

Review

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Metoidioplasty as a one-stage phallic reconstruction in transmen

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Abstract

Gender dysphoria is a condition where there is a discrepancy between the gender assigned at birth and the desired gender, leading the patient to pursue surgical intervention. Reconstruction of the neophallus for transmen is still challenging, even though there are many surgical techniques with satisfying results. The aim of neophallic reconstruction in gender affirmation surgery (GAS) for transmen is to provide stand-up voiding, erotic sensation, orgasm and penetration ability, and acceptable donor site morbidity with minimal scarring and complications. Metoidioplasty as a variant of phalloplasty for transmen is a one-stage procedure that results in male-like external genitals, with minimal scarring, ability of standing micturition, and full erogenous sensation with the ability to achieve orgasm during sexual intercourse. Metoidioplasty is a method of choice for those transmen who wish to have GAS in one procedure without multi-staged procedures to create the adult-male-sized neophallus.

Keywords: Clitoris, gender affirmation surgery, metoidioplasty, neophallus, genital reconstruction, transmen

INTRODUCTION

Gender affirmation surgeries usually represent the final step in the transition process of an individual suffering from gender dysphoria. Genital reconstructive surgeries, known as “bottom surgeries”, are performed according to Standards of Care (SOC) of the World Professional Association for Transgender Health (WPATH): they require two letters of recommendation by two board certified mental health



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professionals and must come after at least 12 months of substitution hormonal therapy^[1]. Preoperative consultation with the selected surgeon performing gender affirmation surgery (GAS) is welcome in order to reconcile the patients' expectations of surgery outcomes and the possibilities of modern medicine, to prevent any postoperative disappointments^[2]. Even though under testosterone therapy transmen's body encounters a lot of changes, some individuals still require facial and body masculinization procedures or frontline hair procedures.

It is still difficult to assess the real prevalence of gender dysphoria, but the latest studies report an increase in prevalence for individuals assigned male at birth to 0.014-0.015, while, for individuals assigned female at birth, it is 0.002-0.003. The self-report of transgender identity in children, adolescents, and adults, ranging from 0.5% to 1.3%, has also increased according to recent studies^[3,4].

Phalloplasty, as previously said, is still a challenging procedure, reserved for highly specialized institutions and surgeons. The first phalloplasty was performed in the 1930s by Bogoras, followed by years of refining surgical techniques to satisfy patients' expectations of functionality and esthetics. However, there is no replacement for erectile, urethral tissue, and nerves that would provide ideal male genitals for males requiring genital reconstruction^[5,6]. The reconstruction of the neophallus should be performed as a one-stage procedure, yielding sensation (tactile and erogenous), functional neourethra (ability of stand-up voiding), penetrative sexual intercourse, and minimal scarring of the donor site^[5,7]. Unfortunately, to this day, there is no single surgical technique to satisfy all these goals of male genitalia reconstruction^[8].

Male genitalia reconstruction in transmale individuals can be performed by two surgical approaches: phalloplasty and metoidioplasty (a variant of phalloplasty). Phalloplasty involves the creation of an adult-sized neophallus using local or outlying tissue flaps, as either pedicled or free flaps with microvascular anastomosis. Rigidity for penetration during sexual intercourse is obtained after penile prosthesis implantation. Metoidioplasty involves creation of the neophallus using the hormonally-hypertrophied clitoris, with or without urethroplasty, and scrotoplasty, with or without testicular prostheses implantation. In the majority of patients, metoidioplasty enables voiding in standing position and full erogenous sensation, but penetration during sexual intercourse is possible in only rare cases (by self-report)^[5,9].

The first report of using clitoris in male genitalia reconstruction was in 1973, and as a term "metoidioplasty" was first introduced by Lebovic and Laub, originally from the Greek words "meta" (change), "aidion" (female genitalia), and "plasty" (formation)^[10,11]. Metoidioplasty can be considered as the method of choice, for those individuals requiring male genitalia reconstruction in single surgery to complete their transition and who do not wish to have stigma scars outside the genital area.

This narrative review aims to evaluate all available techniques of metoidioplasty and to report the postoperative results and complications. The paper was approved by the Institutional Review Board (No. 2-1-1/2020).

Preoperative evaluation

Transmale individuals undergoing genital reconstruction in GAS are required to have spent at least one year on hormonal substitution therapy according to the WPATH SOC^[1]. For those who have chosen metoidioplasty as the surgical technique, additional preoperative short-term use of vacuum pump in combination with local application of dihydrotestosterone gel is recommended to provide better postoperative results^[5,12].

Knowledge of female and male anatomy and embryology is of essential importance for surgeons performing transgender genital reconstructive surgeries. Female and male external genitals, i.e., the clitoris and penis,

are homologous organs and are both responsible for sexual pleasure^[13]. The clitoris, similarly to the penis, has a glans, prepuce, two corpora cavernosa, crura, bulbs, suspensory ligaments, and root. Unlike the penis, it does not contain corpus spongiosum with urethra. In cis-females, clitoral glans and prepuce are the only visible parts of the clitoris, while the clitoral body is curved, hidden, and attached with two parts of suspensory ligament (superficial and deep) to the pubic bones and fatty tissue of the mons, preventing its protrusion during arousal^[14]. Due to the presence of androgen receptors, the clitoris enlarges under testosterone therapy, so that one part of the clitoral body becomes visible as well. As reported by several different studies, the preoperative clitoral size in transmen varies from 2.5 to 4.6 cm^[5,15,16]. Its dissection and the division of suspensory ligaments during metoidioplasty will allow for straightening and additional lengthening of the clitoris and enable voiding while standing. The labia minora are paired, hairless mucocutaneous structures, rich in nerve endings and sensory receptors with very good vascularization, which makes them good tissue for genital reconstruction. The labia majora are paired fibroadipose structures homologous to the scrotum in cis-males and are used for scrotum reconstruction in transmen GAS^[5,17].

Even though GASs have been performed for more than 50 years, little is known about their effects on the sexual experiences of transpeople, especially of transmen. Preoperative counseling with a sexologist, the treating surgeon, and a psychotherapist is very important to reveal the patient's sexuality and sexual functioning before the surgery, but will also be of essential importance after the GA^[18].

Operative techniques

From the time it was first introduced as a genital reconstruction procedure using hypertrophied clitoris, metoidioplasty has been refined by several authors in order to gain neophallic length, achieve more natural-looking male-like genitalia, and to provide voiding while standing^[10,19]. Lebovic and Laub performed ventral chordee release with urethral reconstruction in two stages, wherein the patient was not able to void while standing after the first stage^[10,20]. Bouman's refinement consisted of urethral lengthening to the tip of the clitoris using the vaginal mucosal flap, but without ventral chordee release^[10,21]. Gilbert's modification of the technique included clitoral release and complete urethral reconstruction using only local flaps originating from the labia minora^[10,22]. Hage *et al.*^[7] used the combination of the abovementioned techniques (Bouman's and Laub's) to obtain the best possible results for their patients, who set standing micturition as their main goal^[7,10]. Later, Hage and van Turnhout^[23], in their long-term follow-up study, reported that, on average, 2.6 procedures were needed to achieve satisfying results after performed metoidioplasty. For the purpose of continuous improvement of surgical techniques, Perovic and Djordjevic^[24] reported very high success rate in their series of patients who underwent metoidioplasty related to standing micturition and esthetic appearance.

Nowadays, there are three major subtypes of metoidioplasty that can be considered as distinct procedures: simple metoidioplasty, ring metoidioplasty, and complete metoidioplasty (Belgrade metoidioplasty).

Simple metoidioplasty involves the release of clitoral ligaments and urethral plate, but without urethral reconstruction. It is usually selected by the patients who fear postoperative complications related to urethroplasty. It results in male-like genitals, with a sensate small phallus, scrotum with or without testicular implants, and native urethral opening without the possibility of voiding while standing. The complication rate with simple metoidioplasty is rather small and acceptable by the patients and their surgeons (less than 5%) and is usually related to the skin (dehiscence, local infection, and rotation of the neophallus)^[25,26].

Ring metoidioplasty includes urethral reconstruction along with the dissection of the suspensory ligaments of the clitoris and ventral urethral plate division. The urethral ring flap is harvested from the vaginal



Figure 1. Preoperative appearance. Hypertrophied clitoris under hormonal therapy. Foley catheter inserted into the bladder

introitus, attached ventrally to the clitoral body, and tubularized, thus creating the neophallic urethra. Final urethroplasty is performed by joining the tubularized ring flap and the flap from the anterior vaginal wall in an oblique fashion, while the remaining labial and clitoral skin is used for neophallus shaft reconstruction using multiple Z-plasties to avoid ventral scar contracture^[27]. Complication rates occurring after ring metoidioplasty vary from 3%-5% for urethral strictures to 10%-26% for urethral fistulae. Ring metoidioplasty is performed as a one-stage procedure, except the scrotoplasty, which is always performed as an additional procedure in one or two stages^[25].

Complete metoidioplasty (Belgrade metoidioplasty) is based on the experience in dealing with the most severe forms of hypospadias and disorders of sex development in children^[24,28]. The latest modification of the original technique involves simultaneous removal of internal female organs, vaginectomy (colpocleisis), complete clitoral lengthening and straightening with the urethroplasty to the tip of the glans, and scrotoplasty with bilateral testicular implants insertion as a one-stage procedure. The current technique relies on the embryological and anatomical homology between the clitoris and penis, confirming the clitoris as a smaller version of the penis with impaired urethral development^[2,14] [Figure 1]. The procedure involves laparoscopically-assisted hysterectomy with bilateral salpingo-oophorectomy, if not performed prior to metoidioplasty, and complete vaginal mucosa removal by colpocleisis, with male-like perineoplasty, except for one small portion close to the native urethral meatus. Further, clitoral degloving is performed by a circular incision between the inner and outer layers of the clitoral prepuce downwards to the urethral plate and continued with complete dissection of the superficial and deep portions of the suspensory ligament. Additional straightening and lengthening are obtained by urethral plate dissection to correct ventral chordee [Figure 2]. Urethroplasty is performed using all available hairless skin and/or mucosal grafts over the urethral stent size 12-14Fr so that standing micturition would be possible, and a suprapubic urinary catheter is introduced to the bladder for urine derivation^[5,26,29,30] [Figure 3A and B]. Scrotoplasty is performed by joining two labia minora flaps in the midline and inserting two silicone prostheses [Figure 4]. Postoperative care includes administration of broad-spectrum antibiotics and anticholinergic drugs while the suprapubic catheter is in place. Vacuum pump use, in combination with phosphodiesterase Type-5 inhibitors, for a period of six months postoperatively, is advised to prevent retraction of the



Figure 2. Clitoral lengthening and straightening by urethral plate dissection and suspensory ligaments dissection

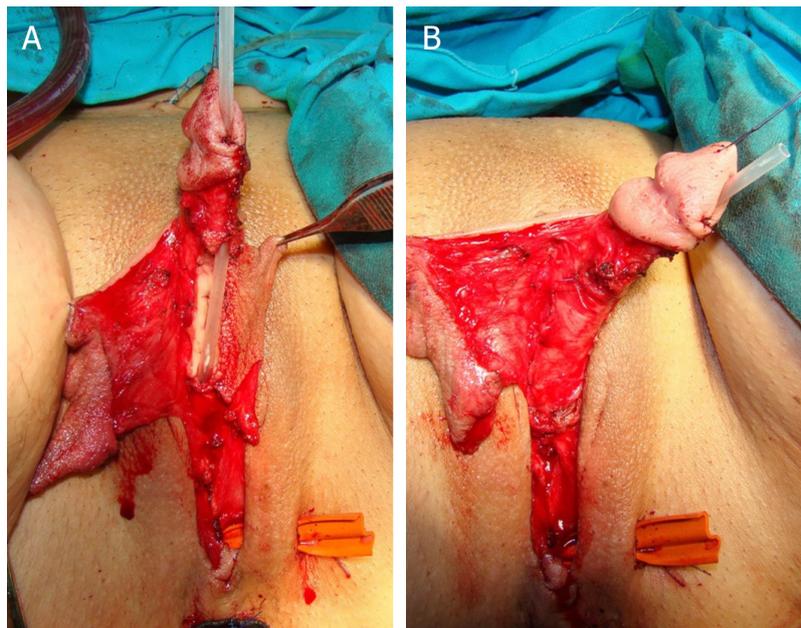


Figure 3. Urethral reconstruction using buccal mucosa graft quilted to the corpora cavernosa and vascularized skin flap originating from the labia minora over the urethral stent (A); All suture lines are covered with vascularized tissue to prevent fistula formation (B)

neophallus^[5,31,32]. Complications occurring after complete metoidioplasty can be classified as minor or major and vary from 10% to 37% depending on different literature data^[5,9,33]. Minor complications are usually managed conservatively (hematoma, skin infection, urinary tract infection, partial skin necrosis, and dribbling and spraying during voiding). Major complications are usually related to urethroplasty and include either urethral fistulae or stricture, problems with testicular implants (displacement and rejection), and persistent vaginal cavity; these require surgical repair^[2,5,26,33,34]. In our latest study, we reported overall complications in 46.8% of our 793 patients. Minor complications occurred in 17.7% and were solved



Figure 4. Appearance at the end of surgery. Neophallic skin is reconstructed using available skin from the labia minora and dorsal clitoral skin. Two testicular silicone prostheses are inserted into the scrotum created from the labia majora. Drain is placed in the vaginal vault

Table 1. Postoperative outcomes after metoidioplasty

Author/year	No. of patients	Follow-up (years, mean)	Aesthetic satisfaction (%)	Voiding while standing (%)	Erogenous sensation (%)	Sexual intercourse (%)	Complications (%)	Urethral fistula (%)	Urethral stricture (%)
Perovic and Djordjevic ^[24] 2003	22	3.9	77.3	NA	NA	NA	22.7	13.6	9
Hage and van Turnhout ^[23] 2006.	70	8	75.7	NA	NA	NA	88.6	37.1	35.7
Takamatsu and Harashina ^[27] 2009	43	0.6	88.4	67.4	100	2.3	34.9	27.9	7
Djordjevic <i>et al.</i> ^[30] 2009	38	2.2	100	100	100	36.8	39.5	5.3	0
Djordjevic and Bizic ^[29] 2013	207	5.3	100	91.8	100	NA	47.8	7.7	2.9
Vukadinovic <i>et al.</i> ^[16] 2014	97	2.5	95.9	100	100	20.6	27.8	6.2	2.1
Stojanovic <i>et al.</i> ^[34] 2017	79	3.7	96.2	100	100	69.6	25.3	5.1	3.8
Bizic <i>et al.</i> ^[5] 2019†	793	NA	94.7	100	100	100	46.8	8.8	1.4
van de Grift <i>et al.</i> ^[18] 2019	38*	2.7	68	NA	36	63.5	NA	NA	NA

*Twenty-nine patients received phalloplasty and nine patients received metoidioplasty; †Personal experience in review study. NA: not applicable

conservatively and spontaneously, while 29.1% of our patients required surgical repair because of major complications^[5]. The majority of patients undergoing metoidioplasty, up to 88% or more according to recent reports, are satisfied with the appearance of their genitals^[5,9,26]. Voiding in standing position was possible for the vast majority of patients in recent studies, up to 93.2% (range 67.4%-100%). Recent studies confirmed increased positive association among gender affirmation, body satisfaction, and sexual outcomes after the performed GAS, which was reported for 63.5% of the patients undergoing metoidioplasty. It may be associated to completely preserved erogenous sensation of the neophallus, which is more prominent. Patients after metoidioplasty report sexual intercourse in a broader sense than just penetration, with increased sexual initiative and pleasure^[18]. Metoidioplasty, as a one-stage genital gender affirmation surgery, brings about 40% overall complication rate, the most common complications being related to urethral reconstruction. Urethral fistulae are more common than urethral strictures, and most heal spontaneously^[15] [Table 1]. However, between 1% and 24% of patients who have undergone metoidioplasty decide to pursue

some other available phalloplasty procedure in order to obtain the adult-sized neophallus as their final goal^[33].

CONCLUSION

The number of gender affirmation surgeries is increasing worldwide. Specifically, genitourinary surgeries are of vital importance in GAS for transmen. The creation of “ideal” male external genitals is still a great challenge, and no surgical approach can fulfill all the criteria to meet this goal. It is important to offer pre- and postoperative counseling to patients, to discuss their expectations from the surgery in order to prevent disappointment and improve their subsequent psychosexual functioning.

The neophallus created by metoidioplasty is often shorter when compared with other phalloplasty techniques, and thus inadequate for penetration during sexual intercourse. In some individuals, this may be a limiting factor for upright voiding. On the other hand, individuals who decide to have metoidioplasty as the final option in their transition are more likely to have a single-stage procedure, to keep erogenous sensation, and to avoid multiple surgeries and complications.

In a sense, the majority of metoidioplasty patients get what is considered “ideal” male genitalia in a one-stage and time-saving procedure with reduced overall treatment costs and low postoperative complication rate.

DECLARATIONS

Authors' contributions

Made substantial contribution to conception and design of the study: Bizic M, Djordjevic M

Performed data analysis and interpretation: Stojanovic B, Bordas N

Performed data acquisition and provided technical support: Stojanovic B, Bencic M

Performed supervision and had responsibility for the organization and course of the project and the manuscript preparation: Bizic M, Djordjevic M

Performed writing of the manuscript: Bizic M, Bordas N, Bencic M

Performed critical review of the manuscript: Djordjevic M

Availability of data and materials

Not applicable.

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Conflicts of interest

All authors declared that there are no conflicts of interest.

Ethical approval and consent to participate

The study was approved by Institutional Review Board (No. 2-1-1/2020) and an informed consent to participate is obtained from the patients prior the surgery.

Consent for publication

A written informed consent for publication is obtained from patients.

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