ABSTRACT

Introduction: Adequate anatomic and physiologic functions of the genitalia are fundamental prerequisites for sexual well-being and reproduction. Mayer-Rokitansky-Küster-Hauser syndrome (MRKHS) compromises female sexual life and makes reproduction impossible.

Aim: To assess the psychosexual effect of vaginal reconstruction using the laparoscopic Vecchietti technique in patients with MRKHS.

Methods: Forty-two patients with MRKHS who underwent laparoscopic Vecchietti vaginoplasty were included. Their partners also were interviewed. A control group of 45 age-matched, childless, sexually active women were examined during the same period.

Main Outcome Measures: A gynecologic examination was performed to determine the anatomic outcome. Psychosexual function was evaluated with the Female Sexual Distress Scale—Revised (FSDS-R), the Female Sexual Function Index (FSFI), and a semistructured interview. Genital self-image was evaluated using the Female Genital Self-Image Scale (FGSIS).

Results: Average neovagina length (7.0 ± 9.6 cm) in the MRKHS group was significantly shorter than the vaginal length in the control group (9.3 ± 2.5 cm). Women with a neovagina reported satisfactory sexual function (FSFI score = 29 ± 2.7) that was not significantly different from the control group (P < .05); however, they also had significantly higher levels of distress (FSDS-R score = 14.5 ± 6.5) and were not satisfied with their genitals (FGSIS score = 22.0 ± 2.4) compared with the control group.

Conclusion: Sexual function in women with MRKHS can be restored successfully by vaginoplasty; however, they have higher rates of distress and are less satisfied with their genitals.

Key Words: Mayer-Rokitansky-Küster-Hauser Syndrome; Vecchietti Vaginoplasty; Neovagina; Female Sexual Dysfunction
Vaginal agenesis can be treated by non-surgical dilatation methods or surgically. Surgical approaches to vaginal agenesis fall into three categories: Williams vulvovaginoplasty with suturing of the labia majora into a perineal pouch; Vecchietti vaginoplasty, in which the vagina increases in size by gradually applying traction to the vaginal vault; and methods involving the creation of a neovagina within the rectovesical space lined with various types of tissue, such as skin (McIndoe technique), peritoneum (Davydov procedure), intestine, or—in perhaps in the future—tissue engineering of the vaginal mucosa. Dilatation methods have fewer complications, but patients’ long-term cooperation is required. Some methods have definite advantages over others: the ideal neovagina maintains its original anatomic placement and is covered with original mucosa. The Vecchietti neovagina, which is covered by non-keratinized squamous epithelium, is the only option that meets the two criteria. Laparoscopic Vecchietti vaginoplasty is used at our gynecologic department. The technique, which enables the creation of a neovagina with good anatomic and functional results, is a simple and effective procedure. The principle of the Vecchietti technique is to create a neovagina by gradual stretching of the patient’s own vaginal skin. An olive-shaped device is placed on the vaginal dimple and drawn up gradually by threads that run through the olive from the perineum into the pelvis and out through the abdomen, where they are attached to a traction device. To create a neovagina, the tension is increased on the traction device to pull the thread and stretch the vagina by approximately 1 to 1.5 cm/d until the vagina reaches approximately 7 to 8 cm in depth. Previous studies have mainly evaluated the subjective feelings of respondents using standardized questionnaires or assessed the psychosocial impact of creating a neovagina. Several studies have assessed the influence of lifelong infertility and physical integrity. Female sexuality is not determined just by the possibility of copulation. It is formed by emotional, relationship, and other social aspects. Furthermore, satisfaction with one’s own body and perception can have substantial significance to female sexuality. The purpose of this study was to investigate the sexual well-being, satisfaction with genitals, and level of distress in women who have an anatomically functional neovagina but no possibility for natural motherhood. We wanted to determine whether these characteristics would be different from those of the general population and the views of sexual partners of women with a neovagina.

**METHODS**

**Selection of Patients After Laparoscopic Vecchietti Vaginoplasty**

From 2004 through 2013, 95 women with MRKHS underwent surgery at our gynecologic department using laparoscopic Vecchietti vaginoplasty. Of 95 letters sent out inviting them for a check-up, 9 were returned because of a change of address. Fifty-five women 17 to 38 years old responded to our invitation, and 42 arrived for examination.

All women had a heterosexual orientation and were not taking any long-term medication. Each woman was instructed about the essential regular use of a dilator, application of a lubricant, and appropriate sexual positions before and after the operation. The patients were informed about their reproductive options (adoption, surrogate motherhood, and UTx with subsequent in vitro fertilization) and asked whether they were interested in any of these methods. The investigation was performed during 2015. It was approved by the ethical committee, and all patients provided written informed consent. All interviews and investigations were performed by one gynecologist with a background in sexology and psychology. Semistructured interviews were conducted with all participants to identify anamnestic information and assess sexual partnerships. In addition, a structured interview with the patient’s current partner was included in the research. He was asked whether he was aware that his partner had undergone the neovagina surgery, how satisfied he had been with his sexual life, and whether infertility might be a reason to leave the relationship.

**Selection of Control Group and Exclusion Criteria**

The control group consisted of 45 age-matched (18–38 years old), sexually active, childless patients who received our contraceptive advisory services. These women used the intrauterine delivery system containing levonorgestrel 13.5 mg (Jaydess; Bayer PLC, Newbury, United Kingdom) and had a sexual partner. All had a heterosexual orientation and did not take any long-term medication. Exclusion criteria were age younger than 18 or older than 40 years, current or previous pregnancy, no sexual partner, history of gynecologic operations, or current severe gynecologic illness. Control subjects underwent the same tests and completed the same questionnaires. They signed the informed consent, and their examination was performed during the same period and by the same expert as women with a neovagina.

**Sexual Partners of Women With a Neovagina**

When evaluating the sexual life of women with a neovagina, only the partners from a current relationship lasting longer than 1 year were included. Information about their age, total number of sexual relationships, severe illness history, and sexual problems was collected. They were asked when they had found out about the partner’s neovagina and whether they would leave the relationship based on infertility.

**Gynecologic Examination and Anatomic Outcome of Vaginal Reconstruction**

The gynecologic examination consisted of assessing basic somatic characteristics (body mass index, hair, and breasts) with primary focus on the genitals; assessment of external genitalia (labia majora and minora, clitoris, vaginal introitus, urinary meatus, and perineum length); and speculum examination (vagina length and spaciousness, tissue estrogenization, vaginal discharge,
strictures, and pelvic floor tone). Vaginal length in women with a neovagina was measured as the distance from the posterior fourchette to the most proximal part of the blind-ending vagina by using a sketched scale on the investigator’s index finger.\(^26,27\)

The length of the vagina in women in the control group was measured from the introitus (approximately at the level of the hymeneal ring) to the posterior vaginal fornix. Vaginal spaciousness was estimated based on the number of inserted fingers. Vaginal discharge was assessed according to vaginal pH (normal range = 3.5–4.7), potassium hydroxide test, microscopic examination, and patients’ subjective feelings. If interested, these women could be included in a UTx program. Therefore, they were examined by ultrasound with a focus on the size and structure of the ovaries and assessment of follicular activity. A basic hormonal evaluation was performed, including estradiol, follicle-stimulating hormone, and luteinizing hormone (immunochemical analysis) on days 3 to 5 and progesterone (direct chemiluminescence) on day 23 of the menstrual cycle to confirm a biphasic ovarian cycle. All women after vaginoplasty were genetically examined by karyotyping.

**Questionnaires Assessing Sexual Life, Distress, and Satisfaction With Own Genitals**

A non-validated, specially structured questionnaire about the general characteristics of their sexual life (first postoperative intercourse, vaginal intercourse frequency, current sexual partner, length of current sexual relationship, total number of sexual partners, masturbation frequency, orgasm experience and satisfaction, and satisfaction with current sexual life) was completed by all participants. To perform a statistical analysis, standardized valid questionnaires (Female Sexual Distress Scale—Revised [FSDS-R], Female Sexual Function Index [FSFI], and Female Genital Self-Image Scale [FGSIS]) were used to evaluate the mutual associations of sexual function, sexual distress, self-image body perception, and partner compatibility.\(^28,29\) The previously reported cutoff score of 26.55 was used for the FSFI total score,\(^30\) with lower values indicating possible sexual dysfunction. The cutoff score used for the 13-item FSDS-R was 11.\(^28,29\) The seven-item FGSIS used to assess participants’ feelings about their genitals can have a total score of 7 to 28, with higher scores indicating a more positive genital image.

**Statistical Assessment**

The comparison of the two groups of 45 women was initially planned, but three women with a neovagina did not come for the examination. Eventually, there were two statistically comparable groups of 42 and 45 women to investigate. Statistical analysis was performed using SPSS 11.0 (SPSS Inc, Chicago, IL, USA). \(P\) values less than .05 were considered significant. All statistical tests were two-tailed. Variables that were not normally distributed \((P < .05\) by Shapiro-Wilk test) were analyzed with the Wilcoxon-Mann-Whitney rank-sum test.

**RESULTS**

**Women With Neovagina and Their Characteristics**

The mean age of the 42 patients with MRKHS was 25.8 ± 4.3 years \((\text{range } = 17–38)\). The average time since neovagina creation with laparoscopic Vecchietti vaginoplasty was 4.6 ± 2.2 years \((1–10)\), and first intercourse occurred on average 4.3 ± 1.4 months \((3–11)\) postoperatively. We did not observe evidence of postoperative complications, vaginal stricture, scarring, or other anatomic irregularities. No participants complained of vaginal discharge or discomfort, dryness, or infections. All women had normal secondary sexual characteristics, 46,XX karyotype, and biphasic ovarian cycle according to hormonal and ultrasound examinations.

MRKHS was associated with abnormalities of the kidneys in six patients (14%), the skeletal system in one (2%), and the heart and auditory systems in one (2%). One patient had mild Charge syndrome (2%) and did not have a sexual partner. Forty-one sexually active participants (98%) were in a stable relationship lasting an average of 4.6 ± 1.9 years \((2–10)\). Forty-one women (95.2%) with a neovagina considered their sexual life to be satisfactory, and this finding was consistent with their level of sexual satisfaction according to the validated FSFI questionnaire. Thirty-five patients (83.3%) were interested in adoption, 15 (35.7%) were interested in surrogacy, and 38 (90.6%) would consider UTx. One woman, during the course of the study, opted for surrogate motherhood, and another adopted a child.

**Characteristics of Control Group**

The control group consisted of 45 sexually active women with long-term partners and a mean age of 26.3 ± 4.1 years \((18–38)\). All 45 sexually active women of the control group (100%) were in a stable relationship lasting an average of 3.6 ± 2.5 years \((1–9)\), and they had in average of 5.1 ± 3.0 sexual partners \((2–16)\). Forty-two women (93.3%) were satisfied with their sexual life according to the validated FSFI questionnaire.

**Comparison of Sexual Life in Patients With a Neovagina and Control Subjects**

The mean neovaginal length \((7.0 ± 9.6 \text{ cm, range } = 5.5–9.0)\) was significantly shorter than the mean vaginal length of the control group \((9.3 ± 2.5 \text{ cm, range } = 9.0–11.5)\), which also demonstrated a significantly longer mean total length of sexual activity \((5.4 ± 1.6 \text{ years})\) compared with the women with a neovagina \((4.4 ± 1.5 \text{ years})\). Length of current long-term sexual partnership also was significantly longer \((4.6 ± 1.9 \text{ years})\) in the group of operated women compared with the control group \((3.6 ± 2.5 \text{ years})\). The frequency of vaginal intercourse in the two groups was not significantly different. Women with a neovagina most frequently reported having intercourse one to two times per week \((n = 24; 57\%)\), followed by two to three times a week \((n = 10; 24\%)\), occasionally \((n = 6; 14\%)\), daily \((n = 1; 2\%)\), and never \((n = 1; 2\%)\). Women in the two groups masturbated...
with a similar frequency of approximately 2.5 times a month. According to our questionnaire, the operated respondents reached orgasm non-significantly more often (83%) than the control group (80%). However, a more detailed analysis showed that women with a neovagina reached vaginal orgasm significantly less frequently (20%), whereas clitoral orgasm was reached significantly more frequently (80%). In the control group, 44% of women had vaginal orgasm and 55% reached clitoral orgasm. Respondents in the two groups reported satisfaction with their sex life (93%–95%) and showed the same desire for motherhood (95%–98%; Table 1).

Results of Validated Questionnaires (FSFI, FGSIS, FSDS-R)
Sexual function as indicated by FSFI total score was similar between groups, which did not significantly differ statistically (29.9 ± 2.7 vs 30.0 ± 2.1). However, the groups differed in four (desire, lubrication, orgasm, and comfort) of the six FSFI domains, with women with a neovagina reporting significantly more frequent orgasms and higher sexual desire but less lubrication and more discomfort (pain) during intercourse. FGSIS assessment of genital perception showed a significantly lower score in women with a neovagina (22.0 ± 2.4 vs 23.5 ± 2.3). The FSDS-R score was significantly higher in operated women compared with the control group (14.5 ± 6.5 vs 6.5 ± 4.6; Table 2).

Attitude of Partners of Women With Neovagina
The mean age of the partners of women with a neovagina was 30.1 ± 4.4 years. At that time, the women had an average of 9.0 ± 5.5 partners. They did not have any severe illness or did not complain of sexual function disorders at the time of or before the study. Men in most cases (n = 40; 97%) did not recognize that their partner had an artificial vagina and at first were not aware of their condition. In one case (2%), the partner was uncertain as to whether the woman underwent vaginal surgery. Women with a neovagina disclosed their condition only to the partners they considered to be possible life partners. Short-term or casual sexual partners were not informed about their medical status. The partners of women with a neovagina stated in 34 cases (83%) that lifelong childlessness would not be a reason to end the relationship, 2 (5%) would leave their partner, and 5 (12%) were not certain how they would act in such a situation.

DISCUSSION
The main finding of our research is that women with MRKHS after laparoscopic Vecchietti vaginoplasty have an adequately spacious and functional neovagina to participate in coitus, with no problem. They have a relatively satisfactory sexual life (their FSFI score was not significantly different from the control group), but they have more distress and lower satisfaction with their genitals.

Effect of Vaginal Length and Spaciousness on a Satisfactory Sexual Life
Neovagina creation is essential for women with MRKHS to ensure the possibility of intercourse. Female sexuality can involve various sexual practices, but vaginal coitus is the most frequently

Table 1. General characteristics of sexual life in patients with a neovagina and in control subjects

|                           | Patients with neovagina (n = 42) | Control group (n = 45) | P value |
|---------------------------|----------------------------------|------------------------|---------|
| Age (y)                   | 25.8 ± 4.3 (17–38)               | 26.3 ± 4.1 (18–38)     | .572    |
| Vaginal length (cm)       | 7.0 ± 9.6 (5.9–9.0)              | 9.3 ± 2.5 (9.0–11.5)   | .001†   |
| Total length of sexual life (y) | 4.4 ± 1.5 (1–10)               | 5.4 ± 1.6 (2–10)       | .020†   |
| Frequency of vaginal intercourse |                                |                        |         |
| No intercourse            | 1 (2.4)                          | 0 (0)                  | .301    |
| Occasionally              | 6 (14.3)                         | 4 (8.9)                | .433    |
| 1–2 per week              | 24 (57.1)                        | 28 (62.2)              | .631    |
| 2–3 per week              | 10 (23.8)                        | 11 (24.4)              | .945    |
| Daily                     | 1 (2.4)                          | 2 (4.4)                | .060    |
| Current sexual partner    | 41 (97.6)                        | 45 (100)               | .343    |
| Length of current sexual partnership (y) | 4.6 ± 1.9 (2–10)               | 3.6 ± 2.5 (1–9)        | .014†   |
| Total number of sexual partners | 3.0 ± 2.9 (1–20)               | 5.1 ± 3.0 (2–16)       | .001†   |
| Masturbation frequency (monthly) | 2.7 ± 2.0                      | 2.5 ± 1.6              | .900    |
| Orgasm—total              | 35 (83.3)                        | 36 (80)                | .690    |
| Vaginal orgasm (from all women reporting orgasms) | 7 (20)                       | 16 (44.4)              | .047†   |
| Clitoral orgasm (from all women reporting orgasms) | 28 (80)                       | 20 (55.5)              | .038†   |
| Importance of sexuality   | 41 (97.6)                        | 45 (100)               | .301    |
| Satisfaction with sexual life | 40 (95.2)                      | 42 (93.3)              | .705    |
| Desire for motherhood     | 40 (95.2)                        | 44 (97.7)              | .276    |
| Vaginal discharge discomfort | 3 (7.1)                       | 5 (11.1)               | .525    |

*Data are presented as mean ± SD (range) or number (percentage).
†Significant difference from control group (P < .05).
performed sexual activity of couples. Quality of sexual life is not determined only by the length or spaciousness of the vagina. Female sexuality is determined by a broad complex of somatic, emotional, mental, partner, and social aspects. Satisfaction with one’s own body and reproductive ability also are very important. Previous studies have evaluated sexual satisfaction based mainly on neovagina length, and they have focused less on other psychosocial aspects that are important for sexual life.

Although the longest neovaginas are created by bowel vaginoplasty, these patients have the largest number of sexual problems and more frequent vaginal discharge. It is impossible to precisely define an adequate vagina length for satisfactory sex. According to Masters and Johnson, the nulliparous vagina from the introitus to the posterior vaginal fornix measures 7 to 8 cm in an unstimulated state and has a width of 2 cm. Pendergrass et al measured vaginal depth in 39 women, of whom only one third were nulliparous, and found that vaginal length ranged from 6.86 to 14.81 cm and width ranged from 4.8 to 6.3 cm. In addition, the vagina can be elongated by 3 to 4 cm during sexual arousal. In some cases, sexual discomfort and dyspareunia can be caused by a disproportion between a narrow and/or short vagina and a relatively large penis. However, the patients in our group did not complain of this problem. The effect of treatment depends on the selected technique (dilatation or surgery), the surgeon’s experience, the patient’s motivation and approach to sex, the partner’s attitude, the interval from diagnosis to therapy, postoperative rehabilitation, and primarily psychological support. The management and comparison of various techniques are not the subject of this study, because these have been summarized in other articles. Despite the recommendation for treatment in MRKHS, there is no consensus on the best technique. In our study, average neovaginal length was 7 cm (7 ± 9.6), consistent with the results of other studies. The neovagina length in our study population ranged from 5.5 to 9.0 cm. A shorter vagina was found mainly in patients who failed to comply with postoperative vaginal rehabilitation (dilatation) after the neovagina creation compared with women who followed recommendations. Neglecting postoperative dilatation can result in shortening of an originally longer neovagina. The frequency of vaginal discharge in women after laparoscopic Vecchietti vaginoplasty did not differ from the control group.

### Table 2. FSFI, FSDS-R, and FGSIS scores in patients with a neovagina and in control subjects

| FSFI domain            | Patients with neovagina (n = 42), mean ± SD | Control group (n = 45), mean ± SD | P value |
|------------------------|--------------------------------------------|----------------------------------|---------|
| Desire                 | 4.3 ± 1.0                                  | 3.8 ± 1.0                        | .037*   |
| Arousal                | 4.9 ± 0.8                                  | 5.1 ± 0.8                        | .209    |
| Lubrication            | 5.2 ± 0.6                                  | 5.5 ± 0.6                        | .046*   |
| Orgasm                 | 5.2 ± 0.6                                  | 4.8 ± 0.5                        | .001*   |
| Satisfaction           | 5.2 ± 0.7                                  | 5.4 ± 0.6                        | .219    |
| Comfort                | 5.1 ± 0.8                                  | 5.4 ± 0.7                        | .041*   |
| Total score            | 29.9 ± 2.7                                 | 30.0 ± 2.1                       | .936    |
| FSDS-R                 | 14.5 ± 6.5                                 | 6.5 ± 4.6                        | .001*   |
| FGSIS                  | 22.0 ± 2.4                                 | 23.5 ± 2.3                       | .006*   |

FGSIS = Female Genital Self-Image Scale (score range = 7–28); FSDS-R = Female Sexual Distress Scale—Revised (score range = 0–52); FSFI = Female Sexual Function Index (score range = 0–6 for each of six domains; total score range = 2–36 for combined scores of six domains).

*Significant difference from control group (P < .05).

### Sexual Satisfaction, Vaginal Orgasm, and Dyspareunia

As in most studies, no decrease in FSFI total score was observed in our study. No signs of sexual frustration were reported in women with a neovagina, although some studies have reported this occurrence. Kimberley et al found that the sooner therapy is launched after the MRKHS diagnosis, the better sexual satisfaction becomes. Higher scores in the FSFI domains of desire and orgasm were found in women with a neovagina compared with the control group, supporting the hypothesis that sexual feelings are regulated at a central level and not always influenced by genital disorders. However, studies evaluating the relation of orgasm and brain activity are widely discordant.

In general, greater orgasm capability in women with a neovagina in our research resulted from more frequently achieved clitoral orgasm, whereas women in the control group reached vaginal orgasm significantly more often. Lower rates of achieving vaginal orgasm can be related to topographic and anatomic aspects of the clitoral complex and vaginas in women who have undergone surgery. Their lubrication also was worse, as in other studies. This factor was attributed to the greater coital discomfort and more frequent dyspareunia reported in such patients.

### Distress, Infertility, and Reproduction Options

One of the main factors of higher distress levels in women with newly created functional vaginas and why they are significantly less satisfied with their genitals might be their incapability to have their own biological child. In most cases (95%), these women want to become mothers. Some studies have considered infertility a main cause of distress. Marci et al noted that besides higher distress, infertility can decrease some FSFI subscale scores (arousal, orgasm, satisfaction, and lubrication), which was not found in our study. The FSFI is focused mostly on sexual functions and in our view does not always satisfactorily reflect the total distress of examined women. An important factor of higher distress levels and frustration is vagina agenesia. The uterus is viewed by women as a symbol of femininity. Similar feelings have been reported by some women after hysterectomy, although their sexual functions are preserved. Gestation surrogacy by in vitro fertilization or UTx provides a chance for women with MRKHS to have their own biological child. These methods are associated with ethical, religious, legal, and social barriers and financial costs. The first UTx was successfully
performed at our clinic in April 2016.\textsuperscript{46} UTx has been considered an experimental procedure thus far.\textsuperscript{47}

Response of Sexual Partners to Neovagina Creation

Sexual partners were satisfied in most cases. We were surprised that in most cases the partners did not recognize that women had undergone the surgery. Nondisclosure of information about neovagina creation can indicate problems with trust in a relationship and its future. As such, the women informed only those men they considered potential life partners. The patients with neovagina had significantly fewer partners and longer relationships than controls, suggesting that patients were more committed to their partners. Most men stated that the absolute sterility of their partners was not a factor to leaving the relationship. However, these were relatively young couples with an average relationship history of 4.6 ± 1.9 years, and such views can change after several years of life in a childless partnership. Most likely, women realized this fact, which could be the reason for greater distress.

Weaknesses of the Study

This study has several weaknesses. First, it included a small number of patients owing to the rarity of the condition, and they were recruited solely at a single institution. The small cohort can limit the value of the information. Fewer than half the approached patients responded to our invitation letter, which might be explained by the requirement for self-reporting about their sex life. Second, only the outcome of laparoscopic Vecchietti vaginoplasty was assessed; the results of conservative therapy were omitted. Third, we evaluated only the postoperative results; we did not have any information about patients’ sexual life before the operation because these women could not experience a normal sexual life before the treatment. Fourth, women in the control group used a contraceptive method, which could affect their sexual behavior. However, they had an intrauterine delivery system containing levonorgestrel, which has a minimal effect on sexual desire.

Recommendation for Clinical Practice

This study underscores the need for an interdisciplinary approach in solving gynecologic, psychosocial, and reproductive issues in patients with MRKHS.

A detailed sexual consultation is essential preoperative therapy for women with MRKHS. They should be instructed about various sexual techniques, appropriate positions, postoperative rehabilitation, use of lubricants, and local hormonal therapy to avoid painful coitus. They should have an option for sexual consultation, if needed, and be in contact with an assisted reproduction center. We consider it essential to address all issues with the two partners and provide them with psychological support. They should be aware of the limitations of current reproductive options and new possible treatments.

CONCLUSION

According to our study, sexual life in women with MRKHS after Vecchietti vaginoplasty is not significantly different from the general population. This surgical method enables the creation of a sufficiently spacious and long neovagina, which is essential for achieving adequate sexual satisfaction in most patients. Nevertheless, these patients demonstrate higher distress levels and dissatisfaction with their genitals owing to their infertility and other biological and psychosocial factors. Therefore, the therapy should be targeted at the psychosexual and reproductive aspects of their lives. A prospective longitudinal study is needed in the future to increase the value of this study.

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Conflicts of Interest: The authors report no conflicts of interest.

Funding: This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

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