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Research Article

Choosing of a Method for Correcting the Prolapse of the Pelvic Organs

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Abstract

Introduction: Pelvic organ prolapse is a very common problem among women and the choice of the correct correction method is the main task for today.

Objective: choice of surgical treatment based on vaginal length and laser Doppler flowmetry.

Materials and Methods: 68 women with a diagnosis of POP-Q stage III-IV were examined, of which 19 patients had post-hysterectomy prolapse.

Results: The lowest laser Doppler blood flowmetry and vaginal length were recorded in the group of women with post hysterectomy prolapse (prolapse of the vaginal stump): Mpvw = 0.4 pf. Unit TVL <9 we used only sacrospinal fixation without mesh prosthesis, Mpvw> 1 pf unit TVL <9 - sacrocolpopexy. Taking into account the decrease in the functionality of the pelvic floor muscle in elderly and non-sexually active women, the mid Lephora - Neugebauer colporrhaphy was performed in combination with loop urethropexy transobturator access.

Conclusion: Thus, it is possible to distinguish 2 degrees of vaginal shortening in post-hysterectomy prolapse: Considering changes in the vaginal walls in the form of decreased blood flow and shortened vaginal lengths, this cohort of patients can be classified as a risk group for retraction of the mesh and recurrent prolapse. According to our data, in the second degree of vaginal shortening, the "Gold" standard is sacrospinal fixation.

Keywords: Laser Doppler flowmetry; Mesenchymal stem cells; Pelvic organ prolapse; Polypropylene mesh

Introduction

Pelvic organ prolapse is understood as a complex of disorders of the functions of ligamentous attachment and pelvic floor muscles [1-3]. According to published data, about 7% of women have a lifelong risk of surgical correction for pelvic organ prolapse, while 13% of them will require reoperation within 5 years due to relapse, and 29% of patients will undergo another operation throughout life [4,5]. To correct pelvic prolapse a polypropylene mesh is used, which is also frequently applied in the pathology of the anterior abdominal wall. Today, the use of polypropylene mesh in gynecology has become a routine operation, but it is associated with the development of complications due to the properties of the material [2]. One of the main complications when using a mesh prosthesis is its retraction. An animal study proved that one of the factors leading to retraction of the mesh prosthesis is the inflammatory response of the tissues. Most studies on mesh-associated retraction have been performed in animals, where the main complication is erosion of the mesh prosthesis [6]. Mesh size reduction in animal models reached up to 16% in diameter. The degree of "Shrinkage", wrinkling, and appearance of scars largely depends on the type of mesh, pore size and the presence of wound infection [7,8]. Each year, the number of papers devoted to significant instability in the form of polypropylene mesh compression in patients after reconstructive operations on the

pelvic floor is increasing [9-11].

According to Tunn R, et.al. [10], ultrasound scanning of the anterior vaginal wall 6 months after surgery showed a reduction in mesh length from 7.5 cm to 3 cm. Svabík K, et.al. [12] during ultrasound scanning noted a decrease in the average mesh length from 9.3 cm to 4.8 cm after correction of the cystocele using a mesh prosthesis. The work of Dietz, et.al. is of greatest interest, revealing a correlation between retraction of the mesh and recurrence of prolapse 3.6 months after surgery, according to a retrospective analysis of 684 clinical cases [13,14]. In another prospective study, 91 patients revealed a statistical relationship between retraction of the mesh and relapse of pelvic prolapse [12,15,16]. Mesh size reduction can reach up to 50% after 6 months of implantation. On the 4th day after the operation, "Wrinkling" of the mesh was observed by 38%, which progressed by another 15% in 3-5 months after the operation [12]. Thus, it can be assumed that after installation, the retraction of the mesh by 50% -70% relative to its initial length occurs [9]. The available data on retraction of the mesh prosthesis should be compared with the anatomical features of the vaginal stump in post hysterectomy prolapse [5], and the possibility of using biological material in combination with the mesh prosthesis should be considered.

The Aim of the Study: Choice of surgical treatment based on vaginal length and laser Doppler flowmetry.

Inclusion Criteria: Post hysterectomy prolapse, stage III-IV POP-Q.

Exclusion Criteria: Inflammatory diseases of the pelvic organs in the acute stage, decubital ulcers, uncorrectable diseases of the central nervous system, diseases of the cardiovascular system in the stage of decompensation, reproductive age, pregnancy, cystocele.

Materials and Methods

68 women with a diagnosis of POP-Q stage III-IV were examined, of which 19 patients had post-hysterectomy prolapse. In literature there are no available data on the performance standards of laser Doppler flowmetry (LDF) of blood from the walls of the vagina, therefore we isolated a control group that included 62 healthy women with normal pelvic floor anatomy, with a score of POP-Q 0 - I stage, not having a history of pregnancy. The vaginal length was measured according to the POP-Q classification. In this study, only the Posterior Vaginal Wall (PVW) was taken into account, because relapse from the anterior wall of the vagina (cystocele) is a symptomatic prolapse.

One of the factors for choosing surgical treatment is the condition of tissues in case of pelvic prolapse. For this purpose, we evaluated the blood flow in tissues using the LDF method. The method is based on determining the perfusion of tissue with blood by measuring the Doppler frequency shift that occurs when reflected from the moving components of the tissue with subsequent registration of radiation. The received signal characterizes blood flow in a volume of up to 1.5 mm^3 of tissue [1]. Data were recorded using a probe from 2 points. The 1st point was located in the middle of the conditional line connecting the external opening of the urethra and the cervical canal. 2nd point - in the middle of the conditional line connecting the anus and cervical canal (dome of the vagina). The probe was fixed using a Bunsen laboratory tripod. The obtained parameters were processed using LAKK 2-20 software. The following indicators were evaluated: M - arithmetic mean value of the Microcirculation Index (MI). A change in M (increase or decrease) characterizes an increase or decrease in blood perfusion, respectively. The parameter is measured in perfusion units (pf units). σ is the mean square deviation of the amplitude of blood flow oscillations from the arithmetic mean value of M. It characterizes the temporal variability of perfusion, reflecting the variability of blood flow in all frequency ranges. The parameter is measured in perfusion units (pf. Unit). The signal from the probe was processed using the LAKK 2-20 software with a measurement accuracy of up to 0.001, which constituted the measurement threshold of this system.

Histological Analysis of the Ligamentous Attachment

Patients with a preserved ligamentous apparatus (cardinal ligaments and sacro-uterine ligaments of the uterus) underwent ligament biopsy. To determine the ratio of muscular and collagen fibers in the uterine ligaments of patients, we performed a morphometric analysis of sections of histological preparations, including computer image analysis using the Axiovision program (C. Zeis, Germany). Sections of biopsy samples were stained by Van Gieson method. Then, using the specialized Axiovision software, muscular structures of bright yellow color were isolated on preparations with a total of X400 magnification of the microscope. We determined the total area of muscular fibers in one field of view. 20 visual fields were used on sections of biopsy samples from patients. For each field of view, the relative area of muscular fibers (in%) was calculated, which was determined in relation to the total area of the image under study by the formula: Srel = (Smus / Stk) x 100%.

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Cultivation of Multipotent Mesenchymal Stem Cells *In Vitro*

We used a sample of lipoaspirate of subcutaneous adipose tissue of the umbilical zone of a woman with connective tissue dysplasia. For MMSC extraction, a complex technique of mechanical and enzymatic processing of lipoaspirate was used. Adipose tissue was placed in centrifuge tubes, an equal volume of phosphate buffer was added (DPBS without Ca and Mg; Biolot, Russia) and centrifuged for 4 min at 2500 rpm. After removing the oil film, the adipose tissue was mechanically treated by passing through a syringe without a needle. The resulting mass was transferred to new tubes, DPBS 1: 1 and type I collagenase (PanEco, Russia) were added to a concentration of 40 U / ml and incubated in a shaker-incubator for 1 h at 37°C. The suspension was centrifuged for 4 minutes at 2500 rpm and ammonium buffer up to 4 ml was added to the pellet to erythrocyte lysis and centrifuged again for 4 min at 2500 rpm. The pellet was resuspended in 1 ml of RPMI 1640 medium (Biolot, Russia) containing 20% fetal calf serum (FBS, Biowest, France) and 40 U / ml gentamicin. Cells were counted on a TC20 automatic counter (BioRad, USA) and scattered into culture vials with a density of 4 · 104 per 1 cm².

Cells were placed in an incubator at 100% humidity and 5% CO_2. After 48 hours, non-adherent cells were removed and the medium replaced with a new one. Cells were subcultered until 70-80% confluence was achieved. For the experiment, cells of 4-5th passages were used. Cells were removed from the substrate using a trypsin-EDTA 0.25% solution (PanEco, Russia), 1.25 · 105 cells in 50 µl of medium were counted and scattered into the holes of a 24-well plate with a non-adhesive surfaces in which pieces of mesh with an area of 1 cm² were placed. A total of 9 holes were prepared: without applying cells; with cells on the grid; with cells deposited on a monofilament polypropylene mesh pretreated with an allograft, respectively. After 4 hours, 200 µl of medium was added to each hole and cells were incubated for 3 days. To record the results, living cells were photographed using the phase contrast method with a Carl Zeiss Axio Observer D1 microscope and an AxioCam MRc5 camera (Carl Zeiss, Germany). An allograft suspension in a volume of 2-2.5 ml was applied onto the non-adhesive cell polypropylene surface of the plate and stitched using an LED dental lamp (460 nm, 1200 mW/cm², 3M Epilar Free Light 2) for 30 s.

Statistical processing of the results was carried out in the Windows 7 operating system using the statistical programs “Statistical 6.0” and “IBM SPSS Statistics 20”.

Results

All patients underwent vaginal extirpation in combination with anterior and / or posterior colporrhaphy without mesh prostheses. Before surgery, the length of the vagina and LDF-metry were measured (data are presented in (Table 1)).

Variable	Before surgery (POP-Q)	After surgery (POP-Q) (1month)	Shortening of the length of the posterior vaginal wall (см)	Without prolapse
n-39	n-39	n-39	n-39	n-62
Ap	6,1 [+1,7;-0,7]	5,5 [-1,7;-2,5]	0,6	-
Bp	5,9[+2;+1,2]	3,5 [-3;-2,4]	2,4	-
TVL	12[8,2;8,6]	9 [5,7;7,9]	3	-
M posterior wall (M_{pvw}) pf. Unit	7±0,731	6,4±0,543	-	21,068±0,960
Σ_{pvw}	3±0,008	1,2±0,018	-	3,697±0,324

Table 1: Pelvic organ prolapse.

After reconstructive operations, TVL is shortened by 3 cm due to suturing of the stump and resection of the vaginal mucosa. In this case, we did not notice a significant decrease in tissue perfusion with blood Mpvw 6.4 ± 0.543 pf. Unit. We also believe that the shortening of the vaginal length occurs due to the reduction of m.levator ani and restoration of the anatomy of the pelvic floor.

Preoperative analysis of the condition of vascularization of vaginal prolapse is an important point when choosing a mesh prosthesis and surgical access, especially with post hysterectomy prolapse. Before surgery, all patients with relapse underwent LDF - metry (Table 2). With stage IV POP-Q, the minimum values of tissue Doppler flowmetry from the posterior vaginal wall Mpvw 0.38 pF units were diagnosed.

Variable	POP-Q IV vaginal stump	POP-Q III- IV cervical stump	Without prolapse
n-19	n-10	n-9	n-62
Ap	2,1[+2;+1,6]	1,9 [+2;-1]	-
Bp	4,9 [+3;+1,4]	5,7[+2;-2]	-
TVL	7 [-1;1]	9 [-1;2]	-
M posterior wall (Mpvw) pf. Unit	0,4	1,7	21,068±0,960
Σ_{pvw}	0,9	2.5	3,697±0,324

Table 2: Post-hysterectomy prolapse.

When the cervix was preserved (1.7 pf units), LDF-metrics were higher, in contrast to the group with prolapse of the vaginal stump (0.4 pf units). This difference is associated with the anatomy of pelvis fascia visceralis, in which the blood, lymph vessels and nerves pass. A statistical evaluation showed the presence of a direct moderate significant correlation between the vaginal length of more than 9 cm and stage III POP-Q prolapse ($p < 0.001$) and stage IV POP-Q with Doppler frequency shift Mpvw <1 pf. Unit ($p < 0.001$).

The average level of the Relative Fiber Area of Muscles (RFA) depended strongly on the degree of prolapse ($\eta I = 0.93$, $F = 187$, $p < 0.0001$). In women with POP-Q stage III genital prolapse, the mean values of RFA were 41.2 ± 2.9%. The lowest level of the average indicator of RFA and at the same time statistically highly significant was noted in the subgroup of women with POP-Q stage IV genital prolapse - 4.2 ± 1.0% ($p < 0.0001$). Thus, in the absence of a ligamentous attachment, ischemia of the vaginal tissues is observed.

Patients with post-hysterectomy prolapse were operated on according to LDF-metrics and vaginal length (Table 3). With a length of the vagina less than 9 cm and Mpvw below 1 pF unit we believe that the installation of a vaginal mesh prosthesis is contraindicated due to the lack of an adequate immune response, which subsequently leads to retraction of the mesh. During sacrospinal fixation we did not use a mesh prosthesis, but polypropylene sutures were used. The Lefora-Neugebauer colporography was performed in combination with loop urethropexy transobturator access.

Type of operations	M pvw> 1 pf. Unit TVL>9	Mpvw <1 pf. Unit TVL <9
sacrocolpopexy	7 (36.8%)	
Median colporrhaphy of Lefora-Neugebauer	2(10.5%)	5 (26.3%)
Sacrospinal fixation		4(21%)

Table 3: Reconstructive surgery for post hysterectomy prolapse, taking into account LDF and vaginal length.

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When cells were cultured in the presence of only a fragment of a mesh prosthesis, weak adhesion of cells to the polypropylene substrate of the plate was observed. By the 4th day, MMSCs formed mainly one focus in each hole of the plate, which consisted of cells tightly attached to each other with virtually no processes forming a large globular structure. Each of such focus surrounded an element of the mesh prosthesis. After MMSC cultivation for 4 days in the presence of a mesh prosthesis fragment and an allograft, a relatively uniform distribution of cells around the mesh of the mesh prosthesis was observed. The cells formed processes and formed multilayer structures resembling a small network.

Thus, the fixation of MMSCs to monofilament polypropylene does not occur on the 4th day, either in the presence of an allograft or without it. The use of mesh prosthesis, allograft and MMSC promotes the formation of a single integrated biological material *In Vitro* (Figure 1).

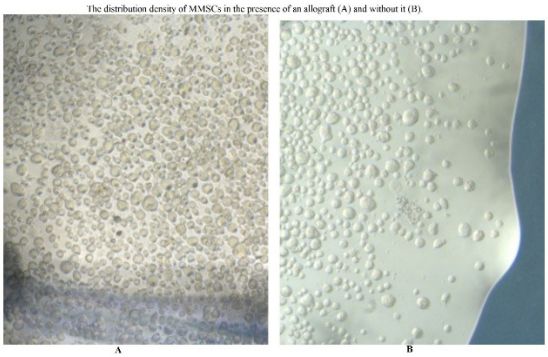

Figure 1: The distribution of density of MMSCs in the presence of allograft (A) and without it (B).

Discussion and Conclusion

After total hysterectomy, apical prolapse is a common complication that negatively affects the quality of life [17]. To assess the condition of the muscles of the pelvic floor, it is advisable to conduct a comprehensive examination, including: laser Doppler blood flowmetry of the posterior wall of the vagina and measurement of the length of the vagina in post-hysterectomy prolapse. The lowest laser Doppler blood flowmetry and vaginal length were recorded in the group of women with post hysterectomy prolapse (prolapse of the vaginal stump): Mpvw = 0.4 pf. Unit TVL-7 [-1;1]. Considering changes in the vaginal walls in the form of decreased blood flow and shortened vaginal lengths, this cohort of patients can be classified as a risk group for retraction of the mesh and recurrent prolapse. Pathogenesis of retraction of the mesh prosthesis involves the inflammatory process [3], in which polypropylene is not able to be replaced by connective tissue, and subsequently the supporting frame does not form and complete regeneration of damaged tissues does not occur.

Fibroblast cells are of particular interest because they are the predominant population of connective tissue cells. But it has been proven that MMSC does not separately attach to polypropylene; for a more maximum impact, a matrix in the form of biological material is needed [18]. The use of mesh prosthesis, allograft and MMSC promotes the formation of a single integrated biological material in vitro. The allograft serves as a matrix for the directed and uniform growth of the MMSC layer, and mesh prosthesis provides the supporting function and mechanical strength of this layer. This can enhance the anti-inflammatory effect. With post hysterectomy prolapse values of Mpvw <1 pf. Unit TVL <9 we used only sacrospinal fixation without mesh prosthesis, Mpvw> 1 pf unit TVL <9 - sacrocolpopexy. Taking into account the decrease in the functionality of the pelvic floor muscle in elderly and non-sexually active women, the mid Lephora - Neugebauer colporrhaphy was performed in combination with loop urethropexy transobturator access. Thus, it is possible to distinguish 2 degrees of vaginal shortening in post-hysterectomy prolapse:

- 1 degree of TVL> 9 (Mpvw> 1 perf. Unit)

- 2 degree TVL <9 cm (Mpvw<1 perf. Unit)

For the first degree, we recommend vaginal, laparoscopic and abdominal access. In the second degree, we recommend only sacrospinal fixation without mesh prosthesis. According to our data, in the second degree of vaginal shortening, the “Gold” standard is sacrospinal fixation.

When choosing a surgical intervention, not only “Gold” standards should be considered. We are obliged to choose the optimal type of surgical treatment, which will have a minimum risk of relapse and contribute to improving the quality of life.

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The study was approved by the ethics committee.

All patients provided informed consent for this study.

The authors have no conflicts of interest relevant to this article.

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Reference

1. Yashchuk AG, Musin II, Rahmatullina IR, Kamalova KA, Yaschuk KN (2018) Pelvic floor muscle training using the biological feedback method in primiparous women after vaginal delivery. Medical journal of Bashkortostan 13: 17-122.

2. Svabík K, Martan A, Masata J, El-Haddad R, Hubka P, et al. (2011) Ultrasound appearances after mesh implantation-evidence of mesh contraction or folding? Int Urogynecol J 22: 529-533.

3. Izquierdo A, Pretorius ES, Shera DM, Shabbout M, Shaunik Barnhart KT (2006) Baseline dimensions of the human vagina. A Hum Reprod 21: 1618-1622.

4. Minassian VA, Stewart WF, Wood GC (2008) Urinary incontinence in women: variation in prevalence estimates and risk factors. Obstetrics and gynecology 111: 324Y331.

5. Jelovsek JE, Maher C, Barber MD (2007) Pelvic organ prolapse. Lancet 369: 1027Y1038.

6. Sergent F, Desilles N, Lacoume Y, Bunel C, Marie JP, et al. (2009) Experimental biomechanical evaluation of polypropylene prostheses used in pelvic organ prolapse surgery. Int Urogynecol J Pelvic Floor Dysfunct 20: 597-604.

7. Klinge U, Klosterhalfen B, Birkenhauer V, Junge K, Conze J, et al. (2002) Impact of polymer pore size on the interface scar formation in a rat model. J Surg Res 103: 208-214.

8. Cobb WS, Burns JM, Peindl RD, Carbonell AM, Matthews BD, et al. (2006) Textile analysis of heavy weight, mid-weight, and light weight polypropylene mesh in a porcine ventral hernia model J Surg Res 136: 1-7.

9. Gauruder-Burmester A, Koutouzidou P, Rohne J, Gronewold M, Tunn R (2007) Follow-up after polypropylene mesh repair of anterior and posterior compartments in patients with recurrent prolapsed. Int Urogynecol J Pelvic Floor Dysfunct 18: 1059-1064.

10. Tunn R, Picot A, Marschke J, Gauruder-Burmester A (2007) Sonomorphological evaluation of polypropylene mesh implants after vaginal mesh repair in women with cystocele or rectocele. Ultrasound Obstet Gynecol 29: 449-452.

11. Velemir L, Amblard J, Fatton B, Savary D, Jacquetin B (2010) Transvaginal mesh repair of anterior and posterior vaginal wall prolapse: a clinical and ultrasonographic study. Ultrasound Obstet Gynecol 35: 474-480.

12. Svabík K, Martan A, Masata J, El-Haddad R, Hubka P, et al. (2011) Ultrasound appearances after mesh implantation - evidence of mesh contraction or folding? Int Urogynecol J 22: 529-533.

13. Dietz HP, Barry C, Lim YN, Rane A (2005) Two-dimensional and three-dimensional ultrasound imaging of suburethral slings. Ultrasound Obstet Gynecol 26: 175-179.

14. Dietz HP (2010) Pelvic floor ultrasound: a review. Am J Obstet Gynecol 202: 321-334.

15. Caquant F, Collinet P, Debodinance P, Berrocal J, Garbin O, Ret al. (2008) Safety of Trans vaginal mesh procedure: retrospective study of 684 patients. J Obstet Gynaecol Res 34: 449-456.

16. Swenson CW, Simmen AM, Berger MB, Morgan DM, DeLancey JO (2015) The long and short of it: anterior vaginal wall length before and after anterior repair. Int Urogynecol J 26: 1035-1039.

17. Argirović R (2013) Posthysterectomy vault prolapse of vaginal walls: choice of operating procedure. Srp Arh Celok Lek 40: 666-672.

18. Pavlov VN, Yashuk AG, Musin II, Mufazalova NA, Shangina OR, et al. (2019) Experimental morphological substantiation of the use of cultures of multipotent mesenchymal stem cells in combination with biomaterials in the reconstruction of the pelvic floor. Urology N° 4: 32-37.