SEX REASSIGNMENT SURGERY

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Sažetak

Transseksualizam predstavlja stanje u kojem osoba ne oseća svojim pol u kojem je rođena i ima jaku želju da to promeni; i kao takvo je prihvaćeno u Međunarodnoj klasifikaciji bolesti. Lečenje osoba sa poremećajem polnog identiteta zahteva multidisciplinarni pristup, u kome učestvuju psihijatri, endokrinolozi, ginekolozi, urolozi i plastični hirurzi. Hirurška rekonstrukcija genitalija predstavlja poslednji korak u tranziciji osoba sa poremećajem polnog identiteta i može se izvesti kod onih pacijenata koji ispunjavaju uslove određene standardima Međunarodnog udruženja za polnu disforiju (WPATH).

Hirurške procedure u sklopu promene pola iz ženskog u muški

Kod pacijenata koji menjaju pol iz ženskog u muški vrši se nekoliko hirurških procedura, sa ciljem da se izvedu u jednom aktu, i koje uključuju: mastektomiju, histerektomiju sa obostranom adnektomijom, vaginektomiju, metoidioplastiku, skrotoplastiku sa implantacijom testis proteza i faloplastiku. Metoidioplastika obuhvata: uklanjanje vagine, oslobađanje ligamenata klitorisa i ispravljanje ventralne horde, ispravljanje i produženje klitorisa, rekonstrukciju uretre korišćenjem grafta bukalne mukoze i genitalnih flapova, kao i rekonstrukciju skrotuma sa implantacijom testis proteza. U našem centru sve navedene procedure se vrše u jednom aktu, što je velika prednost za pacijenta. Rezultat je estetski odličan, omogućavajući mokrenje u stojećem stavu, kao i potpuno očuvanu seksualnu senzaciju, ali zbog malih dimenzija neofalusa penetracija nije moguća. Zbog svega navedenog, kao i zbog male stope komplikacija, pacijenti se često opredeljuju za navedenu opciju. Oni koji hoće veći falus, koji omogućava implantaciju penilne proteze, imaju nekoliko opcija faloplastike, korišćenjem različitih režnjeva. Naš centar je razvio tehniku korišćenjem slobodnog kožnomišićnog režnja širokog leđnog mišića, koji ima brojne prednosti u vidu veličine režnja koji omogućava kasniju implantaciju penilne proteze, dugačke neurovaskularne peteljke, prihvatljiv izgled donorske regije bez gubitka funkcije, kao i manji stepen kasnije retrakcije falusa. Kompletan rekonstrukcija genitalija korišćenjem

navedenog režnja, uključujući i uklanjanje ženskih genitalija, kompletnu rekonstrukciju uretre, glansa i skrotuma sa testis protezama, kao i implantaciju penilne proteze, se vrši u 2 ili 3 akta i predstavlja vrlo opsežnu i kompleksnu hirurgiju sa dugim postoperativnim oporavkom.

Hirurške procedure u sklopu promene pola iz muškog u ženski

Kod pacijenata koji menjaju pol iz muškog u ženski vrši se nekoliko različitih hirurških intervencija, koje sve zajedno dovode do feminizacije muškog tela (lica, grudi, vrata). U rekonstrukciji genitalija, kreiraju se vagina, introitus vagine, ženska uretra, klitoris, velike i male usne. Metoda izbora je 'penile inversion technique', gde se testisi uklanjaju zajedno sa kavernoznim telima penisa u potpunosti, a od ostatka muških genitalija se formiraju ženske spoljašnje genitalije: od dela glansa penisa sa neurovaskularnom peteljkom se formira klitoris, a od kože penisa i skrotuma se formiraju vulva i vagina. Uretra se rekonstruiše da anatomske i funkcionalno odgovara ženskoj uretri. Prednosti ove tehnike su dostupnost flapa, manje invazivna hirurška intervencija, elastičnost kože penisa, odsustvo malja, očuvanje senzitivnosti, prihvatljiv estetski izgled, kao i funkcionalnost. U slučajevima kada primarna rekonstrukcija vagine kožnim penilnim režnjem ne uspe, vaginoplastika se radi korišćenjem slobodnih transplantata ili korišćenjem crevnih segmenata. Pored estetskog i funkcionalnog, mora se obratiti pažnja i na psihosocijalni i psihoseksualni rezultat, koji određuje kvalitet života.

Abstract

Transsexualism, or gender incongruence, presents a state in which a person's assigned sex at birth conflicts with their psychological gender. It is classified in International Classification of Diseases as F64. Treating these persons require multidisciplinary approach, including psychiatrist, endocrinologist, gynecologist, urologist, plastic and reconstructive surgeon. Genital reconstruction is the final step in transition, and can be performed when all other conditions required by World Professional Association for Transgender Health (WPATH) are accomplished.

Female to male sex reassignment surgery

Several surgical procedures can be done in female to male transsexuals, including mastectomy, removal of female genitalia, metoidioplasty, scrotoplasty with implantation of testicular implants, as well as total phalloplasty. The current operative technique of metoidioplasty comprise the following steps: vaginal removal, the release of the ventral chordee and clitoral ligaments, straightening and lengthening of the clitoris, urethroplasty by combining buccal mucosa graft and genital flaps and scrotoplasty with insertion of testicle prostheses. The goal is to perform all these procedures in one stage, and that makes our team famous worldwide. Metoidioplasty results in excellent cosmetic outcome with completely preserved sensitivity and sexual arousal, enables voiding while standing, but without ability to penetrate due to small size of the neophallus. Considering these advantages, including low complication rate, patients often choose this option. For those who require bigger phallus which enables implantation of penile prosthesis, several surgical techniques have been reported using either available local vascularized tissue or microvascular tissue transfer. However, none of them satisfy all the goals of modern penile construction, i.e. reproducibility, tactile and erogenous sensation, a competent neourethra with a meatus at the top of the neophallus, large size that enables safe insertion of penile implants, satisfactory cosmetic appearance with hairless and normally colored skin. We developed a new technique using the musculocutaneous latissimus dorsi free transfer flap, which mostly satisfies the requirements noted above. It has many advantages, such as its workable size which enables prosthesis implantation, long neurovascular pedicle and minimal functional loss after removal, as well as small phallic retraction. Total phalloplasty using latissimus dorsi flap, including total removal of female genitalia, reconstruction of the neourethra to reach the top of the glans, glans and scrotal reconstruction, implantation of testicular implants and penile prosthesis, is performed in 2 or 3 stages, presenting very complex and demanding surgical procedure with longer postoperative recovery period.

Male to female sex reassignment surgery

Several feminizing surgical procedures are performed in male to female transsexuals, including facial, neck, breast and genital surgery. Genital reconstruction comprises vaginoplasty, introitoplasty, clitoroplasty, labioplasty and urethroplasty. There are two substantial tissues for vaginal replacement: skin and bowel. For transgender patients penile inversion vaginoplasty presents the best option. Procedure starts with bilateral or-

chidectomy. The penis is dissected into its anatomical components and corpora cavernosa are completely removed. Glans with neurovascular bundle is used to create clitoris with preserved sensation, while skin of the penis is inverted, as a pedicled flap preserving blood and nerve supplies to form a fully sensate vagina. Urethra is reconstructed as in a female. Available and hairless flap, elasticity of penile skin, preserved erogenous sensation, good cosmetic and functional outcome, are the main advantages of this technique. After penile inversion skin flap, and in cases of failed surgery, sigmoid colon technique presents the method of choice in male to female reassignment surgery. Beside aesthetic and functional result, psychosocial and psychosexual outcome of these procedures are necessary in achieving a good quality of life for these patients.

Introduction

Transsexualism, or gender incongruence, presents a state in which a person's assigned sex at birth conflicts with their psychological gender. Transgender people have a very strong desire to be accepted as people of the opposite sex, both anatomically and functionally. They often describe the feeling of being imprisoned in the body of the wrong gender. Thorough psychiatric evaluation is the first step in treating this condition, followed by the introduction of hormonal therapy by the endocrinologist. Sex reassignment surgery is the final step in transition. Comprehensive preoperative psychological and endocrinological evaluation and treatment are necessary prior to surgery. Initially, a person who is diagnosed with transsexualism (F64 - according to the International classification of diseases- ICD -10), has to undergo detail assessment by two psychiatrists specialized in this field. This evaluation lasts for 6-12 months at least, in order to obtain a written consent to proceed with treatment [1].

World Professional Association for Transgender Health (WPATH) published Standards of Care, which are designed for physicians, psychotherapists, social workers and other specialists who work with transsexuals. Their goal is to achieve a permanent harmony with one's born identity in a safe and effective manner, in order to improve their overall health, psychosexual and psychosocial aspects of life [2].

Female to male sex reassignment surgery

Once the criteria of the WPATH have been met, and the hormonal therapy has lasted long enough, female transgenders can undergo the final step of transition –

gender reassignment surgery. The majority of patients first decide to remove their breasts. Bilateral mastectomy includes the removal of mammary glands, reconstruction of the breast to mimic that of a man, and sometimes reduction and repositioning of the nipples in order to look more like that of a man. Currently there are multiple techniques for bilateral subcutaneous mastectomy. The technique mostly depends on the size of the patient's breasts, previous asymmetry, as well as the size of the nipples. It is not uncommon to find trans-males wearing corsets for long period of time prior to their bilateral mastectomy. Wearing a corset tightly bound around the chest for long periods of time leads to specific changes in the connective tissue of the breast as well as the elasticity of the skin.

Hysterectomy is the removal of the uterus and is often accompanied with the removal of the adnexa considering that there is evidence of ovarian cancer in trans-males due to the high levels of testosterone. Hysterectomy is often done before the final reconstruction of the genitalia because, in most countries, it is enough to perform a hysterectomy and mastectomy for the individual to change their gender officially, as well as personal documentation according to that. Hysterectomy can be performed laparoscopically, transabdominally via supra-pubic transverse laparotomy using a Pfannenstiel incision, or transvaginally. Removal of the vagina (vaginectomy) is the fundamental element of male genital reconstruction. Vaginal mucosa is completely removed in the process of colpocleisis, while the space is closed surgically using circular sutures. The final process in reconstruction of male genitalia is phalloplasty. Currently there are two options for the reconstruction of neophallus in transgender males: metoidioplasty and total phalloplasty.

Metoidioplasty

Metoidioplasty is a procedure of creating a small neophallus by lengthening and straightening the clitoris. The clitoris is initially enlarged due to the preoperative testosterone treatment. Additional enlargement of the clitoris is achieved with preoperative use of dihydrotestosterone administered locally on the clitoris, in combination with a vacuum pump, twice a day, for three months prior to surgery. Metoidioplasty enables the patient to have the appearance of male genitalia, as well as voiding while standing, but without possibility of penetration due to the small size of the neophallus. Nevertheless, erection and sensitivity of the neophallus are completely preserved (**Figures 1-3**).

Figure 1. Preoperative appearance of the female genitalia. The clitoris is enlarged due to hormonal treatment.

Figure 2. The result after metoidioplasty. The scrotum is created using labia majora.

Figure 3. Ventral aspect. Testicular implants are properly positioned in the new formed scrotum. Urinary catheter is placed in the neourethra which opens at the tip of the glans.

Metoidioplasty was introduced into modern medicine by the American surgeon Donald Laub in 1970. The word originates from the greek words “meto”- towards, and “oidion” - male, meaning: resembling male genitalia [3].

There are a few different approaches to metoidioplasty nowadays, but all essentially strive to straighten and lengthen the clitoris and create a small neophallus, with the reconstruction of the urethra and scrotum [4]. Belgrade school for genital reconstructive surgery is known worldwide, especially in the world of transgender people, as well as among doctors, for their technique in metoidioplasty. In our center, metoidioplasty is performed as a one-stage procedure [5].

The surgical technique consists of removing all female genitalia (total transvaginal hysterectomy and vaginectomy by colpocleosis), followed by the lengthening and straightening of the clitoris. After complete degloving, the clitoral ligaments are divided to advance the clitoris. Ventrally, the urethral plate is dissected from the clitoral bodies. Care should be taken to prevent injury of spongiosal tissue around the urethral plate and extreme bleeding. Dissection includes bulbar part of the plate around the native orifice to enable its good mobility for urethral reconstruction. Since the urethral plate is always short causing the ventral clitoral curvature, it is divided at the level of the glanular corona. In this way, complete straightening and lengthening of the clitoris are achieved. The bulbar part of urethra is created by joining

the flap harvested from anterior vaginal wall and remaining part of divided urethral plate.

For additional urethral reconstruction, we use three different techniques, depending on anatomical characteristics of the patient's genitals. In the case when urethral plate is wide and elastic enough, reconstruction of the urethra is possible by simple tubularization, without transecting the urethral plate. The suture site is then covered with well vascularized tissue. Urethral reconstruction requires combined technique in cases where even after dissecting of the clitoral ligaments, ventral curvature is still significantly expressed, or in cases where transecting of the urethral plate would provide significant straightening and lengthening of the clitoris. These combined techniques include buccal mucosa free graft and the vascularized genital skin flaps [6].

Buccal mucosa graft is recognized as tough, resilient, easy to harvest, leave no visible donor site, with high rate of acceptance. Most importantly, after a certain period of time it resembles urinary epithelium. One graft is usually sufficient enough and it is usually harvested from the inner cheek or the inner side of the lower lip [7]. Additional urethral reconstruction is done using buccal mucosa graft and vascularized genital skin flaps. The graft is fixed and quilted to the corporal bodies starting from the advanced urethral meatus to the tip of the glans. In this way, half of the urethra covering corporal bodies is created. Urethral covering can be achieved using either labia minora flap or dorsal clitoral skin flap. Inner part of labia minora is dissected to create a flap with appropriate dimensions without detachment from the outer labial surface. This way, excellent vascularization of the flap is enabled. Flap is joined with buccal mucosa graft over a 12–14-Fr stent to create neourethra without tension. Outer surface of the labia minora then covers all suture lines forming ventral penile skin [8,9]. The reconstruction of the scrotum is performed by using labia majora which are joined in the midline, along with a testicular silicone implants that are of appropriate size for the anatomy of the patient.

The main advantage of our approach is that everything is done in one stage: metoidioplasty, removal of the vagina, and the reconstruction of the urethra and scrotum.

Phalloplasty

Phalloplasty is a surgical procedure in which the adult-sized neophallus is created to provide male appearance of the genitalia, voiding while standing, as well as penetration after implantation of penile prosthesis. Phalloplasty is a very challenging and difficult surgical procedure, for the surgeon as well as for the patient, as it commonly requires multi-staged reconstruction.

Phalloplasty was first introduced into medicine in 1936 by Bogoras. The first procedure was done by using tubularized abdominal flap, without reconstruction of the urethra. The rigidity of the neophallus was achieved by inserting a rib cartilage [10]. The first phalloplasty in the treatment of transgender patient was performed in 1946. The patient's name was Michael Dillon, and the procedure was carried out by Sir Harold Gilles.

Several surgical techniques for neophallic reconstruction have been reported using either available local vascularized tissue or microvascular tissue transfer, such as: cutaneous flap originate from the anterior abdominal wall, inguinal flap, anterolateral thigh flap, forearm flap or a musculocutaneous latissimus dorsi free flap.

Abdominal flap phalloplasty represents the technique in which a cutaneous flap of the anterior abdominal wall is used and transferred on its vascularized pedicle to the pubic region. The flap is mobilized to the rectus abdominis muscle and to the aponeurosis of the external oblique muscle. The base stays fixed and both wings are brought together into the middle section where they are anastomosed in the midline. The reconstruction of the urethra and scrotum are in most cases left for the second stage. The major disadvantages are low sensation and limited size of the neophallus.

Inguinal flap phalloplasty creates a neophallus by using two skin flaps on the vascularized pedicles, which are transferred and anastomosed at the suprapubic line. The skin at the donor site is very hairy, therefore it is often recommended to have them permanently removed before the surgical procedure. Similarly as in the previous procedure, this technique also has a low risk of morbidity, and generally has satisfactory results concerning the scar at the donor region. The negative aspect of this procedure is the creation of a relatively small neophallus, without sensitivity. Also, urethroplasty is left for the third stage, after the implantation of the penile prosthesis [11].

The use of anterolateral thigh flap in the creation of neophallus was first described by Descamp. The flap is mobilized on the branch of the femoral circumflex artery, together with a branch of the cutaneous femoral nerve which will enable its sensitivity. The use of this kind of flap is useful in patients who are not overweight because reconstruction of the urethra can be done in the same stage by mobilizing the smaller vascularized flap, fixating it to the fascial part of the flap and tubularize it over the catheter. The sensation of the neophallus is achieved by anastomosing the branches of the cutaneous femoral nerve with the dorsal nerve of the clitoris. The clitoris remains at the base of the neophallus in the first stage, and is covered in the second stage.

The radial forearm flap represents the golden standard in neophallic reconstruction, according to many

authors. It is indicated in men when the penis is missing due to either congenital or acquired reasons, as well as in women with gender dysphoria. The use of the radial forearm flap, also known as the Chinese flap, was first reported in 1984 by Chang and Hwang [12]. Radial forearm flap is a type of fasciocutaneous flap that is based on septocutaneous perforators of radial artery, which is the essential artery for this flap. The flap is designed following a line that projects the flow of the radial artery on the skin. During the creation of the flap for the neophallus, the urethral flap is created simultaneously, and will later, using "tube within a tube" technique, be incorporated into the neophallus and tubularized over the urinary catheter. When the blood vessels of the recipient site are prepared, the flap is transferred and microsurgery for the anastomosis of the radial artery and femoral artery, cephalic vein and saphenous veins are performed. The acquired length and functionality of the neophallus present the advantages of this procedure, as well as the ability to void in a standing position, and the presence of sensibility and erotic sensation. After implanting the penile prosthesis, the penetration is also enabled. The disadvantages of this procedure are the visible scars of the donor site which basically represents a stigma for these patients. For many patients who do not have a well-developed forearm, the phallus can be inadequate in its circumference, and implantation of penile prosthesis is impossible. One of the complications that can occur is the deficit of vascularization of the hand if the radial artery is not reconstructed with a venous graft.

The use of the latissimus dorsi flap was described in literature in 1895. It was first used in the reconstruction of a defect that occurred due to the amputation of a breast. The first time it was used as a free flap was in 1976. The latissimus dorsi flap has favorable characteristics for the creation of the esthetically and functionally acceptable neophallus. Because of this our center has accepted this method for neophallic reconstruction, which can be seen in our published papers, for the treatment of exstrophy-epispadia complex, micropenis, disorders of sexual development, and gender incongruence [11, 13]. The latissimus dorsi free flap is supplied by the thoracodorsal artery, and venous drainage is provided via thoracodorsal vein, which drains into the axillary vein. Preoperatively, it is recommended to have professional massages at the donor site, which is most often the non-dominant side, as to better elasticity of the skin and therefore enable the direct closure of the donor site. During mobilization of the flap, the patient is placed into a decubital position with abducted upper arms and flexed lower arms. The flap is designed along the lateral edge of the muscle and it consists of two parts: a rectangular part for neophallic shaft, and circular or semilunar component for glans

reconstruction. The flap is then mobilized entirely and stays isolated on the neurovascular pedicle until the recipient blood vessels are prepared. Tubularization of the flap is done while it is still on its neurovascular pedicle. Completely tubularized flap is detached from the axilla after clamping dividing neurovascular pedicle with aim to achieve maximal pedicle length. If the created flap is smaller than 12x15 cm, in most cases there is a possibility of direct closure of the donor site without tension. However, in cases with bigger defects, the free Tirsch transplant is taken from the thigh of the other leg to cover the defect [11, 13]. The advantages of the latissimus dorsi free flap are the consistency of the anatomical characteristics, size of the flap and acceptable scar with direct closure of the donor region. The disadvantages are the lack of sensitive innervation, the volume of the flap in overweight patients, as well as the frequent formation of seroma at the donor site. In the next stage, the glans reconstruction is done by using Norfolk method, as well as insertion of a penile prosthesis (semirigid or inflatable). The reconstruction of the neourethra follows, using buccal mucosa graft (**Figures 4 and 5**) [14, 15].

Even though the most common procedures in genital reconstructive surgery were summarized, their advantages and disadvantages emphasized, none of them satisfy all the goals of modern penile construction, i.e. reproducibility, tactile and erogenous sensation, a competent neourethra with a meatus at the top of the neophallus, large size that enables safe insertion of penile implants, satisfactory cosmetic appearance with hairless and normally colored skin. During the decision making on which procedure to perform, it is essential to listen to the patient's expectations and desires. On the other hand we have to explain to them the possibilities and the limitation of the surgical procedures, to show to them the results and possible complications, as well as to discourage them from surgical intervention if it is not in the best interest of the patient.

Male to female sex reassignment surgery

As in transmen, female transgenders have to fulfill the criteria established by the WPATH prior to surgical treatment, including hormone replacement therapy for at least one year. After that, most patients decide to undergo facial feminizing surgery first, in order to achieve more feminine form. Due to the impact of female sex hormones, the breasts increase in size, though many patients still decide to get silicone breast implants. The majority of the patients choose to reduce the prominence of the laryngeal cartilage (Adam's apple), as well. Some also undergo vocal cords surgery to have their voice be more feminine.

Figure 4. Second stage phalloplasty. Implantation of inflatable penile prosthesis after MLD flap phalloplasty

Figure 5. Erection is achieved due to the penile prosthesis. The final stage of the reconstruction of the neourethra will be performed.

Genital reconstructive surgery in the process of male to female gender reassignment encompasses removal of the testicles along with the penis and creating a vagina, vulvar complex and a female urethra. The first surgical procedure for changing a man into a woman was performed in 1930 on Lili Elbe by German gynecologist

Dr. Kurt Warnekros. She had a bilateral orchiectomy, penectomy, vaginoplasty using the free flaps of the penile skin, as well as transplantation of the ovaries. Due to complications of the ovaries transplantation, the patient died 3 months later. According to Karmin and authors, the goal of reconstructive surgery of the genitals in male to female sex reassignment, is the creation of a functional vagina, urethral meatus and genital appearance that resemble that of a biological woman [16].

Numerous techniques of vaginoplasty have been reported up to date, all of them aiming to create functionally and esthetically acceptable vulvovaginal complex, and normal sexual function (Figure 6). Free graft of the non-genital skin was one of the first materials to be used in reconstruction of the neovagina in female transgenders. The pioneer in this field was Abraham in 1930s, who used the free skin graft, sutured over a spongy model which was inserted between the rectum and bladder, into previously created tunnel for the neovagina.

The use of vascularized flaps of the genital skin for vaginoplasty was reported in the 1950s, and penile skin flap still represents a standard in creating the neovagina in transgender women. There has been only a few minor modifications of the technique up to date: 1. The use of an inverted penile skin flap on a vascularized pedicle; 2. The use of an inverted penile skin flap on a vascularized pedicle with the vascularized flap of the scrotal skin or the free scrotal skin graft; 3. The use of an inverted penile skin flap on a vascularized pedicle that can be enlarged by using a urethral flap, in order to achieve better erogenous sensations and lubrication [17, 18]. The advantages of this technique comparing to skin grafts are numerous: better survival of the flap, small risk of retraction of the flap and stenosis of the neovagina, the preservation of the erogenous sensation due to the neurovascular pedicle, lower rate of complications such as neovaginal prolapse. Furthermore, good lubrication of the neovagina is achieved when urethral flaps are also used. On the other hand, the length of the penile skin and neurovascular pedicle can be a limiting factor in the creation of a neovagina of adequate depth. Also, the clitoris stays more exposed, and therefore more sensitive if it is not hidden between the labia majora.

During the reconstruction of genitalia in male to female sex reassignment surgery, special attention must be taken to completely remove the cavernous bodies of the penis, which have to be excised all the way to their insertion to the pubic bones. If that is not the case, there is a big risk of erection of the cavernous bodies' remnants during sexual arousal, causing strong pain and discomfort, as well as the inability of adequate sexual activity and penetration.

Figure 6. Final appearance after male to female gender reassignment surgery using penile inverted skin flap.

During the creation of vascularized penile skin flap, circular incision is usually made between the inner and outer prepuce (in uncircumcised patients), leaving one part of the inner layer of the foreskin for creating a clitoral prepuce and labia minora. The second circular incision is placed approximately 2 cm from the base of the penis to create a flap that is longer and more mobile. A longitudinal incision is placed along at the base of the flap along with the space for the urethral flap [19]. The space for the neovagina is created between the rectum and the bladder, in front of Devovliers fascia, while taking care not to damage the rectum. Using Deschamp ligature, neovagina is fixated to the sacrospinous ligament, to prevent prolapse. During the fixation of the neovagina to the sacrospinous ligament great care needs to be taken not to place it too close to the spina ischiadica, and avoid injury of the pudendal nerve and blood vessels [17, 20].

Vaginoplasty using intestinal segments

In patients with either insufficient vaginal cavity or previously failed surgery (MRKH syndrome, vaginal carcinoma, vaginal trauma), as well as some cases of gender incongruence, sigmoid colon presents the material of choice for vaginal reconstruction. Use of a sigmoid colon loop seems a most favorable choice, due to the anatomical proximity and easy mobilization of the vascular pedicle of this part of the bowel. In recent decades, due to progress in anesthesiology, antibiotics, and reduced risks associat-

ed with colorectal anastomosis, the sigmoid pedicled flap has become a first-line option.

The ideal reconstructive procedure should provide a vagina that has an appropriate length and that requires minimal, if any, dilatation. It should not scar, stenose or contract and should provide a satisfactory cosmetic result. Reconstructing the vagina using intestinal segments creates an aesthetically pleasing vagina, which seems to be more compatible with sexual activity. The use of intestinal segments for creating a neovagina for the treatment of vaginal agenesis dates back to the 19th century, when a segment of a rectum was used. After the beginning of the 20th century Baldwin performed a reconstruction of a neovagina on a patient with agenesis of a vagina, using a segment of the ileum [21].

We should emphasize that vascular pedicle of sigmoid colon is unique because it does not require micro-anastomoses. Most often the vascular pedicle is highly developed and long, so mobilized segment of the sigmoid colon can be placed into the pelvis for creating a neovagina without tension. Using this technique we reduce the risk of shrinking, narrowing and prolapse of the neovagina. Using the part of the sigmoid colon, we can create a neovagina of adequate depth that will satisfy the patient. Due to the characteristics of the sigmoid colon, neovagina is self-lubricating, has thicker walls and therefore is more resistant to trauma in comparison to the segment of the small intestine [22, 23]. In the postoperative treatment, neovagina does not require long term dilation, like in penile inversion vaginoplasty, except the dilatation of the introitus to prevent stenosis. There is an increase in mucosal secretion in early postoperative period that usually subsides within 3-6 months.

The disadvantages of this method are necessity for laparotomy and intestinal anastomosis, and the possibility of postoperative ileus formation. In the literature, a small percentage of patients is reported to develop ulcerative colitis or adenocarcinoma, postoperatively.

Rectosigmoid vaginoplasty is the most commonly used in patients after failed surgeries where other techniques were used, or in some cases of inadequate penile skin length to construct a satisfactory neovagina [24]. Choice of a technique for vaginal reconstruction mostly depends of the experience of the surgeon. One should also keep in mind that every unsuccessful or any surgical intervention followed with postoperative complications which requires additional care or new vaginoplasty, can bring the patient to great disappointment as well as to emotional instability and uncertainty. Because of this, it is necessary to perform an appropriate surgical procedure that presents the best option in creating a neovagina for each patient.

Creating the vulvar complex: clitoris, labia minora and majora

Creating labia minora and clitoral hood is often done by using part of the base of the penile skin, or in cases of non-circumcised patient, a part from the inner layer of the foreskin. In order to form introitus with natural appearance, Karim et al. introduced the creation of an inverted "Y" incision at the base of the scrotum towards the perineum, so that the posterior commissure seems aesthetically more pleasing, and to enable a smooth intercourse.

One of the most important steps in male to female transsexual surgery is the construction of the neoclitoris. First introduced in literature in 1976, clitoris was created between labia majora by reduction of the glans that was fixated on a neurovascular pedicle. Current technique consists of having the glans of the penis divided into ventral and dorsal halves. The dorsal half with neurovascular bundle gets reduced by removing its central part, but leaving the lateral parts, which are therefore brought closer to form the final shape of a neoclitoris [25].

Labia majora are created from the remaining skin of the scrotum. They should not be too thick or too thin, but just enough to cover the introitus of the neovagina, and provide natural appearance.

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