjectively cured” was defined as an absence of complaints of urine leakage and “subjectively improved” defined as a > 50% decrease in the number of SUI episodes. The rest of the patients were considered as “subjectively failed”. Patients were also asked to rate their overall satisfaction on the surgical outcomes as “satisfied”, “moderately satisfied”, “not very satisfied” or “not at all satisfied”.

All cases were operated on under general anesthesia by a surgeon and all received preoperative broad-spectrum intravenous antibiotics. The same surgeon was used to avoid inter-surgeon variations or differences in operating procedures.

The SPARC procedure was performed as described by Deval et al [10]. Cystoscopy was performed to verify the absence of bladder injury. The plastic sheath covering the Prolene tape remained until the tape was correctly adjusted without tension, leaving a 3–5 mm space between the urethra and the mesh. The MONARC procedure was performed as described by Dargent et al [11] with the patient in a high lithotomy position. A Kelly clamp was placed between the urethra and mesh for tension adjustment, leaving a 3–5 mm space between the urethra and the mesh. In both SPARC and MONARC patients, the vaginal incision was closed with interrupted sutures of resorbable thread. A urinary catheter was inserted in the bladder and was removed the day following surgery, and PVR was measured before the patient was discharged from the hospital. In case of voiding difficulties, hospitalization was prolonged until a PVR of less than 100 mL was obtained.

Patients were classified as having postoperative voiding difficulties if they were experiencing hesitancy in voiding, weak stream, or discontinuous flow and/or residual urine of more than 100 mL.

Postoperative urinary tract infection was assessed at the 1-week postoperative follow-up visit. Urinary tract infection was defined as having bacteriuria ($> 10^5$ colony-forming units/mL of urine) or a white blood cell count of 75 per high-power field in the urine analysis. None of the subjects involved in this study had infections before their operations. Statistical analysis was performed using Student’s *t* test for parametric and non-parametric continuous variables, and Wilcoxon signed rank test or McNemar test for categorical variables. A *p* value of less than 0.05 was considered statistically significant.

Results

Of the 35 patients who underwent the SPARC procedure, three patients were excluded because of loss to follow-up; of the 80 patients who underwent the MONARC procedure, six patients were excluded because of loss to follow-up. There were no significant differences between the groups with respect to age, parity, body mass index, concomitant reconstructive procedure, and ratio of intrinsic sphincter deficiency (Table 1). The SPARC patients had significantly longer operation times and length of hospital stay. There were no statistically significant differences between the two groups in terms of perioperative and postoperative complications (Table 2), except for *de novo* urgency or frequency, which was more common in the SPARC group (25% vs. 2.7%; $p=0.001$). The “obstructive” effects decreased to 12.5% at the 3-month follow-up visit and the last telephone interview found that only 9.7% of the SPARC patients still exhibited

symptoms. A total of 8.1% of the MONARC patients had *de novo* urgency at the 3- to 4-month follow-up visit; however, at the last telephone interview, only 1.4% still showed symptoms. There were trends towards fewer symptoms of voiding difficulty after the MONARC procedure at the 3-month visit (20.3% vs. 31.3%; $p=0.222$) and at the last telephone interview (1.4% vs. 9.4%; $p=0.081$). Postoperative urinary tract infection was more common in the MONARC group (23.0% vs. 6.3%; $p=0.053$). No bladder perforations, hemorrhages or vaginal erosions were apparent in either group. The preoperative and postoperative uroflowmetry evaluation for the MONARC and SPARC groups did not reveal any statistically significant differences (Table 3).

Table 4 demonstrates the objective and subjective surgical outcomes of the two groups; the majority of patients were cured. Objective cure rates were compared at 3–6 months postoperatively and were not significantly different between the groups (MONARC

Table 1. Characteristics of female patients undergoing the suprapubic arc sling (SPARC) versus the transobturator suburethral tape (MONARC) procedures in stress urinary incontinence treatment*

Characteristics	MONARC ($n=74$)	SPARC ($n=32$)	p^{\dagger}
Age (yr)	54.1 \pm 11.7	57.9 \pm 11.3	0.117
Parity	3.5 \pm 1.2	3.9 \pm 1.5	0.141
Menopause status	38.0 (51.4)	21.0 (66)	0.174
Body mass index (kg/m ²)	25.5 \pm 3.7	25.0 \pm 3.1	0.483
Concomitant reconstructive procedure [‡]	52.0 (70.3)	24.0 (75)	0.162
Intrinsic sphincter deficiency [§]	17.0 (23)	5.0 (15.6)	0.414
Mean operative time (min)	93.1	128.6	0.000
Anti-incontinence operation alone (min)	28.2 \pm 19.6 ($n=14$)	25.0 \pm 21.2 ($n=2$)	0.872
With concomitant operation (min)	74.2 \pm 30.8	100.40 \pm 27.3	0.000
Length of hospital stay (d)	4.3 \pm 1.5	5.0 \pm 1.3	0.012
Length of follow-up (mo)	13.1 \pm 4.5	23.9 \pm 2.2	0.000

*Data are presented as mean \pm standard deviation or n (%); [†] p value using Chi-square test or Fisher's exact test; [‡]vaginal total hysterectomy, vaginal anterior repair, vaginal posterior repair, enterocele repair, sacrospinous ligament fixation, uterine suspension; [§]maximal urethral closure pressure of less than 30 cmH₂O.

Table 2. Effect of the suprapubic arc sling (SPARC) versus the transobturator suburethral tape (MONARC) procedures on the operative and postoperative complications in stress urinary incontinence treatment of female patients*

Complication	MONARC ($n=74$)	SPARC ($n=32$)	p^{\dagger}
Bladder perforation	0 (0)	0 (0)	–
Hemorrhage or hematoma	0 (0)	0 (0)	–
Postoperative urinary retention (residual urine, > 100 mL)	6 (8.1)	3 (9.4)	1.000
Voiding difficulty (OPD F/U at 3–6 months)	15 (20.3)	10 (31.3)	0.222
Voiding difficulty (telephone interview)	1 (1.4)	3 (9.4)	0.081
Fever (temperature, > 38°C)	0 (0)	1 (3.1)	0.302
Urinary infection	17 (23)	2 (6.3)	0.053
<i>De novo</i> urgency/frequency	2 (2.7)	8 (25.0)	0.001
<i>De novo</i> urgency/frequency (OPD F/U)	6 (8.1)	4 (12.5)	0.485
<i>De novo</i> urgency/frequency (telephone interview)	1 (1.4)	3 (9.7)	0.081
Vaginal or urethral erosion	0 (0)	0 (0)	–

*Data are presented as n (%); [†]Chi-squared test or Fisher's exact test. OPD F/U = outpatient department follow-up.

Table 3. Effect of the suprapubic arc sling (SPARC) versus the transobturator suburethral tape (MONARC) procedures on preoperative and postoperative uroflowmetry in stress urinary incontinence treatment of female patients*

	MONARC (n = 74)	SPARC (n = 32)	p [†]
Preoperative			
Qmax (mL/s)	19.4 ± 9.7	20.9 ± 11.1	0.523
Qave (mL/s)	10.3 ± 5.4	9.4 ± 4.7	0.399
Postoperative			
Qmax (mL/s)	19.7 ± 8.6	20.4 ± 9.9	0.729
Qave (mL/s)	11.4 ± 13.8	9.6 ± 9.6	0.475
Post-void residual urine	40.6 ± 84.5	29.4 ± 54.5	0.495

*Data are presented as mean ± standard deviation; [†]Chi-squared test or Fisher's exact test. Qmax = maximum urinary flow rate; Qave = average urinary flow rate.

Table 4. Effect of the suprapubic arc sling (SPARC) versus the transobturator suburethral tape (MONARC) procedures on the objective and subjective surgical outcomes in stress urinary incontinence treatment of female patients*

	MONARC (n = 74)	SPARC (n = 32)	p [†]
Objective			
Cured	58 (80.60)	29 (90.60)	0.258
Subjective			
Cured	72 (97.30)	24 (77.40)	<0.05
Improved	1 (1.35)	7 (22.60)	
Failed	1 (1.35)	0 (0)	

*Data are presented as n (%); [†]Chi-squared test or Fisher's exact test.

80.6% vs. SPARC 90.6%; $p=0.258$). There were differences, however, in the subjective outcomes evaluated at the time of the last postoperative telephone interview (both after more than 1 year of follow-up), with the MONARC group having a significantly higher subjective cure rate (97.3% vs. 77.4%; $p<0.05$).

Discussion

The introduction of the retropubic suburethral sling has made a significant impact on the surgical treatments available for the management of SUI as compared with the traditional colposuspension [12]. These tension-free slings have equal efficacy in treating SUI, but the MONARC involves a shorter operating time and lower morbidity rate [13].

Cure rates of 85% have been reported using strict objective and subjective outcome measures, with another 5–10% of patients showing significant improvement [14]. A preliminary analysis of 7-year follow-up results showed a cure rate of 81% [15].

New surgical techniques for SUI also aim to reduce the potential obstructive effects without adversely affecting cure rates. Most researchers found that different techniques were equally efficacious, but fewer postoperative voiding difficulties were noted using the

transobturator route [7,9,16,17]. Our study demonstrated that the SPARC group had a higher objective cure rate than the MONARC group (90.6% vs. 80.6%) at the 3- to 4-month postoperative evaluations, but the difference was not statistically significant ($p=0.258$). When evaluating subjective cure rates at more than 1 year after the operations using telephone interviews, the MONARC group had higher subjective cure rate (97.3% vs. 77.4%) and satisfaction rate (97.3% vs. 77.4%) than the SPARC group. The higher postoperative urinary retention rate and *de novo* urgency rate of SPARC might be related to the differences described above, although the results did not reach a significant level.

A study by Ansquer et al [7] compared the retropubic and the obturator approaches. The patients in the retropubic group had significantly more postoperative voiding difficulties than the obturator group (40% vs. 8%). The results of the study by deTayrac et al [9] confirmed this, showing a postoperative urinary retention rate of 25.8% in the TVT group and 13.3% in the MONARC group ($p>0.05$). Additionally, in the study by Davila et al [18] on the MONARC procedure, they identified urinary retention in just 0.9% of the patients at 26 weeks after surgery. In our study, no significant difference in postoperative immediate urinary retention was found at the 3- to 4-month evaluation (MONARC 8.1% vs. SPARC 9.4%; $p=1.000$).

In the study by Wang et al [16], the SPARC group had more incidences of postoperative frequency and urgency than the MONARC group (10.3% vs. 9.7%; $p = 0.706$); this difference, however, was not statistically significant.

deTayrac et al [9] reported no difference in the incidence of *de novo* urgency between the MONARC (6.7%) and TVT (6.6%) groups. Similar results were obtained by Ansquer et al [7] (retropubic 4% vs. MONARC 4%). In our current study, however, postoperative immediate *de novo* urgency was significantly higher in the SPARC group compared with the MONARC group (25% vs. 2.7%; $p = 0.001$). The “obstructive” effects from tissue reactions seem to diminish over time; at the 1-year follow-up evaluations, rates were reduced to 9.7% in the SPARC group and 1.4% in the MONARC group ($p = 0.081$). There were no bladder, vascular or bowel injuries noted in either the MONARC group or SPARC group in our current study.

In this study, the mean operative time was longer with the SPARC procedure (100.4 vs. 74.2 minutes; $p = 0.00$), possibly owing to the need for a cystoscopy in the SPARC procedure. Moreover, the length of hospital stay was also longer in the SPARC group; it may be partly because of the higher incidence rates of urinary retention and *de novo* urgency found in this group.

The fact that patients involved in this study were not randomized may be potentially limiting; it is, however, still interesting to compare the efficacy and rate of complications between the two groups.

In conclusion, both MONARC and SPARC procedures are effective and safe surgical procedures for the treatment of female SUI. However, patients in the MONARC group showed higher subjective cure and satisfaction rates and less postoperative *de novo* urgency than those in the SPARC group at more than 1 year of follow-up. Cystoscopy is not required in the MONARC technique, which is easier to perform. In addition, bladder and vascular injuries can be avoided, because the treatment does not enter the retropubic space. The MONARC approach could be considered as a preferred choice given its low morbidity rate and high patient satisfaction.

References

- Ulmsten U, Petros P. Intravaginal slingplasty (IVS): an ambulatory surgical procedure for treatment of female urinary incontinence. *Scand J Urol Nephrol* 1995;29:75–82.
- Nilsson CG, Kuuva N, Falconer C, Rezapour M, Ulmsten U. Long-term results of the tension-free vaginal tape (TVT) procedure for surgical treatment of female stress urinary incontinence. *Int Urogynecol J Pelvic Floor Dysfunct* 2001;12(Suppl 2):S5–8.
- Tseng LH, Wang AC, Lin YH, Li SJ, Ko YJ. Randomized comparison of the suprapubic arc sling procedure vs tension-free vaginal taping for stress incontinent women. *Int Urogynecol J Pelvic Floor Dysfunct* 2005;16:230–5.
- Wang AC. The techniques of trocar insertion and intraoperative urethrocystoscopy in tension-free vaginal taping: an experience of 600 cases. *Acta Obstet Gynecol Scand* 2004;83:293–8.
- Zilbert AW, Farrell SA. External iliac artery laceration during tension-free vaginal tape procedure. *Int Urogynecol J Pelvic Floor Dysfunct* 2001;12:141–3.
- Delorme E. Transobturator urethral suspension: mini-invasive procedure in the treatment of stress urinary incontinence in women. *Prog Urol* 2001;11:1306–13. [In French]
- Ansquer Y, Marcollet A, Yazbeck C, et al. The suburethral sling for female stress urinary incontinence: a retropubic or obturator approach? *J Am Assoc Gynecol Laparosc* 2004;11:353–8.
- de Leval J. Novel surgical technique for the treatment of female stress urinary incontinence: transobturator vaginal tape inside-out. *Eur Urol* 2003;44:724–30.
- deTayrac R, Deffieux X, Droupy S, Chauveaud-Lambling A, Calvanèse-Benamour L, Fernandez H. A prospective randomized trial comparing tension-free vaginal tape and transobturator suburethral tape for surgical treatment of stress urinary incontinence. *Am J Obstet Gynecol* 2004;190:602–8.
- Deval B, Levardon M, Samain E, et al. A French multicenter clinical trial of SPARC for stress urinary incontinence. *Eur Urol* 2003;44:254–9.
- Dargent D, Bretones S, George P, Mellier G. Insertion of a sub-urethral sling through the obturating membrane for treatment of female urinary incontinence. *Gynecol Obstet Fertil* 2002;30:576–82. [In French]
- Ulmsten U, Falconer C, Johnson P, Jomaa M, Lannér L, Nilsson CG, Olsson I. A multicenter study of tension-free vaginal tape (TVT) for surgical treatment of stress urinary incontinence. *Int Urogynecol J Pelvic Floor Dysfunct* 1998;9:210–3.
- Ward K, Hilton P. Prospective multicentre randomised trial of tension-free vaginal tape and colposuspension as primary treatment for stress incontinence. *BMJ* 2002;325:789–90.
- Nilsson CG. Latest advances in TVT tension-free support for urinary incontinence. *Surg Tech Int* 2004;12:171–6.
- Nilsson CG, Falconer C, Rezapour M. Seven-year follow-up of the tension-free vaginal tape procedure for treatment of urinary incontinence. *Obstet Gynecol* 2004;104:1259–62.
- Wang AC, Lin YH, Tseng LH, Chih SY, Lee CJ. Prospective randomized comparison of transobturator suburethral sling (Monarc) vs suprapubic arc (Sparc) sling procedures for female urodynamic stress incontinence. *Int Urogynecol J Pelvic Floor Dysfunct* 2006;17:439–43.
- Dietz HP, Foote AJ, Mak HL, Wilson PD. TVT and Sparc suburethral slings: a case-control series. *Int Urogynecol J Pelvic Floor Dysfunct* 2004;15:129–31.
- Davila GW, Johnson JD, Serels S. Multicenter experience with the Monarc transobturator sling system to treat stress urinary incontinence. *Int Urogynecol J Pelvic Floor Dysfunct* 2006;17:460–5.