



Gender reassignment surgery - a 13 year review of surgical outcomes

R. Rossi Neto, F. Hintz, S. Krege, H. Rübber, F. vom Dorp

Department of Urology, University of Essen Medical School (RRN, FH, HR, FvD), Essen, Germany and Department of Urology, Alexianer Hospital Maria Hilf GmbH (SK), Krefeld, Germany

ABSTRACT

Purpose: The aim of this study is to thoroughly report on surgical outcomes from 332 patients who underwent male to female gender reassignment surgery (GRS).
Material and Methods: Records from 332 patients who underwent GRS from 1995 to 2008 were reviewed. All patients were submitted to penile inversion vaginoplasty with glans-derived sensate clitoroplasty. Mean age was 36.7 years (range 19-68 years). Surgical complications were stratified in 5 main groups: genital region, urinary tract, gastrointestinal events, wound healing disorders and unspecific events.

Results: Progressive obstructive voiding disorder due to meatal stenosis was the main complication observed in 40% of the patients, feasibly corrected during the second setting. Stricture recurrence was found in 15%. Stricture of vaginal introitus was observed in 15% of the cases followed by 12% and 8% of vaginal stenosis and lost of vaginal depth, respectively. Rectal injury was seen in 3% and minor wound healing disorders in 33% of the subjects.

Conclusion: Regarding male to female GRS, a review of the current literature demonstrated scarce description of complications and their treatment options. These findings motivated a review of our surgical outcomes. Results showed a great number of adverse events, although functionality preserved. Comparison of our outcomes with recent publications additionally showed that treatment options provide satisfying results. Moreover, outcomes reaffirm penile inversion vaginoplasty in combination with glans-derived sensate clitoroplasty as a safe technique. Nevertheless, discussing and improving surgical techniques in order to reduce complications and their influence on patient's quality of life is still strongly necessary and theme of our future reports.

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INTRODUCTION

Treatment of gender identity disorders has been controversial throughout its existence. After its first public description by Magnus Hirschfeld who coined the term 'transsexualismus' mentioning the 'seelischer Transsexualismus' [psychic Transsexualism], this entity has gone through

enormous advances regarding its standard of care and surgical procedures (1). Recent publications have been able to show technical improvements and great attention has been given to surgical outcomes and their influence on patient's quality of life (2-7). Nevertheless, detailed description of individual technique, its complications as well as treatment options is still missing (8).

A prospective study evaluating our technique and its functional and psychological aspects on 66 patients showed major complications in 14%, being urethral stricture and wound healing disorders the most frequent findings (9). Later on, a review of 200 cases and their complications signaled the need for further and extensive analysis of surgical outcomes in our department (10). Here we report on 332 patients who underwent male to female penile inversion vaginoplasty with glans-derived sensate clitoroplasty in the urological department of the University of Essen - Germany. A thorough description of adverse events related to surgery and their treatment options is provided. Attempts were made on reviewing existing literature and comparing them with our results, leading to frustrating data due to scarce information. Nevertheless, absence of data has encouraged us on writing, opening a precedent for future publications.

MATERIALS AND METHODS

A list of patients, mean age 36.7 years (range 19-68 years), submitted to male to female GRS from 1995 to 2008 was disposed from our central technical information department. Analysis was performed by a standardized method of data collection. Available records were reviewed, case-notes were retrieved and analysed to identify epidemiological data. Early results during outpatient consultations and late events were also included.

Information was collected from two distinct investigators from June to October 2010. Technique modifications introduced at the end of 2008 excluded patients operated thereafter from the actual study, avoiding bias on the end results. A total of 332 patients were included. All complications and relevant notes were reviewed, thoroughly analysed and results from both investigators were compared. No significant disparity was found on retrieved data.

The main goal was to identify the adverse events related to surgery and to describe their treatment options. Surgical complications were stratified in 5 main groups: genital region, urinary tract, gastrointestinal events, wound healing disorders and unspecific events. Results were presented separately and comments were done to the main findings.

Indication for transgender surgery was based on psychological evaluation generating two medical reports from two different psychiatrists, defining surgery as the treatment of choice for all patients. Hormonal therapy with estrogens and anti-androgens for at least 6 months as well as a social integration period of one year were obligatory conditions preceding surgery.

Written informed consent was obtained from all patients as well as permission to publish picture data. 15 days prior to surgery patients were informed to stop hormonal therapy, preventing the risk of thromboembolism. Bowel preparation proceeded 2 days before surgery using osmotic solutions.

Penile inversion vaginoplasty and glans-derived sensate clitoroplasty were the techniques of choice for all patients included and were done in a standardized technique. A total of two planned settings resume surgical procedure, being the second directed to aesthetic and sometimes functional adjustments.

SURGICAL TECHNIQUE

After positioning of the patient and disinfection of surgical area, a 1 meter iodine embalmed tampon is introduced in the rectum used as guide during construction of the neovaginal space. A 16 Fr. urethral catheter is placed and scrotal incision area is marked as shown in Figure-1. Superficial dissection of scrotal skin is performed and the collected tissue conserved in saline medium in case of using it as free skin flap. Bilateral orchiectomy is done followed by closure of the external inguinal ring. The base of the penis is laterally dissected apart from scrotal fat, which will be used to build the labia majora bilaterally. Penile skin is bluntly dissected from the body after circular dissection about 0.5 cm from sulcus coronarius, preserving subcutaneous tissue as much as possible. After identification of the neurovascular bundle (NVB), lateral cauterization and incision along Buck's fascia from the penis base up to sulcus coronarius is performed (Figure-2). The NVB is ventrally dissected and separated from the corpora cavernosa following dismembering of the urethra from the corpora. The corpora are dissected to their base, separated and resected after ligation at the level of the crura.

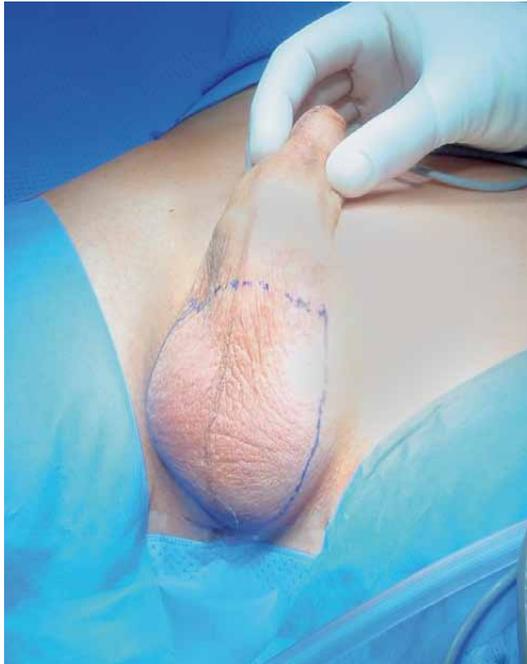


Figure 1 – Delimitation of the scrotal incision.

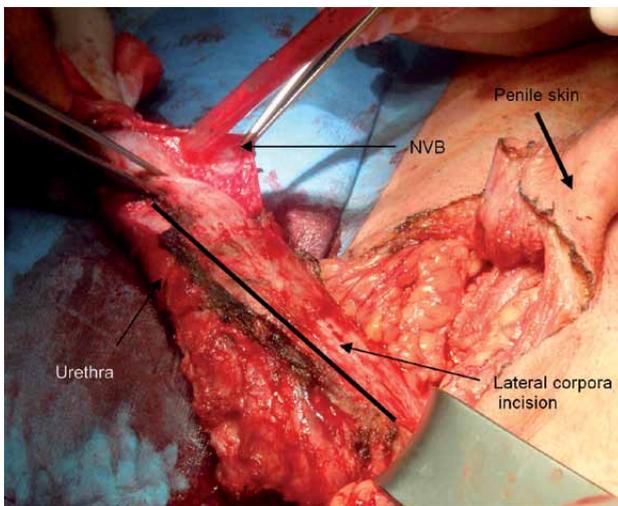


Figure 2 – Lateral incisions along Buck's fascia reaching the base of the penis and exposure of neuro-vascular-bundle (NVB).

After positioning of lateral retractors exposing the bulbar urethra, the centrum tendineum is identified and dissected reaching Denovillier's fascia. The urethra is carefully pulled upwards, retracting its bulbar portion, facilitating further dissection (Figure-3). The bladder is emptied to avoid possible lesions. Blunt dissection of neovaginal

space with a Simon's retractor is performed. Preparation is terminated when a depth over 14 cm is achieved. Identification of right anatomic layers, avoiding injuries of the urethra, prostate, seminal vesicles, sphincter and bladder is essential. After its distal closure, the phallic cylinder is stabilized with a vaginal stent (inflatable silicone prosthesis-Coloplast™) and placed inside the cavity. The position of the clitoris and urethra are defined and a longitudinal incision is made in order to exteriorise both segments. Glans-derived sensate clitoroplasty is then performed.

After exteriorisation of the glans-penis, about 25% of its surface is left epithelialized forming the neoclitoris, while the remaining de-epithelialized segment is adapted subcutaneously. The long NVB is now positioned subcutaneously near the groin. The corpus spongiosum is on its ventral side in its extension resected, preventing further swelling during sexual stimulation. The meatal orifice is incised on the 6 and 12 hour positions after resection of urethra to skin level and implanted with inverted sutures at skin limits. Finally, the

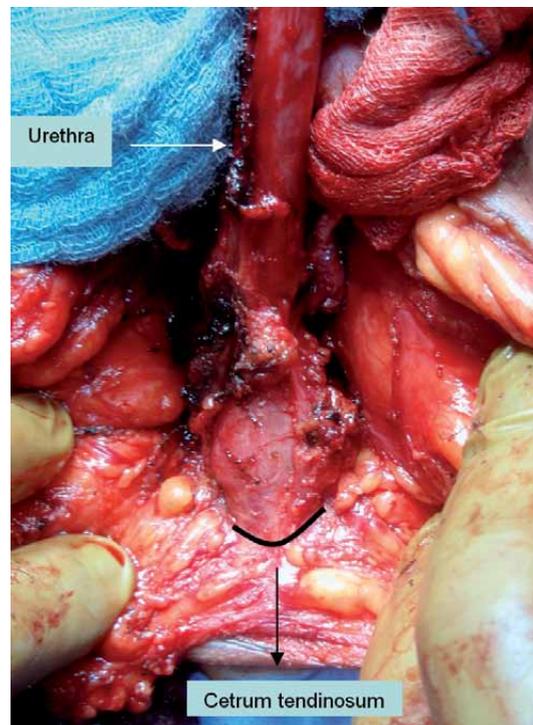


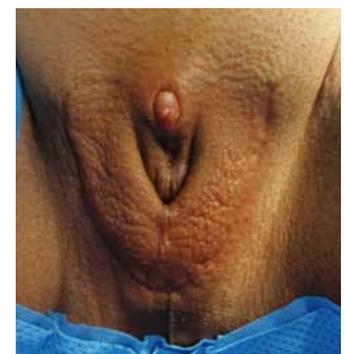
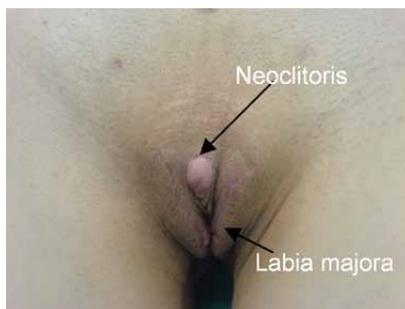
Figure 3 – Identification of the centrum tendineous and urethral retraction preceding dissection of vaginal space.

phallic cylinder is placed in the vaginal space after superficial spraying of 2 mL fibrin glue (Tissucol - Baxter Deutschland GmbH). Two suction drains are positioned along the labia majora and adaptation of the subcutaneous and skin layers is done. A suprapubic catheter is placed and compressive dressings applied.

Wound inspection is made every two days until dismissal. The transurethral catheter is removed 2 days after surgery and the vaginal stent on the fourth day, following inspection of vaginal walls. Deambulation starts on the fifth post-operative day. Patients are instructed to begin vaginal stent handling thereafter and spontaneous voiding is evaluated by closure of the suprapubic catheter, which is removed 24 hours after spontaneous micturition. If the postoperative course is uneventful,

the patient leaves the hospital 8 to 10 days after surgery. By this time all of the patients are able to handle their vaginal stents. Patients are seen 15 days after dismissal and if necessary in subsequent visits to our outpatient clinic.

The second surgical stage is performed 8-10 weeks later. It includes incision of the posterior vaginal vault, neoclitoris plasty, creation of a mons pubis (suprapubic skin plasty), construction of labia minora, correction of labia majora and if necessary a meatoplasty (Figures 4 and 5). This procedure takes about 45 minutes and is done under general anaesthesia. Patients are generally dismissed 3-5 days after surgery. Figures 6-8 show some early esthetical results after the first and second settings. Breast implants are an optional intervention that can be simultaneously performed.



Figures 4 and 5 - Second surgery, 8-10 weeks after first procedure. Figure 4 (left) showing incision of posterior vaginal vault and Figure 5 (right) after correction of the labia majora and creation of the mons pubis.

Figure 6 - Genital appearance 6 weeks after first surgery.



Figures 7 and 8 - Genital appearance 6 and 12 weeks after second surgery.

Table 1 - Complications after gender reassignment surgery †

	Rossi et al. (n=332)	Lawrence (31) (n=232)	Goddard et al. (33) (n=233)	Baranyi et al. (Lit. Review)§
Genital region	(%)	(%)	(%)	(%)
Stricture of vaginal introitus	15	*	*	22
resection of residual corpora tissue	15	*	*	*
vaginal stricture	12	8	6	*
lost of vaginal depth	8	*	6	11
vaginal segment necrosis	3	*	*	8
Dyspareunia	2	9	*	9
partial clitoris necrosis	2	3	*	10
Vaginal prolapse	1	*	*	*
Clitoral pain	1	*	*	*
Urinary tract				
obstructive voiding disorder	40	25	18	*
stricture recurrence	15	18	23	*
Dribbling	8	33	*	*
transitory urinary retention	5.4	*	*	*
Meatal edema	5	*	*	*
transitory urinary incontinence	4	*	*	*
Urethral fistula	4	*	*	11
Distal urethral necrosis	1	*	*	3
Gastrointestinal events				
Rectal injury	3	*	*	*
Bowel atony	1.5	*	*	*
Defecation discomfort	0.6	*	*	*
Rectocele	0.3	*	*	*
Wound healing disorders				
Minor wound healing disorders	33	*	*	*
local abscesses	5	*	*	*
subcutaneous hematoma	4	*	*	*
Unspecific events				
Blood transfusion	2	*	*	*
Inguinal hernia	1	*	*	*
Compartment syndrome	0.3	*	*	*
Inguinal lymphocele	0.3	*	*	*
Genital pain	3	*	*	9

† Data comparison between our results and publications with n > 200 and a literature review. All studies used a penile-inversion vaginoplasty technique, with or without scrotal skin flaps or grafts. Most common complications are marked in italic.

§ Baranyi et al. (4) 2009 - review based on Medline literature search summarizing the pertinent literature of the past 22 years.

* A dash indicates that the presence or absence of a complication was not reported.

RESULTS

Table-1 lists the adverse events found in the last 13 years of gender reassignment surgery in our clinic. A review of the literature publications with a number of subjects greater than 200 was carried out. Few references were found, especially regarding overall complication rates. These main studies are listed below, and a comparison between their findings and our actual data was made. Surprisingly there was a great lack of information in the literature, supporting our decision on presenting the results.

Surgical complications were stratified into 5 groups according to their characteristics, giving us better background on how to improve our technique.

Genital region

In this group, stricture of vaginal introitus was found in 48 (15%) cases, loss of vaginal depth in 25 (8%) and vaginal stricture in 40 (12%). Vaginal wall necrosis was observed in 9 (3%) cases and in 6 (2%) partial clitoris necrosis occurred. 4 (1%) patients presented vaginal prolapse. All of them were submitted to reinsertion of the neovagina using fibrin glue and no further intervention was necessary. 30 (9%) patients underwent a neovagina reconstruction using mesh grafts or skin flaps and 3 (10%) of them received an ileal augmentation because of stricture recurrence.

Dyspareunia was a transitory problem in 5 (2%) patients and 50 (15%) patients underwent a third surgery with resection of residual corpora tissue, due to related pain during sexual arousal or intercourse. Clitoral pain was reported in 4 (1%) cases.

Urinary tract

132 (40%) patients presented obstructive voiding disorder due to progressive meatal stenosis after the first surgery, leading to a simple Y-V plastic reconstruction at the second planned surgery. This finding represented the most frequent complication related to surgery. Symptoms ranged from progressive subjective obstructive voiding disorders to urinary retention. The last was ob-

served in only 7 (5%) patients. 20 (15%) patients underwent further corrections due to stricture recurrence, mostly observed 3 to 4 months after the second surgery. Dribbling persisted in 26 (8%) patients after the second operation. 14 (4%) patients showed transitory stress urinary incontinence Grades I-II after first surgery, although in 2 cases grade III incontinence was detected. Urethral injury was found in 12 (4%) patients; although in 5 cases the lesions were identified and immediately repaired during the surgery. The remaining 7 patients had post surgical diagnosis, leading to successful transvaginal repair in all cases. Distal urethral necrosis was observed in 4 (1%) patients. In 18 (5%) patients a second transurethral catheter was temporarily introduced due to meatal swelling and removed prior to dismissal.

Neomeatus bleeding occurred in 11 (3%) patients and 5 of them needed immediate surgical intervention consisting of external haemostatic sutures of its walls. On the remaining patients, urethral catheter was changed to a 22 Fr. catheter, ceasing the bleeding.

Gastrointestinal events

Rectal injury occurred in 11 (3.3%) patients. Among them, 9 developed post surgical fistulas (6 recto-neovaginal, 2 vesico-rectal and 1 recto-perineal). Seven patients underwent local trans-neovaginal surgical correction with protective colostomy. The remaining two patients had a 3.5 cm and 5.0 cm rectal injury, respectively. These were identified during surgery, undergoing successful primary closure. In 1 (0.3%) patient a vesico-vaginal fistula was diagnosed and treated with double-layer tissue interposition after identification and closure of injury and in 1 (0.3%) patient a rectocele was identified and after 3 months showed remission.

Wound healing disorders

Wound dehiscence was found in 108 (33%) patients and mostly seen in areas of tissue tension, such as introitus vaginalis and labia. In 18 (5%) cases, local abscess was found and 13 (4%) patients presented infrapubic subcutaneous hema-

toma. In 5 (2%) cases partial necrosis of the inferior labia were observed.

Unspecific events

Inguinal hernia was found in 3 (1%) patients due to insufficient closure of the exterior inguinal ring. No reports of incarceration were found and there was no need for surgical intervention in the 2 years of follow up. In 1 (0.3%) patient a para-stomal hernia was documented after protective colostomy and repaired at the time of surgical reposition. Compartment syndrome was surgically resolved with fasciotomy in 1 (0.3%) case, with no further intervention. Blood transfusion was performed in 6 (2%) patients using auto-transfusion, collected prior to surgery.

Hormonal therapy was reinitiated at home and no withdrawal was needed for the second surgery. There has been no report of thromboembolic events except for the mentioned case of compartment syndrome.

DISCUSSION

Reporting on surgical outcomes after GRS is challenging. Sutcliffe et al. performed a representative systematic review on main literature databases showing important limitations regarding surgical outcomes and treatment options (8). Indeed, conducting a long term prospective study with this heterogeneous group of patients is not easy. We are normally confronted with high drop-out follow-up quotes, especially if good functional results are achieved. Many patients reappear only when complications emerge.

Another barrier on describing surgical outcomes is the lack of comparable publications detailing the techniques used and their complications, not to mention on how to manage them, precluding reproduction of the available surgical methods.

Eldh et al. (11) and Lawrence (12) concluded that surgical outcomes have a positive impact on patient's outcome and satisfaction. Furthermore a 5 year follow-up from MtF (male to female) GRS reported by Bodlund and Kullgren (13) showed that over 70% of patients improved

their social relations, psychological, and psychiatric aspects after surgery, indicating GRS as the best treatment option supporting psychotherapy. These data suggest that surgery belongs to one of the keys leading to improvement on quality of live among these patients.

Penile inversion vaginoplasty or neocolporrhaphy was the technique of choice on treating our patients. This surgical technique, combined with glans-derived sensate clitoroplasty, is considered to be the international standard in male to female GRS (Giraldo et al. (14); Hage (15); Karim et al (16)).

Vaginal strictures and lost of depth are the main functional complications, although persistent dilatation with vaginal stents may achieve satisfactory results. An outcome review of different techniques documented the presence of vaginal stenosis in 6-15% using penoscrotal skin flaps (17-19), 5-55% with penile skin inversion only (20-24) and 8-45% using free-skin grafts (25-28). In our group of patients, lost of vaginal depth occurred in 7.5% of the cases along with vaginal (12%) and introitus (14.5%) strictures. There are several reasons explaining this complication; local infection and tissue retraction due to diminished blood supply after penile skin inversion are the most important ones. But we also identified that complaints related to depth are frequently brought by patients who discontinued dilatation after primary surgery. Another point is the penile skin retraction caused by edema and swelling of the symphysis, withdrawing the neovagina.

Penile skin retraction is one of the main problems regarding penile inversion vaginoplasty. Up to 4 cm depth can be lost in the first 10 days after the surgery. For this reason patients are requested to use the vaginal dilators directly after surgery and as long as possible after dismissal. In order to avoid this retraction, subcutaneous tissue is mobilised above the symphysis pushing the skin downwards. This leads in turn to significant problems; it will inevitably come to dislocation of neoclitoris and urethral positions if adaptation of the neovagina is not achieved, resulting either on compression of the meatus or protuberance of the neoclitoris. Besides, it is also responsible for post surgical hematoma, which may also reduce vas-

cularization of the neoclitoris through local compression. In our point of view, defining the minimal length of 12 cm before using a scrotal skin flap is the best option to minimize retraction.

The surgical treatment of short, strictured and necrotic neovaginas is the most challenging aspect. These complications are associated with extensive surgical corrections using skin flaps and strenuous post surgical management. Preferentially, we use ellipsoid hypogastric free skin flaps in cases where patients have regional skin excess. Another option is the inner side skin of the adductor region (thigh). Usually a 20 cm x 5 cm area is delimited and prepared using a dermatome (calibration 0.8 mm). In many patients there's also need to perform skin meshing, normally in a 2:3 proportion in order to guarantee good extensions. In all of these cases the use of fibrin spray may help skin adaptation and vaginal stent removal should only take place 4 days after surgery. We found 30 patients who underwent vaginal reconstruction in our review due to severe infection and reduction of local blood supply. Three patients needed a new reconstruction with ileal segment, and no surgical complication was observed. In all of these patients, the main difficulty represented patient's low compliance regarding post surgical dilatation. We suggest supervised neovaginal dilatation and wound care until patient is confident to leave hospital. No functional complaints have been reported till now, although in some cases lost of depth has been reported. Attempts using intestinal interposition have shown no advantages compared to skin flaps, especially if complications are considered (29,30). For this reason we indicate up to two reconstructions with skin flaps before using ileal segments. We have no experience with colonic segment interposition.

In cases of stricture of lateral neovaginal walls, we suggest lateral incisions along its length as well as intensive dilatation for at least 4 months, 3 times a day. This procedure should preferably be done with cold lateral incisions using the scalpel, avoiding scar formation observed when using monopolar cautery.

Dyspareunia has shown to be a transitory problem which can be solved with extensive periods of neovaginal dilatation. In 15% of the cases a correlation between pain during sexual arousal

or intercourse and remaining corpora stump was observed. A simple surgery with extended resection reaching the crura was undertaken, solving patient's complaints. Genital pain is expected in up to 9% of operated patients in the literature (31,32). In our series, 2% showed this complaint, normally related to the size of partner's penis. Treatment option was the use of larger vaginal dilators and pelvic relaxation methods prior to intercourse. Nevertheless, precise description of localization and correlation of pain with anatomical findings are not clearly described.

Clitoral pain was successfully treated with topic anaesthetic (lidocain and prilocain) for a period of maximal three months. We suppose that in some patients there is a neural hypersensibilisation due to local inflammation, but there is no literature describing its pathophysiological causes.

Concerning overall complication rates, progressive obstructive voiding disorders due to neomeatal stenosis (132/332 patients) were the major adverse event, however feasibly reconstructed with a simple Y-V meatoplasty. Despite the high incidence in our series, urgent intervention due to urinary retention was an uncommon event (5% / 6 patients). In most cases, progressive urinary stream weakening due to stricture of neomeatus was observed. Treatment consisted of suprapubic catheterization and neomeatal reconstruction on the following day. Wound inspection showed scar formation and diminished local vascularization in all cases sent to pathology. Urethral mobilization as well as re-implantation of neomeatus was the procedure of choice. Nevertheless, a recurrence rate of about 15% was observed, leading in some cases to repeated surgeries. Literature describing local findings and pathophysiology of meatal strictures are scarce. We believe that this problem relies on the reduction of local blood supply after partial resection of corpus spongiosum and consequent scar formation along with urethral withdrawal after retraction of penile skin. New techniques are being developed in our department showing promising functional results.

Lawrence described a total of 25% meatal revision surgeries after GRS, although long follow-up period of these patients were not reported (31). Moreover, a retrospective analysis of 233 patients

from Goddard et al. detected urethral stenosis after first intervention in 18.3% of cases. In 7 (1.0%) patients no urinary status was recorded and minor reconstructive urethral surgery was performed in 15% of the patients, including 42 urethral dilations and 8 meatotomies. Interestingly, a follow-up from 70 patients after a period of 3 years showed a urethral stenosis in 23% of the cases (33). Controversy is seen when different literature sources are reviewed, but again the main point relies on missing relevant late results.

Transitory stress urinary incontinence was detected in 4% (14/332) of patients. Nevertheless, all patients regained urinary continence after pelvic training. We believe that dissection of neovaginal space may lead to partial injury of sphincter fibres, resulting in transitory dysfunction.

Trans-operative urethral injuries were effectively treated with defect exposure and primary closure using absorbable 5-0 sutures, as well as longer catheterization periods (7-10 days). Patients with post surgical diagnosed injuries were treated with open, transvaginal repair with local tissue interposition, and long term catheterization (15 days). On the other hand, cases of distal urethral necrosis were treated with reconstruction using rotational flaps gained from the labia majora. Later technique modifications showed that avoiding resection of corpus spongiosum improved surgical outcomes, minimizing this event.

Rectal injury was observed in the first years of experience, representing a serious complication. A better definition of anatomical structures and identification of the centrum tendinosum as well as Denonvillier's fascia has lead to considerable reduction of cases. Extensive rectal lesions are important and may require colostomy. Generally, careful tissue interposition is sufficient and safe. More importantly, bowel preparation still remains one of the most important steps prior to surgery. Defining the maximal injury length for primary closure is difficult, especially because of the small number of cases in our series. Nevertheless, we consider lesions ≤ 5 cm safe for primary closure.

Post surgical rectal fistula represents a major complication, compelling immediate intervention in cases where local inflammatory process is limited. Fistula resection as well as tissue mobilization and

interposition is the best alternative, showing good post surgical results. In extreme cases we suggest colostomy and trans-neovaginal reconstruction. An abdominoperineal approach with interposition of omentum major may be necessary in some cases. In the past 6 years there has been no report of rectal lesions among operated patients in our clinic.

All local abscesses were treated conservatively, with incision and drainage, as well as cephalosporin-based antibiotics until complete remission. For uncertain reasons they were mostly localized in the labia, but we believe that they appear after local infection due to remaining sutures. In most cases we could identify suture remains during wound exploration.

Four percent of the patients developed infrapubic subcutaneous hematoma after the first surgery. These findings possibly rely on mobilization of subcutaneous tissue above the symphysis, gaining elasticity for adaptation of penile skin (neovagina). Although this step has been removed from our technique, we still find some cases possibly caused by post surgical bleeding from the NVB or groin. Local cooling is the easiest and most effective treatment option.

Wound healing disorders are commonly described as local tissue dehiscence, mostly observed on critical retraction areas such as vaginal vault and labia. The majority of cases are perfectly treated with local care. Good reepithelization and no need for further reconstruction are expected. Nevertheless, in case of tissue necrosis, some patients may need local debridement. Since second stage involves plastic reconstruction of the labia and introitus vaginalis, corrections can be made at this moment.

A maximal transoperative blood loss of 50 to 500 mL (mean 145 mL) was documented among operated patients. Auto-transfusions took part in cases of hemodynamic decompensation evaluated and indicated by our anesthesists. Since 2008, pre-surgical blood donation is no longer part of the prerequisites for GRS in our clinic.

CONCLUSIONS

Reviewing the literature on surgical outcomes after male to female GRS showed us several limitations regarding unavailable controlled stud-

ies, prospective data collection and high follow-up loss. Furthermore, an extended description of surgical outcomes is found in very few publications.

Our data show that gender reassignment surgery, even if performed by trained surgeons in a qualified centre, is still associated with important complication rates. Our findings were unable to describe permanent limiting adverse events that could decisively influence functionality after GRS. The results also confronted us with new information concerning our patients' surgical outcomes, leading to technical improvements aiming optimisation of functional results. An effort should be made to establish new therapy guidelines, follow-up methods and subjective evaluation of outcomes. Furthermore, outcomes reaffirm penile inversion vaginoplasty in combination with glans-derived sensate clitoroplasty as a safe technique when treating transgender patients. New data evaluating our technical developments and its influence on surgical outcomes as well as patient's quality of life are themes of our future reports.

CONFLICT OF INTEREST

None declared.

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Correspondence address:

Dr. Roberto Rossi Neto

Department of Urology

University of Essen

Hufelandstr. 55

45122 Essen, Germany

Fax: + 49 201 723-5902

E-mail: roberto.rossineto@uk-essen.de