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Efficacy of Sling Procedures for Treatment of Female Stress Urinary Incontinence

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ABSTRACT 5

The aim of this study was to determine the efficacy and surgical outcome of the sling procedures in stress incontinent women in comparison to conventional anterior colporrhaphy. Total of 56 patients with stress urinary incontinence (SUI) were treated with sling procedure between November 2011 and March 2013, 39/56 (69.6%) with suprapubic arc (SPARC) and 17/56 (30.4%) with MiniArc method. During the same period total of 49 patients with SUI were treated with traditional anterior colporrhaphy according to Bagović method as the control group. All patients were prospectively clinically assessed over a period of 3, 6 and 12 months after surgery. The objective cure rate after the follow-up was 92.9% (52/56) in observed group of patients and 79.6% (39/49) in control group and improvement was occurred in rest of 5.4% (3/56) and 18.4% (9/49), respectively ($p < 0.05$). The overall complications rate was significantly lower in the observed group of patients than in the control group, 12.5% (7/56) vs. 28.6% (14/49), ($p < 0.05$). In the sling group was postoperatively noticed slightly higher rate of urinary incontinence, but in the colporrhaphy group was emphasized rate of urinary retention. Only one from the each group of patients failed the surgical procedure and required additional correction for SUI. The mean operating time for SPARC and MiniArc procedure was 19 ± 7 and 9 ± 5 minutes, respectively ($p < 0.0001$). Mean duration of hospitalization was significantly shorter in the sling group of patients (2.6 ± 1.0 , range 2–7) days than in the control group of (9.6 ± 1.8 , range 6–18), ($p < 0.001 < 0.0001$). According to presented results, sling is a highly effective method in patients with SUI with low incidence of perioperative complications, promising long-term results and high patient's satisfaction.

Key words: stress urinary incontinence, females, sling, treatment, efficacy

Introduction

According to International Continence Society (ICS) definition, Stress urinary incontinence (SUI) is involuntary discharge of urine caused by the congenital or acquired defect of pelvic organs static with loss of vesicourethral anatomic support¹. Stress urinary incontinence is clinically recognized as urethral hypermobility and intrinsic sphincter deficiency (ISSD). Hypermobility indicates a significant change in position of the urethra and bladder neck during the act of micturition. It is caused by insufficient support of the bladder and urethrovesical junction due to rupture of the pubocervical fascia. ISSD is a condition in which the urethral sphincter is unable to

achieve sufficient tone which could overcome the intravesical pressure, especially during the filling of the bladder. It is caused by insufficient closure mechanism of the urethra^{2–4}. The diagnosis of stress urinary incontinence can be set by the history, because patients referred incontinence on some physical activity, e.g. sneezing, coughing, running load lifting etc., which significantly reduces their quality of life and ability to work⁵.

Many studies have shown an increased prevalence of urinary incontinence with advancing age. Urinary incontinence is estimated to affect up to 35% of adult women and up to 50% of elderly women leading to deterioration

in quality of life of those affected⁶. The severity of urinary incontinence also increases with age. This may be explained by the interplay of multiple factors during the aging process, including increasing medical comorbidities, medications use, impaired mobility and menopause. Low estrogen production after menopause results in atrophy of the urethral epithelium with subsequent atrophic urethritis and cystitis that can predispose to the development urinary incontinence. Increasing number of vaginal deliveries and higher birth weight of newborns are important risk factors for obstetrical pelvic floor injuries connected to pelvic organ prolapse and urinary incontinence. Obesity is risk factor for urinary incontinence, and higher Body Mass Index (BMI) is associated with an increased severity of urinary incontinence^{5,7}.

Urinary incontinence is an important public health problem with great impact on physical and mental health of women. Treatment success depends on a diagnostic procedure and a properly chosen therapy method. The treatment of urinary incontinence can be performed by surgical and conservative methods. Currently, there are more than one hundred surgical methods to treat stress urinary incontinence, which indicating that there are differences in the understanding of its etiopathogenesis and in the principles of surgical treatment for those patients. Such a large number of proposed procedures, which are performed in daily routine and the results of which are often difficult to compare and are differently presented, obviously prove that there are differences in their efficacy^{5,8,9}. A current trend in surgical therapy for stress urinary incontinence is the application of simple, effective and safe laparoscopic surgery and sling methods (SPARC, MiniArc)^{10,11}.

Stress urinary incontinence is a prevalent problem for which surgical treatment with a vaginal sling provides an effective solution with low complication rates¹². These methods significantly reduce hospitalization and therapy expenses, with earlier restoration of working ability. Local tissue impairment and intervention is minimal which decreases postoperative complications and provides for restoration of the normal function⁷.

Over the past decade there have been several advancements for the treatment of stress urinary incontinence in females¹³. The treatment of stress urinary incontinence has been revolutionized by the introduction of the tension-free vaginal tape (TVT)^{12,14,15}. Since then, many new slings with several modifications of the technique have seen the light and are currently used in clinical practice. The midurethral tension-free vaginal tape sling has emerged as the gold standard to treat female stress urinary incontinence. The transobturator approach was then developed to reduce risks of retropubic needle passage. After the introduction of transobturator route, the new trend now seems to be the mini-sling which uses a single incision approach. Validation of these rapidly evolving techniques is an absolute necessity^{12,16,17}.

The retropubic (TVT) and transobturator (TOT) minimally invasive slings are effective and relatively safe with cure rates of between 80 and 90%. However, there

are inherent risks associated with the external needle passes through the abdomen or the groin⁶. The suprapubic arc (SPARC) polypropylene midurethral tape is considered as one of the best surgical treatment methods for women with stress urinary incontinence. The reported success rate of the pubovaginal sling procedures using various materials fluctuated impressively from 80–95%. Until recently, the procedure has been reserved for patients who previously failed other surgical treatments, but nowadays the indications are extended and the treatment is widely applied in all types of stress urinary incontinence¹⁸.

Obesity is considered not only a risk factor for stress urinary incontinence, but there is also a concern about a higher failure rate for SUI procedures¹⁹. Most recently, the mini-sling has been developed in attempts to place the sling without any needle passages through the abdomen or groin¹⁴. The concept of mini-slings was to eliminate foreign material, easing the procedure to be carried out under local anesthesia with achieving the same efficacy as previous generations of tension free vaginal tapes. The single incision MiniArc sling is a novel even less invasive, easier to handle and more swiftly sling procedure⁹. MiniArc procedure was developed to limit the number of incisions and reduce the risks of blind needle passes through the groin or abdomen, while mimicking the position and results of the TOT sling. Over recent years their use has been increasing worldwide as numerous observational cohort studies have shown minimal complications, quick recovery and 1-year efficacy within the range 85–94%^{6,12,14,16}.

The sling operation using polypropylene tape in patients with stress urinary incontinence is a minimally invasive method with a rare postoperative complications and shorter hospitalization compared with conventional surgery. The sling method allows a successful anatomical and functional reconstruction of the anterior vaginal wall defects and significantly improves the quality of life^{11,15,18}. We have done a prospective study to assess objective and subjective outcome of a minimal invasive sling procedures in treatment of female stress urinary incontinence compared with the established conservative surgery.

Patients and Methods

This prospective study included a total number of 105 patients surgically treated for stress urinary incontinence. In the period between September 2011 and March 2013 a total of 56 patients with SUI were treated with sling procedure, 39/56 (69.6%) with suprapubic arc (SPARC) and 17/56 (30.4%) with MiniArc method. During the same period a total of 49 patients with SUI were treated with traditional anterior colporrhaphy as the control group.

All of patients were preoperatively assessed by physical examination and urodynamic study. Defects of the anterior vaginal wall was estimated according to the Pelvic Organ Prolapse Quantification (POP-Q) system and all

types of other vaginal support defects such as cystocele, rectocele or uterine prolapse were excluded from the study²⁰. All patients filled in two customized questionnaires, Pelvic Floor Distress Inventory (PFDI-20) and Pelvic Floor Impact Questionnaire (PFIQ-7) which includes questions about the quality of life until the past 3 months before operation^{21,22}.

The collection of clinical data and the responses from the questionnaires prospectively continued 3, 6 and 12 months after surgery, and also recorded any perioperative or later complications. Patients were followed for persistent urinary leakage, urgency and retention. Statistical analysis was performed. Clinical success was defined as complete resolution of stress urinary incontinence requiring no further treatment.

Surgical methods

SPARC procedure (American Medical Systems, Minnetonka, MN, USA) was performed positioning the polypropylene tape under the midurethra into the subcutaneous tunnel which passes at the posterior wall of the symphysis through the endopelvic fascia without fixation. Following intraoperative cystoscopy after intravesical instillation of 250 mL 0.9% saline solution has done to check for potential bladder injury. During the bladder was full, the optimal tension of the tape was achieved by the slightly simultaneous traction with scissors placed between tape and midurethra to avoid postoperative retention. Finally, continence was checked by the patients coughing or abdominal wall compression above the symphysis, depending of patient's compliance and type of the anesthesia. Tension was considered sufficient if no significant urine leaking obtained during the provocation test^{11,18}. A Foley catheter routinely stayed inserted in the bladder until a day after surgery.

MiniArc sling (American Medical Systems, Minnetonka, MN, USA) was performed as original procedure placing the short polypropylene tension-free tape under the midurethra through the small suburethral vaginal incision and bilateral fixation into the internal obturator muscle following minimal periurethral dissection. The vaginal epithelium was dissected off the underlying suburethral tissues out to the pelvic sidewall, adjacent to the posterior surface of the ischiopubic ramus. The tunnel that is created should be only large enough to ensure the tape lies flat under the urethra. The sling/needle assembly is then placed into the dissected tunnel and directed towards the obturator space into the obturator internus muscle. The needle is then easily removed by simply sliding it back out of the fixating tip. The needle is then placed into the other self-fixating tip, and the sling is introduced into the contralateral side. The needle is slowly advanced into the obturator internus muscle until a tension-free adjustment is completed under the midurethra. The vaginal epithelium is then closed with absorbable sutures^{11,23}. A Foley catheter routinely stayed inserted in the bladder until a day after surgery.

Conventional anterior colporrhaphy was performed according to Bagović method of the urethral plication.

The patient initially was placed in a high-dorsal lithotomic position with the perineum at the end of the operating table for surgical exposure. The bladder was emptied and a weighted speculum was inserted into the vagina. After the sagittal incision of anterior vaginal wall the vaginal mucosa was grasped at its cranial border with two clamps. The mucosa was freed laterally from its underlying adherent fascia. A series of vertical mattress sutures were placed in the mobilized paraurethral and paravesical fascia to reduce the cystourethrocele and elevate the posterior urethra to a high-retropubic position. The suburethral placement of nonabsorbable X-suture to achieve bladder neck elevation and functional urethral elongation was the leading moment for correction SUI. The redundant mucosa was excised and the edges were reapproximated and excision margins were closed with absorbable sutures. A Foley catheter was often inserted at the end of the surgery to prevent bladder overdilatation and routinely removed on sixth day after surgery^{5,24}.

All procedures were completed under general or regional/local anesthesia as determined by the surgeon and anesthesiologist.

Outcome evaluation

The incidence of perioperative and later postoperative complications such as urinary retention, urgency, incontinence and infection were observed, as well as the other milder difficulties like transitory pain. Urinary retention was identified as residual urine >50 mL after spontaneous micturition. Urgency and incontinence was considered if persisted >4 weeks after the operation. Urinary infection was recognized by the clinical signs and verified by the microbiological urine analysis. Operating time and hospitalization period were also noticed in both groups of patients.

Objective operation outcome was evaluated from the patient's symptoms, urogynecologic inspection and urodynamic estimation at postoperative check-up controls. Subjective patient's satisfaction was assessed by the customized questionnaires regarding the general health condition, eventual consequent difficulties and postoperative improvement of quality of life including sexual activities. Surgical outcome was defined as completely cured, partial improved and failed. Completely cured patients had no any lower urinary system symptoms, partial improved were patients with very mild urinary voiding difficulties and surgery failed in patients with moderate to severe postoperative SUI.

Statistics

Statistical analysis included χ^2 -test and Student's t-test. Probabilities lower than 5% ($p < 0.05$) were recognized statistically significant. Statistics was performed with Statistical Package for Social Sciences, version 13.0 (SPSS Inc., Chicago, IL, USA) and Microsoft Excel, version 11.0 (Microsoft Corporation, Redmond, WA, USA).

Results

The study included a total of 105 patients with SUI, 56/105 (53.3%) treated by the sling method and 49/56 (46.7%) treated by the conventional surgery. There was no significant difference in the mean age (54.6 ± 11.6 vs. 58.8 ± 12.7) and parity (2.1 ± 0.9 vs. 2.1 ± 0.8) between the sling operation patients and traditional anterior colporrhaphy group (Tables 1–3).

TABLE 1
AGE AND PARITY MEAN VALUES

| | Age | | Parity | |
|------------------|-----------------|-----------------|---------------|---------------|
| | Sling | Colporrhaphy | Sling | Colporrhaphy |
| $\bar{X} \pm SD$ | 54.6 ± 11.6 | 58.8 ± 12.7 | 2.1 ± 0.9 | 2.1 ± 0.8 |
| Range | 24–82 | 30–81 | 0–5 | 0–4 |

TABLE 2
AGE DISTRIBUTION OF THE PATIENTS

| Age | Sling (N) | % | Colporrhaphy (N) | % |
|-------|-----------|-------|------------------|-------|
| <45 | 12 | 21.4 | 8 | 16.3 |
| 46–55 | 17 | 30.4 | 9 | 18.4 |
| 56–65 | 18 | 32.1 | 17 | 34.7 |
| >65 | 9 | 16.1 | 15 | 30.6 |
| Total | 56 | 100.0 | 49 | 100.0 |

$\chi^2=4.34$, $p=0.227$, t -test=1.77, $p=0.080$

TABLE 3
PARITY DISTRIBUTION OF THE PATIENTS

| Parity | Sling (N) | % | Colporrhaphy (N) | % |
|--------|-----------|-------|------------------|-------|
| 1 | 13 | 23.2 | 10 | 20.4 |
| 2 | 33 | 58.9 | 28 | 57.1 |
| >3 | 10 | 17.9 | 11 | 22.4 |
| Total | 56 | 100.0 | 49 | 100.0 |

$\chi^2=0.38$, $p=0.825$, t -test=0.35, $p=0.731$

In the sling group of patients, there was a slightly higher proportion of childbearing and perimenopausal women, 29/56 (51.8%) vs. 17/49 (34.7%), in the colporrhaphy group, but not significantly ($\chi^2=3.10$, $p=n.s.$, Table 4).

Of the total 56 patients in the sling group, SPARC procedure was performed in 39 (69.6%) patients and MiniArc procedure in the rest of 17 (30.4%) patients. The mean operating time for SPARC and MiniArc procedure was 19 ± 7 and 9 ± 5 minutes, respectively ($p<0.0001$). In all 49 patients of the control group were performed conventional anterior colporrhaphy according to Bagović method. Mean duration of hospitalization was 2.6 ± 1.0 (range 2–7) days in the observed group and 9.6 ± 1.8 (range 6–18) days in the control group of patients ($\chi^2=82.66$, $p<0.001$, t -test=25.30, $p<0.0001$, Table 5).

In 29/56 (51.6%) patients of the observed group sling procedure was the first operation, as well as colporrhaphy in 28/49 (57.1%) patients of the control group. The remaining 27 (48.4%) patients in the observed group and 21 (42.9%) in the control group had undergone the abdomino-pelvic operation previously ($\chi^2=0.03$, $p=n.s.$, Table 6).

A total of 42 previous operations were done in the sling group of patients and 26 in the control group. In the sling group of patients there was a slightly higher proportion of previous vaginal hysterectomy 5/56 (8.9%), anterior colporrhaphy 5/56 (8.9%), cervical conisation or amputation 4/56 (7.1%) and sling 4 (7.1%) or mesh 7/56 (12.5%) procedure than in the control group, but not significant ($\chi^2=3.95$, $p=n.s.$, Table 7).

The overall complications rate after the follow-up was 12.5% (7/56) in observed group of patients and 28.6% (14/49) in control group ($\chi^2=4.22$, $p<0.05$). In one patient from colporrhaphy group was occurred persistent perioperative hemorrhage which required surgical revision 3 hours after the operation. In the sling group was postoperatively noticed slightly higher rate of urinary incontinence, but in the colporrhaphy group was emphasized rate of urinary retention. All of those patients managed conservatively, without voiding difficulties on con-

TABLE 4
HORMONAL STATE DISTRIBUTION OF THE PATIENTS

| Hormonal state | Sling (N) | % | Colporrhaphy (N) | % |
|----------------|-----------|-------|------------------|-------|
| Generative age | 12 | 21.4 | 8 | 16.3 |
| Perimenopause | 17 | 30.4 | 9 | 18.4 |
| Postmenopause | 27 | 48.2 | 32 | 65.3 |
| Total | 56 | 100.0 | 49 | 100.0 |

$\chi^2=3.10$, $p=0.078$

TABLE 5
DURATION OF THE HOSPITALIZATION

| Hospitalization days | Sling (N) | % | Colporrhaphy (N) | % |
|----------------------|-----------|-------|------------------|-------|
| <7 | 55 | 98.2 | 5 | 10.2 |
| >7 | 1 | 1.8 | 44 | 89.8 |
| Total | 56 | 100.0 | 49 | 100.0 |

$\chi^2=82.66$, $p<0.001$, t -test=25.30, $p<0.0001$

TABLE 6
FREQUENCY OF THE PREVIOUS SURGERY

| Previous surgery | Sling (N) | % | Colporrhaphy (N) | % |
|------------------|-----------|------|------------------|------|
| 1 | 19 | 33.9 | 18 | 36.7 |
| 2 | 4 | 7.1 | 2 | 4.1 |
| >3 | 4 | 7.1 | 1 | 2.0 |

$\chi^2=1.33$, $p=0.515$

TABLE 7
PREVIOUS SURGERY

| Previous surgery | Sling (N) | % | Colporrhaphy (N) | % |
|--------------------------------|-----------|------|------------------|------|
| Abdominal hysterectomy | 6 | 10.7 | 6 | 12.2 |
| Adnexectomy/Salpingectomy | 3 | 5.4 | 5 | 10.2 |
| Vaginal hysterectomy | 5 | 8.9 | 2 | 4.1 |
| Anterior colporrhaphy | 5 | 8.9 | 2 | 4.1 |
| Cervical conisation/amputation | 4 | 7.1 | 2 | 4.1 |
| Sling | 4 | 7.1 | – | – |
| Mesh | 7 | 12.5 | – | – |
| Appendectomy | 2 | 3.6 | 4 | 8.2 |
| Other | 6 | 10.7 | 5 | 10.2 |

 $\chi^2=3.95$, $p=0.413$ **TABLE 8**
INCIDENCE OF COMPLICATIONS

| Complications | Sling (N) | % | Colporrhaphy (N) | % |
|-------------------|-----------|-----|------------------|------|
| Retention | 2 | 3.6 | 6 | 12.2 |
| Urgency | 1 | 1.8 | 2 | 4.1 |
| Incontinence | 4 | 7.1 | 2 | 4.1 |
| Hemorrhage | – | – | 1 | 2.0 |
| Urinary infection | – | – | 3 | 6.1 |

 $\chi^2=4.22$, $p=0.040$

trol visits. There was no significant difference in the overall complications rate in the both groups of patients between those ones with and without previous surgery (Table 8).

The objective cure rate after the follow-up was 92.9% (52/56) in observed group of patients and 79.6% (39/49) in control group and improvement was occurred in rest of 5.4% (3/56) and 18.4% (9/49), respectively ($\chi^2=3.98$, $p<0.05$). Only one from the each group of patients failed the surgical procedure and required additional correction for SUI (Table 9).

No major intraoperative or seriously immediate post-operative complications were observed in the sling group of patients and no bladder injury was occurred during routine post-op cystoscopy. No vascular damage or significant bleeding was noticed in this group of patients and

there was no alteration between preoperative and post-operative red blood cell count. After removal of Foley catheter 54/56 (96.4%) patients of the sling group could void volitionally with no residual urine. None of those patients required releasing of sling tension because of urinary retention and no permanent voiding difficulties or strain to void noticed on routine check-up controls. Other milder complications like transitory episodes of pain, urinary urgency, polakisuria and nocturia were infrequent and not statistically significant.

Discussion and Conclusion

Minimally invasive operations for SUI are nowadays most desirable and justified methods, not only for medical reasons but also for social and economic reasons. Those procedures are quick, low risk and minimally invasive operations in which the genital organs are not extirpated. This means that the patient's body integrity is preserved, which is exceptionally important not only for medical and psychological reasons but for reproductive and sex life reasons as well^{10,12}.

Regional/local anesthesia considerably reduces the risk of anesthesiologic complications, including fatality. In addition, the ability to communicate with the patient during the operation leads to maximal cooperation in each phase of the operation, especially during the traction of the polypropylene tape when the patients can contract the abdominal wall themselves (by coughing instead of Valsalva maneuver), enabling the surgeon to check the effect of the correction. It is obvious that regional/local anesthesia requires careful selection of physiological well-prepared patients for the sling procedures^{15,25}.

Quick mobilization of the patient along with spontaneous voiding without prolonged catheterization and prophylactic antibiotics decreases the risk of postoperative complications (thromboembolic disease, urinary infection). The short hospital stay, faster rehabilitation and short sick-leave obviously represent a number of advantages, social, medical and economic. Relatively high cost price of polypropylene tape is compensated with savings

TABLE 9
SURGICAL OUTCOME

| Outcome | Sling (N) | % | Colporrhaphy (N) | % |
|----------|-----------|-------|------------------|-------|
| Cured | 52 | 92.9 | 39 | 79.6 |
| Improved | 3 | 5.4 | 9 | 18.4 |
| Failed | 1 | 1.8 | 1 | 2.0 |
| Total | 56 | 100.0 | 49 | 100.0 |

 $\chi^2=3.98$, $p=0.046$

achieved at all other levels of surgical treatment by sling operation^{6,15}.

Our study strongly confirmed these facts and objectively contributed to the knowledge of the sling procedures for SUI. All patients in our study were regularly hospitalized for minimally invasive or conventional surgery for genuine stress incontinence. Both groups of patients were approximately similar age and parity distribution with a slightly higher proportion of postmenopausal women in the control group, but not significantly. Regarding the age, parity and hormonal state as a proven risk factors of SUI it was easy to explain that structure of our patients. Relatively higher share of posmenopausal patients in the control group was associated with something more frequent choice of conventional anterior colporrhaphy in these patients, particularly those without previous surgery correction of SUI. Comparing the control group, it was obvious that the group of sling patients recorded higher number of previous vaginal surgery such as vaginal hysterectomy, anterior colporrhaphy, cervical conisation or amputation and sling or mesh procedure. Particularly those patients with previously performed sling or mesh procedure were represented here by a share of almost 20%.

Considering the recent reports on sling procedures efficacy^{6,12,14,16}, the objective cure rate after the follow-up in our study was evidently high (92.6%) and in remaining patients has been achieved satisfactory improvement. Comparing to objective cure rate in colporrhaphy group (79.6%), difference was statistically significant ($p < 0.05$). The mean operating time for SPARC and MiniArc procedure was < 20 and < 10 minutes, respectively ($p < 0.0001$), which correlates with recently published studies^{12,19}. Hospitalization period was also significantly shorter in observed group than in control group ($p < 0.001 < 0.0001$), which gives more advantage to the minimal invasive sling procedure.

Overall complications rate was significantly lower in the sling group than in colporrhaphy group ($p < 0.05$). Perioperatively was recorded 3/7 complications in the sling group and 10/14 complications in the colporrhaphy group. Higher incidence of perioperative urinary retention occurred in this group comparing to the sling group (6 vs. 2) was probably related to the duration and technical characteristics of open surgery approach. The rest of four complications in each group of patients were occurred postoperatively. In the sling group were observed four patients with incontinence from 3 to 6 months after surgery, and in the control group a total of four patients with various complications from 3 to 12 months after surgery.

According to presented results, neither perioperative bladder injury nor seriously urinary retention was occurred in our study. All cases of urinary retention managed conservatively without further voiding difficulties, usually reported by previous investigations. Vascular, bowel or nerve injury reported previously, have also not been detected. The anatomical and functional reconstruction of anterior vaginal wall was achieved in all pa-

tients. No infection, erosion or defective healing of the vaginal wall was observed. There were no alterations between preoperative and postoperative blood cell count except in one patient from colporrhaphy group with persistent perioperative hemorrhage and surgical revision.

Postoperative urgency and incontinence in both group of patients was caused by the various and different reasons, i.e. age, hormonal state, mechanic irritation, nervous and myogenic detrusor instability etc. In the sling group 3/4 patients with postoperative incontinence were previously undergone to urogynecological surgery (vaginal hysterectomy with anterior colporrhaphy, PERIGEE) which corresponding to published reports^{15,18}. One patient from the sling group had previously SPARC and MiniArc procedure and was undergone to conservative treatment by the urethral injection of dextranomer/hyaluronic acid copolymer (Urodex)²⁶. The other patient from the colporrhaphy group was successfully undergone to additional SPARC procedure. Rest of the patients was managed successfully treated with medications, i.e. muscarinic M3-selective receptor antagonist (solifenacin) and β 3-adrenergic receptor agonist (mirabegron) in accordance with current guidelines^{27–29}. Some of those patients were also additionally undergone to the extracorporeal magnetic innervation (ExMI) treatment³⁰.

Urinary infection was observed in 3/4 patients with some complications from the colporrhaphy group and no one in the sling group, which was probably related to the surgical approach, duration of surgery and a longer period of bladder catheterization. All patients successfully treated with antibiotics considering to microbiological analysis of urine.

In all sling group patients has been noticed normal vaginal healing. We observed no rejection or exposure of the sling tape and subjectively none of patients complained on later prolapse symptoms. Patient's satisfaction and the favorable surgical outcome were generally achieved including sex life improvement.

In our study the sling procedure showed significantly higher objective cure rate and lower overall rate of complications with shorter operation time and hospitalization period in comparison to conventional anterior colporrhaphy. We consider the sling procedure as highly efficacious and safe minimally invasive and body integrity preserving method with remarkably low rate of complications.

The sling procedures has objectively become the gold standard in patients with genuine or mixed SUI, in whom there is no need of an operation of the uterus or/and adnexa, as well as in patients who have previously undergone unsuccessful SUI correction, including a possible previous sling operation. In patients with SUI, especially without preceding vaginal operations, sling methods promising successful long-term results and high patient satisfaction.

Our experience strongly supports initial favorable impressions of recent published studies, so we intend to evaluate wider aspects and perspectives of this proce-

dure. Moreover, we expect further results of this study to properly confirm the specific impact of the sling opera-

tion on the quality of life in patients with SUI compared with patients operated by conventional surgery.

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UČINKOVITOST SLING POSTUPAKA U LIJEČENJU ŽENA SA STATIČKOM INKONTINENCIJOM URINA

SAŽETAK

Cilj ovog istraživanja bilo je utvrditi učinkovitost i operacijski ishod sling postupaka u žena sa statičkom inkontinencijom urina (SIU) u poredbi sa konvencionalnom prednjom kolporafijom. U razdoblju od studenog 2011. do ožujka 2013. sling postupcima liječeno je ukupno 56 bolesnica sa SIU, 39/56 (69,6%) metodom SPARC i 17/56 (30,4%) metodom MiniArc. Tijekom istog razdoblja ukupno je 49 bolesnica sa SIU operirano primjenom klasične prednje kolporafije metodom po Bagoviću kao poredbena skupina. Sve bolesnice prospektivno su klinički nadzirane u razdoblju od 3, 6 i 12 mjesec nakon operacije. Ukupna stopa izlječenja nakon razdoblja kliničkog nadzora iznosila je 92,9% (52/56) u promatranoj skupini bolesnica i 79,6% (39/49) u poredbenoj skupini, a do poboljšanja je došlo u ostalih 5,4% (3/56) bolesnica u promatranoj i 18,4% (9/49) bolesnica u poredbenoj skupini ($p < 0,05$). Ukupna stopa komplikacija bila je značajno niža u promatranoj skupini bolesnica nego u poredbenoj skupini, 12,5% (7/56) naspram 28,6% (14/49), ($p < 0,05$). U skupini bolesnica liječenih sling metodama poslijeopreacijski je zabilježena nešto viša stopa inkontinencije, a u skupini klasično operiranih bolesnica nešto izraženija stopa urinarne retencije. Kirurško liječenje nije uspjelo u samo po jedne bolesnice iz svake skupine i bilo je potrebno učiniti dodatnu korekciju SIU. Prosječno trajanje operacije iznosilo je 19 ± 7 minuta za SPARC, a 9 ± 5 minuta za MiniArc, ($p < 0,0001$). Prosječno trajanje bolničkog liječenja bilo je značajno kraće u skupini bolesnica liječenih sling postupkom ($2,6 \pm 1,0$, raspon 2–7) dana nego u poredbenoj skupinu ($9,6 \pm 1,8$, raspon 6–18), ($p < 0,001 < 0,0001$). Slijedom prikazanih rezultata, sling metode su vrlo učinkovite u liječenju SIU sa niskom pojavnosću perioperacijskih komplikacija i obećavajućim dugoročnim rezultatima te primjerenim zadovoljstvom bolesnica.