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Sexual functioning, sexual esteem, genital self-image and psychological and relational functioning in women with Mayer–Rokitansky–Küster–Hauser syndrome: a case–control study

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STUDY QUESTION: Do sexual functioning, sexual esteem, genital self-image and psychological and relational functioning in women with Mayer–Rokitansky–Küster–Hauser (MRKH) syndrome differ from a comparison group of women without the condition?

SUMMARY ANSWER: In comparison to controls, women with MRKH with a non-surgically or surgically created neovagina did not differ in psychological and relational functioning but reported lower sexual esteem and more negative genital self-image, intercourse-related pain, clinically relevant sexual distress and sexual dysfunction, with sexual esteem levels strongly associated with sexual distress and sexual dysfunction.

WHAT IS KNOWN ALREADY: Studies on sexual functioning measured with standardized questionnaires in women with MRKH syndrome compared with women without the condition have yielded contradictory results. Factors associated with sexual functioning in this patient population have rarely been investigated.

STUDY DESIGN, SIZE, DURATION: Between November 2015 and May 2017, 54 women with MRKH syndrome with a neovagina and 79 age-matched healthy women without the condition were enrolled in this case–control study.

PARTICIPANTS/MATERIALS, SETTING, METHODS: All participants had to be at least 18-years old and had to live in a steady heterosexual relationship. Women with MRKH syndrome were asked to participate by their (former) gynecologists at three university hospitals and by MRKH peer support group. Controls were recruited via advertisement in local newspapers and social media. Standardized questionnaires were administered to assess sexual functioning, sexual esteem, genital self-image and psychological and relational functioning.

MAIN RESULTS AND THE ROLE OF CHANCE: Women with MRKH syndrome with a surgically or non-surgically created neovagina reported significantly more pain during intercourse ($P < 0.05$, $d = 0.5$), but did not differ in overall sexual functioning from control women. More women with MRKH syndrome reported clinically relevant sexuality-related distress ($P < 0.05$, odds ratio (OR): 2.756, 95% CI 1.219–6.232) and suffered a sexual dysfunction ($P < 0.05$, OR: 2.654, 95% CI: 1.088–6.471) in comparison with controls. MRKH women scored significantly lower on the sexual esteem scale (SES) ($P < 0.01$, $d = 0.5$) and the female genital self-image scale (FGSIS) ($P < 0.01$, $d = 0.6$) than controls. No significant differences were found between the two groups regarding psychological distress, anxiety and depression, global self-esteem and relational dissatisfaction. Sexual esteem was significantly associated with the presence of clinically relevant sexual distress ($\beta = 0.455$, $P = 0.001$) and suffering a sexual dysfunction ($\beta = 0.554$, $P = 0.001$) and explained, respectively, 40% and 28% of the variance.

LIMITATIONS, REASONS FOR CAUTION: Given the nature of the study focusing on sexual functioning, a potential selection bias cannot be excluded. It is possible that those women with the most severe sexual and/or psychological disturbances did or did not choose to participate in our study.

WIDER IMPLICATIONS OF THE FINDINGS: The study results add new data to the very limited knowledge about psychosexual functioning of women with MRKH syndrome and are of importance for more adequate counseling and treatment of these women.

STUDY FUNDING/COMPETING INTEREST(S): The research was financially supported by the Dutch Scientific Society of Sexology (Nederlandse wetenschappelijke Vereniging Voor Seksuologie). The funding was unrestricted, and there was no involvement in the conduct of the research. There are no conflicts of interest to declare.

Key words: Mayer–Rokitansky–Küster–Hauser syndrome / vaginal agenesis / sexual problems / sexual distress / sexual dysfunction / sexual esteem / genital self-image / psychological functioning / relational functioning

Introduction

Mayer–Rokitansky–Küster–Hauser (MRKH) syndrome is an uncommon congenital condition, characterized by an agenesis or hypoplasia of the uterus and vagina in women with a normal female karyotype (46 XX) and phenotype (Griffin *et al.*, 1976). At the location of the vaginal opening, a small, slightly compressible dimple can be observed. The precise pathogenetic mechanism of the uterovaginal agenesis is still unknown (Simpson, 1999). The incidence is estimated to be one case per 5000 live female births (Herlin *et al.*, 2016). In general, the diagnosis will be made during adolescence when a woman with otherwise typical growth and pubertal development presents with primary amenorrhoea. Nearly, all women decide to enlarge their vaginal depth, either actively by dilators and/or intercourse, or more passively by surgery. To date, the non-surgical vaginal elongation by dilation with vaginal dilators according to Frank (1938) is the first choice of treatment (ACOG, 2018). This technique can easily be combined with attempts of sexual intercourse. Dilation can also be performed surgically with Vecchietti's procedure (Veronikis *et al.*, 1997) and involves a laparoscopic attachment of a traction device to the abdomen with subperitoneal sutures and a plastic 'olive' placed on the vaginal dimple. With other surgical techniques, a canal of adequate size is created and oriented in the correct axis by dissection of a neovaginal space situated between the bladder and rectum. The newly created space may be covered with skin grafts (McIndoe and Bannister, 1938), peritoneum (Davydov and Zhvitiashvili, 1974) and amnion (Nisolle and Donnez, 1992) or segments of ileum, caecum or sigmoid colon (Baldwin, 1904). Also, an external pouch formed by suturing the labia majora could function as a neovagina (Williams, 1964). The kind of surgery that is performed depends largely on the surgeon's preference and experience.

Most published outcome studies of these surgical and non-surgical procedures comprise the final vaginal length and the report of 'being able to have intercourse satisfactorily'. In recent decades, standardized questionnaires such as the Female Sexual Function Index (FSFI) and Female Sexual Distress Scale (FSDS) have been used to assess post-treatment sexual functioning. Mixed results have been observed (Callens *et al.*, 2014). Compared with the standardization population, the reported mean total FSFI scores in treated women with MRKH syndrome were within the normal range or indicated lower sexual function after either vaginal dilation or neovaginoplasty. The prevalence of a sexual dysfunction (Wiegel *et al.*, 2005), meaning the presence of sexual problems (FSFI total score ≤ 26.55) in combination with the experience of sexuality-related distress (FSDS score ≥ 15), remained unclear. Prevalence was only assessed in two (Callens *et al.*, 2012; Carrard *et al.*, 2012) of the 18 studies that were included in Callens' review (Callens *et al.*, 2014).

In addition to the sexual sequelae of the syndrome, the condition can have a negative impact on women's well-being (Weijenborg and ter Kuile, 2000; Heller-Boersma *et al.*, 2009a; Liao *et al.*, 2011; Callens *et al.*, 2012) due to confusion regarding female identity, as well as social and sexual roles with reference to what it means to be a woman. Many women with MRKH syndrome can develop negative self-beliefs, seeing themselves as defective, inferior or unlovable as women (Heller-Boersma *et al.*, 2009b), which also can compromise sexual functioning (Brotto *et al.*, 2016). So far, only a few studies have assessed psychosexual and psychosocial factors with standardized measurements in MRKH women (Callens *et al.*, 2014). Moreover, relational factors associated with sexual functioning in MRKH women have not been studied yet.

Therefore, the primary aim of the present study was to assess sexual functioning, sexual esteem, genital self-image and psychological and relational functioning with standardized questionnaires in women with MRKH syndrome and to compare the results with the findings of age-matched women without the condition. A further aim was to evaluate potential associations between sexual functioning on the one hand and sexual esteem, genital self-image and psychological and relational functioning on the other hand and to identify potential predictors of sexual functioning.

Materials and Methods

Design and participants

All women with MRKH syndrome who were known by the Dutch peer support group 'The foundation of MRK women' (www.mrkstichting.nl) were invited to participate in this case–control study as well as current or former patients diagnosed with MRKH syndrome at the departments of Gynecology in three University Medical Centers in the Netherlands: Erasmus University Medical Center, Rotterdam, Radboud University Medical Center, Nijmegen and the Leiden University Medical Center. The board of the foundation and the gynecologists at each medical center approached the women with an information letter on the purposes of the study and an invitation to consider participation. A brochure with extensive information on the study was enclosed. The board of the foundation of MRK women also made a call about this research project on a website. Non-responders received one reminder. Control women, recruited by advertising in local newspapers and social media, were healthy females without the condition, age-matched

with the study population. All eligible women had to be involved in a heterosexual relationship for at least 6 months, had to be 18 years or older and be able to speak, understand and write the Dutch language properly. Pregnant and lactating women in the control group were excluded.

Procedure

In case a woman was interested to participate, she could contact the co-ordinator of the study by telephone or email, who could be reached easily at any moment during daytime for further questions. If eligible, a letter with a weblink to a personal portal was sent. For those who were not able to use the web-based questionnaires, a paper and pencil version was sent to their home address on their request. Informed consent was requested via the web-based application or with a letter of consent. For completion of the questionnaires, about 30 min time was estimated, and participants (MRKH and control women) received a small financial compensation of €15 (about 17 US$).

The study was approved by the Human Subjects Ethical Review Boards of the three university hospitals and conducted according to the principles of the Declaration of Helsinki (Tokyo, 2004) and in accordance with the Medical Research Involving Human Subjects Act (WMO), and the Guideline for Good Clinical Practice (July, 1996).

Measures

Sexual functioning

With the 19-item FSFI (Rosen *et al*., 2000; Ter Kuile *et al*., 2006), the experience of sexual problems during the preceding 4 weeks was measured by evaluating six domains, i.e. sexual desire, sexual arousal, lubrication, orgasm, sexual satisfaction and pain. The total score ranged from 0 to 36 with higher scores indicating better sexual functioning. A total score of 26.55 and lower indicates the presence of clinically relevant sexual problems.

The 12-item FSDS (Derogatis *et al*., 2002; Ter Kuile *et al*., 2006) was used to evaluate sexuality-related personal distress. The score ranged from 0 to 48, with higher scores denoting more distress. A total score of 15 or higher indicates the presence of clinically relevant sexual distress.

According to the Diagnostic and Statistical Manual of Mental Disorders (2000) (Fourth edition, text revision) (DSM IV-TR) a *Female Sexual Dysfunction* (FSD) is diagnosed in case of decreased sexual function and increased sexual distress. Therefore, a participant is described as suffering a FSD when her scores on the FSFI show a clinically relevant problem (26.55 and below) in combination with clinically relevant distress (FSDS score of 15 and above) (Wiegel *et al*., 2005).

From the original nine-item *Genital Pain Rating* (GPR) *questionnaire* (Brauer *et al*., 2007), only those items were used that assessed vulvovaginal pain, experienced at insertion of the woman's or partner's finger into the vagina and/or during intercourse. Items were rated on a scale of 0 (not painful at all) to 10 (worst pain imaginable). Furthermore, the location of the pain during intercourse was asked for, with pain at the introitus, deep in the vagina, or both as rating options.

Sexuality-related factors

The 10-item SES, a subscale of the Multidimensional Sexuality Questionnaire (MSQ) (Snell and Papini, 1989), was used to assess sexual esteem. The total score ranged from 10 to 50 with higher scores indicating higher sexual esteem.

The seven-item FGSIS was administered to observe a woman's evaluation of her genitals (vulva and vagina) (Herbenick and Reece, 2010; DeMaria *et al*., 2012). The total score ranged from 7 to 35, with higher scores indicating a more positive genital self-image.

Psychological functioning

Psychological distress was measured with the 90-item Symptom Checklist-90 (SCL-90) (Derogatis and Cleary, 1977; Arrindell and Ettema, 2003). The total score ranged from 90 to 450, with higher scores representing greater psychological distress.

The Hospital Anxiety and Depression Scale (HADS) (Zigmond and Snaith, 1983; Spinhoven *et al*., 1997) was used to evaluate the presence of anxiety and depressive states and consists of two seven-item scales (anxiety and depression) both with a score ranging between 0 and 21. Higher scores represent higher levels of anxiety and depression. A score of 11 and higher is indicative for an anxiety or depressive disorder.

Global self-esteem was assessed with the 10-item Rosenberg's Self-Esteem Scale (RSES) (Rosenberg, 1965; Franck *et al*., 2008). The score ranged from 10 to 50 with higher scores indicating higher global self-esteem.

Relational functioning

The subscale relationship satisfaction of the Maudsley Marital Questionnaire (MMQ) (Crowe, 1978; Arrindell *et al*., 1983) was used to evaluate relational functioning. The range of this subscale is 0–80, with higher scores denoting more relational dissatisfaction.

Demographic and clinical variables

A questionnaire was designed to cover demographic and clinical characteristics of the study participants such as age, duration of the partner relation and educational level. A woman with MRKH syndrome was asked whether and when she (had) created a neovagina and which method was used: surgical or non-surgical.

To assess the prevalence of sexual abuse during childhood and in adulthood, the seven-item Sexual and Physical Abuse Questionnaire was applied (Kooiman *et al*., 2002). Only three questions from this questionnaire were used: Has anyone ever touched your sex organs in a sexual manner against your will? Has anyone ever forced you to touch his or her sex organs in a sexual manner and against your will? and Has anyone ever tried to force you to have sexual intercourse against your will? For each item, the woman could indicate the age when it first happened. A positive answer on one or more of the three questions was interpreted as sexual abuse (in the past).

Statistical analyses

Statistical analyses were performed using SPSS (version 23 for windows, SPSS Inc., Chicago, IL, USA). Descriptive statistics were calculated for all variables. If necessary, datasets were transformed to obtain a normal distribution. Chi squared (χ^2) or Fisher's exact test and Student's *t*-test for independent samples in case of dichotomous or continuous variables were used where appropriate. To indicate a measure of strength of the difference between two variables in the context of the *t*-test means, we used Cohen's *d* (Cohen, 1988)

with 0.2 indicative of a small effect, 0.5 a medium and 0.8 a large effect.

First, data on the main outcome regarding sexual functioning collected with the FSFI and the FSDS as well as data on sexual esteem, genital self-image and psychological and relational functioning were analyzed with two groups (MRKH women with a neovagina versus control women) ANOVA's and Chi squared (χ^2) tests for, respectively, continuous and dichotomous variables. We calculated the presence of a FSD by combining a FSFI total score of 26.55 and below with a FSDS score of 15 and above (Wiegel *et al.*, 2005).

In the second step, correlations between the main outcome, i.e. the presence of clinically relevant FSFI and FSDS, and of FSD on the one hand and sexual esteem, genital self-image, psychological and relational functioning and demographic and clinical variables on the other hand, were examined. Next, those variables that were significantly correlated with the main outcome measures were put into a multiple regression analyses to examine which variables turned out to be the strongest predictors. The statistical significance (two sided) was set at $P < 0.05$.

Results

Participants

Sixty-three women with MRKH syndrome and 79 control women completed the questionnaires. Fifty-four (85%) MRKH women had a neovagina, of whom 32 (59%) had (had) constructed their neovagina more than 10 years ago, and the majority ($N = 37$, 68%) had used dilation and/or intercourse to create her neovagina. Two other women did not indicate whether they had had surgery or created their vagina themselves. Different surgical techniques were mentioned by the operated women (Davydov $N = 5$; Vecchietti $N = 1$; McIndoe $N = 5$; Williams $N = 1$, cutaneous groins flap $N = 1$, kind of surgery not known $N = 2$). Six women with MRKH were excluded from the analyses, two because they were creating their neovagina at the moment of study participation and four because of missing data. Nine women who at first indicated they had not created a vagina themselves and had no surgically created vagina, had to be excluded from further analyses as well. Reviewing their answers to the FSFI, an incongruence emerged, as seven of these nine women scored 'some to always pain during intercourse'. Therefore, it was unsure whether they had or had not created a neovagina.

Data were collected from November 2015 to May 2017. All participants gave oral and written informed consent. Initially, a total of 688 information letters on the study were sent out, 338 through the peer support group and 350 through the gynecologists of the medical centers. For reasons of privacy, the research group was not informed about the names of the women, who were notified by the peer support group and the other medical centers. From clinical practice, it is known that a woman with MRKH syndrome can visit more than one medical center and also join the peer support group. Therefore, the exact number of unique persons to whom the information letter was sent remained unclear. Consequently, a response rate could not be calculated, and no comparisons could be made between responders and non-responders or between the results of MRKH women recruited via the medical centers and the peer support group.

Demographic and clinical characteristics of women with MRKH syndrome with a neovagina

As shown in Table I, MRKH women had a statistically significant longer duration of their relationship ($P < 0.05$, $d = 0.5$) and reported sexual abuse experiences significantly less frequently ($P < 0.05$, OR: 0.378; 95% CI: 0.173–0.826) than the control group. All other variables did not differ significantly between the groups.

Sexual functioning

As shown in Table II, sexual functioning as reflected by the FSFI total scores did not differ significantly between MRKH women and controls. Also, no significant differences were found between both groups regarding the FSFI domains such as sexual desire, arousal, lubrication, orgasm and sexual satisfaction. However, MRKH women scored significantly lower on the subscale pain ($P < 0.05$, $d = 0.5$). This result indicates that MRKH women reported significantly more often pain during intercourse. Significantly, more MRKH women than controls reported the presence of some or higher levels of pain during intercourse as assessed with the GPR (MRKH women: $N = 31$, 65% versus controls: $N = 30$, 41%; $P < 0.05$, OR: 2.675, 95% CI: 1.261–5.672). This finding concurs with the results of the FSFI questionnaire. MRKH women indicated more frequently that their pain was located deep in their neovagina (MRKH women $N = 19$, 68% versus controls $N = 12$, 43%; $P = 0.06$, OR: 2.815, 95% CI: 0.946–8.376), but this difference between groups did not reach statistical significance. Controls indicated significantly more often superficial dyspareunia (MRKH women: $N = 4$, 14% versus controls $N = 13$, 46%; $P < 0.05$, OR: 0.192, 95% CI: 0.053–0.701). Furthermore, no significant differences were found between MRKH women and controls regarding sexuality-related personal distress (FSDS) scores. Also, the proportion of women with clinically relevant sexual problems (i.e. FSFI total score ≤ 26.55) did not differ significantly between both groups. However, significantly more MRKH women experienced clinically relevant sexuality-related distress (i.e. FSDS ≥ 15) in comparison with controls ($P < 0.05$; OR: 2.756, 95% CI: 1.219–6.232). Moreover, significantly more MRKH women than controls suffered a FSD ($P < 0.05$, OR: 2.654, 95% CI: 1.088–6.471).

Sexuality-related factors

As shown in Table III, MRKH women scored significantly lower on the SES ($P < 0.01$, $d = 0.5$) and on the FGSIS ($P < 0.01$, $d = 0.6$) than control women, indicating that MRKH women showed less sexual esteem and a more negative genital self-image. No significant differences were found between both groups on their scores on the SCL-90, HADS, RSES and MMQ subscale relationship satisfaction, indicating that MRKH women showed similar levels of psychological distress, anxiety and depression, global self-esteem and relational dissatisfaction as control women.

Predictors of sexual functioning, sexual distress and female sexual dysfunction in MRKH women with a neovagina

Correlational analyses revealed that none of the demographic or clinical variables, such as age, living together with a partner, level of education, having experienced sexual abuse and the way a neovagina

Table I Demographic and clinical characteristics of 54 women with Mayer-Rokitansky-Küster-Hauser syndrome with a neovagina and 79 control women without the condition.

	MRKH (N = 54)	Controls (N = 79)	MRKH versus controls		
	M (SD)	M (SD)	*p*	*d*	
Age (yrs)	39.2 (13.8)	36.7 (11.1)	.26	.2	
Duration relationship (yrs)	13.8 (14.7)	8.3 (8.2)	.01*	.5	
	N (%)	N (%)		OR	95% CI
Level of education[a]			.31	1.458	0.705-3.019
Low	21 (39)	24 (30)			
High	33 (61)	55 (70)			
Sexual abuse history (yes)	12 (22)	34 (43)	.01*	0.378	0.173-0.826
Yrs after neovagina creation					
≤ 1 yr	2				
1–5 yrs	11				
5–10 yrs	6				
>10 yrs	32				
Missing	3				

MRKH: Mayer–Rokitansky–Küster–Hauser syndrome; yr(s): year(s); N: number; M: mean; OR: odds ratio.
*$p < 0.05$ (Chi squared (χ^2) and/or Fisher's exact test or Student's t-test for independent samples in case of dichotomous or continuous variables, where appropriate); $d = 0.2$ small effect; $d = 0.5$ medium effect $d = 0.8$ large effect (Cohen, 1988).
[a]High: upper secondary vocational education, higher professional education, pre-university, university; Low: primary school, special education, lower secondary education (vocational and general).

was created (surgically or non-surgically), were associated with the main outcome, i.e. clinically relevant FSFI, clinically relevant FSDS and suffering a FSD. A significant negative correlation was found between time since creation of the neovagina and the FSDS scores, indicating that less sexuality-related distress was reported with a longer period since the creation of the neovagina. Sexual esteem, genital self-image, psychological distress total score, HADS anxiety and depression score, global self-esteem and relational dissatisfaction were significantly correlated with clinically relevant FSFI and clinically relevant FSDS. Sexual esteem, genital self-image, psychological distress total score and relational dissatisfaction were significantly correlated with suffering a FSD.

As shown in Table IV, after multiple regression analyses, it was found that sexual esteem ($\beta = 0.670$, $P = 0.001$), the anxiety subscale score of the HADS ($\beta = -0.454$, $P = 0.021$) and global self-esteem (RSES) ($\beta = 0.408$, $P = 0.025$) were significantly associated with clinically relevant FSFI, and these factors explained 38% of the model. Sexual esteem was significantly associated with clinically relevant FSDS ($\beta = 0.455$, $P = 0.001$) and suffering a sexual dysfunction (FSD) ($\beta = 0.554$, $P = 0.001$) and explained 40% and 28% of the variance, respectively, as shown in the results of the adjusted R square (adj R^2).

Discussion

Women with MRKH syndrome with a neovagina reported significantly more pain during intercourse and specifically more deep pain, in comparison with women of similar age without the condition. The scores on the other FSFI domains and the proportion of women with clinically relevant sexual problems did not differ significantly between both groups. However, compared with controls, significantly more MRKH women experienced clinically relevant sexuality-related distress and suffered a FSD, irrespective of the way they (had) created their neovagina (surgically or non-surgically). The longer ago the creation of the neovagina was, the less distress MRKH women experienced. MRKH women also scored significantly lower on sexual esteem and genital self-image in comparison with controls. Moreover, sexual esteem turned out to be the most important predictor of sexual distress and sexual dysfunction.

A comparison of our findings with the results of previous studies that used the FSFI as a standardized measurement to assess sexual functioning in comparison with a control group is hampered. As shown in Table V, there are great differences between studies and our study regarding study design, follow-up period, study population, the number of participants and the nature of the comparison or control group. About 16 of the 20 studies performed the assessment after a surgical procedure to create a neovagina, while we enrolled women who created their neovagina non-surgically or surgically. Despite this, some findings of this comparison regarding FSFI and FSDS scores, sexuality-related factors, such as sexual esteem and genital self-image, and psychological functioning must be highlighted.

First, in line with our results, 12 of the 20 studies (60%) (Communal *et al.*, 2003; Giannesi *et al.*, 2005; Liu *et al.*, 2009; Fotopoulou *et al.*, 2010; Csermely *et al.*, 2011; Walch *et al.*, 2011; Zhu *et al.*, 2013; Zhao *et al.*, 2015; (Çetin *et al.* 2016; Wu *et al.*, 2016; Pastor *et al.*, 2017; Cheikhelard *et al.*, 2018) found that the FSFI total scores of MRKH women did not differ significantly from the scores of the control women, indicating that MRKH women do not report more sexual

Table II Sexual functioning of 54 women with MRKH with a neovagina and 79 controls.

	MRKH (N = 54)	Controls (N = 79)	MRKH versus controls		
FSFI scores[a]	**M (SD)**	**M (SD)**	***p***	***d***	
Total	27.1 (5.8)	27.9 (6.1)	.38	.1	
Desire	3.5 (1.0)	3.6 (1.1)	.56	.0	
Arousal	4.7 (1.2)	4.6 (1.2)	.71	.0	
Lubrication	4.9 (1.2)	5.2 (1.3)	.19	.2	
Orgasm	4.7 (1.5)	4.7 (1.4)	.96	.0	
Satisfaction	4.9 (1.3)	4.7 (1.2)	.27	.2	
Pain	4.2 (2.1)	5.1 (1.6)	.01*	.5	
FSDS score[b]	11.7 (12.8)	8.9 (8.7)	.14	.2	
	N (%)	**N (%)**		**OR**	**95% CI**
Clinically relevant FSFI (yes ≤ 26,55)	21 (39)	21 (27)	.14	1.758	0.838-3.686
Clinically relevant FSDS (yes ≥ 15)	19 (35)	13 (17)	.01*	2.756	1.219-6.232
FSD (yes)	15 (28)	10 (13)	.03*	2.654	1.088-6.471
GPR					
Coital pain (yes)[c]	31 (64.6)	30 (40.5)	.01*	2.675	1.261-5.672
Location of pain[d]					
Superficial	4 (14)	13 (46)	.01*	0.192	.053-.701
Deep	19 (68)	12 (43)	.06	2.815	.946-8.376
Both	5 (18)	3 (11)	.45	1.812	.389-8.444

FSFI: Female Sexual Function Index; FSDS: Female Sexual Distress Scale; FSD: Female Sexual Dysfunction; GPR: Genital Pain Rating questionnaire.
*$p < 0.05$; $d = 0.2$ small effect; $d = 0.5$ medium effect; $d = 0.8$ large effect (Cohen, 1988).
[a]Higher scores indicate better sexual function.
[b]Higher scores indicate more sexual distress.
[c]MRKH N = 48, controls N = 74, due to unanswered items.
[d]MRKH N = 28, controls N = 28, due to unanswered items.

problems than controls. Six studies (Fedele *et al*., 2008; Allen *et al*., 2010; Fedele *et al*., 2010; Liao *et al*., 2011; Callens *et al*., 2012; Fliegner *et al*., 2014) reported significantly lower FSFI total scores than controls indicating impaired sexual functioning. Only one study (Leithner *et al*., 2015) reported significantly higher FSFI total scores in comparison with controls, suggesting that MRKH women showed better sexual function than controls.

Second, also in line with our findings, 10 studies (50%) (Giannesi *et al*., 2005; Nadarajah *et al*., 2005; Fedele *et al*., 2008, 2010; Allen *et al*., 2010; Csermely *et al*., 2011; Liao *et al*., 2011; Callens *et al*., 2012; Çetin *et al*., 2016; Pastor *et al*., 2017) observed that, compared with controls, the mean score of MRKH women in the pain domain of the FSFI was significantly lower, indicating that they reported more frequently pain during intercourse. Some of these studies hypothesized that this pain could be the result of decreased lubrication during sexual intercourse because they found lower scores on the lubrication domain of the FSFI. In contrast, we did not find a significant difference in lubrication scores between groups, and observed that MRKH women indicated more frequently deep pain during intercourse. Therefore, another hypothesis that this deep dyspareunia could be associated with a shorter neovagina can be valid, as previously also suggested by others (Allen *et al*., 2010; Callens *et al*., 2012; Both *et al*., 2018). Unfortunately, we cannot provide further evidence for this assumption, as we did not examine the length of the neovagina of the study participants. Another hypothesis regarding the differences in the location of pain felt during intercourse between MRKH women and controls can be suggested. Normally, the outer third of the vagina contains mixed somatic and visceral afferents, with the vulvar vestibule containing a high concentration of somatic afferents. The upper two-thirds of the vagina, in contrast, are very sparsely innervated with visceral nerves only. Somatic and visceral nerves produce different qualities of perception, which can affect the quality of genital sensation (Pfaus *et al*., 2016). When in women with MRKH syndrome, the vaginal dimple is enlarged by intercourse and/or dilators or by surgery, the anatomy and innervation will be different compared with that of women without the condition: possibly, these differences result in differences in sensations (e.g. pain) during intercourse.

Third, only three of the 20 studies (Callens *et al*., 2012; Pastor *et al*., 2017; Cheikhelard *et al*., 2018) used the FSDS to evaluate sexuality-related personal distress. These studies observed that the sexuality-related distress scores of MRKH women were significantly higher than the scores of controls. In contrast, we did not find a statistically significant difference in scores on the FSDS between MRKH women and controls. However, more MRKH women than controls experi-

Table III Sexual esteem, genital self-image, psychological and relational functioning of 54 women with MRKH with a neovagina and 79 controls.

	MRKH (N = 54)	Controls (N = 79)	MRKH versus controls	
Sexuality related factors	**Mean (SD)**	**Mean (SD)**	***P***	***d***
SES[a]	32.2 (11.7)	37.6 (10.2)	.005**	.5
FGSIS[b]	23.9 (6.8)	27.9 (6.1)	.001**	.6
Psychological functioning				
SCL-90[c]	131.1 (57.3)	126.5 (38.6)	.59	.1
HADS-anxiety[d]	4.7 (3.4)	4.5 (3.7)	.72	.0
HADS-depression[e]	2.4 (2.9)	2.7 (2.9)	.63	.1
RSES[f]	41.4 (8.9)	42.2 (7.1)	.58	.0
Relational functioning				
MMQ-relational[g]	10.8 (12.1)	12.6 (12.2)	.40	.1

*$p < 0.05$; **$p < 0.01$; $d = 0.2$ small effect; $d = 0.5$ medium effect $d = 0.8$ large effect (Cohen, 1988).
SES: Sexual Esteem Scale; FGSIS: Female Genital Self-Image Scale; SCL-90: Symptom Check List-90 items; HADS: Hospital Anxiety and Depression Scale; RSES: Rosenberg Self-Esteem Scale; MMQ-relational: Maudsley Marital Questionnaire, subscale relationship satisfaction.
Higher scores indicate:
[a]More sexual esteem.
[b]More positive genital self-image.
[c]More psychoneurotic-somatic discomfort.
[d]More anxiety.
[e]More depression.
[f]More global self-esteem.
[g]More relational dissatisfaction.

Table IV Regression for clinically relevant FSFI and FSDS and presence of FSD in 54 women with MRKH with a neovagina.

	Clinically relevant FSFI (yes)				Clinically relevant FSDS (yes)				FSD (yes)			
	B	**SE**	**ß**	***p***	**B**	**SE**	**ß**	***p***	**B**	**SE**	**ß**	***p***
SES	**.028**	**.007**	**.670**	**.001**	**.019**	**.006**	**.455**	**.001**	**.021**	**.006**	**.554**	**.001**
FGSIS	.002	.011	.025	.875	.008	.011	.118	.453	–.003	.010	–.052	.746
SCL-90	.001	.002	.115	.595	–.002	.002	–.277	.202	.000	.001	.062	.659
HADS-anxiety	**.066**	**.028**	**–.454**	**.021**	.001	.027	.007	.970				
HADS-depression	.010	.040	.059	.808	.033	.039	.200	.403				
RSES	**.023**	**.010**	**.408**	**.025**	.002	.010	.053	.849				
MMQ-relational	.002	.005	.046	.721	–.008	.005	–.208	.106	0.006	.005	–.169	.196
Adj R^2	.380				.391				.281			

p < 0.05. significant association with outcome

enced a clinically relevant level of distress that was associated with the time since creation of the neovagina. Only one other study (Callens *et al.*, 2012) evaluated the presence of a FSD, where there needs to be clinically relevant sexuality-related distress (FSDS ≥ 15) as well as clinically relevant sexual problems (FSFI ≤ 26.55) (Wiegel *et al.*, 2005). Callens found that eight of the 17 women (50%) of a mixed study population comprising MRKH women ($N = 7$) and women with androgen insensitivity syndrome ($N = 28$) suffered a sexual dysfunction, with no significant differences between those who had created their neovagina surgically or non-surgically. In contrast, we observed that only 28% of MRKH women suffered a sexual dysfunction, irrespective of the method of neovagina creation. This difference in percentages could be related to the major differences in study population between the two studies.

Fourth, only two other studies assessed sexuality-related factors. In line with our results, Liao *et al.* (2011) observed that MRKH women scored lower on sexual esteem in comparison with the norm group of the MSQ, and Pastor *et al.* (2017) reported a significantly lower genital self-image in MRKH women compared with age-matched controls. Only four other studies also evaluated psychological functioning in their cohort of MRKH women (Liao *et al.*, 2011; Fliegner *et al.*, 2014; Leithner *et al.*, 2015; Cheikhelard *et al.*, 2018). Liao *et al.* (2011) found that, in comparison with controls, MRKH women showed a lower quality of life and more anxiety, while the other studies, like our

Table V Overview of follow-up, cross-sectional and case control studies after treatment of women with vaginal agenesis, such as MRKH and assessment of sexual functioning (FSFI), sexual distress (FSDS), sexuality-related factors and psychological functioning using standardized measurements.

Author, yr of publication	Allen et al., 2010	Callens et al., 2012	Çetin et al., 2016	Cheikhelard et al., 2018	Communal et al., 2003
N	6	35	62	131	16
Diagnosis	MURCS (1), AIS (1), vaginal agenesis (4)	MRKH (7), AIS (28)	MRKH	MRKH	MRKH
Study design	FU case series	FU, comparative	FU, case control	FU, cross sectional	FU, case series
FU time (mean)	6 mths	6 yrs	48 mths	10 yrs	3.3 yrs
Treatment	S	S (15), D (17)	S	S (85), D (46)	S
FSFI total score	↓↓	↓↓	=	=	=
FSFI lubrication	↓↓	↓↓	=	=	NR
FSFI pain	↓↓	↓↓	=	=	NR
FSFI ≤ 26.55	NR	All	NR	NR	4/11
FSDS (−R) ≥ 15 (11)	NR	46% > 11	NR	71% > 11	NR
FSD	NR	50%	NR	NR	NR
Sexuality related	NR	NR	NR	NR	NR
Psychological factors	NR	NR	NR	WHOQol-BREF	NR
Controls	Standardization population	Standardization population	65 women, 18–31 yrs, gyneological outpatient	Standardization or general population	Standardization population

Author, yr of publication	Csermely et al., 2011	Fedele et al., 2008	Fedele et al., 2010	Fliegner et al., 2014	Fotopoulou et al., 2010
N	23	110	30	60	7
Diagnosis	MRKH	MRKH	MRKH	MRKH (49), CAIS (11)	MRKH
Study design	Case control	FU, case series	FU, case series	Cross sectional	FU
FU time (mean)	2–11 yrs	1 yr	30 mths	NR	1.5 yrs
Treatment	S	S	S	S (50), D (10)	S
FSFI total score	=	↓↓	↓↓	↓↓	=
FSFI lubrication	↓↓	↓↓	=	NR	NR
FSFI pain	↓↓	↓↓	↓↓	NR	NR
FSFI ≤ 26.55	NR	NR	NR	NR	NR
FSDS	NR	NR	NR	NR	NR
FSD	NR	NR	NR	NR	NR
Sexuality related	NR	NR	NR	NR	NR
Psychological factors	NR	NR	NR	FUSS, RSES, BSI	NR
Controls	25 sexually active age-matched women of contraception department	Standardization population	Standardization population	Standardization populations	Standardization population

(Continued)

Table V Continued

Author, yr of publication	Giannesi *et al.*, 2005	Leithner *et al.*, 2015	Liao *et al.*, 2011	Liu *et al.*, 2009	Nadarajah *et al.*, 2005
N	28	10	56	31	60
Diagnosis	MRKH	MRKH	MRKH	MRKH	MRKH
Study design	Case control	Case control	Cross sectional	Case control	FU
FU time (mean)	43 mths	3–77 mths	6 mths-5 yrs	NR	NR
Treatment	S	S	S (8), D (48)	S	D
FSFI total score	=	↑↑	↓↓	=	NR
FSFI lubrication	↓↓	NR	↓↓	=	↓↓
FSFI pain	↓↓	NR	↓↓	=	↓↓
FSFI ≤ 26.55	NR	NR	NR	NR	NR
FSDS	NR	NR	NR	NR	NR
FSD	NR	NR	NR	NR	NR
Sexuality related	NR	NR	MSQ	NR	NR
Psychological factors	NR	PHQ 15, BSI, WHOQoL-BREF, PBI, body esteem questionnaire	SF-12, HADS	NR	NR
Controls	28 age-matched women, gyn outpatient clinic	20 age-matched healthy women from gynecologic practice	Standardization populations	Standardization population	Standardization population

Author, yr of publication	Pastor *et al.*, 2017	Walch *et al.*, 2011	Wu *et al.*, 2016	Zhao *et al.*, 2015	Zhu *et al.*, 2013
N	42	10	60	83	53
Diagnosis	MRKH	MRKH	MRKH	MRKH	MRKH
Study design	Case control	Case control	FU comparative	Case control	Prospective FU
FU time (mean)	4.6 yrs	33 mths	3 mths	46 mths	21 mths
Treatment	S	S	S	S	S
FSFI total score	=	=	=	=	=
FSFI lubrication	↓↓	=	=	=	=
FSFI pain	↓↓	=	=	=	=
FSFI ≤ 26.55	NR	NR	NR	NR	NR
FSDS	↑↑	NR	NR	NR	NR
FSD	NR	NR	NR	NR	NR
Sexuality related	FGSIS	NR	NR	NR	NR
Psychological factors	NR	NR	NR	NR	NR
Controls	45 age-matched childless, women visiting a contraception clinic	Standardization population	30 age-matched family members of outpatients	85 healthy volunteers who accompanied (other) patients to clinic	24 age-matched healthy women in outpatient clinic

MURCS: Müllerian-Renal-Cervical Somite Abnormality; (C)AIS: (Complete) Androgen Insensitivity Syndrome; FSDS(−R): Female Sexual Distress Scale (-Revised); FUSS: Feeling of Inadequacy in Social and Sexual Situations; BSI: Brief Symptom Inventory; SCL-90-R: Symptom Checklist-90-Revised; IIP: Inventory of Interpersonal Problems; MSQ: Multidimensional Sexuality Questionnaire; WHOQoL-BREF: World Health Organization Quality of Life BREF; CTLM: Cohen test for Life Management; PHQ-15: Patient Health Questionnaire-15 items; BSI: Brief Symptom Inventory; PBI: Parental Bonding Instrument; SF-12: Short Form 12 Health Survey; BDI: Beck Depression Index.
FU: follow-up; mths: months; wks: weeks; NR: not reported; S: Surgery; D: dilation and/or intercourse. =: no significant difference between study population and control group scores; ↓↓: significantly lower than standard/control population scores; ↑↑: significantly higher than standard/control population scores.

study, did not observe such differences. Regarding global self-esteem, no significant difference between the scores of MRKH women and controls was found in two previous studies (Fliegner *et al*., 2014; Leithner *et al*., 2015), as in the present study. So far, only one other study (Liao *et al*., 2011) reported on factors associated with sexual functioning and found a positive correlation between the FSFI orgasm and lubrication domains and sexual satisfaction scores, as assessed with the MSQ. In the Liao *et al.* (2011) study, no association was observed between sexual functioning and sexual esteem. Instead, we found that sexual esteem was an important predictor of sexual dysfunction.

Overall, after comparison of our study results with findings of other reports in the literature, it can be concluded that our results concur with those of others and that discrepancies can most likely be explained by methodological differences. That our results point to sexual esteem as an important factor in sexual functioning adds new knowledge to the existing literature. Furthermore, the comparison with the reports in the literature makes clear that a biopsychosocial and, therefore, multidimensional view on sexual functioning (McCabe *et al*., 2010; Brotto *et al*., 2016) is not yet fully reflected in the assessment of women with MRKH syndrome, although in the last decade, the use of standardized outcome measures has increased considerably and is considered a great step forward (Bean *et al*., 2009).

Important strengths of our study are the fact that we could include a substantial number of women with MRKH syndrome, despite the rarity of the condition, and that we not only focused on sexual functioning, but also addressed sexuality-related distress, sexual esteem, genital self-image, psychological functioning and relationship satisfaction in this patient group. Also, we compared our results with an age-matched control group and used standardized questionnaires. Moreover, we evaluated whether sexual esteem, genital self-image and psychological and relational factors could predict the presence of clinically relevant sexual problems, sexuality-related personal distress and suffering a FSD.

Nonetheless, our results have to be interpreted with caution. First, the findings cannot be generalized to all MRKH women because we cannot exclude a selection bias. Although we sampled from three centers all over the Netherlands and in the peer support group of MRKH women, it is possible that those women with more severe sexual and/or psychological disturbances choose to participate or not to participate in our study. Also, the group of women without the condition who were willing to participate in a study on sexual functioning is a selection of women from the general population, which still may not be truly representative. Furthermore, we did not include single women or those with a homosexual or bisexual orientation. In addition, there is another indication that our study population is a selection of all MRKH women in the Netherlands. We encountered that the differences in results regarding psychological well-being between MRKH women and controls were smaller than we hypothesized. As approximately, 50% of the participants had lived with the knowledge of having MRKH for more than 10 years, it could be that most women in our cohort had adjusted to the diagnosis, knowing that the greatest impact on psychological well-being occurs immediately after the diagnosis. Also, the fact that MRKH women were more commonly in a relationship than control subjects may have reduced differences in psychological well-being between groups because a partnered relationship can be a protective factor against psychological distress. On the other hand, it is important to realize that an absence of psychiatric morbidity in our study population does not preclude that women can be deeply concerned about certain aspects and implications of their condition, such as the inability to carry a pregnancy (Kimberley *et al*., 2011).

Second, although it was impossible to determine the exact response rate, the number of women that were enrolled in our study seems relatively low. Possibly, the subject of our study, namely sexual functioning, discouraged women to participate, and the approach by mail of potential participants may not have been optimal. More individualized recruitment (e.g. via telephone or face to face in the clinic) might have yielded better results.

Third, we did not assess factors that also might influence sexual functioning such as the vaginal depth at the moment of completion of the questionnaire and the use of (hormonal) medication. Whether MRKH women received psychosexual support to guide emotional responses following the diagnosis (Liao *et al*., 2006; Heller-Boersma *et al*., 2009a,b; Callens *et al*., 2014; Roen *et al*., 2018) was not evaluated either.

Fourth, some publications (Callens *et al*., 2014; Roen *et al*., 2018) question the use of the FSFI and FSDS to assess sexual functioning and distress in a cohort of MRKH women because the standardized questionnaires might not be well tailored to assess some specific situations of women with vaginal hypoplasia (e.g. infertility) that might affect the outcomes. However, at this moment, both questionnaires are widely used and allow comparison of data with results obtained in other studies. In our study, we did not only use the FSFI and FSDS, but also we asked the participants to complete standardized questionnaires covering sexual esteem and genital self-image because we hypothesized that these sexuality-related sequelae of women being born with MRKH syndrome could be (partially) covered with these measurements. The use of these questionnaires yielded new information on the important role of sexual esteem on sexual functioning in MRKH women.

Finally, one has to keep in mind that the cross-sectional design of our study does not permit interpretation of causal relationships. The finding that sexual esteem and genital self-image are partially related to sexuality-related distress can also be viewed vice versa or can be explained by an interaction with other factors. Also, despite having studied a relatively large sample of women with MRKH syndrome, analyses by subgroup seemed inappropriate because out of all MRKH women with a neovagina, only a minority has had surgery.

For clinical practice, the main finding of our study indicates that promotion of sexual esteem should be a key element in the consultation with MRKH women on sexuality and sexual functioning. A discussion on sexuality can be started right after the syndrome is diagnosed and on different occasions thereafter during treatment and follow-up, depending on the psychosexual development of the particular woman (Heller-Boersma *et al*., 2009a). The broad range of emotional responses following diagnosis, the threat of the diagnosis and its implications for sexual and reproductive life must be addressed over time. A medical health professional can refer the woman to a psychologist, either on her request or to support the provided medical plan. With respect to the sequelae of MRKH syndrome regarding sexual life, psychosexual education might cover information on the diagnosis, its etiology and characteristics and on the appearance and functioning of the external genitals that are similar to women without the condition. It can be explained that affected women are able to experience sexual arousal and orgasm and that they can achieve sexual intimacy,

relationships and pleasure, for which a neovagina is not a prerequisite (Ismail-Pratt *et al.*, 2007; Callens *et al.*, 2014; Roen *et al.*, 2018; Dear *et al.*, 2019). Also, 'the need' for treatment, frequently influenced by normative pressure, can be questioned (Roen *et al.*, 2018). At the same time, it can be brought up that creation of a neovagina is a non-urgent intervention, with potential advantages and disadvantages (Liao *et al.*, 2006; Bean *et al.*, 2009; Callens *et al.*, 2014; Roen *et al.*, 2018; Dear *et al.*, 2019).

The finding that MRKH women experienced more pain during intercourse compared with controls might raise a bothersome problem regarding clinical management for the health professional as well as the women. Referring to current evidence in sexology practice (Goldstein *et al.*, 2016), the first advice in case of dyspareunia is to abstain from that which hurts, namely intercourse. Second, attention to factors that may increase sexual arousal, lubrication and relaxation of pelvic floor muscles might be helpful, as well as discussion of the position during intercourse and encouragement of communication about the sexual experience itself between partners. When a MRKH woman is creating her neovagina by using dilators or when she has to use dilators after vaginal reconstruction, she may be advised to dilate and to engage in regular intercourse despite experienced pain. In these cases, it is important that the health professional weighs carefully the pros and cons of this management together with the woman and her partner. It is like navigating between the mythical Scylla and Charybdis searching for the best way to a pleasurable sexual life and at the same time to a continuation of the use of the dilator or to have intercourse to gain and retain vaginal capacity. A personalized guidance for each individual woman is essential.

The results of our study showed an important role of sexual esteem in the experiences of sexual distress and dysfunction in a relatively large cohort of MRKH women. Overviewing the literature so far, it seems that studies are conducted from only a medical, psychosexual or psychosocial perspective. In future research, it would be useful to integrate these perspectives more. Findings from qualitative studies can be used in quantitative (controlled) studies. The results of these studies can inspire the different fields. The numerous questions that need further attention vary from questions regarding changes in anatomy and physiology after surgical or non-surgical creation of a neovagina, well-being and sexual functioning of single and homosexual or bisexual MRKH women to the impact on sexual function and sexual esteem of women's infertility (Kimberley *et al.*, 2011) and partner relation (Bean *et al.*, 2009), their motivation for treatment (Roen *et al.*, 2018) and their experiences with surgical and dilator treatment itself (Liao *et al.*, 2006; Roen *et al.*, 2018). Furthermore, studies are needed to evaluate whether a patient-education video tool (Adeyemi-Fowode and Dietrich, 2017) or other e-health initiatives as an adjunct to counseling, psychoeducation in an individual or group program format (Heller-Boersma *et al.*, 2007; Heller-Boersma *et al.*, 2009b) or in guided peer support groups do increase sexual esteem and consequently decrease sexuality-related distress.

In conclusion, our results show that, compared with controls, MRKH women with a neovagina and living in a heterosexual relationship report more deep pain during intercourse experience clinically relevant sexuality-related distress and suffer a sexual dysfunction more often. Also, they report lower sexual esteem and genital self-image, reflecting that this group of MRKH women feels more insecure about themselves as a sexual partner. Specifically, sexual esteem seems to be a significant predictor of sexuality-related distress and sexual dysfunction. Health professionals who care for MRKH women should proactively discuss sexual and psychological sequelae of the diagnosis to help women develop sexual self-confidence.

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Authors' roles

Study organization, study design, data collection and data analysis were performed by P.W. and S.B. Supervision of study design, data analysis and manuscript draft were performed by K.B.K., A.B.D., M.J.K.B. and S.B., K.B.K., A.B.D. and M.J.K.B. helped to collect the patient medical records and invited the patients for study participation. All authors have read the manuscript before submission.

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Conflict of interest

None declared.

References

ACOG. Müllerian Agenesis: diagnosis, management, and treatment. ACOG Committee Opinion No. 728. American College of Obestetricians and Gynecologists. *Obstet Gynecol* 2018;**13**:e35–e42.

Adeyemi-Fowode OA, Dietrich JE. Assessing the experience of vaginal dilator use and potential barriers to ongoing use among a focus group of women with Mayer-Rokitansky-Küster-Hauser syndrome. *Pediatr Adolesc Gynecol* 2017;**30**:491–494.

Allen LM, Lucco KL, Brown CM, Spitzer RF, Kives S. Psychosexual and functional outcomes after creation of a neovagina with laparoscopic Davydov in patients with vaginal agenesis. *Fertil Steril* 2010;**94**:2272–2276.

Arrindell WA, Boelens W, Lamber H. On the psychometric properties of the Maudsley marital questionnaire (MMQ): evaluation of self-ratings in distressed and 'normal' volunteer couples based on the Dutch version. *Personal Individ Differ* 1983;**4**:293–306.

Arrindell WA, Ettema JHM. *SCL-90. Handleiding bij een multidimensionele psychopathologie indicator. [manual for multi-dimensional psychopathology indicator]*. Lisse: Swets & Zeitlinger BV, 2003

Baldwin JF. The formation of an artificial vagina by intestinal transplantation. *Ann Surg* 1904;**40**:398.

Bean EJ, Mazur T, Robinson AD. Mayer-Rokitansky-Küster-Hauser syndrome: sexuality, psychological effects, and quality of life. *J Pediatr Adolesc Gynecol* 2009;**22**:339–346.

Both S, Kluivers K, ten Kate-Booij M, Weijenborg PTM. Vaginal blood flow and subjective sexual arousal response in women with the Mayer-Rokitansky-Küster-Hauser (MRKH) syndrome with a non-surgically created neovagina. *Am J Obstet Gynecol* 2018;**219**: 283.e1–283.e8.

Brauer M, ter Kuile MM, Janssen SA, Laan E. The effect of pain-related fear on sexual arousal in women with superficial dyspareunia. *Eur J Pain* 2007;**11**:788–798.

Brotto L, Atallah S, Johnson-Agbakwu C, Rosenbaum T, Abdo C, Byers ES, Graham C, Nobre P, Wylie K. Psychological and interpersonal dimensions of sexual function and dysfunction. *J Sex Med* 2016;**13**:538–571.

Callens N, De Cuypere G, Wolffenbuttel KP, Beerendonk CCM, van der Zwan YG, van den Berg M, Monstrey S, van Kuyk M, De Sutter P, Belgian-Dutch Group on DSD *et al.* Long-term psychosexual and anatomical outcome after vaginal dilation or vaginoplasty: a comparative study. *J Sex Med* 2012;**9**:1842–1853.

Callens N, De Cuypere G, De Sutter P, Monstrey S, Weyers S, Hoebeke P, Cools M. An update on surgical and non-surgical treatments for vaginal hypoplasia. *Hum Reprod Update* 2014;**20**:775–801.

Carrard C, Chevret-Measson M, Lunei A, Raudrant D. Sexuality after sigmoid vaginoplasty in patients with Mayer-Rokitansky-Küster-Hauser syndrome. *Fertil Steril* 2012;**97**:691–696.

Çetin C, Soysal C, Ürünsak IF, Api M, Çetin T. Long-term outcomes of laparoscopic Bean vaginoplasty (modified Vecchietti procedure) for Mayer-Rokitansky-Küster-Hauser syndrome. *J Laparoendosc Adv Surg* 2016;**26**:591–595.

Cheikhelard A, Bidet M, Baptiste A, Viaud M, Fagot C, Khen-Dunlop N, Louis-Sylvestre C, Sarnacki S, Touraine P, French MRKH Study-Group *et al.* Surgery is not superior to dilation for the management of vaginal agenesis in MRKH syndrome: a multicenter comparative observational study in 131 patients. *Am J Obstet Gynecol* 2018;**219**:281.e1–281.e9.

Cohen J. *Statistical power analysis for the behavioral sciences*, 2nd edn. New York: Academic Press, 1988

Communal PH, Chevret-Measson M, Golfier F, Raudrant D. Sexuality after sigmoid colpopoiesis in patients with Mayer-Rokitansky-Küster-Hauser syndrome. *Fertil Steril* 2003;**80**:600–606.

Crowe MJ. Conjoint marital therapy: a controlled outcome study. *Psyhol Med* 1978;**8**:673–676.

Csermely T, Halvax L, Sárkány A, Jeges S, Vizer M, Bózsa S, Farkas B, Bódis J. Sexual function after modified laparoscopic Vecchietti's vaginoplasty. *J Pediatr Adolesc Gynecol* 2011;**24**:147–152.

Davydov SN, Zhvitiashvili OD. Formation of vagina (colpopoiesis) from peritoneum of Douglas pouch. *Acta Chir Plast* 1974;**16**: 35–41.

Dear J, Creighton SM, Conway GS, Williams L, Liao LM. Sexual experience before treatment for vaginal agenesis: a retrospective review of 137 women. *J Pediatr Adolesc Gynecol* 2019;**32**:300–304.

DeMaria AL, Hollub AV, Herbenick D. The female genital self-image scale (FGSIS): validation among a sample of female college students. *J Sex Med* 2012;**9**:708–718.

Derogatis LR, Cleary PA. Confirmation of dimensional structure of the SCL-90: a study in construct validity. *J Clin Psych* 1977;**33**: 981–989.

Derogatis LR, Rosen R, Leiblum S, Burnett A, Heiman J. The female sexual distress scale (FSDS): initial validation of a standardized scale for assessment of sexually related personal distress in women. *J Sex Marital Ther* 2002;**28**:317–330.

Diagnostic and Statistical Manual of Mental Disorders. *Fourth Edition, Text Revision (DSM-IV-TR)*. Washington, DC: American Psychiatric Association, 2000

Fedele L, Bianchi S, Frontino G, Fontana E, Restelli E, Bruni V. The laparoscopic Vecchietti's modified technique in Rokitansky syndrome: anatomic, functional, and sexual long-term results. *Am J Obstet Gynecol* 2008;**198**:377.e1-6.

Fedele L, Frontino G, Restelli E, Ciappina N, Motta F, Bianchi S. Creation of a neovagina by Davydov's laparoscopic modified technique in patients with Rokitansky syndrome. *Am J Obstet Gynecol* 2010;**202**:33.e1-6.

Fliegner M, Krupp K, Brunner F, Rall K, Brucker SY, Briken P, Richter-Appelt H. Sexual life and sexual wellness in individuals with complete androgen insensitivity syndrome (CAIS) and Mayer-Rokitansky-Küster-Hauser syndrome (MRKHS). *J Sex Med* 2014;**11**:729–742.

Fotopoulou C, Sehouli J, Gehrmann N, Schoenborn I, Lichtenegger W. Functional and anatomic results of amnion vaginoplasty in young women with Mayer-Rokitansky-Küster-Hauser syndrome. *Fertil Steril* 2010;**94**:317–323.

Franck E, De Raedt R, Barbez C, Rosseel Y. Psychometric properties of the Dutch Rosenberg self-esteem scale. *Psychologica Belgica* 2008;**48**:25–35.

Frank RT. The formation of an artificial vagina without operation. *Am J Obstet Gynecol* 1938;**135**:1053–1055.

Giannesi A, Marchiole P, Benchaib M, Chevret-Measson M, Mathevet P, Dargent D. Sexuality after laparoscopic Davydov in patients affected by congenital complete vaginal agenesis associated with uterine agenesis or hypoplasia. *Hum Reprod* 2005;**20**:2954–2957.

Goldstein AT, Pukall CF, Brown C, Bergeron S, Stein A, Kellogg-Spadt S. Vulvodynia: assessment and treatment. *J Sex Med* 2016;**13**:572–590.

Griffin JE, Edwards C, Madden JD, Harrod MJ. Congenital absence of the vagina: the Mayer-Rokitansky-Küster-Hauser syndrome. *Ann Intern Med* 1976;**85**:224–236.

Heller-Boersma JG, Schmidt UH, Edmonds DK. A randomized controlled trial of a cognitive-behavioural group intervention versus waiting-list control for women with uterovaginal agenesis (Mayer-Rokitansky-Küster-Hauser syndrome: MRKH). *Hum Reprod* 2007;**22**:2296–2301.

Heller-Boersma JG, Schmidt UH, Edmond DK. Psychological distress in women with uterovaginal agenesis (Mayer-Rokitansky-Küster-Hauser syndrome, MRKH). *Psychosomatics* 2009a;**50**:277–281.

Heller-Boersma JG, Edmonds DK, Schmidt UH. A cognitive behavioural model and therapy for utero-vaginal agenesis (Mayer-Rokitansky-Küster-Hauser syndrome: MRKH). *Behav Cogn Psychother* 2009b;**37**:449–467.

Herbenick D, Reece M. Development and validation of the female genital appearance scale. *J Sex Med* 2010;**7**:1822–1830.

Herlin M, Bjørn AM, Rasmussen M, Trolle B, Petersen MB. Prevalence and patient characteristics of Mayer-Rokitansky-Küster-

Hauser syndrome: a nationwide registry-based study. *Hum Reprod* 2016;**31**:2384–2390.

Ismail-Pratt IS, Bikoo M, Liao LM, Conway GS, Creighton SM. Normalization of the vagina by dilator treatment alone in complete androgen insensitivity syndrome and Mayer-Rokitansky-Küster-Hauser syndrome. *Hum Reprod* 2007;**22**: 2020–2024.

Kimberley N, Hutson JM, Southwell BR, Grover SR. Well-being and sexual function outcomes in women with vaginal agenesis. *Fertil Steril* 2011;**95**:238–241.

Kooiman CG, Ouwehand AW, ter Kuile MM. The sexual and physical abuse questionnaire (SPAQ). A screening instrument for adults to assess past and current experiences of abuse. *Child Abuse Negl* 2002;**26**:939–953.

Leithner K, Naderer A, Hartung D, Abrahamowicz C, Alexopoulos J, Walch K, Hilger E. Sexual and psychosocial functioning in women with MRKHS after neovaginoplasty according to Wharton-Sheares-George: a case control study. *PLoS One* 2015;**10**: e0124604.

Liao L-M, Doyle J, Crouch NS, Creighton SM. Dilation as treatment for vaginal agenesis and hypoplasia: a pilot exploration of benefits and barriers as perceived by patients. *J Obstet Gynaecol* 2006;**26**:144–148.

Liao L, Conway GS, Ismail-Pratt I, Bikoo M, Creighton SM. Emotional and sexual wellness and quality of life in women with Rokitansky syndrome. *Am J Obstet Gynecol* 2011;**205**:117.e1-6.

Liu X, Liu M, Hua K, Li B, Guo SW. Sexuality after laparoscopic peritoneal vaginoplasty in women with Mayer-Rokitansky-Küster-Hauser syndrome. *J Minim Invasive Gynecol* 2009;**16**:720–729.

McCabe M, Althof SE, Assalian P, Chevret-Measson M, Leiblum SR, Simonelli C, Wylie K. Psychological and interpersonal dimensions of sexual function and dysfunction. *J Sex Med* 2010;**7**:327–336.

McIndoe AH, Bannister JB. An operation for the cure of congenital absence of the vagina. *J Obstet Gynaecol Br Emp* 1938;**45**:490–494.

Nadarajah S, Quek J, Rose GL, Edmonds DK. Sexual function in women treated with dilators for vaginal agenesis. *J Pediatr Adolesc Gynecol* 2005;**18**:39–42.

Nisolle M, Donnez J. Vaginoplasty using amniotic membranes in cases of vaginal agenesis or after vaginectomy. *J Gynecol Surg* 1992;**8**: 25–30.

Pastor Z, Froněk J, Nováčková M, Chmel R. Sexual life of women with Mayer-Rokitansky-Küster-Hauser syndrome after laparoscopic Vecchietti Vaginoplasty. *Sex Med* 2017;**5**:e106–e113.

Pfaus JG, Quintana GR, Mac Cionnaith C, Parada M. The whole versus the sum of some of the parts: toward resolving the apparent controversy of clitoral versus vaginal orgasms. *Socioaffect Neurosci Psychol* 2016;**6**:32578. doi: 10.3402/snp.v6.32578.

Roen K, Creighton SM, Hegarty P, Liao LM. Vaginal construction and treatment Providers' experiences: a qualitative analysis. *J Pediatr Adolesc Gynecol* 2018;**31**:247–251.

Rosen R, Brown C, Heiman J, Leiblum S, Meston C, Shabsigh R, Ferguson D, D'Agostino R. The female sexual function index (FSFI): a multidimensional self-report instrument for the assessment of female sexual function. *J Sex Marital Ther* 2000;**26**:191–208.

Rosenberg M. The measurement of self-esteem. In: Rosenberg M (ed). *Society and the adolescent self-image*. Princeton: Princeton University Press, 1965,16–36.

Simpson JL. Genetics of the female reproductive ducts. *Am J Med Genet* 1999;**89**:224–239.

Snell WE Jr, Papini DR. The sexuality scale: an instrument to measure sexual-esteem, sexual-depression and sexual-preoccupation. *J Sex Res* 1989;**26**:256–263.

Spinhoven P, Ormel J, Sloekers PP, Kempen GI, Speckens AE, Van Hemert AM. A validation study of the hospital anxiety and depression scale (HADS) in different groups of Dutch subjects. *Psychol Med* 1997;**27**:363–370.

Ter Kuile MM, Brauer M, Laan E. The female sexual function index (FSFI) and the female sexual distress scale (FSDS): psychometric properties within a Dutch population. *J Sex Marital Ther* 2006;**32**:289–304.

Veronikis DK, McClure GB, Nichols DH. The Vecchietti operation for constructing a neovagina: indications, instrumentation, and techniques. *Obstet Gynecol* 1997;**90**:301–304.

Walch K, Kowarik E, Leithner K, Schätz T, Dörfler D, Wenzl R. Functional and anatomic results after creation of a neovagina according to Wharton-Sheares-George in patients with Mayer-Rokitansky-Küster-Hauser syndrome-long-term follow-up. *Fertil Steril* 2011;**96**:492–497.

Weijenborg PTM, ter Kuile MM. The effect of a group programme on women with the Mayer-Rokitansky-Küster-Hauser syndrome. *BJOG* 2000;**107**:365–368.

Wiegel M, Meston C, Rosen R. The female sexual function index (FSFI): cross-validation and development of clinical cut-off scores. *J Sex Marital Ther* 2005;**31**:1–20.

Williams E. Congenital absence of the vagina: a simple operation for its relief. *Br J Obstet Gynecol Br Commonw* 1964;**71**:511–512.

Wu J, Guo R, Chu D, Wang X, Li L, Bian A, Zhao Q, Shi H. Comparison of two techniques of laparoscopy-assisted peritoneal Vaginoplasty. *Minim Invasive Gynecol* 2016;**23**:346–351.

Zhao XW, Ma JY, Wang YX, Zhang H, Zhang J, Kang S. Laparoscopic vaginoplasty using a single peritoneal flap: 10 years of experience in the creation of a neovagina in patients with Mayer-Rokitansky-Küster-Hauser syndrome. *Fertil Steril* 2015;**104**:241–247.

Zhu L, Zhou H, Sun Z, Lou W, Lang J. Anatomic and sexual outcomes after vaginoplasty using tissue-engineered biomaterial graft in patients with Mayer-Rokitansky-Küster-Hauser syndrome: a new minimally invasive and effective surgery. *J Sex Med* 2013;**10**:1652–1658.

Zigmond AS, Snaith RP. The hospital anxiety and depression scale. *Acta Psychiatr Scand* 1983;**67**:361–370.