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**Review – Andrology****Systematic Review of Neovaginal Prolapse After Vaginoplasty in Trans Women****Stephanie Tran^{a,b,*}, Cyrille Guillot-Tantay^a, Paul Sabbagh^c, Adrien Vidart^a, Pierre-Olivier Bosset^a, Thierry Lebret^a, Xavier Biardeau^d, Aurélie Schirmann^a, François-Xavier Madec^{a,e}**^a Department of Urology, Foch Hospital, Suresnes, France; ^b Department of Urology, Pitié-Salpêtrière Hospital, Paris, France; ^c Department of Urology, University Hospital of Rouen, Rouen, France; ^d Department of Urology, University Hospital of Lille, Lille, France; ^e UMR 1179, Inserm Faculty of Medicine, Versailles Saint-Quentin University, Paris Saclay, 78180 Montigny le Bretonneux, France**Article info****Article history:**

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Vaginoplasty**Abstract****Background and objective:** Most trans women are requesting a gender affirming genital surgery by vulvovaginoplasty. However, long-term complications such as genital prolapse are unknown. Through this systematic review, our objective was to provide an overview of the published outcomes related to genital prolapse after vaginoplasty in male-to-female transgender individuals, including prevalence, identified risk factors, and treatment.**Methods:** We included all studies reporting genital prolapse rates following vulvovaginoplasty from 1995 to the present. Only studies that focused on the transgender population were included. The primary outcome was the genital prolapse rate. The secondary outcomes included risk factors and treatment of genital prolapse after vulvovaginoplasty. Article selection was performed by two independent reviewers.**Key findings and limitations:** Twenty-four studies, involving 3166 patients, that presented sufficient data were analyzed. The mean age at the time of vulvovaginoplasty was 37.7 yr. The mean follow-up time was 22.5 mo. Most of the studies were retrospective case series of low to intermediate quality. The penile skin inversion technique was the most frequently employed method (in 85% of the 3166 patients). The prevalence of prolapse ranged from 0% to 7% with the penile skin inversion technique and from 1.6% to 22.7% with intestinal vaginoplasty. Upon consolidating the results, an overall rate of 2.7% was observed. Specifically, the prolapse rate within the penile inversion technique subgroup was 2.5%, while the rate for the intestinal-derived neovagina subgroup was 3.5%. The only significant risk factor identified was a high body mass index at the time of surgery. The most employed intraoperative technique to prevent neovaginal prolapse involves fixation to the sacrospinous ligament, coupled with systematic vaginal packing. Few case reports addressed the surgical treatment of neovaginal prolapse, predominantly using open abdominal or laparoscopic approaches. None of these considered* Corresponding author. Department of Urology, Pitié-Salpêtrière Hospital, Paris, France. E-mail address: tran.stephanie@outlook.fr (S. Tran).

transvaginal or perineal approaches. No recommendation exists about the use of vaginal prosthesis.

Conclusions and clinical implications: Neovaginal prolapse in male-to-female transgender patients remains a rare complication, but its significance is growing as the transgender population ages. Scarce information is available regarding preventative techniques and treatments, necessitating further exploration, hampered by its infrequent occurrence.

Patient summary: Neovaginal prolapse in male-to-female transgender patients is a rare complication, with the only recognized risk factor being a high body mass index. However, its importance is growing with the aging of the transgender population. Long-term complications, preventive techniques, and management of these prolapses need to be explored through further research.

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1. Introduction

Transgender individuals have a gender identity that differs from the one assigned at birth. In the adult US population, this proportion is estimated to be around 0.53% [1]. Hormonal and surgical interventions for transgender individuals who seek these have shown high satisfaction rates, with an 80% satisfaction rate according to Siira et al [2]. These interventions are associated with reduced psychological distress and suicidal ideation [3], and a low regret rate of 2%, as evaluated in Bustos et al's [4] meta-analysis.

It is worth noting that >75% of trans women express a desire for gender-affirming genital surgery [5].

1.1. Reminder of the different types of vaginoplasty procedures

There are several distinct types of vaginoplasty procedures that can be undertaken, depending on individual factors and objectives (Fig. 1). Among the most prevalent techniques are the following:

1. Penile inversion vaginoplasty: This is considered the gold standard for vulvovaginoplasty among trans women [6]. It involves using the penile skin to create the vaginal canal. The penile skin is inverted and used to line the inside of the neovagina, while the scrotal skin is frequently employed to shape the labia and increase the depth of the vaginal cavity, when penile skin is insufficient.
2. Alternative techniques: These techniques come into play in situations where penile tissue is insufficient or unavailable. Such approaches may use tissue from other body regions, such as the colon (sigmoid colon vaginoplasty), the perineum (perineal vaginoplasty), or even a combination of various tissue sources.
3. Combined techniques: These approaches amalgamate diverse tissue sources and methods to customize the procedure according to the individual's specific requisites and anatomical considerations. This may involve combining penile inversion with alternative tissue sources or modifications.

4. Vulvovaginoplasty: This is a variant of vaginoplasty in which the creation of a vaginal canal is omitted, the emphasis being on crafting external genitalia or labia. This procedure is favored by individuals who may not have the desire or need for a vaginal canal but still seek external feminization.

To create a vaginal space that is as anatomically accurate as possible, a surgical procedure involves the dissection of the rectovesical septum to separate the rectum from the urethra and the posterior wall of the urinary bladder. This process begins with an incision at the tendinous center of the perineum, followed by dissection through the Denonvilliers fascia to the Douglas pouch. Muscular fibers of the levator ani muscle are dissected and partially cut to expand the neovaginal cavity (Fig. 1), potentially leading to organ prolapse due to loss of support (Fig. 2).

The prevalence of vaginoplasty procedures has been rising steadily since the early 2000s, and this trend has continued to gain momentum over the past decade. Consequently, it is imperative to address the health care needs of the aging transgender population that has undergone these surgeries. Notably, there is a paucity of long-term follow-up studies, and the occurrence of genital prolapse is an under-reported concern in this specific population.

Research studies exclusively centered on prolapse following vaginoplasty are rare, and the existing data mainly stem from case reports and small case series. Most investigations exploring complications after vaginoplasty tend to encompass a range of potential issues without offering specific prevalence rates for genital prolapse or its treatment.

It is crucial to acknowledge that genital prolapse in medical literature is defined poorly, and the severity of cases can vary among studies, presenting challenges in establishing a definitive prevalence rate.

Vaginal prolapse after vaginoplasty surgery is occasionally categorized as a pelvic floor disorder without further specifications. It differs from pelvic organ prolapse (POP) in cis females, often involving graft or flap loss and/or non-adherence [7]. True POP is rare due to minimal impact on

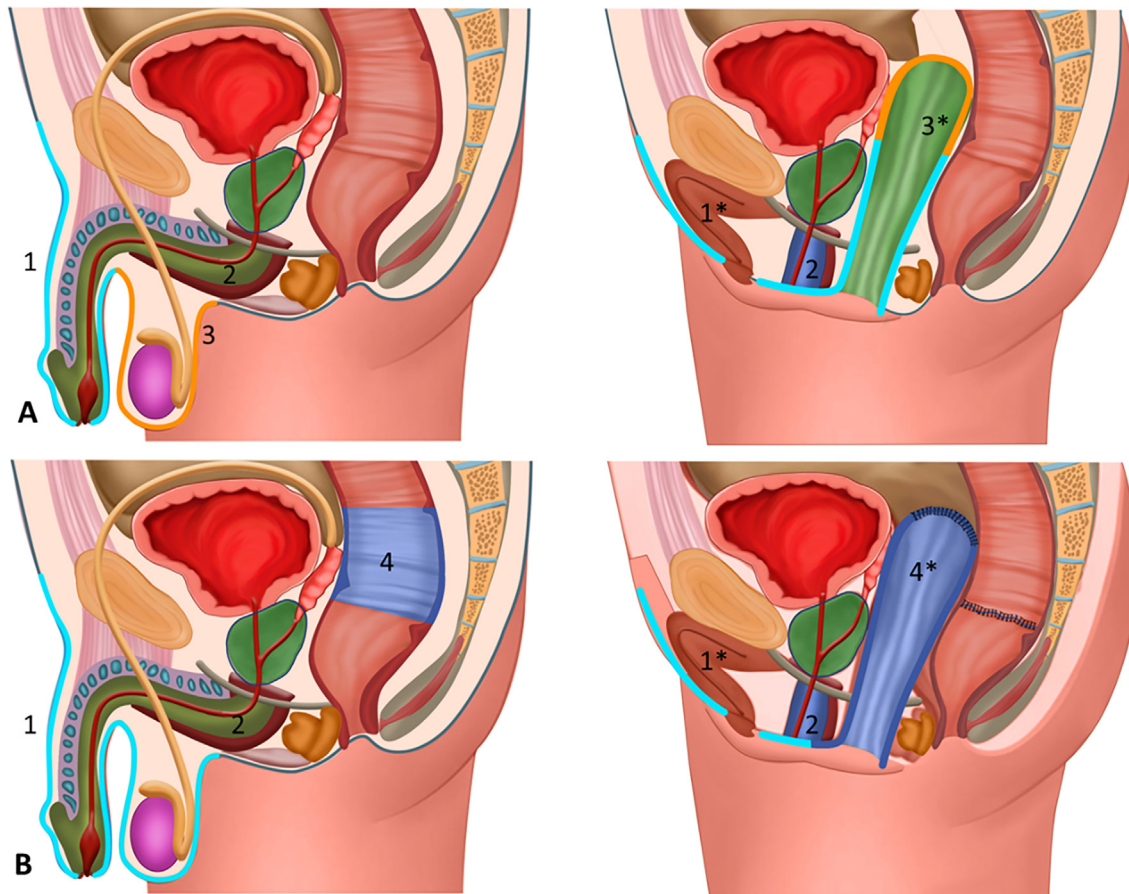


Fig. 1 – (A) Penile skin inversion vaginoplasty diagram. (B) sigmoid colon–derived vaginoplasty diagram. 1 = penis; 2 = urethra; 3 = scrotal skin; 4 = Sigmoid colon; 1* = clitoris; 3* = vagina (with penile and scrotal skin); 4* = vagina (with sigmoid).

the pelvic suspension of the rectum and bladder by vaginoplasty. However, in bowel vaginoplasty, a lack or loss of suspension of the bowel segment may lead to prolapse of the used bowel segment.

According to the International Continence Society, a POP refers to the descent of one or more of the anterior vaginal wall, posterior vaginal wall, uterus (cervix), or apex of the vagina. The pelvic organs susceptible to prolapse encompass the bladder, uterus, rectum, small intestine, and upper portion of the vaginoplasty.

The objective of this review is to concentrate on POP following vaginoplasty, aiming to delineate its prevalence, identified risk factors, and treatments within the male-to-female (MtoF) population.

2. Methods

This systematic review was conducted according to the Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA) 2020 [3]. The protocol is registered on PROSPERO CRD42023462160.

2.1. Data sources

We carried out a literature search in Medline via PubMed, Embase, and Cochrane Central databases starting from

1995 as the prevalence of vaginoplasties notably increased from the year 2000 onward.

To ensure a thorough search, we developed a search algorithm (detailed in the [Supplementary material](#)) including keywords and free-text words related to vaginoplasty, prolapse, and transgender women without language restriction. Furthermore, we screened the reference lists of relevant studies and employed the “cited references” function on PubMed to identify additional pertinent studies.

2.2. Eligibility criteria

For assessing the prevalence of neovaginal prolapse, we included articles that met all the stipulated inclusion criteria and were devoid of any exclusion criteria, as presented in [Table 1](#).

2.2.1. Study type and patients' characteristics

We included all studies reporting genital prolapse rate in transgender women after vaginoplasty.

When the same cohort was reported in different articles, we focused on the article reporting the longest follow-up. We considered only studies with at least 2 mo of follow-up.

2.2.2. Intervention types

We included all techniques for complete vaginoplasty in our analysis. Studies where the surgical technique was unspecified were excluded from our review.



Fig. 2 – Illustration of a sigmoid neovaginal prolapse.

Table 1 – Inclusion and exclusion criteria

Inclusion criteria	Exclusion criteria
<ul style="list-style-type: none"> ✓ Patient group of $n \geq 10$ male-to-female transgenders ✓ All ages ✓ All techniques for complete vaginoplasty ✓ Publication year >1995 ✓ Article reporting neovaginal prolapse ✓ Follow-up of at least 2 mo 	<ul style="list-style-type: none"> × Patient groups consisting of patients other than MtoF transgenders, eg, patients with vaginal aplasia or vaginectomy × Unspecified surgical technique × Conference abstract

MtoF = male to female.

2.2.3. Outcomes

The primary outcome was the prolapse rate irrespective of the type of vaginoplasty performed. The secondary outcomes included the prolapse rate following penile skin inversion vaginoplasty, the prolapse rate following intestinal-derived vaginoplasty, the perioperative preventive neovaginal fixation strategy, as well as the surgical treatment of prolapse.

2.2.4. Selection process

Two reviewers (S.T. and C.G.T.) independently screened all included studies. The selection process was first based on title and abstracts, and then on full text for included studies. Disagreements have been solved by consensus with a third

researcher (F.X.M.) to reach a consensus on the studies to include.

2.2.5. Data extraction

Two reviewers (S.T. and C.G.T.) independently extracted the following characteristics: general characteristics, including the year of publication and country of publication; study design; number of included patients; type of surgical approach—penile skin inversion, sigmoid colon, or right colon; prolapse rate; preventive neovaginal fixation; surgical treatment of prolapse; and follow-up duration after vaginoplasty.

2.2.6. Risk of bias assessment

We evaluated the risk of bias [8] of each included study using the Critical Appraisal Skills Programme (CASP) checklist for cohort studies [9].

2.2.7. Analysis

We described the included studies in terms of general characteristics, study design, patient characteristics, surgical approach, and follow-up. Missing data were not replaced. We represented the prolapse rate graphically, by the technique of vaginoplasty. Owing to the high heterogeneity of included studies, no meta-analysis was performed.

3. Results

3.1. Literature search

The PRISMA flow chart [10] is presented in Figure 3. The most recent search was conducted in October 2023, yielding a total of 80 articles. After eliminating duplicates and ineligible articles, 24 studies were chosen for a qualitative synthesis. The publication years of these studies ranged from 1996 to 2022.

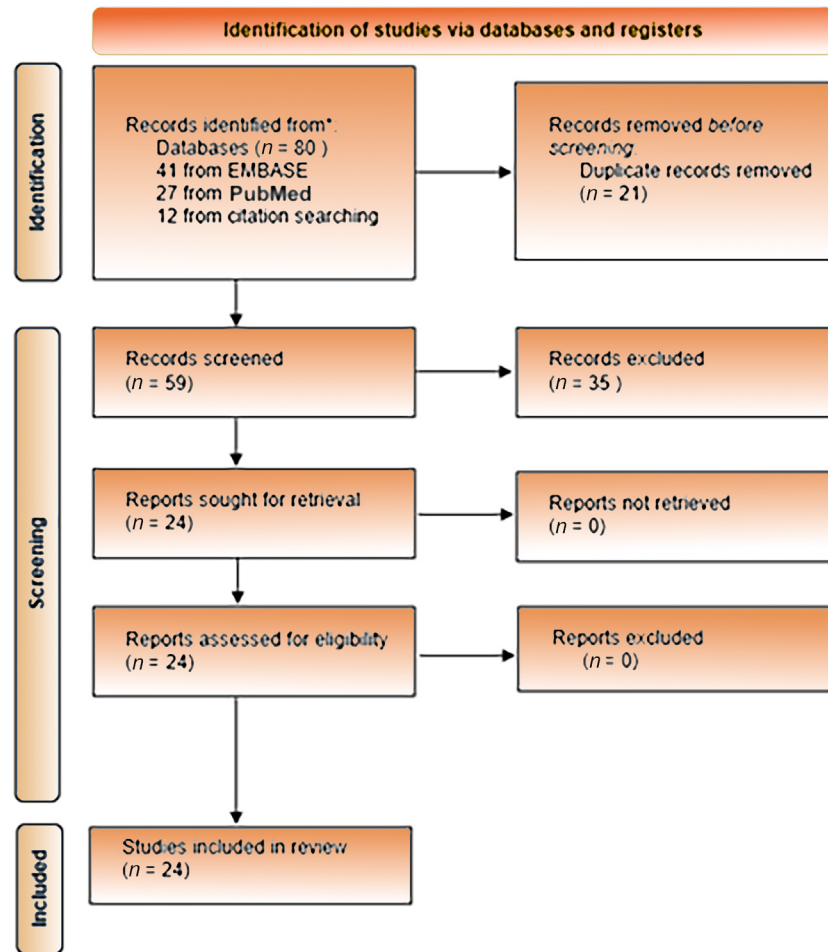
3.2. Study characteristics

Among the 24 articles included, all were observational studies, with four being prospective. All studies were conducted at single-center institutions, involving a single operating team or surgeon, except for Kuhn et al's [11] article, where patient operations took place in 14 different centers (Table 2). Only two studies (those of Stanojevic et al's [12] and Kuhn et al's [11]) identified neovaginal prolapse as the primary outcome, while the others focused on describing the long-term outcomes of their vaginoplasty techniques. The median number of included patients was 64, with an interquartile range of (27; 242).

3.3. Patients' characteristics

Out of the 24 studies, five focused on intestinal vaginoplasty, with three using sigmoid colon tissue, one using right colon tissue, and one combining sigmoid colon and penile skin (Table 2). Additionally, only one study addressing peritoneum vaginoplasty specifically for MtoF patients was identified. This study focused on salvage vaginoplasty following complications from penile inversion vaginoplasty, which included neovaginal canal stenosis and/or shortening.

PRISMA 2020 flow diagram for new systematic reviews



From: Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. *BMJ* 2021;372:n71. doi: 10.1136/bmj.n71 For more information, visit <http://www.prisma-statement.org/>

Fig. 3 – PRISMA flow chart of the selection process. PRISMA = Preferred Reporting Items for Systematic Reviews and Meta-analyses.

The remaining 17 studies described penile skin-derived vaginoplasty, either with or without a scrotal flap in cases of insufficient penile skin. Kuhn et al's [11] study regrouped both penile skin inversion and sigmoid colon vaginoplasty techniques, without specifying the prolapse rate for each. Consequently, it was excluded from our subgroup statistical analysis. Patients' mean age (when given) was 37.7 yr, with an age range spanning from 18 to 78 yr.

3.4. Follow-up

The median follow-up duration was 22.5 mo, ranging from 42 d to 44 yr across the included studies, with some loss to follow-up in each study. Follow-up data were not available in two of the studies (Table 2).

3.5. Risk of bias assessment

The assessment of the risk of bias is detailed in the [Supplementary material](#) for the CASP (cohort studies). In cohort studies, the risk of bias appears to be high since most of the studies did not specifically investigate the prolapse rate

after vaginoplasty. Instead, these studies reported primarily on the incidence of other complications. Consequently, limited or no exploration of confounding factors or risk factors related to prolapse was conducted. Furthermore, it is important to note that the measurement of prolapses following vaginoplasty remains challenging, largely because of the lack of a standardized definition for such cases.

Additionally, many studies in this context experienced high loss-to-follow-up rates due to individuals relocating following their sexual reassignment, a common phenomenon noted at the initiation of their "new life" [13].

Moreover, certain studies, such as those conducted by Kuhn et al [11] and Van Der Sluis et al [14], incorporated different vaginoplasty techniques, which can complicate generalizability to the broader population.

3.6. Prolapse rate

We included 24 studies that provided sufficient data on our topic. Most of these studies were retrospective case series of low to intermediate quality. The most frequently used tech-

Table 2 – Study characteristics and outcome

Authors	Country	Study design	Technique	Neovaginal fixation	n	Age (yr), median (range)	Neovagina prolapse, n (%)	Follow up (mo), median (range)	Surgical treatment	Comment
Berg et al (1997) [42]	SWE	Retrospective	Penile and scrotal skin	No	93	34 (20–67)	6 (6.5)	69.6 (6–360)	–	
Krege et al (2001) [22]	DEU	Prospective	Penile and scrotal skin	No	66	36.9 (20–57)	2 (3)	>6	–	Prolapses occurred during the removal of the packing
Goddard et al (2007) [13]	GBR	Retrospective	Penile and scrotal skin	No	180	41 (19–76)	3 (1.7)	1.8 (0.3–11.5)	–	Early follow-up
Stanojevic et al (2007) [12]	SRB	Retrospective	Penile skin and urethral flap ± scrotal flap	Sacrospinous ligament fixation	70	26 (18–58)	4 (6)	36 (9–96)	–	Late follow-up
Wagner et al (2010) [17]	DEU	Prospective	Penile and scrotal skin	Sacrospinous ligament fixation	62	26 (18–58)	0	32 (7–102)	–	–
Kuhn et al (2011) [11]	CHE	Retrospective	49 penile and scrotal skin, 3 sigmoid colpoplasty	No	50	38.5 (25–52)	0	36	–	2 minor bulges in the anterior wall
Reed (2011) [43]	USA	Retrospective	Penile and scrotal skin	No	52	57 (39–69)	4 (7.7) ICS–POP stage ≥2	192 (156–348)	1 had laparoscopic sacrocolpopexy, 1 had anterior fascial repair	1 only had re-education
Rossi Neto et al (2012) [44]	DEU	Retrospective	Penile and scrotal skin	No	250	(19–62)	6 (2.4)	–	–	–
Amend et al (2013) [18]	DEU	Retrospective	Penile skin and urethral flap	Sacrospinous ligament fixation	332	36.7 (19–68)	4 (1.2)	(30–156)	–	–
Bucci et al (2014) [30]	ITA	Retrospective	Penile and scrotal skin	Stitches to the Denonvilliers and prerectal fasciae	24	39.1 (20–54)	0	39.7 (19–69)	–	–
Wangjiraniran et al (2015) [32]	THA	Retrospective	Penile and scrotal skin	No	282	–	17 (6)	Evaluation at 6 and 12 mo	1 open colposacropexy	All prolapses occurred within 6 mo
Buncamper et al (2016) [23]	NLD	Retrospective	Penile and scrotal skin	No	395	–	1 (0.3)	–	–	–
LeBreton et al (2017) [19]	FRA	Prospective	Penile and scrotal skin	No	475	38.6 (18.1–70.8)	3 (0.6)	After tampon removal (on postop day 5)	–	Fixed by tampon replacement for 5 d and bed rest
Massie et al (2018) [26]	USA	Retrospective	Penile and scrotal skin	No	28	41 (25–60)	18 (3)	93.6 (12–190.8)	Corrected with minor surgery in all patients	–
Manrique et al (2019) [20]	USA	Prospective	Penile and scrotal skin	No	117	38 (16–78)	2 (1.7)	21 (13–34)	–	–
Levy et al (2019) [45]	USA	Retrospective	Penile and scrotal skin	No	40	40.7 (19–72)	0	24	–	–
Nijhuis et al (2020) [24]	NLD	Retrospective	Penile skin ± pedicled scrotal flap	No	240	33 (IQR 27–44)	1 (0.4)	2.9 (IQR 1.4–4.7)	0	–
Ferrando et al (2020) [46]	USA	Retrospective	Penile skin	No	42	28 (18–66)	3 (7)	13 (2–44)	1 surgical excision of some skin	Conservative treatment for others
Van Der Sluis et al (2016) [14]	NLD	Retrospective	Sigmoid colon (n = 23) ileum (n = 1)	No	76	41 ± 17	1 (1.4)	12.5 (6–50)	Reoperation	Neovaginal prolapse on postop day 2
Salgado et al (2018) [21]	USA	Retrospective	Sigmoid colon	No	24	58 (50–73)	3 (12.5)	285.6 (51.6–528)	Excision for 2 mucosal prolapse Laparoscopic sacropexy for 1 total prolapse	All were secondary reconstructions after failure of a first penile inversion vaginoplasty
Mukai et al (2019) [33]	JPN	Retrospective	Rectosigmoid colon	Fixation to the peritoneum	12	47 ± 15.4	0	6	–	–
					18	34.6 ± 10	2 (11.1)	20.8	–	–

Table 2 (continued)

Authors	Country	Study design	Technique	Neovaginal fixation	n	Age (yr), median (range)	Neovagina prolapse, n (%)	Follow up (mo), median (range)	Surgical treatment	Comment
Kaushik et al (2019) [25]	IND	Retrospective	Sigma-lead technique with penile skin and rectosigmoid	Vaginal dome fixed to sacral promontory	386	39 (22–63)	6 (1.6)	34 (12–84)	4 surgeries of mucosal prolapse	
García et al (2020) [16]	USA	Retrospective	Right colon	Fixation to the right abdominal wall	22	36.5 (20–59)	5 (22.7)	4 (1–24)	Laparoscopic non-mesh pexy to the sacral promontory for the 4 full-thickness prolapses Perineoplasty for the 1 mucosa prolapse	All prolapse occurred 2–10 mo after surgery. 1 prolapse of the mucosa and 4 full-thickness prolapses
Smith et al (2022) [15]	USA	Retrospective	Peritoneum	No	10	36.4 (SD 10.2)	0	18.3 (SD 14)		All were salvage vaginoplasty after penile inversion vaginoplasty
Total					3166		85 (2.7)			
Subgroup ^a : penile skin vaginoplasty					2645		65 (2.5)			
Subgroup ^a : intestinal vaginoplasty					459		16 (3.5)			

– = not available; CHE = Switzerland; DEU = Germany; FRA = France; GBR = UK; IND = India; IQR = interquartile range; ITA = Italy; JPN = Japan; NLD = The Netherlands; SD = standard deviation; SRB = Serbia; SWE = Sweden; THA = Thailand.
Countries listed using the ISO-alpha3 code.
^a Kuhn et al's [11] and Smith et al's [15] studies were excluded.

nique was the penile skin inversion technique (85% of MtoF patients), often with an additional scrotal flap.

Studies employing the sigmoid colon for vaginoplasty predominantly pertained to specific conditions such as vaginal agenesis or postdemolitive surgery for gynecologic malignancies. Conversely, the penile inversion technique found primary application in MtoF transgender patients.

Detailed results can be found in Table 2. The prevalence of neovaginal prolapse spanned from 0% to 7% for those using the penile skin inversion technique. For sigmoid colon-derived vaginoplasty, the prolapse rate ranged from 0% to 11.1%.

A limited number of studies employed the ileum for vaginoplasty in MtoF patients, and Van Der Sluis et al [5,14] incorporated it in his global description.

In the only article [15] about peritoneal vaginoplasty in transgender women, no prolapse was reported.

García et al's [16] study reported a 22.7% prolapse rate in secondary laparoscopic right colon vaginoplasty.

A 0% prolapse rate was reported in both penile skin [12,17–20] and intestinal vaginoplasty [21], irrespective of whether with [12,17,18] or without [19–21] neovaginal fixation.

It is important to highlight the lack of specificity regarding the precise definition of “prolapse” in the literature. When available, Table 2 outlines the characteristics of the prolapse and the corresponding treatments applied. Some instances involved skin graft failure and subsequent expulsion upon removal of the surgical pack [7,22,23], while others described mucosal prolapse or skin prolapse potentially stemming from poorly adhered skin flap [14,16,24,25].

García et al [16] report “full-thickness prolapses” without further elaboration.

Wagner et al [17] noted two “minor bulges in the anterior wall” but did not classify these as prolapse.

Cases treated with conservative treatments [11,24] might have been self-resolving edema, although no definitive information could be found.

In total (Fig. 4), pooled data from all surgical techniques of vaginoplasty encompassed 3166 patients, with 85 presenting neovaginal prolapse, equating to a rate of 2.7%. It is important to note that when calculating this rate, only patients in the late follow-up were considered, particularly in cases where both late and early follow-up were available, as reported by Goddard et al [13] and Buncamper et al [23].

It is worth mentioning that the mean prolapse rate was 2.5% in the penile skin inversion technique subgroup and 3.5% in the intestinal vaginoplasty subgroup. Kuhn et al's [11] study was excluded from this subgroup analysis, as it included both penile skin and intestinal vaginoplasties.

3.7. Risks factors

As per Massie et al [26], an increased body mass index, without a specified threshold, stands out as the sole risk factor identified to predict postoperative vaginal prolapse, with an odds ratio of 1.2.

Age has not been evaluated as a potential predictor of vaginal prolapse.

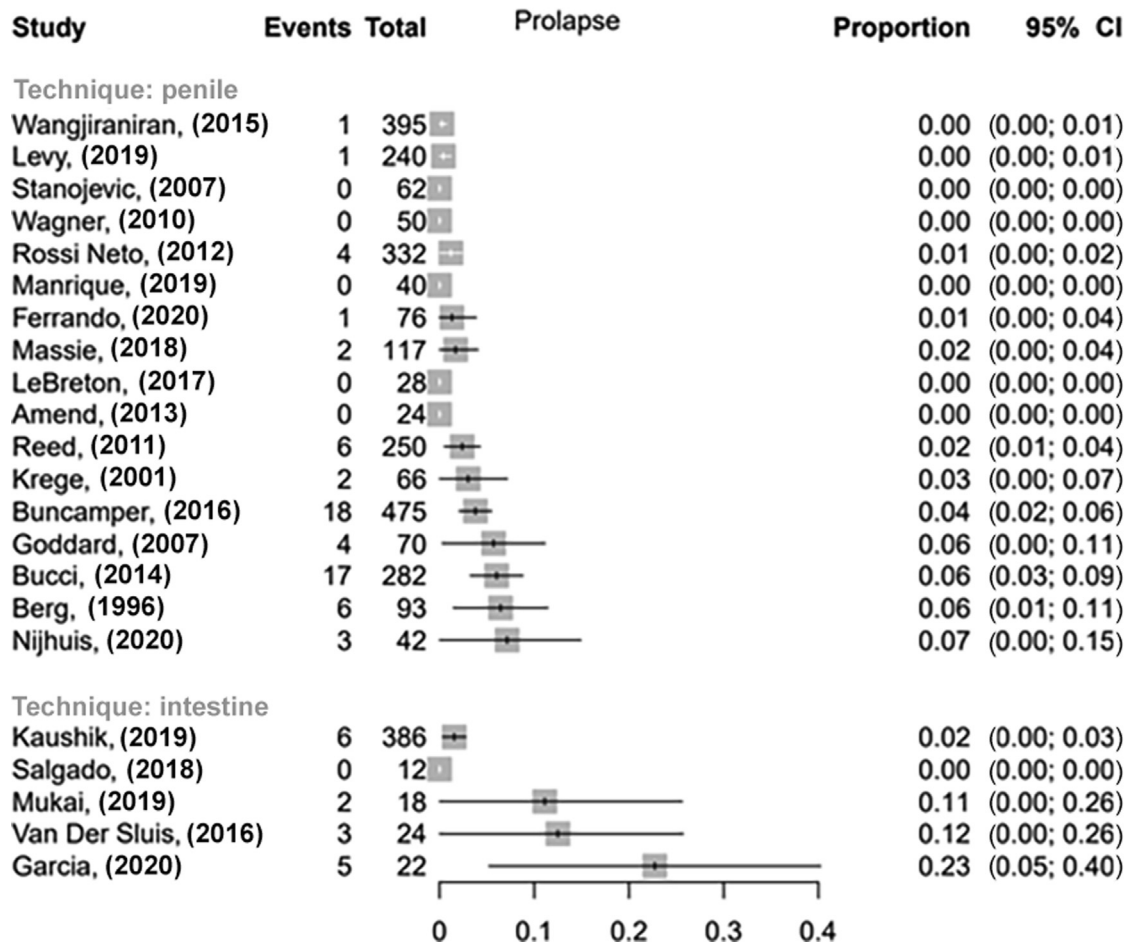


Fig. 4 – Prolapse rate forest plot. CI = confidence interval.

In the two studies including both early and long-term results, it appears that the prolapse rate tends to escalate over time. Goddard et al [13] noted a vaginal prolapse rate of 6% during late follow-up (with a median of 36 mo), compared with 1.8% in the early follow-up (with a median of 56 d). Similarly, Buncamper et al [23] observed a 3% vaginal prolapse rate in the long-term follow-up versus 0.6% after the removal of the tampon on day 5.

However, given the lack of a clear definition for neovaginal prolapse, the term “early” vaginal prolapse might refer to nonadherence of the skin graft or inadequate dissection of the vaginal canal, whereas “late” vaginal prolapse could signify a bulge in the vaginal wall [27].

Loverro et al [28] proposed a hypothesis that sexual activity might trigger progressive lengthening of the neovagina, coupled with the discontinuation of neovaginal fibrotic adhesions due to the absence of normal female suspensory systems.

The literature does not provide any other predictors for vaginal prolapse.

3.8. Prevention

Different techniques were developed to reduce the risk of neovaginal prolapse.

One of these techniques drew inspiration from the original sacrospinous fixation method outlined by Nichols [29]. It involves using absorbable stitches of either 2/0 [12,17,18] or 3/0 Vicryl [30] for fixation to the sacrospinous ligament.

The largest cohort to undergo prophylactic sacrospinous suspension during neovagina creation was reported by Stanojevic et al [12]. In this technique, the distal third of the neovaginal tube is sutured to the right sacrospinous ligament medially to the ischial spine, employing a suture carrying device loaded with 2-0 delayed absorbable suture. Bilateral fixation was not performed, and a monofilament suture facilitated passage through the ligature carrier device. Notably, care was taken not to suture too close to the ischial spine to avoid pudendal nerve and internal pudendal vessel injury. Among the 62 patients in this cohort, three experienced anterior vaginal bulges, which were managed with simple excisions. An isolated temporary complication associated with suspension was reported—a mild right buttock pain in two patients, which resolved within 2 mo.

Dreher et al's [31] meta-analysis revealed that studies implementing prophylactic sacrospinous fixation had notably lower prolapse rates than those without fixation. The median prolapse rate was 0% in the former group and 2.7% in the latter.

Bucci et al [30] proposed an alternative technique, deeming sacrospinous fixation too perilous due to its anatomical proximity to the pudendal vessels and nerves, sciatic nerve, ureter, and rectum. In their approach, the neovagina was secured using four absorbable stitches: two from the top of the penoscrotal cylinder to the Denonvilliers fascia, incorporating prostatic tissue or seminal vesicles, and the other two from the posterior neovaginal wall to the prerectal fascia. A prolapse rate of 6% was reported.

Wangjiraniran et al [32] who achieved a 0.3% prolapse rate, detailed a stitch connecting the scrotal flap and the rectum, while also avoiding the use of a large scrotal flap.

Mukai et al [33], with an 11.1% prolapse rate, presented a rectosigmoid-derived neovagina technique involving fixation between the perineal side of the rectosigmoid stump and the peritoneum.

Garcia et al [16], who outlined a right colon vaginoplasty with a 22.7% prolapse rate, affixed the neovagina to the right lateral abdominal wall using two stitches of 2-0 permanent braided sutures.

All described techniques, regardless of suture fixation, included the use of lubricated intravaginal packing postoperatively for a duration of 5 d to provide support for the graft.

3.9. Treatments

Magnetic resonance imaging can help in assessing postoperative anatomy and identifying complications in MtoF sex reassignment surgery. A T2 sequence can be particularly useful for evaluating the extent of neovaginal prolapse before surgical correction (Figs. 2 and 5) [34].

Clear methods for treating neovaginal prolapse remain elusive, and only a handful of case reports are available. Corrective procedures in transgender women pose challenges, as surgeons must possess a sound understanding of male pelvic anatomy and local planes of dissection, given that these factors may interfere with a transvaginal or perineal approach.

Frederick and Leach [35] as well as Loverro et al [28] detailed three instances of the open abdominal sacro-

colpopexy technique employing a Prolene mesh. In all cases, there were no reports of prolapse recurrence during follow-ups ranging from 5 to 16 mo.

Roslan et al [36] described a case of laparoscopic sacrocolpopexy for repairing neovaginal prolapse, using a polypropylene mesh. This intervention led to a reduction in prolapse from a Pelvic Organ Prolapse Quantification (POP-Q) stage 3 to a stage 1. Similarly, Horton and Phillips [37] reported treating successfully a patient with neovaginal prolapse using laparoscopic sacrocolpopexy with a polypropylene mesh. Notably, Horton and Phillips [37] emphasized the importance of minimizing the risk of mesh erosion by ensuring adequate coverage of the neovagina with fascia.

In contrast, Condous et al [38] reported a laparoscopic repair without the use of mesh. The technique involved nonabsorbable sutures attaching the lateral side of the neovaginal vault to the iliococcygeus fascia on both sides, along with sutures connecting each side of the paravaginal tissue to the iliopectineal ligament. This approach drew inspiration from female colposuspension techniques [39]. Over an 8-yr follow-up period, no recurrence was observed.

Notably, none of these cases reported any complications related to bowel or sexual function.

As of now, no definitive recommendations regarding mesh use for prolapse in vaginoplasty cases have been established.

4. Discussion

Neovaginal prolapse remains an infrequent complication of vaginoplasty in transgender patients, with an average rate of 2.7%. One recognized risk factor is a high body mass index, which is consistent with the predictors of prolapse observed in the female population.

Currently, no specific perioperative technique, such as sacrospinous fixation, can definitively be recommended for preventing neovaginal prolapse, as there are no comparative studies in this context. However, Dreher et al's [31] findings suggested that prophylactic sacrospinous fixation yielded notably lower prolapse rates compared to procedures without fixation. In any case, the implementation of vaginal packing emerges as a straightforward and noninvasive measure to consider, as it provides support to the neovaginal graft.

When addressing the management of neovaginal prolapse, if surgical intervention is deemed necessary, an abdominal or laparoscopic approach, inspired by female sacrocolpopexy, appears more suitable given the altered local planes of dissection following vaginoplasty. This approach seems more appropriate than a perineal or transvaginal approach.

To acquire more accurate and comprehensive data, large-scale, long-term studies characterized by standardized definitions and follow-up protocols would be indispensable. However, conducting such studies presents challenges due to the rarity of this complication.

A statistical analysis was not possible, as the data extracted for complications and functional outcomes were very heterogeneous. Instead, the review focused on summa-

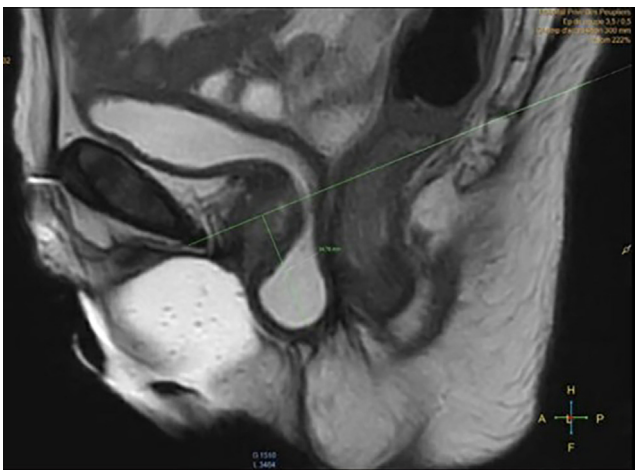


Fig. 5 – T2-weighted MR Image of neovagina and cystocele. MR = magnetic resonance.

rizing the findings from each article, aiming to enhance accessibility to the available evidence for future studies.

Most articles did not provide specific details regarding the nature of the prolapse (such as whether it was a rectocele, a cystocele, or just mucosal prolapse), nor did they offer a precise definition or grading of the prolapse. Among the studies, only Massie et al's [26] study conducted statistical analyses to identify the predictors of neovaginal prolapse. However, these analyses did not explore well-known risk factors aside from those specific to females, such as chronic abdominal hyperpressure arising from factors such as constipation, chronic coughing, and occupational conditions.

In terms of the treatment and management of neovaginal prolapse, available data are scarce. Only four case reports, each featuring one or two patients, could be found.

With the increasing prevalence of gender-affirming surgeries, addressing the long-term complications of these procedures is an up-and-coming topic.

Neovaginal prolapse, with a prevalence of approximately 2.7%, currently lacks specific recommendations for its prevention and treatment. Notably, these prolapses differ from those in cisgender women, where prevalence varies between 2.9% and 11.4% in questionnaire-based studies and between 31.8% and 97.7% according to the ICS Pelvic Organ Prolapse Classification (POP-Q) anatomical classifications [40]. These differences can be attributed to the male anatomy, in which the pelvis remains narrower and maintains an atrophied prostate. However, it is essential to note that the median follow-up duration of the analyzed studies was only 22.5 mo, leaving uncertainties about prolapse developments in the following years.

When considering recommendations for prolapse treatment, parallels can be drawn with cisgender women, raising the question of whether physiotherapy and re-education might improve neovaginal prolapse. In cisgender women, these noninvasive approaches serve as first-line treatments.

Furthermore, surgical treatment of cystocele or rectocele after vaginoplasty presents unique challenges, requiring dissection in an already operated area. The addition of prosthetics further complicates the procedure, heightening the risk of fistula development and prosthesis infection.

While vaginal prolapse in cisgender women has been associated with pelvic floor symptoms such as obstructive bladder and obstructive bowel [41], these correlations have yet to be studied in transgender women.

It should be noted that, due to genital dysphoria, pelvic floor symptoms may be more prevalent in the transgender population. The absence of a validated questionnaire for assessing POP or genitourinary symptoms in MtoF transgender individuals highlights the need for more research and tailored tools to address their unique health care concerns.

5. Conclusions

Although neovaginal prolapse in MtoF transgender patients appears to be a rare complication, its importance is likely to increase as the transgender population ages. The results of preventive techniques and specific management of these

prolapses are rare and should be the subject of future research.

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Study concept and design: Tran, Madec.

Acquisition of data: Tran, Guillot-Tantay.

Analysis and interpretation of data: Tran, Madec.

Drafting of the manuscript: Tran.

Critical revision of the manuscript for important intellectual content:

Biardeau, Schirmann, Vidart, Bosset, Lebret, Madec.

Statistical analysis: Tran, Guillot-Tantay.

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Appendix A. Supplementary data

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