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Brief communication (Original)

Anorectal physiology evaluation after male-to-female sex reassignment surgery

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Background: Male-to-female sex reassignment surgery (MTF-SRS) is a treatment for gender identity disorders (GID) wherein the penis is removed and an epithelialized neovagina is created in the retroprostatic or rectovesical space. This is a space between the double layers of Denonvilliers' fascia that contains motor, sensory, and autonomic nerves to the pelvic organs. Injury to these nerves may lead to anorectal dysfunction. However, there has been no objective study of anorectal physiologic changes after SRS.

Objectives: To compare anorectal physiological parameters, before and after, male-to-female sex reassignment surgery (SRS) and to evaluate the effects of SRS on anorectal physiology.

Methods: In 10 patients with MTF GID who underwent SRS at King Chulalongkorn Memorial Hospital, anorectal manometry was performed using a water perfused catheter (Mui Scientific, Ontario, Canada) and a state-of-the-art anorectal manometry system (Medtronic, Minneapolis, MN, USA) at the Gastrointestinal Motility Research Unit at 2 weeks before and 3 months after the SRS. Data were analyzed using PolygramNet software. Anal sphincter pressures (mmHg) with volume used to elicit rectal sensation (mL).

Results: There was no significant change in the resting anal sphincter pressure, anal sphincter squeezing pressure, sustained squeezing pressure, and duration of squeeze, rectal sensation, and threshold of the desire to defecate affected by SRS. Cough reflex and rectoanal inhibitory reflex were normal both before and after SRS in all patient participants.

Conclusions: Sex reassignment surgery seems to produce no effect on clinical anorectal functions. This was proven by absence of clinically significant changes in anorectal manometry.

Keywords: Anorectal manometry, anorectal physiology, anorectal sphincter, gender identity disorders, sex reassignment surgery, sex reassignment surgical technique

Gender identity disorder (GID, previously "transsexualism") is used to describe individuals with persistently strong psychological cross-gender identification and extreme dislike of their biological sex. In 1966, Harry Benjamin described a systematic multidisciplinary approach for the management of these people and raised the potential benefits of sex reassignment surgery (SRS) [1, 2]. The prevalence of GID is 1:25,000–1:30,000 for male-to-female (MTF) and 1:100,000 for female-to-male (FTM) change issues [3, 4]. SRS has been introduced in Thailand since 1975 as a treatment option for GID. Most of the cases are MTF-SRS where the penis is removed and an epithelialized neovagina is created in the retroprostatic or rectovesical space. This potential space is located between the double layers of Denonvilliers' fascia, which comes down between the rectum and the prostate as far as its apex [5]. Motor, sensory, and autonomic innervations of the pelvic organs course laterally from the pelvic side wall and are situated in this fascia at the posterolateral area of the prostate [6]. Autonomic and pelvic nerve preservation is a major concern for coloproctologists, urologists, and gynecologists during pelvic dissection. Injury to these nerves may lead to urogenital and

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anorectal dysfunction. According to a study by Kuhn et al., defecation problems, namely incomplete emptying of the bowel and fecal urgency were found in 7.6% and 9.4% of patients during a long-term follow up after SRS [7]. However, there has been no objective study of the anorectal physiology in patients with MTF-GID and whether there is any anorectal physiological change after SRS is unknown. Therefore, the aim of this study was to evaluate the anorectal physiology of patients with MTF-GID before and after sex reassignment surgery using anorectal manometry. Through this study we hope to gain better insight into the effects of SRS on anorectal physiology.

Materials and methods

We performed a comparative, before-and-after, study of anorectal physiological parameters using standard anorectal manometry in patients with MTF-GID who underwent sex reassignment surgery at the Division of Plastic and Reconstructive Surgery, Department of Surgery, the Faculty of Medicine, Chulalongkorn University, Thailand. All patient participants were questioned about their gastrointestinal symptoms, underlying medical conditions, regular medication(s) or history of intra-abdominal surgery using a questionnaire.

This study was approved by the Institution Review Board (IRB) of the Faculty of Medicine, Chulalongkorn University, Bangkok, Thailand (IRB No. 359/54). All patients have been provided detailed information of what they will undergo and all have provided signed written informed consent.

Patient participants

All MTF-GID patients scheduled for SRS at the Division of Plastic and Reconstructive Surgery, King Chulalongkorn Memorial Hospital from March 2011 to June 2011 were asked to participate in this prospective study. We excluded patients with an abnormal bowel habit, irritable bowel syndrome, previous history of anorectal surgery, and those who denied anorectal manometry. Patients who took medications known to affect anorectal function including prokinetics, smooth muscle relaxants and medications with anticholinergic effects, were asked to stop such medication(s) for at least one week before the anorectal manometry study.

Procedures

Sex reassignment surgery technique

The sex reassignment surgery was performed under general anesthesia with the patient lying in the lithotomy position. The dorsal pedicle scrotal flap and the ventral pedicle penile skin flap were created. A neovaginal pocket was created initially just behind the transverse perinei muscle. Dissection was carried out between the bulbospongiosus and the anal canal caudally, then upwardly behind the urethra, prostate gland and bladder anteriorly and the rectum posteriorly until the peritoneum reflection was reached [8, 9]. The levator ani was partially excised bilaterally to enlarge the neovaginal pocket. After that, orchidectomy, penectomy, and labioplasty were performed. A clitoris was then created from the glans penis. The neovaginal pocket was lined with the previously prepared flaps. In case that the flaps were inadequate, a full-thickness skin graft would be used.

All patients were followed up every two weeks at the out-patient clinic for wound inspection and neovagina evaluation.

Anorectal manometry study

All patient participants underwent two anorectal manometry studies, each at 2 weeks before and 3 months after the sex reassignment surgery.

The anorectal manometry study (ARM) was performed by using anorectal manometry with a water-perfused catheter (Mui Scientific, Ontario, Canada) and the state of the art of anorectal manometry system (Medtronic International, Minneapolis, MN, USA). The anorectal manometry catheter has eight side holes located at 5.5, 5, 4.5, 4, 3.5, 3, 2, and 0.5 cm from the tip.

All patient participants underwent the anorectal manometry study at the Gastrointestinal Motility Research Unit, Chulalongkorn University after a 6-hour fasting period. All patient participants received a single-dose rectal enema with 250 mL of normal saline solution at least one hour before the study. The patients were asked to lie in a left lateral position with flexed hip and knees. Then, an 8-channel water perfused anorectal manometry catheter with a balloon at the tip was inserted into the rectum. Standard ARM was performed as previously described [10, 11]. After a 5-minute run-in period, the baseline pressure (resting anal sphincter pressure) was recorded for 10 minutes. Then, the patient was asked to squeeze their anal sphincter and hold as long as possible or at least 30 seconds for the maximal squeezing pressure and sustained squeezing pressure to be observed (**Figure 1**). The procedure was practiced at least 3 times to minimize communication misunderstanding. After that, rectal sensory testing was performed by rectal balloon distention. The distention was performed by inflating a balloon with air using a hand-held syringe, in a stepwise increment of the air volume: 10, 20, 30, 40, 50, 60, 90, 120, 150, 180, 210, 240, 270, 300, and 330 mL, respectively. The balloon volume that elicited the first sensation, desire to defecate, urge to defecate, and maximal tolerance were recorded. The procedure was stopped after the maximal toleration or the 330 mL rectal balloon distention was reached. Rectoanal inhibitory reflex and cough reflex were tested. The data were analyzed using PolygramNet software (Medtronic, Fridley, MN). Additionally, neovaginal pressure was measured at the end of the procedure with a different catheter.

Data analysis

Manometric results are expressed as mean ± SD. Differences between preoperative and postoperative values were compared using Student paired *t* tests.

Results

Fifteen patients underwent SRS at King Chulalongkorn Memorial Hospital. However, five patients were excluded because they denied anorectal manometry. Ten SRS patient participants (mean age 25 ± 5.3 years) were then enrolled. During the follow up, none of the patients complained of bowel symptoms, including constipation, difficult defecation, or fecal incontinence.

All patient participants completed preoperative and postoperative ARM. One patient denied postoperative neovaginal pressure measurement. The comparative data of the preoperative and postoperative values are shown in **Table 1**. Cough reflex and rectoanal inhibitory reflex were normal both before and after SRS in all patient participants.

The measured length of the neovagina was 8.90 cm (range 8.75–9.50 cm). Partial flap necrosis was found in two cases and was successfully treated. Of the nine patients that participated in neovaginal pressure measurement, there was no high pressure seen at rest. When the patients were asked to squeeze, there was a rise in pressure at the upper neovaginal area in all patients. The neovaginal squeezing pressure was 151 ± 77 mmHg.

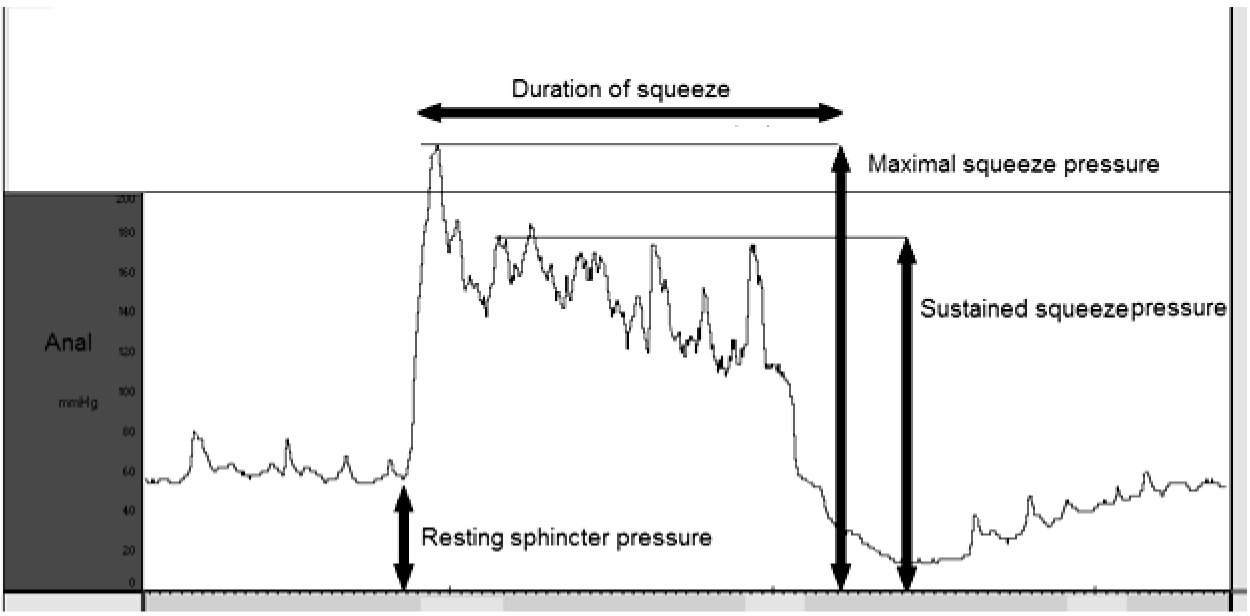

Figure 1. Anorectal physiological parameters: Resting sphincter pressure- the baseline pressure while the patient is asked to lie down and relax. Maximal squeeze pressure is the highest measurable pressure when the patient is asked to squeeze and hold as long as possible. Sustained squeeze pressure is the average pressure during the time of squeeze. Duration of squeeze is the time that the patient can hold the squeeze.

Table 1. Anorectal manometric data of 10 patients who underwent sex reassignment surgery

	Preoperative	Postoperative	*P* (*t* test)
Age (years)	25 ± 5.3 (20–35)		
Length of high pressure zone, at rest (cm)	3.25 ± 0.8	3.05 ± 0.6	0.52
Length of high pressure zone, at squeeze (cm)	3.95 ± 0.8	3.55 ± 0.6	0.28
Anal resting pressure (mmHg)	72.25 ± 21.2	81.10 ± 20.6	0.30
Maximal squeeze pressure (mmHg)	252.93 ± 68.0	220.17 ± 51.5	0.06
Sustained squeeze pressure (mmHg)	164.40 ± 38.0	158.36 ± 58.4	0.58
Duration of squeeze (seconds)	31.10 ± 7.9	32.80 ± 6.7	0.58
First rectal sensation (mL)	13.0 ± 4.8	18.0 ± 16.2	0.41
Desire to defecate (mL)	54.0 ± 27.1	76.0 ± 46.5	0.13
Urge to defecate (mL)	91.0 ± 57.0	99.0 ± 58.0	0.54
Maximal toleration (mL)	149.0 ± 104.8	127.0 ± 66.8	0.53
Neovaginal pressure (mmHg) (n = 9)	nd	150.67 ± 77.4	nd

nd = not done

Discussion

The SRS was first introduced in Thailand by Tiewtranon et al. in 1975 [2]. Their technique was gradually developed to improve cosmetic and functional outcomes. Until 1983, SRS was included in the plastic surgery residency training program at our center. To date, over 1,000 cases of SRS have been performed by plastic surgeons trained at our center.

Theoretically, when dissecting in the plane behind the prostate gland, where the nerve supplying urogenital and anorectal organs are situated, it is thus possible to disturb urogenital and bowel functions [5, 8, 9, 12, 13]. A previous report showed that fecal urgency and incomplete emptying of the bowel was observed in 9.4% and 7.6% of patients, respectively [7]. To our knowledge, there have been no data published concerning the effect of SRS on anorectal physiology of male patients with GID. This study is the first that prospectively collected objective parameters of anorectal functions measured by anorectal manometry before and after SRS in male GID patients.

Our study demonstrated that SRS produced no significant effect on resting anal sphincter pressure, squeezing anal sphincter pressure, duration of squeezing, the length of high pressure zone (both at rest and during squeeze) and rectal sensation ($P > 0.05$). Theoretically, the length of the high pressure zone and the squeezing power of the anal sphincter muscles can be decreased by partial myectomy of the puborectalis muscles, which is the most medial part of levator ani, on both sides, during the creation of the neovaginal pocket. However, our study suggested that the effect of SRS on the length of anal sphincter high pressure and squeezing power was minimal and not clinically significant ($P > 0.05$). Because we evaluated the effect of SRS at 3 months after surgery, minor neural disturbances of the nerve supplying of external anal sphincter (branches of the pudendal nerve) and autonomic nerve supplying the rectum or so-called neurapraxia, which might develop immediately after the surgery, might recover. This may explain the insignificant effect of SRS on the anorectal functions as found in our study. We also found no disturbances in neural arcs contributing to cough and rectoanal inhibitory reflexes.

A decrease in the pelvic space that the neovagina occupies and shares in the area just in front of the rectum, and injury to the nerve may affect rectal compliance and sensation. In our study of rectal compliance and sensation including the first rectal sensation, desire to defecate, urge to defecate, and maximal toleration in Table 1, we found some rectal sensory changes, but the changes did not reach the level of statistical significance ($P > 0.05$).

We found no resting pressure or tonic contraction of the neovagina. The voluntary squeeze pressure of the neovagina was observed at the upper part of the neovagina, which was the level of the puborectalis muscles. These muscles course from the inferior pubic rami anteriorly to curve around the rectum posteriorly. The similarity of the sustained anal sphincter squeezing pressure and the voluntary squeezing pressure of the neovaginal confirmed that the neovagina was supported by this muscle bilaterally and functioned only with voluntary control.

A limitation of our study was the small sample which may lead to a type II error. Although, a larger sample size of patients may demonstrate significant changes in anorectal function after surgery; the results of the present study suggest that such changes would be small and not clinically significant. In our study, we found no clinical complaint of any defecation problem or abnormal bowel symptoms. During the SRS in our study, we carefully dissected the plane of Denonvilliers' fascia between the prostate gland and the rectum during neovaginal pocket creation. This meticulous technique may minimize the effect of surgery on anorectal physiological functions in our study.

Another limitation was the short follow-up period (3 months). A long-term follow up of patients may help us to understand long term adaptation of any physiological change post-SRS.

Conclusion

Sex reassignment surgery at our center, seems to produce no adverse effects on clinical anorectal functions shown by no significant changes in anorectal manometry. Further studies in a larger number of patients may reveal additional findings.

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The authors have no conflict of interest to declare.

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