CLINICAL STUDY

Vaginosacral colpopexy (VSC) – A new modification of the Mc Call operation using vaginosacral ligaments as autologous sliding grafts in posthysterectomy vault prolapse

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Abstract

Objectives: **The effect of a new modification of the Mc Call operation, vaginosacral colpopexy (VSC) was evaluated in the group of 32 patients.**
Background: **Due to our bad experience with transabdominal lumbosacral colpopexy, we tried to find out another solution.**
Methods: **VSC using the mobilized vaginosacral ligaments as sliding grafts (two sutures through the vaginosacral ligaments and posterior vaginal wall and the third suture through the uterosacral ligaments) for vault prolapse was performed in the group of 32 patients.**
Results: **Before operation, the median stage of prolapse was: stage III (range, 0–IV) for anterior site; stage II (range, 0–IV) for posterior site; stage I (range, 0–IV) of the apical segment, and stage III (range 0–IV) for the most severe segment of prolapse. The mean follow-up was 24.5 months (range 9–42 months). There were no intraoperative injuries of the bladder, ureter, rectum or small bowel. At the final follow-up, the mean stage of the prolapse was following: stage 0 (range, 0–III) for anterior site, posterior site and the most severe segment of prolapse; and stage 0 (range, 0–I) of the apical segment. The total vaginal length (tvl) increased significantly ($p<0.001$) (Valsalva maneuver) (Vm) and ($p<0.001$) (Pozzi maneuver) (Pm) from the preoperative mean value of 3.20±1.18 (Vm) and 2.70±0.92 (Pm) to (-8.33±0.77) (Vm) and (-7.82±0.89) (Pm). All 8 patients with genuine stress incontinence, became continent. 3 of 4 patients with potential urinary incontinence required Marshal-Marchetti operation for persistent stress incontinence.**
Conclusion: **VSC seems to be quick, safe and effective procedure for vault prolapse *(Tab. 5, Fig. 8, Ref. 31)*.**
Key words: pelvic organ prolapse, vaginal ligaments, vaginal reconstructive surgery.

Posthysterectomy vaginal vault prolapse has been treated by some form of vaginal repair, using sacrospinous colpopexy, Shull operation (1) or Mc Call culdoplasty to anchor the vault (2). Open abdominal procedures, such as transabdominal sacropexy, have generally been reserved for more complex cases and for failed procedures. Recently interest has focused on less invasive operative methods, including laparoscopic pelvic floor repair and laparoscopic sacral colpopexy (3), or a new daycare method based on the integral theory, the infracoccygeal sacropexy (4).

Because of our bad experience with transabdominal lumbosacral colpopexy using mersilene prothesis, we tried to find out other solution for posthysterectomy vault prolapse. In our series of 41 lumbosacral colpopexy we noticed 12 cases (29.27 %) of partial or complete ejection of the prothesis through the vaginal apex and consequent recurrent vault prolapse in mean time of 43 months after the operation (8 to 98 months). Therefore, in the last three years we were performing a modification of the Mc Call operation, the vaginosacral colpopexy (VSC) representing a transvaginal extraperitoneal colpopexy with the vaginosacral ligaments used as sliding autologuous grafts.

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Material and methods

1. *Eligibility criteria for participants*: presence of the posthysterectomy vault prolapse.

2. *The setting, location and timing where and when the date were collected*: Department for Urogynecology and pelvic floor disorders, University Clinic for Gynecology and Obstetrics, The Medical faculty of „Saint Cyril and Methodius" University of Skopje, Republic of Macedonia, time period from the 1st of January 2000 to the 1st of January 2003. The study was designed according to the CONSORT statement (5). The local ethics committee has approved the study. All subjects were given a study explanation and informed consent was obtained. Women who were unhappy to be randomized were excluded and they did not undergo the operation.

3. *Precise details of the interventions for the study group, how and when they were actually administered:* There was only one group, the study group, which consisted of 32 patients who underwent vaginosacral colpopexy (VSC) for posthysterectomy vault prolapse. The results of the follow-up control were used as a comparison regarding the effectiveness of this proposed modification of Mc Call operation. The postmenopausal patients (n=28) were treated with preoperative/postoperative 28-day regiment of transdermal estrogen hormone replacement therapy (HRT) using transdermal estradiol 50 g/day (FEM 7, Merck), 14 days before and 14 days after the operation.

4. How sample size was determined: Each patient with posthysterectomy vault prolapse, admitted to the Department for Urogynecology and pelvic floor disorders in the period from the 1st of January 2000 to the 1st of January 2003, was assessed for the eligibility (n=44). Four patients were excluded from the study because they refused to participate and they did not undergo any intervention. Forty patients were randomised. Six of them were excluded due to the presence of some HRT contraindications: two with the history of breast cancer, one with the history of endometrial cancer, one with the presence of biliary calculosis and two with great disturbance of haemostasis: elevated plasminogen inhibitors and decreased protein C and protein S. Two additional patients dropped out of the study because they were not able to return for a follow-up visit. Thirty two patients have completed the study.

5. *Specific objectives and hypotheses*: The aim of this study was to assess the benefits and safety of the VSC operation. The hypothesis was following: VSC operation is an easy, safe and successful method for posthysterectomy vault prolapse treatment.

6. *Clearly defined primary and secondary outcome measures, any methods used to enhance the quality of measurements:*

The preoperative evaluation

1. *Demographic data*: age, duration of the postmenopausal age, parity, habits of smoking and alcohol consuming, body mass index (BMI). 2. *Complete evaluation for urinary incontinence* included: a structured questionnaire for urinary symptoms with standardized terminology based on the International Continence Society recommendation (6); Marshall's coughing test in upright position, lithotomy and lithotomy position with artificial apex reposition after bladder filling with 300 ml of 3 % boric acid by transurethral catheter; and a complete multi-channel urodynamic examination: retrograde provocative multi-channel urethrocystometry, passive and dynamic urethral pressure profilometry, cough and Valsalva leak point pressure, simple uroflowmetry with postvoid residual urine volume.

3. *Complete evaluation for genital prolapse*: a structured questionnaire with standardized terminology and pelvic organ prolapse quantification according to the International Continence Society's Pelvic Organ Prolapse Quantification (POPQ) system (7). In our Urogynecological protocol we made some modifications of the POPQ system, because we noticed that in the presence of the posthysterectomy vault prolapse, the point C (vaginal cuff or vaginal scar) and point D were not obligatory at the same level, especially after our techniques of hysterectomies, which included obligatory fixation of the uterosacral ligaments to the posterior vaginal wall. Because of this fact, the point C and D were analyzed separately. In great part of our series, point C was in lower level than point D. The new parameters, such as: tvl (the distance between point D and vaginal introitus) and tvl1 (the distance between point C and vaginal introitus) were also included in the analysis. In all patients, pelvic examination was performed in the supine position in a birthing chair while performing the Valsalva maneuver (Vm) with maximal effort and during Pozzi maneuver (Pm), i.e. pulling down of the vaginal apex with Pozzi clamp, allowing the full development of the prolapse. The bladder was emptied by catheterization, and rectum by morning defecation.

4. On the day of admission and on the third and seventh postoperative day *some laboratory analyses* such as: haemoglobin; haematocrit; total number of leukocytes; differential leukocytes' formula, C-reactive protein as indicators of the body infection type; same parameters of the coagulation such as: prothrombin time, activated partial tromboplastin time, thrombin time and number of platelets; and body temperature (in the early morning and late afternoon), were performed.

Surgical technique. All patients received a routine perioperative antibiotic prophylaxis and sequential compression boots for deep vein thrombosis prophylaxis. Patients were placed in dorsal lithotomy position while they were under spinal anesthesia. Our VSC is similar to the Shull operation (1, 8).

Stage 1 – the vaginal apex is pulled down through the vaginal outlet by two long Kocher clamps placed on its both sides. A horizontal opening of the vaginal vault, a sharp cleavage between the anterior vaginal wall and bladder in central zone, and an anterior midline longitudinal colporrhaphy to the external urethral meathus were made. A blunt finger dissection with a single gauze thickness along the strong vaginal fascia-Halban, stuck to the vaginal epithelium, supplied a wide mobilization of the bladder and urethra backwards, together with their surrounding gentle fasiae. This step is crucial for the safety of ureter and for a successful reposition of the ptotic bladder to its normal, high position (Fig. 1).

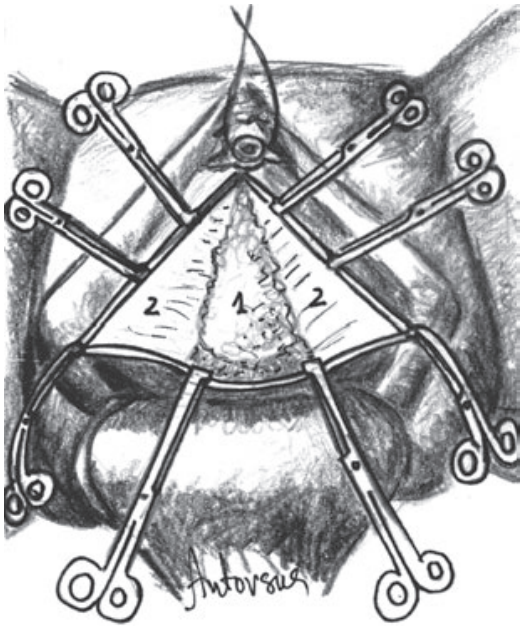

Fig. 1. Anterior midline longitudinal colporrhaphy and wide bladder mobilization (1 – bladder, 2 – anterior leaf of the vaginal endopelvic fascia - Halban).

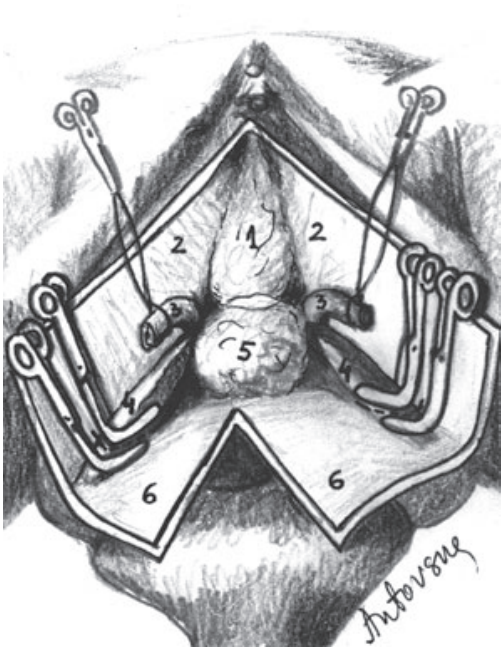

Fig. 3. Mobilization of the vaginosacral ligament and triangular cutting of the upper part of the posterior vaginal wall (1 – bladder, 2 – anterior leaf of the vaginal endopelvic fascia - Halban, 3 – uterosacral ligament, 4 – vaginosacral ligament, 5 – rectum, 6 – posterior leaf of the vaginal endopelvic fascia - Halban).

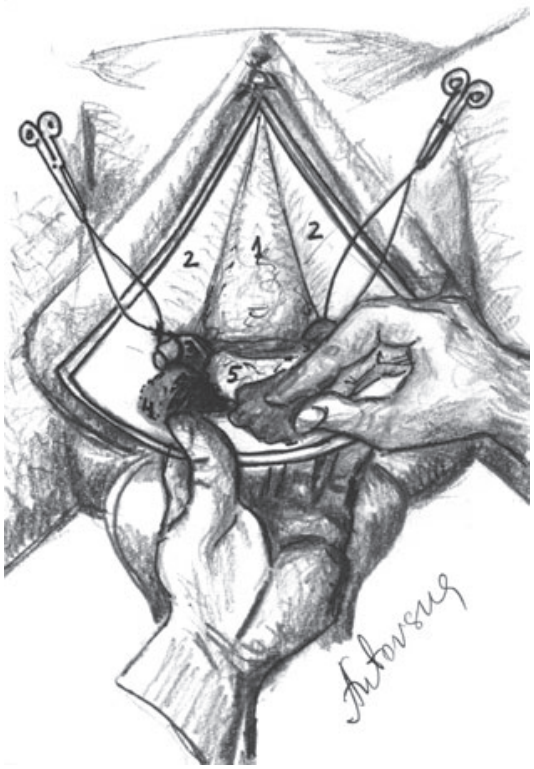

Fig. 2. Wide blunt finger dissection of the rectum from the vagina (1 – bladder, 2 – anterior leaf of the vaginal endopelvic fascia – Halban, 3 – uterosacral ligament, 4 – vaginosacral ligament, 5 – rectum).

Stage 2 – a dissection of the posterior and both lateral vaginal walls in their upper 1–2 cm from the rectum was performed with a vaginal wall stripping down with almost closed scissors. The inner free ends of the uterosacral ligaments become quite naked and well visible in the open vault. The lower structures-vaginosacral ligaments, which are quite below the uterosacral ligaments and slightly more central, stayed attached to the posterior vaginal wall after the hysterectomy, susceptible to the increased abdominal pressure like a stretched out string. Therefore they might be elongated and slightly weakened in its most upper part, but still intact, strong, and suitable as a natural suspensive material. After identification, they were mobilized with a curved Kocher clamp, replaced by stay ligature with 1–0 delayed absorbable suture, kept as a guy suture. A wide blunt finger dissection of the rectum, situated between both vaginosacral ligaments, from the posterior vaginal endopelvic fascia-Halban leaf with a single gauze sponge thickness was performed. The wide mobilization and backwards pulling of the rectum are important for its safety and provided an excellent access to the anterior attachment of vaginosacral ligaments (Fig. 2).

Stage 3 – two gentle curved Kelly clamps were placed on the vaginal attachment of the vaginosacral ligaments and their farther mobilization with a sharp dissection between them and vaginal wall was made. Two stay ligatures with 1–0 delayed absorbable sutures were placed on their mobilized ends and hold as guy sutures. This procedure provided a satisfactory mobilization of the vaginosacral ligament and a 3-cm long free edge, which was planned to be transposed upwards and fixed to the vagina as a

Fig. 4. Correct suture placement: suture I – at 2.5 cm from the free edges of the both vaginosacral ligaments and posterior vaginal wall; suture II in the same manner, but at 1 cm from the free edges; suture III – through the free edge of the both uterosacral ligaments and circularly through the central third part of the posterior vaginal margin (1 – bladder, 2 – anterior leaf of the vaginal endopelvic fascia – Halban, 3 – uterosacral ligament, 4 – vaginosacral ligament, 5 – rectum, 6 – posterior leaf of the vaginal endopelvic fascia – Halban).

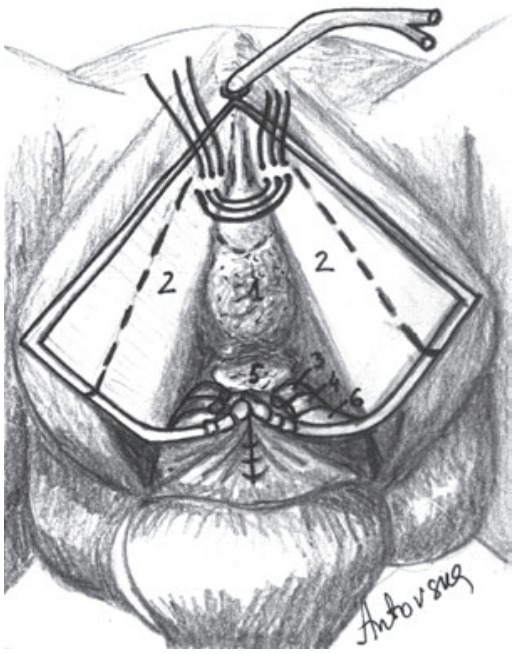

Fig. 5. Suburethral support: plicaturation of the anterior vaginal endopelvic fascia - Halban in the bladder neck area with three mattress 1–0 delayed – absorbable sutures and triangular cutting of the anterior vaginal wall (1 – bladder, 2 – anterior leaf of the vaginal endopelvic fascia - Halben, 3 – uterosacral ligament, 4 – vaginosacral ligament, 5 – rectum, 6 – posterior leaf of the vaginal endopelvoc fascia - Halban).

sliding graft. In cases where the upper part of the posterior vaginal wall was extremely relaxed and a great upper rectocele was present, a triangular cutting of this upper part is recommended (Fig. 3).

Stage 4 – In this stage we use three 1–0 delayed-absorbable sutures. The two first sutures were placed through the mobilized, free part of the left vaginosacral ligament, at 2.5 cm and 1 cm of the edge, then through the posterior vaginal wall 2.5 cm and 1 cm down of its margin, and through the right vaginosacral ligament at the same levels of the edge. These sutures provide: 1) a strong suspension of the upper posterior vaginal wall; 2) a horizontalization of the vagina and additional prevention from the recurrent vault prolapse or enterocele; 3) shortening and reinforcement of the vaginosacral ligaments. The third suture was placed through the free edge of the left uterosacral ligament, circularly through the central third of the posterior vaginal margin, and finally through the free edge of the right uterosacral ligament. This suture provides an additional elevation and elongation of the vagina and reinforcement of the suspension. At the end we tied these three sutures separately in the central area and all guy sutures of the uterosacral and vaginosacral ligaments mutually (Fig. 4).

Stage 5 – after placing a Foley urethral catheter No 18, a suburethral support was made according to Lazarevski operation (9): a strong vaginal endopelvic fascia-Halban was plicated in a form of three slingoidal layers just underneath the bladder neck with three mattress 1–0 delayed-absorbable sutures. The head of the catheter marks the bladder neck. This procedure forms a pyramidal supporting wedge just underneath the bladder neck, which functions as a support only during the increased abdominal pressure. The sutures were placed through the strong vaginal fascia-Halban, not through the gentle periurethral fascia. With the triangular cutting of the anterior vaginal wall, the relaxed, partially deteriorated central part of the anterior vaginal endopelvic fascia-Halban was excised and replaced with its strong, healthy lateral parts (Fig. 5).

Stage 6 – At the end a circular nonstayed 1–0 delayed-absorbable suture through the whole vaginal free edge and a tight vaginal tamponade were made. The tamponade and Foley catheter were removed on the second postoperative day (Fig. 6). Figure 7 represented the position of the pelvic organs, ligaments and surrounding tissues in: A) generative age; B) in posthysterectomy vaginal prolapse; C) after VSC operation.

This technique is similar to the technique of the Mc Call culdoplasty and Shull-Bachofen operation (1). However our modification: Vaginosacral colpopexy (VSC) uses the vaginosacral ligaments as autologous sliding grafts.

Postoperative care. All patients received a postoperative antibiotic prophylaxis (3-day cephalosporine of the third genera-

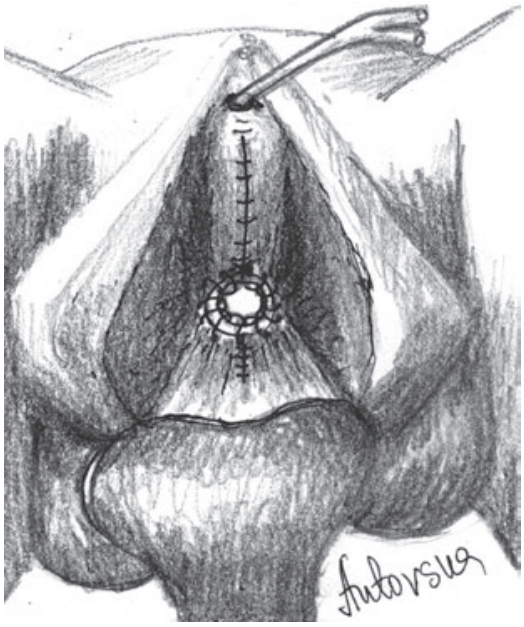

Fig. 6. Midline closure of the anterior vaginal wall and circular closure of the whole vaginal vault.

tion therapy in injection) and thromboembolism prophylaxis (7-day low-molecular Heparin 3000 UI /day) till withdrawal.

The postoperative evaluation

The postoperative evaluation included:

1) *operative details:* duration of the operation, blood loss (with measurement of the used gauzes before and after the operation and changes in haemoglobin and haematocrit), intraoperative complications such as: lesion of the bladder, rectum, ureter.

2) *signs of systemic body infectio*n: total number of leukocytes, differential leukocytes' formula, neutrophilles/lymphocytes ratio, axilary body temperature (expressed in degrees Celsius).

3) *signs of local infection*: vaginal bleeding, vaginal discharge, fetid vaginal discharge, swelling, crusting, pain, clearly visible wound opening on the vaginal vault and vaginal wall suture sites;

4) duration of the postoperative hospitalization.

The follow-up analysis. Initial follow-up was performed at the 4-week of postoperative visit, when the wound healing signs such as: duration of pain symptom in the postoperative period, duration of the vaginal postoperative discharge, duration of dysuria after removal of an urethral catheter, degree of suture-sites re-epithelization and patient's assessment of outcome were evaluated. At the last follow-up (median 24, 5 months (range 9–42 months)) all patients underwent following procedures:

1) *complete evaluation for urinary incontinence*;

2) *complete evaluation for genital prolapse*;

3) time of renewal and satisfaction of sexual intercourses.

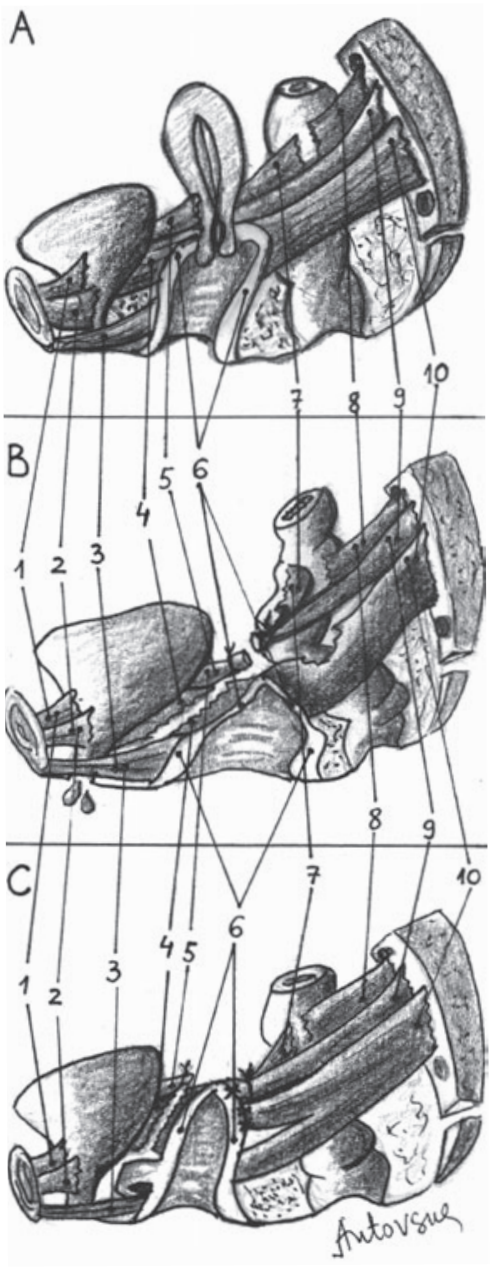

Fig. 7. Position of organs, ligaments and surrounding tissues in: A) generative age, B) in posthysterectomy vaginal prolapse, C) after VSC operation (1 – pubovesical ligament, 2 – pubourethral ligament, 3 – pubovaginal ligament - Carcassoni (retrourethral ligament - Shaw), 4 – vesicovaginal ligament, 5 – vesicouterine ligament (columns of bladder), 6 –anterior and posterior leaf of the vaginal endopelvic fascia - Halban, 7 – rectovaginal ligament, 8 – rectosacral ligament, 9 – uterosacral ligament, 10 – vaginosacral ligament).

Statistical methods. The Student's paired test was used to compare preoperative and postoperative POPQ measurements and the Pearson's X^2 test to compare the proportion of pelvic floor symptoms that were present before and after vaginal recon-

struction, as well as the stage of prolapse according to the formula:

$$X^2 = \frac{n\,[(AD-BC) - n/2]^2}{(A+b)(C+D)(A+C)(B+D)}$$

Results

Table 1 represents the demographic data of our group of patients. All 32 patients had undergone previous hysterectomy: 1. Abdominal hysterectomy 56.25 % of subjects (18/32) and vaginal hysterectomy 43.75 % of subjects (14/32).

Table 2 shows the overall stage of pelvic organ prolapse. Before the VSC operation: 1. the stage of the most severe segment of prolapse was either III or IV in 65.6 % (21/32) of subjects during Valsalva maneuver (Vm) and in 75.1 % (24/32) during Pozzi maneuver (Pm); 2. the stage of anterior segment prolapse was stage II or more in 81.3 % (26/32) during Vm and Pm; 3. the stage of the posterior segment prolapse was at least stage II in 53.2 % (17/32) during Vm and 50.0 % (16/32). Regarding the prolapse of the apical site, there was 34.4 % of stage II or IV during Pm when the apical site was below than >1 cm above the hymen. At the last follow-up visit we found stage 0 or I of prolapse of: 1. the anterior segment in 90.6 % (29/32) of patients during Vm and in 87.5 % (28/32) during Pm; 2. the posterior segment in 93.8 % (30/32) during Vm and Pm; 3. the apical segment in 100 % of subjects (32/32) during Vm and 96.9 % (31/32) during Pm; 4.the most severe segment of prolapse in 90.6 % (29/32) of subjects during Vm and 87.4 % (28/32) during Pm. The number of patients who had 0 stage prolase increased

Tab. 1. Demographic data: age, duration of the postmenopausal age, parity, habits of smoking and alcohol consuming, sport, diet, body mass index, systolic/diastolic blood pressure, type of menopause (natural/ surgical).

Age (years)	48.52±5.7
Duration of thepostmenopausal period (months)	29±6.20
Parity	2 (0 to 5)
Smokers	10/32
Consumers of alcohol	2/32
Body mass index (BMI)	27.81±3.84
Sport/diet	3/32 8/32
Systolic/diastolic blood pressure (mmHg)	2.23±11.20 / 146.11±24.60
natural menopause/surgical menopause/generative age	9/32 / 19/32 / 4/32

Table 2 Stage of prolapse at anterior, posterior, apical and most severe segments

POPQ stage	preoperative values Valsalva/Pozzi	last follow up (mean 24.5 mo) (n=32) Valsalva/Pozzi	X_V	X_p
Anterior segment				
Stage 0	3(9.3%)/2(6.3%)	19(59.4%)/19(59.4%)	**15.6^**	**18.1^**
Stage I	3(9.3%)/4(12.5%)	10(31.2%)/9(28.1%)	**3.9#**	1.5
Stage II	7(21.9%)/3(9.3%)	2(6.2%)/2(6.2%)	2.1	0.0
Stage III	8(25.0%)/9(28.1%)	1(3.1%)/2(6.2%)	**5.2#**	**6.2#**
Stage IV 1	1(34.3%)/14(43.8%)	0(0%)/0(0%)	**11.0^**	**15.5^**
Posterior segment				
Stage 0	2(6.3%)/3(9.4%)	22(68.8%)/21(65.6%)	**24.1^**	**19.3^**
Stage I 1	3(40.6%)/13(40.6%)	8(25.0%)/9(28.1%)	1.1	0.6
Stage II	11(34.4%)/5(15.6%)	1(3.1%)/1(3.1%)	**8.3***	1.7
Stage III	2(6.2%)/5(15.6%)	1(3.1%)/1(3.1%)	0.0	1.7
Stage IV	4(12.5%)/6(18.8%)	0(0%)/0(0%)	2.4	**4.6#**
Apical segment				
Stage 0	3(9.4%)/0(0%)	22(68.8%)/22(68.8%)	**21.3^**	**36.6^**
Stage I	22(68.8%)/21(65.6%)	10(31.3%)/9(28.1%)	**7.6***	**11.7^**
Stage II	3(9.4%)/4(12.5%)	0(0%)/1(3.1%)	1.4	0.9
Stage III	2(6.3%)/0(0%)	0(0%)/0(0%)	0.5	0.0
Stage IV	2(6.3%)/7(21.9%)	0(0%)/0(0%)	0.5	**5.9#**
Stage of the most severe segment of prolapse				
Stage 0	0(0%)/0(0%)	25(78.1%)/26(81.2%)	**44.4^**	**47.2^**
Stage I	3(9.4%)/4(12.5%)	4(12.5%)/2(6.2%)	0.0	0.2
Stage II	8(25.0%)/4(12.5%)	2(6.2%)/2(6.2%)	**3.0~**	1.9
Stage III	9(28.1%)/10(31.3%)	1(3.1%)/2(6.2%)	**5.8#**	**5.0#**
Stage IV	12(37.5%)/14(43.8%)	0(0%)/0(0%)	**12.4^**	**15.5^**

Legend: POPQ – International Continence Society's Pelvic Organ Prolapse Quantification system; Stage 0 – Aa, Ap, Ba and Bp are all at -3, but C is upper or equal to (tvl-2); Stage I – the most distal portion of the prolapse is >1 cm above the hymen; Stage II– the most distal portion of the prolapse is less or equal to 1 cm proximal to or distal to the plane of the hymen; Stage III – the most distal portion is >1 cm below the hymen but protrudes no further than 2 cm less than total vaginal length(tvl); Stage IV – the distal portion of the prolapse protrudes to at least (tvl-2) cm; Xv – differences between preoperative values and last follow-up values during Vm; Xp – differences between preoperative values and last follow-up values during Pm;
Pearson's X^2 test: (~) $p<0.10$; (#) $p<0.05$; (*) $p<0.01$; (^) $p<0.001$.

Tab. 3. Quantitative description of pelvic organ position with anatomic landmarks.

		preoperative value	last follow up (n=32) (mean 24,5 mo)	t(Vm) t(Pm)
Aa	(Valsalva)	+0.23±1.04	-2.54±0.71	**2.20#**
	(Pozzi)	+0.55±1.02	-2.48±0.60	**2.58***
Ba	(Valsalva)	+0.63±1.05	-2.54±0.71	1.51
	(Pozzi)	+0/98±1.08	-2.48±0.60	1.22
C	(Valsalva)	-2.51±2.07	-8.33±0.77	**2.64 ***
	(Pozzi)	-1.16±2.29	-7.82±0.89	**2.72 ***
D	(Valsalva)	-3.62±1.89	-8.33±0.77	**2.31 †**
	(Pozzi)	-2.89±1.77	-7.82±0.89	**2.49 †**
Bp	(Valsalva)	-0.66±1.07	-2.61±0.38	1.73~
	(Pozzi)	-0.13±1.08	-2.49±0.49	**1.99#**
Ap	(Valsalva)	-1.48±1.05	-2.61±0.38	1.02
	(Pozzi)	-1.47±1.09	-2.49±0.49	0.85
gh	(Valsalva)	5.06±0.59	3.68±0.52	1.77~
	(Pozzi)	5.17±0.61	3.85±0.49	1.69~
pb	(Valsalva)	3.07±0.44	3.12±0.37	0.09
	(Pozzi)	3.12±0.52	3.02±0.42	0.16
tvl	(Valsalva)	-3.62±1.89	-8.33±0.77	**2.31†**
	(Pozzi)	-2.89±1.77	-7.82±0.89	**2.49 †**
tvl1	(Valsalva)	-2.51±2.07	-8.33±0.77	**2.64 ***
	(Pozzi)	-1.16±2.29	-7.82±0.89	**2.72 ***

Student's paired test: (~) $p<0.10$; (#) $p<0.05$; (†) $p<0.025$; (*) $p<0.01$; (^) $p<0.001$.

POPQ – International Continence Society,s Pelvic Organ Prolapse Quantification system
Legend: Aa – a point located in the midline of the anterior vaginal wall 3 cm proximal to the external urethral meatus; Ba – the most distal position of any part of the upper anterior wall from the vaginal cuff to point Aa; C – leading edge of the vaginal cuff scar; D – the highest point of the posterior vaginal wall and it represents the level of vaginosacral ligament attachment to the vagina; Bp – the most distal position of any part of the upper posterior wall from the vaginal cuff to point Ap; Ap – a point located in the midline of the posterior vaginal wall 3 cm proximal to the hymen; gh – genital hiatus; pb – perineal body; tvl – distance between point D and vaginal introitus; tvl1 – distance between point C and vaginal introitus.

t(Vm) – differences between preoperative values and last follow-up values during the Valsalva maneuver,
t(Pm) – differences between preoperative values and last follow-up values during the Pozzi maneuver.

significantly ($p<0.001$ for the anterior, posterior, apical and most severe segment of prolaps). Table 3 shows the quantitative description of pelvic organ position with anatomic landmarks according to the POPQ system including our modification, which includes: point C and D, tvl and tvl1. There was statistically significant improvement in long-term follow-up in the most of POPQ measurements: 1. point Aa [(0.05 (Vm) and 0.01 (Pm); 2. point C and tvl1 [0.01 (Vm and Pm)]; 3. point D and tvl [0.025 (Vm and Pm)]; 4. point Bp for 0.05 (Pm). Ninety-one percent of subjects (29/32) had tvl>7 cm during the last follow-up.

Table 4 represents the preoperative and postoperative functional symptoms and urodynamic diagnoses. All local subjective symptoms, such as: vaginal pressure or pain, awareness of tissue protrusion, observation or palpation of a mass, low-back pressure and abdominal pressure improved significantly ($p<0.01$) at last follow-up control, as well as sexual symptoms, such as satisfactory intercourse ($p<0.01$). The prevalence of defecatory dysfunction and fecal incontinence decreased too, but only discomfort during defecation and feeling of incomplete evacuation reached statistical significance ($p<0.05$). The urinary symptoms showed a decreased prevalence: stress incontinence (SI) ($p<0.05$), genuine SI ($p<0.01$), frequency ($p<0.05$), nocturia ($p<0.05$), incomplete emptying ($p<0.05$), week stream ($p<0.05$), needfulness of manual reposition to start voiding ($p<0.05$), incontinence during the intercourse ($p<0.05$). One third of patients had a preoperative urodynamic diagnosis of detrusor instability, and this number did not change significantly after vaginal reconstruction. In three of four patients there was a potential urinary incontinence preoperatively. This situation persisted during the fist control and they underwent the Marshal-Marchetti-Burch operation. The overall de novo genuine SI rate was 0 %.

The mean operative time was 65 minutes, mean blood loss 270±110mL (range 120 to 430 mL), none of the patients required a blood transfusion. There were no intraoperative injuries of the bladder, ureter, rectum or small bowel. All patients were discharged in good condition after mean stay of 7.67 days. None of the patients had a postoperative urinary retention. At the first 4-week postoperative visit an intravenous x-ray urography was performed and not a single ureteral subocclusion or hydronephrosis was noted.

Table 5 shows the results in regard to an early postoperative period and wound healing. Only 28.12 % (9/32) of patients

Tab. 4. Preoperative and postoperative functional symptoms and urodynamic diagnoses.

preoperative values	initial (n=32)	follow-up (4wk) (n=32)	last follow up(n=32) (median 24,5 mo)	X12	X22	X32
Urinary symptoms						
Stress incontinence (SI)	12(37.50%)	3(9.37%)	–	5.57/<**0.05**	–	-
Potential SI	4(12.50%)	3(9.37%)	–	0.00/NS	–	-
Genuine SI	8(25.00%)	0(0.00%)	0(0.00%)	7.00/<**0.01**	7.00/**<0.01**	0.00/NS
Frequency	20(62.25%)	10(31.25%)	12(37.50%)	5.08/<**0.05**	3.06/NS	0.07/NS
Urgency	16(50.00%)	13(40.63%)	15(46.87%)	0.25/NS	0.06/NS	0.06/NS
Detrusor instability	12(37.50%)	8(25.00%)	8(25.00%)	0.65/NS	0.65/NS	0.00/NS
Hesitancy	15(46.87%)	11(34.37%)	12(37.50%)	0.65/NS	0.25/NS	0.00/NS
Nocturia	18(56.25%)	8(25.00%)	9(28.12%)	5.74/<**0.05**	0.10/<**0.05**	0.00/NS
Incomplete emptying	11(34.37%)	1(3.12%)	2(6.25%)	8.31/<**0.01**	6.18/<**0.05**	0.00/NS
weak stream	9(28.13%)	3(9.37%)	2(6.25%)	2.56/NS	3.95/<**0.05**	0.00/NS
manual reposition to start voiding	6(18.75%)	0(0.00%)	0(0.00%)	4.60/<**0.05**	4.60/<**0.05**	0.00/NS
Bowel symptoms						
flatus incontinence	3(9.37%)	0(0.00%)	0(0.00%)	1.40/NS	1.40/NS	0.00/NS
Incontinence of liquid stool	1(3.13%)	0(0.00%)	0(0.00%)	0.00/NS	0.00/NS	0.00/NS
urgency of defecation	3(9.37%)	0(0.00%)	0(0.00%)	1.40/NS	1.40/NS	0.00/NS
discomfort with defecation	10(31.13%)	2(8.25%)	2(8.25%)	5.03/<**0.05**	5.03/<**0.05**	0.00/NS
constipation	13(40.63%)	6(18.75%)	8(25.00%)	2.69/NS	1.13/NS	0.09/NS
digital manipulation to finish defecation	5(15.63%)	0(0.00%)	0(0.00%)	3.47/NS	3.47/NS	0.00/NS
feeling of incomplete evacuation	15(46.87%)	6(18.75%)	6(18.75%)	4.54/<**0.05**	4.54/<**0.05**	0.00/NS
rectal protrusion during defecation	6(18.75%)	3(9.37%)	4(12.50%)	0.52/NS	0.12/NS	0.00/NS
Sexual symptoms						
Pain with coitus	28(87.50%)	5(15.62%)	6(18.75%)	30.27/<**0.01**	27.67/<**0.01**	0.00/NS
Unsatisfactory coitus	30(93.75%)	7(21.87%)	6(18.75%)	30.10/<**0.01**	33.59/<**0.01**	0.00/NS
Decrease in orgasmic response	18(53.12%)	10(31.25%)	10(31.25%)	3.97/<**0.05**	3.97/<**0.05**	0.00/NS
Incontinence during the intercourse	8(25.00%)	0(0.00%)	0(0.00%)	4.02/<**0.05**	4.02/<**0.05**	0.00/NS
Other local symptoms						
Vaginal pressure and heaviness	28(87.50%)	1(3.13%)	2(6.25%)	42.62/<**0.01**	39.22/<**0.01**	0.00/NS
Vaginal/perineal pain	15(46.87%)	3(9.37%)	2(6.25%)	9.35/<**0.01**	11.53/<**0.01**	0.00/NS
Awareness of tissue protrusion	32(100%)	0(0.00)	0(0.00%)	37.81/<**0.01**	27.79/<**0.01**	0.00/NS
Low back pain	23(71.87%)	4(12.50%)	5(15.62%)	20.76/<**0.01**	18.35/<**0.01**	0.00/NS
Abdominal pressure	20(62.25%)	0(0.00%)	0(0.00%)	26.25/<**0.01**	26.25/<**0.01**	0.00/NS
Observation or palpation of a mass	26(81.12%)	1(3.13%)	1(3.13%)	19.23/<**0.01**	19.23/<**0.01**	0.00/NS

Pearson's X^2 test: **X12 –** differences between preoperative values and initial follow-up (4wk) values; **X22 –** differences between preoperative values and last follow-up values **X32 –** differences between initial follow-up (4wk) values and last follow-up values

Tab. 5. Wound healing.

Duration of pain symptom in the postoperative period (days)	4.52±1.70
Duration of the vaginal postoperative discharge (days)	14.23±6.31
Duration of dysuria after the removal of an urethral catheter (days)	3.22+1.20
Presence of fetid vaginal discharge	3/32 of subjects (9.37%)
Presence of swelling, crusting and pain in the first seven postoperative days	4/32 of subjects (12.50%)
Presence of clearly visible wound opening on thevaginal vault or vaginal suture sites	1/32 of subjects (3.12%)
Presence of laboratory signs of infection on thethird postoperative day	9/32 of subjects (28.12%)
Present laboratory signs of infection on the 7th postoperative day	6/32 of subjects (18.75%)
Increased early morning body temperature on the third postoperative day	5/32 of subjects (15.63%)
Increased early morning body temperature on the 7th postoperative day	0/32 of subjects (0.00%)
Patient assessment of outcome at the follow-up control:	
1. satisfied	29/32 of subjects (90.63%)
2. not satisfied	3/32 of subjects (9.37%)
Re-epithelization of the suture sites on the first (4wk) control:	
1. complete	30/32 of subjects (93.75%)
2. incomplete	2/32 of subjects (6.25%)
Time of renewal of sexual intercourses (weeks)	7.82+2.46

showed laboratory signs of infection on the third postoperative day and 18.75 % (6/32) patients on the seventh postoperative day, but all 32 patients were without fever on the seventh postoperative day. Only one patient (3.12 %) showed a partial wound opening of the anterior suture site in the early postoperative period and on the first (4 wk) control 93.75 % (30/32) of subjects had a complete re-epitelization of the suture sites. Ninety-one percent of subjects (29/32) were satisfied of outcome at the last follow-up.

Discussion

The possible advantages of the VSC operation versus sacrospinous ligament suspension (SSS) could be following: 1) providing a central position and normal vagina inclination (SSS results in a non-anatomical lateral and posterior deflection of the vagina, which can result in postoperative stress incontinence and anterior wall prolapse ranging from 18 % to 92 % (10, 11, 12); 2) avoiding the risk of injury to the pudendal and gluteal vessels, which is increased during the SSS (8); 3) avoiding a vaginal overtension and providing a comfortable and painless intercourse; 4) providing a wide access to the bladder neck, so the therapeutic procedures for stress incontinence can be performed more easily and meticulously; 5) offering a good access for upper rectocele or enterocele correction. Morley (13) reported in 57 patients with sacrospinous suspension 12.28 % reccurent vaginal prolapse and 15.79 % postoperative stress urinary incontinence cases; Guner (14) reported in 26 women only 11.54 % recurrences of vaginal prolapse; Hewson (15) 60 % cure of stress incontinence with additional buttressing sutures and only 35 % improvement of intercourse; Giberti (16) observed in one case of 12 sacrospinous fixations registred recurrent vaginal vault prolapse; Lantzsch (17) reported in 200 unilateral sacrospinous fixations a temporary irritation of the sciatic nerve in 7.5 %, a temporary partial ureteral obstruction in 5.5 % and a reccurent vaginal prolapse in 14.63 % of the patients. In our study, the rate of reccurent vaginal prolapse stage II was 6.2 % and stage III only in 3.1 %. According to the two recent studies (18, 19) the vaginal prolapse stage II is present in 4 % to 47 % of women in the generative age, and authors suggest that this rate of prolapse may fall within the normal spectrum of vaginal support.

We suggest that the disadvantages of the abdominal sacral colpopexy (ASC) versus VSC are following: 1) a possibility of prothesis ejection through the vaginal vault after ASC; 2) a risk of an overtension which could result in dispareunia; 3) a risk of a postoperative vertebra-osteitis with discomfort and continuous low-back pain: 4) a risk of intraoperative lesion of the right ureter, rectosygmoidal part of the colon, vessels injury (vein cava and right common illiacal vein); 5) a risk of a partial rectosygmoidal stenosis resulting in longlasting constipation, injury of the anonymous sygmoidal artery (arteria sygmoidea ima) resulting in sigmoidal necrosis. Nevertheless, ASC has some very precious advantages, such as: 1) providing a higher length of the vagina than the VSC; 2) the suspensive results last longer; 3) this procedure offers a good access to the Retzius-space and an excellent possibility for Burch operation. The risk of bladder or rectum injury is similar during VSC and ASC because the cleavage during both operations is performed between the same layers, only the approach is different. We suggest that the advantages of VSC versus ASC could be following: 1) a possibility for cleavage along the whole length of the vagina, reparation of the sliding bladder prolapse and prolapse grade III and IV of the anterior site; 2) a possibility for a reparation of the low rectocele; 3) there is no reaction to the used prosthetical material. Fox and

Stanton (20) in 29 ASC reported postoperative increase of constipation from 41 % to 50 %, and increase of incomplete defecation from 24 % to 36 %. According to Winters (21) the complications of ASC include: mesh infection, mesh erosion, bowel obstruction, ileus, and bleeding from the presacral venous complex. Scarpero (22) reported 3 cases of recurrent grade II cystoceles, and 3 cases of grade II rectoceles in 20 women with previous ASC. In the group of 42 ASC, Geomini (23) reported 2 infections with Gore-tex graft, 3 recurrences of the vaginal prolapse and 10 moderate enterorectoceles. Pohl and Frattarelli (24) reported 4.5 % (3/40) of recurrent cystoceles after ASC. In the group of 35 ASC, Pilsgaard and Mouritsen (25) observed one severe bleeding from the presacral veins, one stool incontinence and three intestinal obstructions. Lefranc (26) reported in the group of 85 ASC using a Burch procedure 3 postoperative urinary retentions and 27.05 % relapsing stress incontinence. In our study, the relapse of stress incontinence occurred in 9.37 % of subjects.

The risk of persistent or recurrent prolapse in the iliococcygeus suspension (ICS) is 4–21 % (10), but the point of the apical fixation is inferior to the normal position and may result in vaginal foreshortening (8). Meeks (27) reported in 110 patients with ICS 3 hemorrhages >750 ml, 1 bowel and bladder injury, and 4 cases with recurrent anterior vaginal prolapse. According to Peters (28) the ICS has a projected 96 % cure rate in 2 years and SSS has only 80 % cure rate. In our study, the cure rate of vaginal prolapse was 90.7 % in 2 years using our VSC.

The differences between the VSC operation and the Shull operation-Bilateral uterosacral ligament vaginal suspension (BUVS) (1, 8) are following: 1) during the Shull operation, the midline longitudinal incision of the anterior vaginal wall is performed using a dissection of the vaginal epithelium of the underlying endopelvic fascia, but during VSC the vaginal epithelium remains stuck to its underlying strong endopelvic fascia-Halban, which is planned to supply a strong bladder and urethral support with its lateral parts. Opposite to Richardson (29), in all our cases we did not find any discrete breaks or tears in the endopelvic vaginal fascia-Halban, but its generalized stretching and attenuation; 2) during VSC the peritoneal cavity is not open, except when an enterocele is present; 3) VSC provides a satisfactory safety of the ureters and rectum with wide mobilization and pulling backwards the bladder and rectum. To protect these structures during BUVS, two Briesky-Navratil retractors and essential intraoperative cystoscopy are used. Despite this prevention, Barber [8] reported a 11 % rate of ureteral injury; 4) during VSC, other anatomic structure-vaginosacral ligament is used in regard to uterosacral ligament during BUVS; 5) the correct suture placement and tying of suspension sutures are different. During the Shull operation, the suture is placed in the posteromedial aspect of proximal uterosacral ligament. Its one end is placed through the corresponding lateral aspect of the superior edge of the pubocervical fascia and the other laterally through the superior edge of the rectovaginal fascia. During VSC, after a satisfactory mobilization of the vaginosacral ligament, two sutures are passed through the vaginosacral ligaments from side to side, incorporating intervening upper part of the posterior vaginal wall, and they are tied separately in the central area; 6) during Shull operation the plication of the urethrovesical junction with endopelvic fascia is performed according to the Hurt's technique (30) with surrounding gentle, loosened periurethral fasia. During VSC, the strong vaginal endopelvic fascia-Halban is plicated in a form of three slingoidal layers just underneath the bladder neck with three mattress 1–0 delayed-absorbable sutures in a form of supporting wedge, which functions only during the increased abdominal pressure (Lazarevski operation, 9).

The differences between the VSC operation and the High uterosacral vaginal vault suspension (HUVS) (31) are following: 1) during HUVS, an intraperitoneal suspension of the vaginal vault to the uterosacral ligaments is performed, but during VSC, the vaginal suspension is performed extraperitoneally; 2) during VSC, other anatomic structure-vaginosacral ligaments are used versus uterosacral ligaments during HUVS; 3) the correct suture placement and tying are different in both operations. During HUVS, permanent sutures (usually 2–4) are passed through the uterosacral ligaments from side to side, incorporating intervening peritoneum and delayed absorbable sutures (usually 4–6) are used to suspend the anterior and posterior vaginal walls high up to the uterosacral ligaments on each side. During VSC, two 1–0 delayed absorbable sutures are passed through the vaginosacral ligaments from side to side, incorporating intervening upper part of the posterior vaginal wall. In 5 cases (2.4%), Karram (31) reported 2.4 % of ureteral injury. The fact, that our sutures are placed much lower than the ureter path, on the vaginosacral ligaments, which are widely mobilized, could be a possible explanation for safety of VSC regarding the ureter injuries.

Our technique is reserved for cases where not a total vaginal eversion is present, and for that reason there is not a total detachment of the vaginal ligament supports, but only their weakening, stretching, and, in worst, their little, partial rupture. So the ligaments are clearly visible, strong enough and accessible to be identified by the operator. As a matter of fact, for a long time, we had a few cases of reccurent exteriorised posthysterectomy vault prolapses of the apical segment with our techniques of the vaginal and abdominal hysterectomy, which obligatory include fixation of the uterosacral ligaments to the posterior vaginal wall. This procedure is primarily a support of the apical segment, yet preoperatively almost 80 % of patients had stages 0 or 1 where the apex was 1 cm above the introitus", i.e. 68 % of stage I during Valsalva maneuver. However, there were even 35 % of stage II or IV during Pozzi maneuver. Nevertheless, there were a lot of cases with exteriorised prolapses of the anterior segment (more than 80 %) and the posterior segment (about 50 %) preoperatively, and that fact can not be ignored.

In our series the point C (vaginal cuff or vaginal scar) and point D were not obligatory at the same level due to our techniques of hysterectomies, which included a fixation of the uterosacral ligaments to the posterior vaginal wall. Because of that, we suggest that the point D should not be omitted in the absence of the cervix. In majority of our cases, point C was at lower level than point D. For that reason, our modification of the POPQ system included the point C and point D in the preoperative measurements, and also tvl (the distance between point D and vaginal introitus) and tvl1 (the dis-

tance between point C and vaginal introitus). The lowest edge of the prolapse preoperatively was point Aa in most of the cases, i.e. there was a predominance of the anterior wall prolapses. However, point C and tvl preoperatively had not the same values due to the fact that in some cases point D was higher than point C. So, the presented tvl was the distance of the point C or point D from introitus, depending on the situation, the highest point in each case.

Conclusion

VSC seems to be quick, safe and effective procedure for posthysterectomy vaginal prolapse. Our results should be confirmed in a larger group of patients and longer follow-up.

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