Creation of a neovagina according to Wharton-Sheares-George in patients with Mayer-Rokitansky-Küster-Hauser syndrome

Theresa Schätz, M.D., Johannes Huber, M.D., and René Wenzl, M.D.
Department of Gynaecology and Obstetrics, University of Vienna Medical School, Vienna, Austria

Objective: To introduce a simple and quick surgical alternative for creating a neovagina in patients with Mayer-Rokitansky-Küster-Hauser (MRKH) syndrome that offers good anatomic and functional results.

Design: Historical report.

Setting: Tertiary center for gynecologic endocrinology.

Patient(s): Three patients with MRKH syndrome.

Intervention(s): The creation of a neovagina according to Wharton-Sheares-George in patients with MRKH syndrome.

Main Outcome Measure(s): Axis, length, and width of neovagina.

Result(s): The George modification of the Wharton-Sheares neovaginoplasty was successfully performed in three patients. The results were excellent (normal axis and adequate length and width of neovagina), and there were no major complications.

Conclusion(s): The George modification of the Sheares technique represents a simple, safe, and effective surgical option for creating a neovagina. The procedure is not highly complex and is therefore easy to learn and perform; no special surgical equipment is needed. Anatomic and functional results are very satisfying. Short-term hospitalization, accelerated recovery, and a rapid return to everyday life are important benefits for these young patients. These benefits also result in lower surgery-related expenses and therefore reduce the strain on the hospital’s budget compared with other therapeutic options. The creation of a neovagina according to Wharton-Sheares-George might provide a satisfactory alternative for the surgical management of vaginal aplasia in patients with MRKH syndrome. (Fertil Steril 2005;83:437–41. ©2005 by American Society for Reproductive Medicine.)

Key Words: MRKH syndrome, vaginal aplasia, müllerian duct anomalies, vaginoplasty, neovagina

Mayer-Rokitansky-Küster-Hauser (MRKH) syndrome is a rare malformation (incidence of 1 in 5,000 live-born girls) characterized by complete or partial agenesis of the vagina and uterus with variable müllerian duct and possible associated renal (40%), skeletal (10%–12%), and auditory abnormalities (4.5%) (1). Individuals with MRKH syndrome have a normal female 46,XX karyotype and regular ovarian hormonal function. Thus, the development of secondary sexual characteristics and adolescent progress is normal. The cause of the syndrome remains unclear; a multifactorial mode of inheritance, including genetic and environmental factors, seems to be the most likely explanation. The MRKH syndrome is the second most common cause of primary amenorrhea.

There are many surgical techniques for creating a neovagina: using olive-shaped plastic forms combined with traction devices (Vecchietti technique), Hegar dilators or specially constructed bicycle seats for dilatation; bowel transplants; labial, thigh, or SC abdominal flaps; and insertion of an inlay split-thickness skin graft, or peritoneal graft. The goal of any method is to create a vaginal canal of adequate diameter and length to accommodate sexual intercourse. However, consensus has not been reached concerning the best therapeutic approach.

The technique presented in this article is based on the method described by Sheares (2), whereby a perineal skin flap is inserted as an isograft into the space tunneled between the rectum and bladder, with the müllerian ducts used for orientation, and on the principle of Wharton, which states that epithelialization of the new tunnel occurs both from the vaginal orifice and from the edges of the isografts (3) if a vaginal mold is left undisturbed for 2–3 weeks.

George modified the Sheares technique by forbearing from inserting the mucosal flap into the posterior surface of the newly created cavity. Thus, the operation becomes simpler, easier, and faster to perform and therefore less susceptible to complications.

MATERIALS AND METHODS

Three patients with MRKH syndrome were treated at our hospital between June 2001 and April 2003. In all three
patients a neovaginoplasty according to the “Wharton-Sheares-George” technique was performed.

Each of the patients exhibited primary amenorrhea and normal secondary sex characteristics. They all underwent a preoperative workup, including genetic evaluation, evaluation of the hormonal status, abdominal/vaginal sonography, rectal examination for identifying the presence of a fibrous remnant in place of the uterus, chest x-ray, and intravenous pyelography, and they were told to apply estriol creme (Ovestin; Organon, Oss, The Netherlands) to the vaginal dimple starting approximately 3 weeks before the operation. The patients were informed about the adopted “new technique” of the operation, and both written and verbal consent were obtained.

With the patient in the lithotomy position under general anesthesia and catheterized bladder, a diagnostic laparoscopy was performed for orientation and confirmation of the abdominal organs. Considering the embryologic development of the vagina, the vestiges of the müllerian ducts were localized in the connective tissue plane between the bladder and rectum. These ducts can be identified in all patients with MRKH syndrome, 2 cm dorsal to the external urethral os-tium and 1 cm paramedially. In patients with a vaginal dimple, they can be identified 1 cm laterodorsal to the dimple (Fig. 1). This vestigial organ represents the orientation guide for forming a neovagina. Starting at the existent vaginal dimple, the rudimentary müllerian ducts were dilated step by step by gently pushing Hegar dilatators (2.5–14) (Figs. 2, 3), in the direction of the pelvic axis. On the basis of the principle of blunt dissection, a double-barreled canal was created. After digital probing of the newly created cavities, the median raphe was intersected with diathermy. This step can be easily performed in every patient. Thus, the double-barreled canal is converted into a single chamber. When examining the neovagina, it will be noted that, with exception of the intersection area of the median raphe, the neovagina is lined by smooth tissue. The dome of the recessus is formed by peritoneum reflected from the superior surface of the bladder to the anterior aspect of the rectum (2). The newly created vaginal cavity is capable of easily accommodating the length of two fingers. Subsequently, a vaginal mold (Adjustable Vaginal Stent; Mentor Corporation, Santa Barbara, CA) (Fig. 4), coated with estriol (Ovestin) was inserted into the newly created cavity and held in position by four sutures (Vicryl 1.0; Johnson & Johnson, New Brunswick, NJ) closing the labia majora.

The patients were given antibiotics for 8 days to prevent secondary infection. The urinary catheter was maintained for

### Table 1

<table>
<thead>
<tr>
<th>Patient</th>
<th>Genetic evaluation</th>
<th>Associated anomalies</th>
<th>Hormonal status</th>
<th>Existent vaginal dimple</th>
<th>Age at operation (y)</th>
<th>Operation time (min)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>46,XX</td>
<td>None</td>
<td>Regular</td>
<td>3 cm</td>
<td>16</td>
<td>20&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>2</td>
<td>46,XX</td>
<td>None</td>
<td>Regular</td>
<td>0 cm</td>
<td>20</td>
<td>60</td>
</tr>
<tr>
<td>3</td>
<td>46,XX</td>
<td>Inguinal hernias</td>
<td>Regular</td>
<td>1 cm</td>
<td>17</td>
<td>55</td>
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</tbody>
</table>

<sup>a</sup>Without diagnostic laparoscopy.


### Table 2

<table>
<thead>
<tr>
<th>Patient</th>
<th>Hospitalization (d)</th>
<th>Duration of postoperative pain</th>
<th>Time until first postoperative sexual intercourse (mo)</th>
<th>Orgasm</th>
<th>Time until complete return to employability (d)</th>
<th>Patient's satisfaction (1–10)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>10</td>
<td>First 10 d</td>
<td>2</td>
<td>Yes</td>
<td>15</td>
<td>9</td>
</tr>
<tr>
<td>2</td>
<td>8</td>
<td>First 7 d</td>
<td>4</td>
<td>Yes</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>3</td>
<td>10</td>
<td>First 10 d</td>
<td>—</td>
<td>—</td>
<td>12</td>
<td>9</td>
</tr>
</tbody>
</table>

the first week to avoid postoperative urine retention. Analgetic medication (diclofenac, lornoxicam, piritramide) was adjusted to individual necessity. On the seventh day, the vaginal mold was removed under general anesthesia, and after gentle irrigation with antiseptic lotion (on the condition that no signs of necrosis were detected) a larger plastic mold was inserted. The patients were advised to wear the vaginal mold day and night for the first 3 postoperative months. After this period, the vaginal mold had to be worn each night until normal sexual intercourse was possible.

The operation yielded functionally satisfactory results in all three patients. The patient characteristics and the results of the operations are shown in Tables 1 and 2. Operation time, including the diagnostic laparoscopy, was approximately 58 minutes; there were no postoperative complications. The removal of the vaginal adjustable stent and repeated insertion under general anesthesia was well tolerated. In two patients, minor old blood secretions were found. The duration of this procedure varied between 15 and 25 minutes. The median follow-up was 12 months (range 2–23). Evaluation of the postoperative results after intervals of 2–6 months revealed a well-formed neovagina in each patient, with a length of 7–10 cm and a two-finger width. Postoperative pain was reported by the patients for the first 7–10 days. Patients were able to return to work after 10–15 postoperative days. The hospitalization periods ranged from 8–10 days.

The patients started experiencing sexual intercourse within 2–4 months after surgery. Their initial complaints were of partially insufficient lubrication and dyspareunia, which resolved by maintaining regular sexual activity and using lubricating gels. At the most recent follow-up (10–30 months after operation), all patients had widely patent neovaginas. No evidence of significant local irritation or abnormalities was seen. All patients reported satisfactory sexual function and claimed to be reaching orgasm during intercourse. Each of the young women expressed general satisfaction with her individual results from the operation (VAS: 9.3/10).

**DISCUSSION**

The diagnosis of MRKH syndrome, characterized by agenesis of the vagina and uterus, has a profound impact on a young woman’s sense of femininity, emotional stability, and self-confidence, thus the creation of a functioning neovagina is imperative in such cases. As with the treatment of various other congenital abnormalities, construction of a neovagina has gone through many changes, with successes as well as failures. Data from the literature regarding the surgical treatment of MRKH syndrome (method used, number of patients, indication, complication rate, and anatomic and functional success rates) are presented in Table 3.

<table>
<thead>
<tr>
<th>Method</th>
<th>Authors (reference)</th>
<th>No. of patients</th>
<th>Indication</th>
<th>Complication rate (%)</th>
<th>Anatomic success rate (%)</th>
<th>Functional success rate (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frank</td>
<td>Rock et al. (14)</td>
<td>21</td>
<td>MRKH</td>
<td>43</td>
<td>43</td>
<td>0</td>
</tr>
<tr>
<td>McIndoe</td>
<td>Cali and Pratt (20)</td>
<td>121</td>
<td>MRKH</td>
<td>5.8</td>
<td>57</td>
<td>90</td>
</tr>
<tr>
<td>Vecchietti laparotomic</td>
<td>Vecchietti (19)</td>
<td>307</td>
<td>MRKH</td>
<td>1.6</td>
<td>—</td>
<td>99</td>
</tr>
<tr>
<td>Vecchietti laparoscopic</td>
<td>Fedele et al. (12)</td>
<td>52</td>
<td>MRKH</td>
<td>0</td>
<td>100</td>
<td>98.1</td>
</tr>
<tr>
<td>Williams</td>
<td>Creatsas (1)</td>
<td>10</td>
<td>MRKH</td>
<td>—</td>
<td>100</td>
<td>94.4</td>
</tr>
<tr>
<td>Sigma-vagina</td>
<td>Schmidt (21)</td>
<td>8</td>
<td>MRKH</td>
<td>12.5</td>
<td>85</td>
<td>80</td>
</tr>
<tr>
<td>Peritoneal colpopoiesis</td>
<td>Davydov (22)</td>
<td>30</td>
<td>MRKH</td>
<td>0</td>
<td>100</td>
<td>96</td>
</tr>
</tbody>
</table>


**FIGURE 1**

Vaginal dimple—rudimentary müllerian duct. Hegar pointing to the left müllerian duct.
With George’s modification of the Wharton-Sheares neovaginoplasty, a method of treatment evolved that is simple, safe, and effective. The Wharton-Sheares-George technique is not highly complex and is therefore easy to learn and perform; no special equipment is necessary, and this, combined with the decrease in hospitalization time, is favorable to hospital budgets.

Compared with neovaginoplasty according to McIndoe (4), Vecchietti (5, 6, 12), Frank (7), Wharton (8), or Lin (9), neither laparotomy nor autologous transplants nor application of traction or pressure to the perineum is needed, and the trauma is limited to the area of the neovagina. Thus the probability of complications is, in contrast to other surgical procedures [bowl transplants (9, 10), split-thickness grafts (4, 7), or skin flaps], at a minimum. Postoperative pain and discomfort within the vaginal–perineal region can be kept low.

By forbearing from inserting the mucosal flap into the posterior surface of the newly created cavity, as described by Sheares (2), George’s modification eliminates the characteristic complications (bleeding, infection, necrosis, stenosis, rejection) of allogenic transplantations. Compared with the intermittent pressure technique of Frank (7) or the gradual dilatation by Vecchietti (5, 6, 12, 13), the Wharton-Sheares-George method requires considerably less time and causes less patient discomfort.

In highly motivated patients not agreeing with surgical intervention and with the existence of a vaginal dimple of ≥1 cm, an initial trial of vaginal dilatation with careful instruction and counseling might be considered (7).

The neovaginoplasty according to Wharton-Sheares-George impresses, providing 100% satisfactory anatomic and functional results, considering that a vaginal length of ≥6 cm is required for sexual intercourse to be performed without problems (15), and especially considering that women with an artificial vagina, like women with a primary normally structured vagina, experience a functional extension of 2–3 cm during the excitement phase of sexual intercourse (16). All of our study patients described their sexual life as satisfactory; orgasm could be achieved.

Essential for long-term success of the surgical result (besides early and regular postoperative cohabitation) is the postoperative use of the mold to avoid contraction of the neovagina (17). The model of the vaginal mold (Adjustable Vaginal Stent) is of secondary concern, as long as the patient feels comfortable using it.

Another major factor in determining success is the adjustment of the patient to her congenital defect and the patient’s understanding that a satisfactory functional result is more meaningful for success than is the actual final capacity of the neovagina (18). Therefore, psychological support is essential before and after treatment.

The best time for the operation has to be determined individually and depends on the psychological and physical maturity and the growing desire for sexual intercourse of the adolescent patient. Additionally, the 3–4 months of postoperative sexual continence has to be taken into account when considering surgical creation of a neovagina.

Nevertheless, regardless of the method of vaginal reconstruction, a multidisciplinary team of surgeons, endocrinologists, gynecologists, and psychiatrists should be involved in the procedure to optimize the psychosocial, social, and surgical outcomes in patients with MRKH syndrome as soon as the patient reaches the sexual age. The creation of a neovagina according to Wharton-Sheares-George might provide a satisfactory alternative for the surgical management of vaginal aplasia in these patients.
George’s modification of the Sheares technique represents a simple, safe, and effective surgical procedure for creating a functional neovagina. Little surgical effort is required, and trauma due to the operation is limited to the area of the newly created vagina. Thus, intraoperative blood loss, postoperative pain, and complication rates can be diminished compared with more invasive techniques (4, 9–11).

The short hospitalization period, accelerated convalescence, and the rapid return to everyday life are important benefits for young patients. Because of these circumstances and because no special equipment (laparoscopic/laparotomic equipment, traction devices) is required, the operation costs less compared with other therapeutic options (McIndoe and Barnister, Baldwin, Hohenfellner, Vecchietti).

Although no conclusive recommendation can be made on the basis of the limited number of cases presented here, the creation of a neovagina according to Wharton-Sheares-George achieved encouraging results in our patients. This technique might provide a satisfactory option for the surgical management of vaginal aplasia in women with MRKH syndrome (Figures 1–4).

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REFERENCES