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REVIEW ARTICLE

Sexual satisfaction in patients with Mayer-Rokitansky-Küster-Hauser syndrome after surgical and non-surgical techniques: a systematic review

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Abstract

Introduction and hypothesis The treatment and mental support of patients with Mayer-Rokitansky-Küster-Hauser syndrome are very important. Many of these patients seek treatment to improve their sexual relationships and the quality of their sexual life. This systematic review sought to evaluate the sexual satisfaction of patients with MRKH syndrome following various types of vaginoplasty and non-surgical procedures over the past 10 years.

Methods A systematic review of studies published in English during 2008–2018 was performed. Electronic databases and valid sites, including PubMed, EMBASE, Science Direct, Cochrane Library, SCOPUS, Ovid, and ProQuest, were searched for articles published from the beginning of 2008 to February 2018. Literature restricted to women with Mayer-Rokitansky-Küster-Hauser syndrome who underwent vaginoplasty surgery or a non-surgical technique was reviewed. Of 195 papers identified, 45 articles were analyzed. All studies that reported sexual and functional outcomes following various vaginoplasty procedures and non-surgical procedures were selected.

Results Greater vaginal length and higher sexual satisfaction were observed following surgical procedures than after non-surgical techniques. A range of complications was reported following the use of different surgical approaches. The Female Sexual Function Index (FSFI) was the most commonly applied tool to measure sexual satisfaction, but its results were not always in agreement with the findings of other research tools. Finally, women who underwent surgical techniques had higher sexual activity levels than those who received non-surgical procedures.

Conclusion The reviewed studies highlighted the need for further quantitative and qualitative research on the sexual performance and outcomes of patients with MRKH syndrome.

Registration number None.

Keywords Sexual satisfaction · Mayer-Rokitansky-Kuster-Hauser syndrome · Surgical · Non-surgical

Introduction

Vaginal agenesis is a birth defect in the female genital tract with an incidence rate of 1 in every 4000–5000 births. One of the most common causes of this disorder is Mayer-Rokitansky-Küster-Hauser (MRKH) syndrome [1], which is characterized by congenital underdevelopment of the Müllerian duct (uterus and ovaries) as well as vertebral, renal, cardiac, urologic, and hearing abnormalities. However, women with MRKH syndrome have normal indicators such as karyotype (46xx), secondary sexual characteristics, and appearance of the external genitalia. They also have normal ovarian function and fallopian tubes [2]. Although the origin of this syndrome is considered to be genetic, the underlying cause remains unclear. While vaginal aplasia is detectable with the physical examination of babies, it is usually diagnosed during adolescence with early primary amenorrhea. Occasionally, after marriage, people come forward with complaints of dyspareunia or unsuccessful intercourse [3].

MRKH syndrome is categorized into four grades based on the degree of formation and defects in the uterus and vagina.

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In grade one, part of the vagina is not formed, but the function of the uterus is normal. In grade two, the vagina is not fully formed and the uterus has undergone hypoplasia. The third grade involves the absence of vaginal formation and the presence of the primary uterus. In grade four, both the uterus and vagina are absent [2, 4].

The diagnosis of this syndrome in a teenage girl can disrupt her self-image and sexual identity. In a woman, the diagnosis may lead to poor quality of life due to an inability to become pregnant and enjoy normal sexual intercourse. Therefore, the treatment and mental support of many of these patients are very important. These patients seek treatment to improve their sexual relationships and the quality of their sexual life [5].

Various surgical and non-surgical methods have been proposed for the treatment of vaginal aplasia (Fig. 1). In some cases, surgery or a new vagina is not needed, and non-surgical techniques, such as simple pressure (described by Frank) or pressure from a bicycle stool (Ingram technique), suffice. These patients are recommended to have regular sexual intercourse [7]. However, surgical procedures are more commonly used as non-surgical techniques [8] are associated with disadvantages such as low patient satisfaction, non-applicability at younger ages, the need for long use, vaginal prolapse, and fatigue [9].

Surgical procedures may be with or without grafting. While techniques such as the Davydov, Williams, McIndoe, Vecchietti, and intestinal vaginoplasty do not require grafting, a group of procedures such as the pudendal thigh flap, labia minora flaps, and Malaga flap require grafting. Each of these methods has its own advantages and disadvantages, and the choice of best method is debatable [10]. Different studies have shown that vaginoplasty improves the sexual function and thus

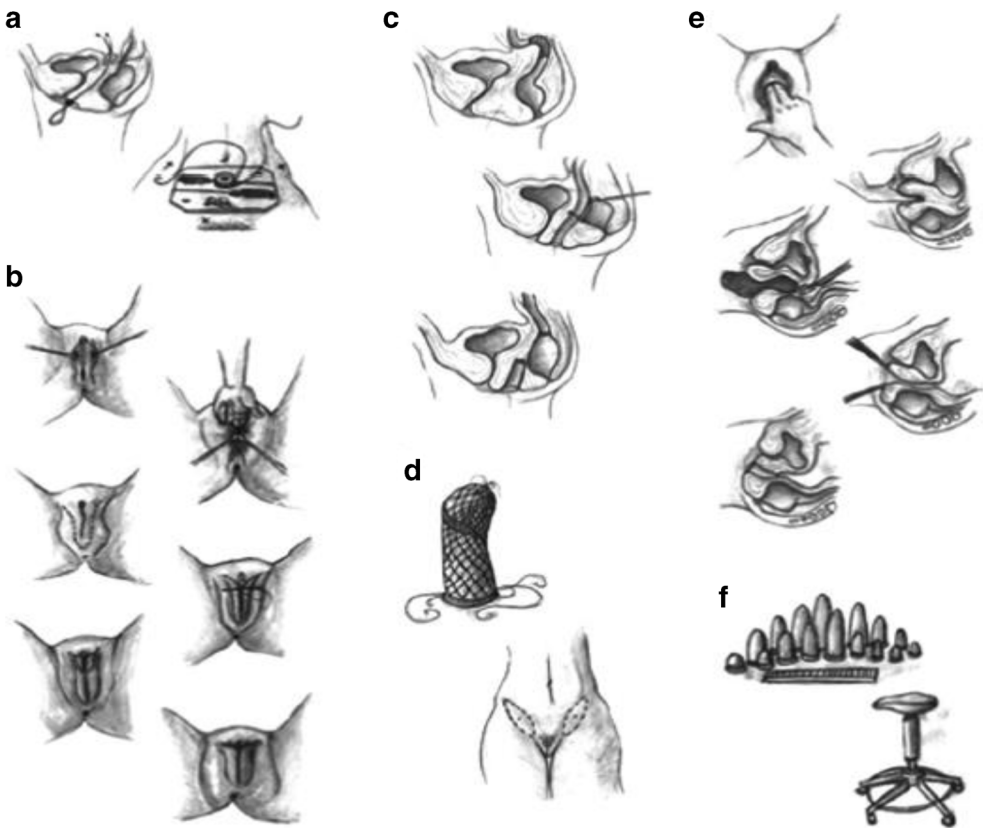

Fig. 1 Vaginal reconstruction techniques. **a** Vecchietti technique: pressure is applied on the vaginal dimple by an acrylic olive connected by threads that pass through the potential neovaginal space, are guided preperitoneally along the abdominal wall, and exit via the anterior abdominal wall where they are connected to a traction device. The threads are tightened daily. **b** Williams' procedure: the labia majora are used to line an external pouch formed by a U-shaped perineal incision. **c** Bowel vaginoplasty: a short segment of bowel (ileum or sigmoid colon) is isolated. The mesentery of the bowel segment is extensively dissected upwards to connect this neovagina with minimal tension. **d** McIndoe procedure: split-thickness skin grafts are obtained from the thighs or buttocks and adapted around a mold to line the dissected space between rectum and bladder. **e** Davydov procedure: A transverse incision is made below the urethra; the peritoneum is dissected off the rectum, bladder, and side wall of the pelvis using fingers and developing a space; the canal is tightly packed and an incision is made in the peritoneum over the pack; stay sutures in the peritoneum are used to pull a tube of peritoneum toward the perineum; the edges of the peritoneal tube are sutured to the skin of the introitus, and the abdominal end of the tube is closed. **f** Vaginal dilation techniques: These include Frank vaginal dilators of different sizes increasing in length and width and the Ingram stool method whereby patients are instructed to sit on a bicycle seat-shaped stool for short periods with a vaginal dilator held in position in or at the vaginal opening to stretch the vaginal tissue [6]

self-confidence and quality of life of individuals [11]. One of the most important consequences of surgical procedures is patients' higher satisfaction with the quality of their sexual relationships [10]. Previous studies have used both standard tools, e.g., the Female Sexual Function Index (FSFI) [12, 13] and Golombok Rust Inventory of Sexual Satisfaction (GRISS) [14], and non-standard scales to measure sexual satisfaction [4, 15, 16]. This systematic review sought to evaluate the sexual satisfaction of patients with MRKH syndrome following various types of vaginoplasty and non-surgical procedures over the past 10 years.

Materials and methods

The present study was carried out based on the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) [17].

Protocol

After removing the duplicates, two researchers independently reviewed the titles and abstracts. Articles containing full text were entered into a review and screened separately by two researchers. In cases where there was a disagreement between the two researchers, the articles were re-reviewed. Figure 2 (the PRISMA diagram) shows the process of study selection. Two researchers independently extracted data from the selected papers, and a template was designed to collect the data from different texts.

Eligibility criteria

The inclusion/exclusion criteria are listed in Table 1.

Literature search

Cohort, comparative, experimental, descriptive, RCT, and case studies were included in this study. Electronic databases and valid sites, such as PubMed, EMBASE, Science Direct, Cochrane Library, SCOPUS, OVID, and ProQuest, were searched for articles published from the beginning of 2008 to February 2018. All studies that reported the sexual and functional consequences of various vaginoplasty and non-surgical procedures were included. Many studies used a prospective design to determine the anatomical and functional

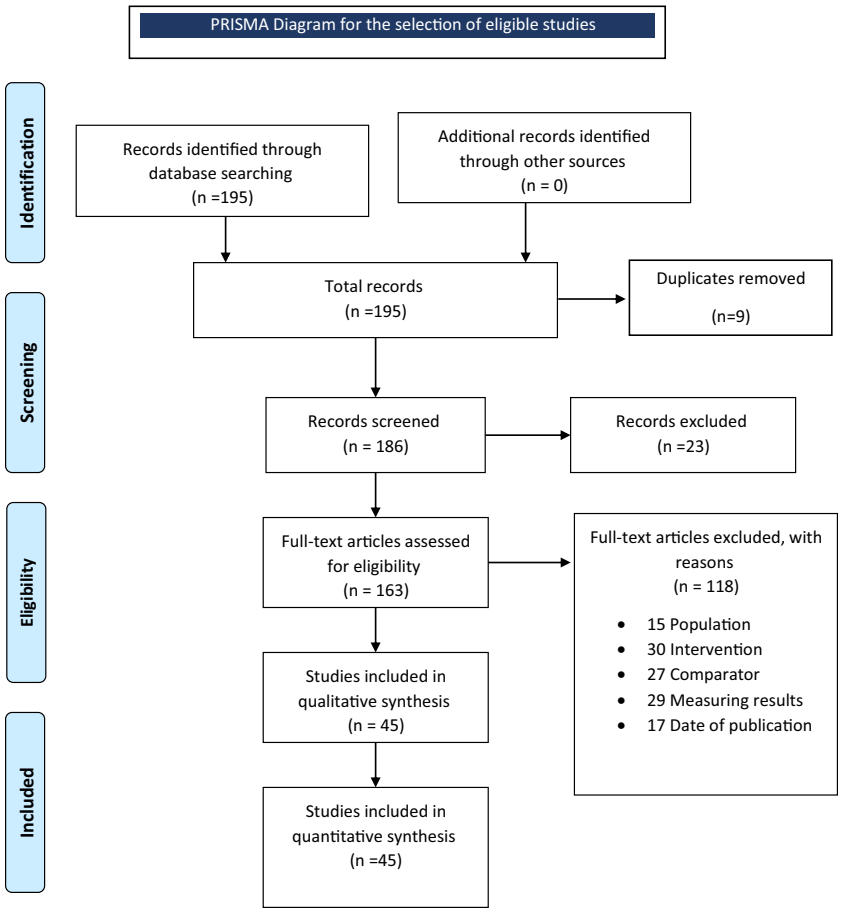

Fig. 2 PRISMA diagram for the selection of eligible studies

Table 1 Inclusion and exclusion criteria

Characteristic	Inclusion criteria	Exclusion criteria
Population	Women with Mayer-Rokitansky-Küster-Hauser syndrome	Women with other types of vaginal aplasia
Intervention	Vaginoplasty surgery or non-surgical technique by the treatment team	–
Comparator	Use of sexual performance measurement tools	Studies that did not mention sexual function or a specific method to examine and compare it
Measuring results	Anatomical characteristics of the vagina, sexual effects after the procedure, the spouse/partner's satisfaction, sexual factors affecting sexual satisfaction	Not discussing the anatomical characteristics of the vagina, postoperative sexual outcomes, or factors affecting sexual satisfaction
Study design	Cohort studies (retrospective, prospective), comparisons, cross-sectional, experimental, descriptive, case studies, and RCTs	Review articles
Article language	English	Other languages
Date of publication	Beginning of 2008 to February 2018	Before 2008 and after February 2018

outcomes and complications associated with surgery and patient satisfaction. Some other studies assessed the surgical and non-surgical consequences of all types of patients with vaginal agenesis. A number of key terms, including "sex" OR "libido" OR "orgasms" AND "sexual behavior" OR "sexual characteristics" OR "sexual gratifications" OR "satisfaction" OR "gratifications" AND "patients" OR "clients" AND "Mayer-Rokitansky-Küster-Hauser syndrome" OR "Rokitansky syndrome" AND "methods" OR "procedures" OR "operations" OR "surgical procedures" OR "operative" OR "non-surgical", were used during the search, and no restrictions were placed on the location of these words in the paper. The following data were extracted from all studies: author's name, title, purpose, year of publication, country, characteristics of the target population, sample size, type of study, allocation method, choice of the control and intervention group, methodology, grade of syndrome, duration of dilator use, time of beginning of intercourse after the procedure, mean duration of follow-up, postoperative complications, number of patients with complications, length and width of the vagina before and after the intervention, method of sexual satisfaction measurement, sexual satisfaction after the procedure, causes of dissatisfaction, percentage of sexually active patients after the treatment, menstrual and fertility returns, and results.

Risk of bias assessment

The number of clinical trial studies reviewed was low. Disagreements were discussed and solved by a third researcher when needed.

Data analysis

Frequency data are presented as numbers and percentages.

Results

A total of 195 articles published from the beginning of 2008 to February 2018 were identified using the mentioned key terms, and 45 articles were finally reviewed. Of the 45 reviewed articles, 42 studies were related to vaginoplasty and only three evaluated non-surgical procedures (Frank's simple pressure) (Fig. 3a). In some articles, two different surgical and non-surgical procedures were used in two distinct groups, and the results were compared. Therefore, some articles were categorized into two techniques to obtain richer results [4, 11, 18–21]. Traction vaginoplasty, a type of Vecchietti technique, was used in two papers (one paper assessed the original technique and the other focused on a modified form). The McIndoe method was presented in eight papers (four assessed the modified unidentified type technique and four were modified by amnion). Buccal mucosa and autologous in vitro cultured vaginal tissue were each mentioned in one article. Four papers evaluated skin flap vaginoplasty and classified each flap into two groups, i.e., single peritoneal flap (in two articles), pedicled bladder flap (in one article), and labia minora flap (in one article). Two articles were related to the Williams surgical procedure, one of which used a modified technique. The Davydov technique was used in ten studies (three papers used a modified version). Intestinal vaginoplasty using the sigmoid, sigmoid-colon, ileum, and jejunum was reported in nine, one, two and one papers, respectively. Other studies used different techniques including human-tissue manufacturing, biomaterial grafting, small intestinal submucosa (SIS) grafting, the Wharton-Sheares-George method, transvestibular approach, abdominal sacrocolpopexy, and Shears neovagina. One paper used mixed methods including dilation and ileum vaginoplasty (Fig. 3a, b). Therefore, sigmoid vaginoplasty was the most frequently used technique over the 10-year period evaluated. Many studies used a prospective design to determine the anatomical and functional outcomes and complications associated with surgery and patient

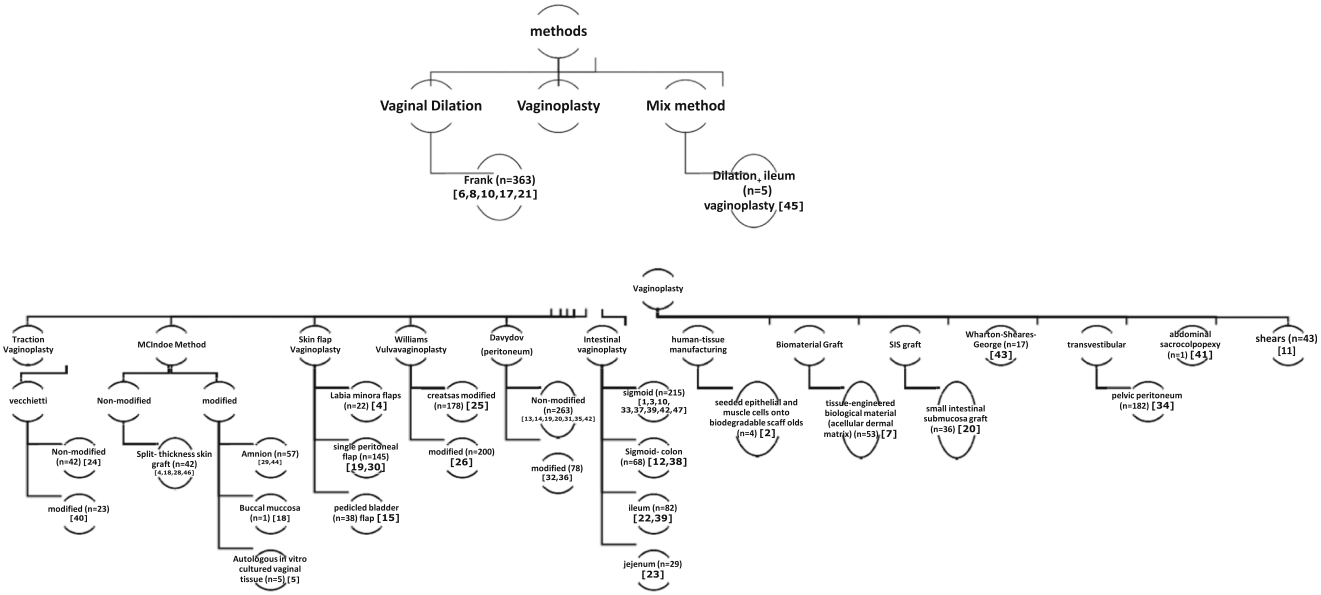

Fig. 3 **a** Types of methods reviewed. **b** Types of methods reviewed

satisfaction, and the number of clinical trial studies reviewed was low (Fig. 4).

Non-surgical techniques

Four articles focused on Frank's simple pressure technique [7, 9, 11, 22]. The mean age of the subjects under this technique was 19 years. In two studies, an expert nurse performed the technique and trained the patients during successive sessions [7, 22]. In the other two articles, there was no reference to how the technique was performed [9, 11]. Generally, an average of 4 months was required to create a suitable vagina with this method. There was a direct relationship between vaginal length and duration of dilator use [9]. The mean vaginal length with this technique was 7–8 cm. Sexual satisfaction was measured using the FSFI tool in two studies [9, 11] and informal questions in two other articles [7, 22]. While the FSFI scores suggested the sexual satisfaction of the participants in one study [7], the other study showed no change in the degree of satisfaction after the procedure. However, the orgasm score was higher than that before the Frank technique. The score of lubrication and arousal dimensions had decreased 1 year later, despite improvement in their scores compared with the time before intervention. In general, failure or dissatisfaction of individuals with this technique was related to several factors, including: unpleasant reminders, fatigue due to the daily repetition of the procedure, fear of damage to the genital area by inserting a hard object into the vagina, the need for private space, and social and cultural factors. Urinary tract obstruction was reported in one case [9]. The vaginal size was significantly larger in a study that used this technique along with auxiliary treatments, such as xylocaine and nitrogen oxide use. Such improvement was attributed to the better tolerance of the dilatants [7].

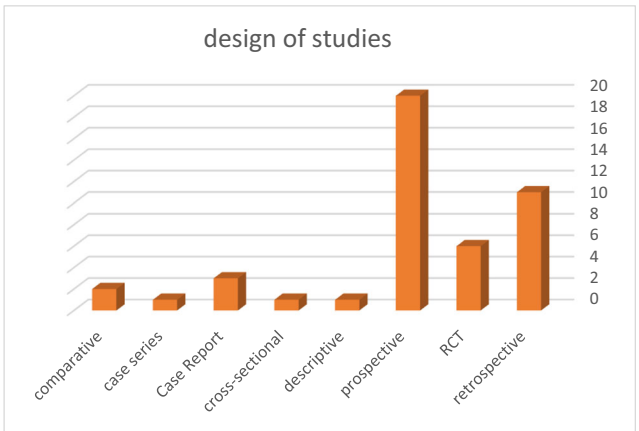

Fig. 4 Types of studies reviewed

Surgical techniques

The mean age of the subjects under this technique was 21.9 (range 1–52) years. Sigmoid vaginoplasty and the non-modified Davydov technique were the most and second most commonly used surgical techniques (Fig. 3b). The greatest length and width of the vagina were obtained with intestinal vaginoplasty using the ileum (length: 15–18 cm) [23] and jejunum (width: 14.5 cm) [24], respectively.

Sixteen articles did not mention the use of dilators after surgery [1–4, 11, 13–16, 18, 24–28]. In some studies, after the surgery, the patients were instructed to use a dilator before sexual intercourse to prevent myometrial contractions followed by vaginal stenosis [12, 19–21, 23, 29–36]. Among these papers, the shortest period of dilator use before regular sexual intercourse was observed following the Shears process in

which the patients were recommended to use these substances for up to 5 days and then have regular sexual intercourse [12]. The longest dilator use was seen following Davydov's procedure (9 months) and in the absence of regular sexual intercourse [37]. In some studies, patients were instructed to regularly use templates throughout the day if they did not have sex partners [5, 8, 12, 19–21, 23, 29–31, 33–35, 38, 39]. It seems availability of a partner for a normal sexual life is necessary because use of templates throughout the day is unpleasant for women [9].

The patients who underwent surgery could begin sexual intercourse after recovery (wound healing). The need for dilators was eliminated if regular sexual intercourse occurred at least twice a week. The shortest duration between the surgery and onset of intercourse (1 month) was observed in cases of intestinal vaginoplasty using jejunum [24], labia minora flaps [4], and the Williams technique [27]. The greatest duration between the surgery and initiation of intercourse (12 months) was seen after the non-modified Davydov technique [15], SIS grafting [21], and intestinal vaginoplasty using ileum [40].

Complications after treatment

Complications are inevitable after any surgical or invasive procedure. Various complications have been reported after surgical and non-surgical vaginoplasty procedures. The only complication after non-surgical techniques was urinary tract obstruction, which was reported in one person [9]. The complications following surgical techniques are presented in Table 2.

Table 2 Complications after treatment

Technique		Complication	Sexual function score (FSFI)	Reference
Frank		Dyspareunia, urinary duct obstruction	30	[9, 11]
Vecchietti-modified		Bladder damage, vaginal fistula to the rectum	30.1	[41]
McIndoe-non-modified	Split- thickness skin	Graft rejection, contractions of the vaginal duct, excessive hair growth in the new duct, dyspareunia	Not reported	[4, 19]
McIndoe-modified	Amnion	Vaginal duct stenosis, urinary infection, surgical site infection, wound in the vagina, holes in the rectum	30.4	[30, 42]
	Autologous in vitro cultured vaginal tissue	Bleeding, spotting	27.2	[5]
Skin flap vaginoplasty	Labia minora flaps	Dyspareunia	Not reported	[4]
	Single peritoneal flap	Vaginal mucus discharge, vaginal duct stenosis, vaginal duct stenosis, granulation on the vagina, bleeding during intercourse	29.6	[31]
	Pedicled bladder flap	Vaginal duct stenosis, bleeding, vaginal fistula, urinary infection, rupture of the vagina, mucosal prolapse of the vaginal wall	Not reported	[16]
Williams vulvavaginoplasty-non-modified		Excessive hair growth in the new duct	Not reported	[26]
Williams vulvavaginoplasty-modified		Open wound after surgery	Not reported	[27]
Davydov-non-modified		Vaginal mucus discharge, vaginal duct stenosis, dyspareunia, rectal damage, urinary infection, vaginal infection, vaginal polyps, vaginal adhesion, vaginal hernia	27.4	[14, 36]
Davydov-modified		Vaginal duct stenosis, dyspareunia	Not reported	[33, 37]
Intestinal vaginoplasty	Sigmoid	Mucosal prolapse, vaginal mucus discharge, vaginal duct stenosis, contractions of the vaginal duct, bleeding, pelvic hematoma, rectal damage, abscess in the uterus, vaginal prolapse, stenosis in anastomosis location, frequent pain in the genital area, abdominal abscess, unusual vaginal odor	26.39	[1, 11, 38, 40, 43]
	Sigmoid colon	Surgical site infection, wound in the vagina, stress ulcers	28.10	[39]
	Ileum	Vaginal duct stenosis, urinary stricture, abdominal bleeding, ileus	Not reported	[23]
	Jejenum	Mucosal prolapse, vaginal mucus discharge	27.5	[24]
Biomaterial graft		Dyspareunia	26.7	[8]
SIS graft		Vaginal mucus discharge	25.6	[21]
Wharton-Sheares-George		Liquid retention in the vagina	29.9	[44]
Transvestibular		Rectal damage	Not reported	[35]
Dilation + ileum		Bladder damage, vaginal discharge	Not reported	[45]

Sexual satisfaction measures

A variety of tools, including researcher-made scales or standard scales such as the FSFI, Female Sexual Distress Scale (FSDS-R), and Golombok Rust Inventory of Sexual Satisfaction (GRISS), were used to measure sexual satisfaction after the intervention (Table 3).

As seen in Table 3, the FSFI was the most commonly used tool. Researcher-made tools were the second most frequently used scales, but their standardization was not discussed in any studies. The greatest amount of dissatisfaction was observed with vaginoplasty using jejunum. Following this procedure, 9 of 34 patients were dissatisfied because of factors related to desire (45%), arousal (25%), lubrication (10%), orgasm (40%), satisfaction (40%), and pain during sexual intercourse (15%) [24]. The most common causes of dissatisfaction with the Davydov technique, regardless of the type (modified or not), were irregularities in orgasm, pain during intercourse, low vaginal lubrication, decreased arousal, and shortness or stenosis of the vagina [14, 28, 32]. The greatest cause of dissatisfaction with the Vecchietti technique was low vaginal lubrication [25, 41]. Pain during intercourse was generally the most common cause of dissatisfaction following various procedures [4, 11, 25, 33].

Moreover, the patients who underwent surgical procedures had higher sexual activity levels than those receiving non-surgical techniques. Among the surgical techniques, the highest percentages of the procedures were 100%, for the non-modified Davydov procedure [15, 36] and the modified McIndoe [5, 19, 37]. Other studies in which these percentages were reported as 100% included these methods: human-tissue manufacturing [2] and abdominal sacrocolpopexy [47]; in these studies, the small number of samples was one of the factors affecting the percentage of sexually active persons. In the technique using the sigmoid, this percentage in one study was 100% [43] and in another study was 13.63%, which was the lowest percentage compared with other techniques and even the Frank technique [11].

The evaluation of women's sexual function showed differences in the achievement of orgasm following various techniques. Women receiving a pedicled bladder flap and unmodified Vecchietti procedure tended to reach an orgasm mainly through the clitoris [16, 25]. Women who underwent the non-modified Davydov technique rarely experienced an orgasm, and these rare orgasms were reached through catalytic stimulation [14].

One study reported the rate of marital failure following the McIndoe technique and labia minora flaps as 83.3% and 22.7%, respectively [4]. This index was not measured in other studies.

A few studies focused on menstruation and pregnancy. One study used the non-modified Williams technique and reported one successful twin pregnancy with surrogacy [26]. In another study, 12% of women who underwent sigmoid vaginoplasty adopted one or more children [13]. Only two studies measured couples' satisfaction after surgery [13, 21]. Following the sigmoid technique, the husband's satisfaction rate was calculated as 93% [13]. Moreover, following SIS grafting, there was a direct relationship between the husband's satisfaction and the vaginal length, i.e., women with vaginal length > 6 cm had higher satisfaction [21].

Discussion

The purpose of the present systematic review was to evaluate the sexual satisfaction of patients with MRKH syndrome following various types of vaginoplasty and non-surgical procedures over the past 10 years. Many women with MRKH syndrome seek to improve their sexual relationships and quality of their sexual life. Due to the absence of studies on the exact consequences of each procedure among patients with different

Table 3 Sexual satisfaction measures

Tools	Articles
FSFI	[2, 3, 5, 9, 12, 18, 20, 24, 30–33, 36, 37, 39, 41–43]
FSFI + GRISS	[14]
FSFI + researcher-made scale	[44]
FSFI + FSDS-R + researcher-made scale	[11]
FSFI + informal questions	[8, 13]
FSFI + VAS (husband's satisfaction)	[21]
Researcher-made scale	[4, 15, 16, 23, 26, 27, 37, 40, 46]
FSFI modified	[35]
Informal questions	[22, 29, 34, 38, 47, 48]
None	[1, 7, 19, 45]

FSFI Female Sexual Function Index, *GRISS* Golombok Rust Inventory of Sexual Satisfaction, *FSDS-R* Female Sexual Distress, *ScaleVAS* visual analog scale

grades of MRKH syndrome, recommending a particular method of treatment to the patients is very challenging. However, advising and guiding people to select a suitable method based on their individual characteristics is very important. According to our review, surgical procedures, particularly sigmoid vaginoplasty, have been the most common techniques in the past 10 years. Among non-surgical techniques, we only found reports of Frank's simple pressure.

The complications of vaginoplasty and non-surgical procedures are undeniable. Based on our findings, the incidence of these complications is much higher following surgical procedures than with non-surgical procedures. The common complication using Frank's simple pressure is dyspareunia, which is caused by the lack of a new vagina with an adequate or expected anatomy. Having a sexual experience before a non-surgical intervention is a motivating factor for continuing treatment. In one article, people who had sex before the treatment started to have more success in completing the treatment than those without a similar experience [9].

Despite their wide range of complications, surgical techniques are preferred by the patients as they lead to faster achievement of the expected outcomes and provide a desirable vaginal length. Meanwhile, non-surgical methods can be frustrating, painful, and hard to practice on a daily basis for a person with cultural and social barriers.

The highest rates of postoperative complications were associated with Davydov [14, 23, 28, 36] and intestinal vaginoplasty [11, 39, 40, 43] especially sigmoid vaginoplasty [11, 39, 43]. The most common complications after a variety of procedures were dyspareunia, vaginal stenosis, and mucosal secretions from the vagina.

After a surgical procedure, the patient is instructed to wear a mold to prevent contractions and postoperative stenosis. The duration of mold wearing varies based on the type of procedure. Based on the results obtained in this review, the shortest and longest periods of dilator use before the onset of regular sexual intercourse were related to the Shears process [12] and modified Davydov method [37], respectively. Techniques which require wearing a mold until regular sexual intercourse may become frustrating for women without a sex partner/spouse and lead to the cessation of treatment [9]. These women should actually wear the molds regularly and overnight until they can have regular sexual activity (at least twice a week). This will have the same consequences as non-surgical procedures. Therefore, one of the most common complications after surgical procedures was vaginal stenosis.

One of the factors affecting the quality of life of women with MRKH is satisfaction with their sexual function. Sexual satisfaction is hence measured as an important outcome after various techniques. Unfortunately, there is not a single method for the measurement of this outcome, and thus different results have been obtained in this regard. According to the reviewed studies, the FSFI was the most commonly applied tool. Meanwhile, the simultaneous use of two or more tools did not yield consistent results [11, 25]. One study used three tools to measure sexual satisfaction in patients with MRKH syndrome. According to their findings, women receiving Frank's simple pressure who had a normal score on the FSFI had a low score on the distress dimension of the FDS-R scale. In the same study, patients treated with sigmoid vaginoplasty did not have pain during sexual intercourse but had normal scores on the FSFI. The researchers reported that 38% of the results were contradictory between the two tools [11].

In another study, the FSFI scores were within the normal range, but women with MRKH syndrome had lower vaginal pain and lubrication scores compared with healthy women. Moreover, the duration of sexual participation was longer in women with MRKH syndrome than in healthy women, but the duration of sexual activity was less reported [25]. In contrast to the results of one study, both the researcher-made tool and FSFI yielded similar results [44]. It seems that the existence of a specific tool for sexual function measurement among these groups of patients is very helpful in obtaining actual results.

Orgasm is an important aspect of sexual satisfaction. However, few studies have focused on orgasm among patients with MRKH syndrome. Based on their results, women with MRKH tend to achieve an orgasm through clitoral rather than vaginal stimulation [14, 16, 25].

In conclusion, further studies are warranted to obtain clear results about sexual activity. In fact, although all participants were reported to be sexually active in some studies, their small sample size did not allow generalization [2, 47]. Moreover, there were conflicting results regarding sigmoid vaginoplasty [11, 43]. Nevertheless, the highest rates of sexual activity were reported after non-modified Davydov [15, 36] and modified McIndoe procedures [5, 19, 37].

Other issues that have been addressed in a limited number of studies and require further research included marital relations, husband's satisfaction, fertility return rates, and menstruation. One of the factors affecting the husband's satisfaction is vaginal length. One of the reviewed studies found a significant positive relationship between marital satisfaction in women and greater vaginal length [21]. In another study, a 93% satisfaction rate was calculated among women, and women undergoing sigmoid vaginoplasty had no complaint of vaginal discharge [13].

Limitation

This review has limitations. We attempted to identify all articles on vaginoplasty and non-surgical procedures in patients

with MRKH syndrome over the past 10 years, since 2008. Despite our best efforts, some articles might have been missed through either the initial search or human error during the screening process. We minimized these limitations by having two authors perform screening, selection, and extraction independently, and the internal observer's reliability was high overall. We used the PRISMA checklist as a criterion to evaluate the articles. We did not assess the gray literature, but our aim was only to assess the published literature. We did not conduct a meta-analysis; however, we reviewed various items including the design of studies, complications after treatment, and sexual satisfaction measures. Also, this study lacked access to all databases and review of articles in other languages. One limitation that remains is many studies used a prospective design to determine the anatomical and functional outcomes and complications associated with surgery and patient satisfaction, and the number of clinical trial studies reviewed was low. Like any systematic review or meta-analysis, the limitation of our study is that it is only as strong as the weakest study included, and we do not see that as a stated limitation.

Conclusion

The reviewed studies highlighted the need for further quantitative and qualitative research on the sexual performance and outcomes of patients with MRKH syndrome. Design and development of a comprehensive tool to address all aspects and factors affecting the quality of sexual function of these patients can also play a significant role in creating reliable knowledge and planning appropriate treatment. More detailed studies based on the grades of MRKH syndrome can provide clearer information to facilitate the choice of treatment according to each individual patient's physical characteristics.

Compliance with ethical standards

Conflicts of interest None.

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