# Uterine Malformation: Diagnosis and Results After Hysteroscopic Metroplasty

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## Contents



## 3.1 Introduction

Uterine anomalies result from a defect in the development or fusion of the paired Mullerian ducts during embryogenesis and are the most common types of malformations of the female reproductive system. The septate uterus is the most common structural uterine anomaly and results from failure of the partition between the two fused Mullerian ducts to resorb (Taylor and Gomel 2008). Congenital malformations may be associated with recurrent pregnancy loss, preterm labor, abnormal fetal presentation, and infertility (Heinonen et al. 1982). The overall frequency of uterine malformations was 4.0 % (Raga et al. 1997). Infertile patients (6.3 %) had a significantly ($P<.05$) higher incidence of Mullerian anomalies, in comparison with fertile patients (3.8 %). Septate (33.6 %) and arcuate (32.8 %) uteri were the most common malformations observed (Raga et al. 1997). The septate uterus is associated with the highest incidence of reproductive failure among the Mullerian anomalies (Fedele et al. 1993). Thirty-eight percent to 79 % of pregnancies in women with septate uteri ended in miscarriage (Raga et al. 1997; Homer et al. 2000). Such outcomes are thought to be a result of poor blood supply, rendering the septum inhospitable to the implanting embryo (Fedele et al. 1996). Diagnosis is established with hysterosalpingography, magnetic resonance imaging, and ultrasound. The diagnostic accuracy of hysterosalpingography in patients with septate

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uteri has been reported to be between 20 and 60 % (Braun et al. 2005; Pellerito et al. 1992). Transvaginal ultrasonography is more accurate, with a sensitivity of 100 % and a specificity of 80 % in the diagnosis of the septate uterus (Pellerito et al. 1992). Three-dimensional sonography (3DULS) is associated with an even higher diagnostic accuracy of 92 % (Wu et al. 1997) and hysterosonography, with a 100 % diagnostic accuracy in the largest series published to date (Alborzi et al. 2002). The benefit of 3DULS is the view of the uterus in the coronal plane, which allows the operator to distinguish between arcuate, septate, and bicornuate uteri, thereby eliminating the need for simultaneous laparoscopy (Figs. 3.1 and 3.2). In this review we describe the diversity of clinical presentations, management strategies, and report the obstetric outcomes observed in our series of 114 women with uterine septa.

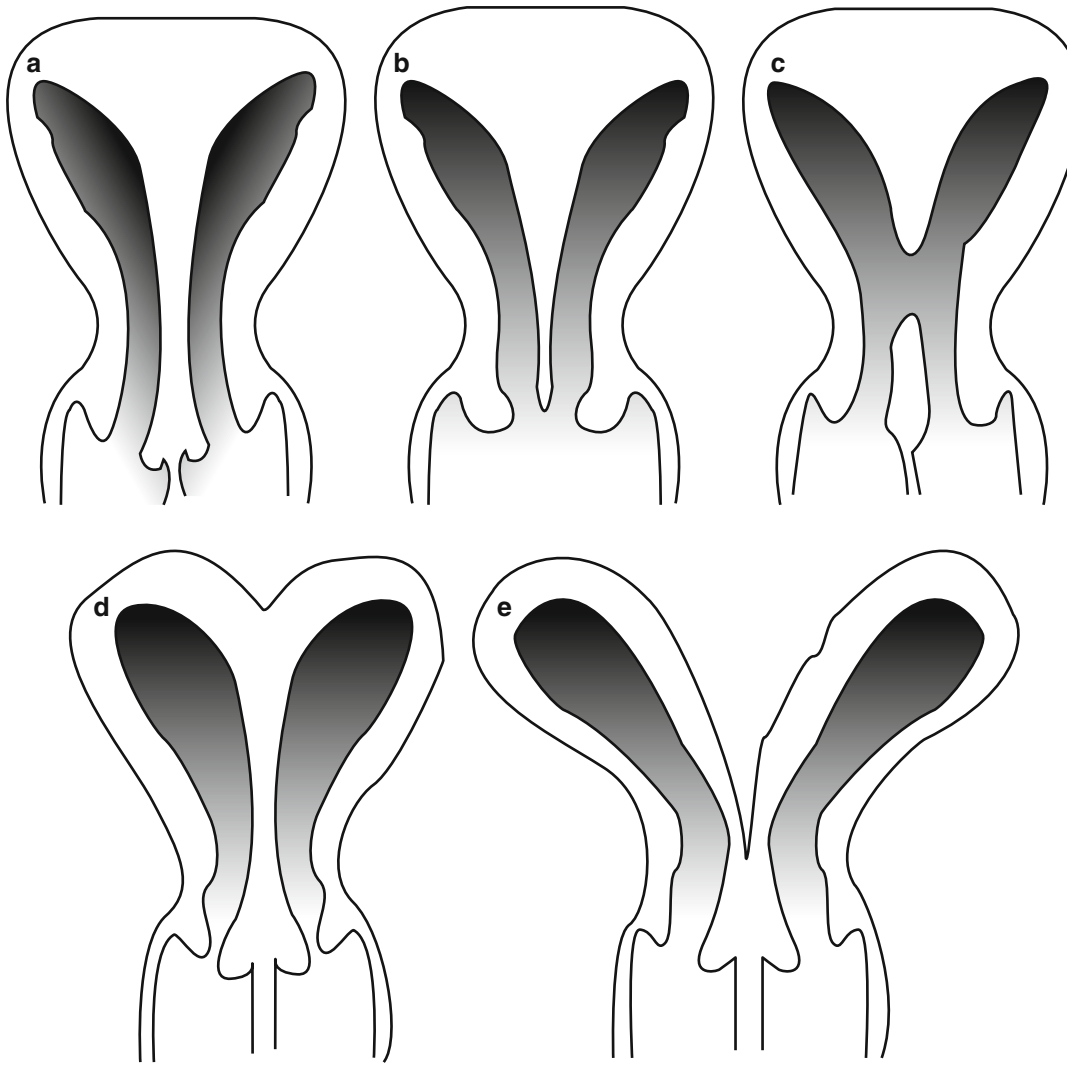


**Fig. 3.1** Different types of uterine malformations. (**a**) Uterus septus cervix duplex vagina septa. (**b**) Uterus septus cervix septa. (**c**) Uterus communicans septus cervix septa vagina septa. (**d**) Uterus bicornis duplex vagina septa. (**e**) Uterus didelphys cervix duplex vagina septa

## 3.2 Materials and Methods

A total of 114 women were investigated and their fertility outcome was followed for an average of 2 years. Patients with some degree of Mullerian malformation, as detected at their local gynecologist on transvaginal ultrasound or at our department during admission for any condition connected to the anomaly, were included in our study. The patients were assessed using B-mode, 3D ultrasound examinations using a Voloson 730 Expert (General Electric Healthcare, Zipf,

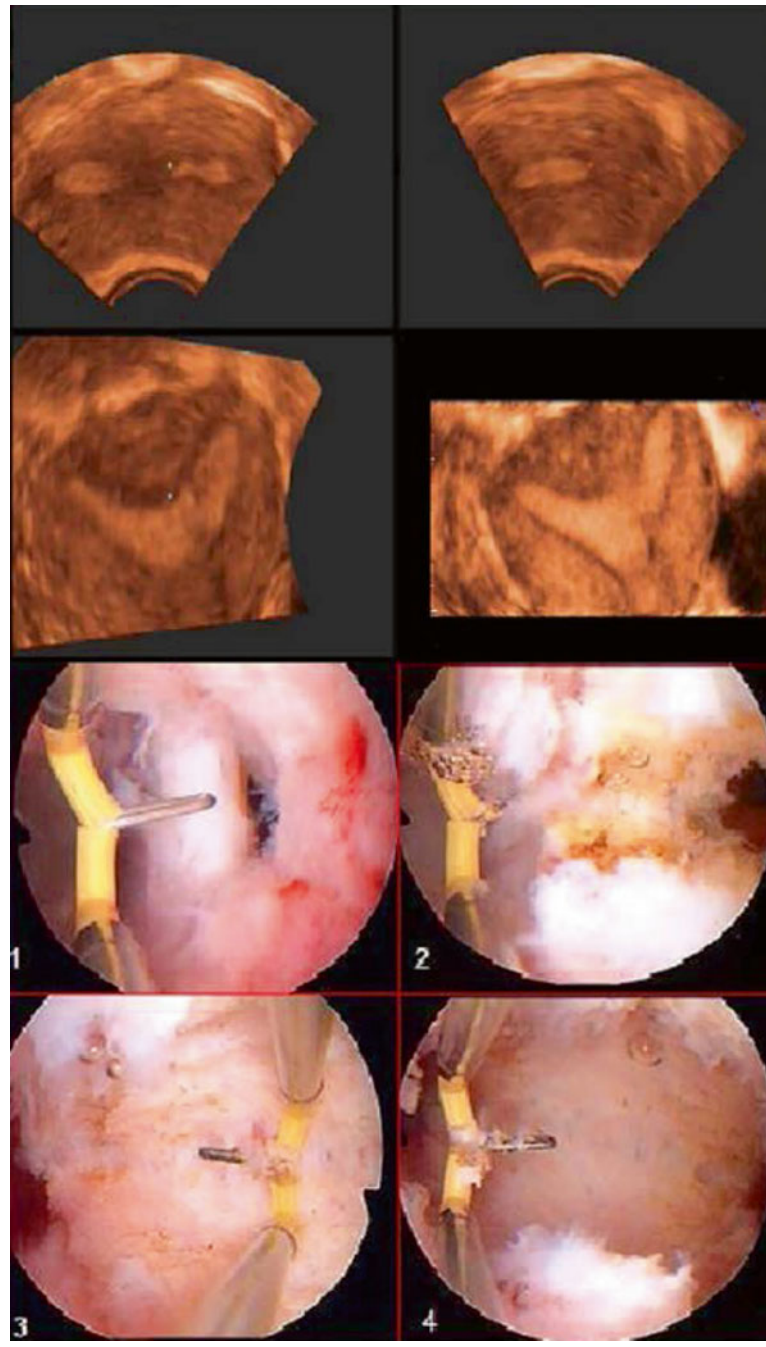


**Fig. 3.2** Three-dimensional ultrasound and metroplasty of the uterine septum

Austria) with a vaginal multifrequency probe (5–9 Hertz). An initial B-Mode examination provided morphologic evaluation of the pelvic organs, including uterine size and endometrium thickness, followed by a saline infusion sonography in most of the patients with findings suggestive of a uterine septum. The operations were performed under general anesthesia using the following surgical technique for all patients. During hysteroscopy, the automatic pressure cuff (Olympus, Center Valley, PA) maintained an infusion pressure of 100 mmHg, and suction of 10–15 mmHg was applied to the outflow tube to achieve a sufficient flow. The TCRis resectoscope (Olympus), Ch. 26 model WA 22061 with 12 optic 22001A (Hamburg, Germany), using NaCl 0.9 % (Braun, Melsungen, Germany) as irrigant, with a needle of 5 mm was then used to perform the metroplasty. The needle was used with a bipolar cutting current of 280 W to incise the lower segments of the septum from side to side until the tubal ostia were visualized. The high power is needed for the ignition of the plasma only. A couple of milliseconds after the ignition, the generator automatically regulates the power down to normal values around 100 W. The septum excision was stopped approximately 10 mm from the line between the two ostia. In six patients, a total uterine septum was identified. In these cases, the incision was made horizontally toward the other obliterated cavity, starting just after the internal ostium. In cases with a double cervix the same procedure was performed leaving the cervices intact (Fig. 3.1). The received information was entered in statistical software (SPSS, version 14, SPSS 22 Inc., Chicago, IL). Patient characteristics of the study groups were analyzed with one way analysis of variance in case of normally distributed continuous variables, and Pearson's chi-square test in case of dichotomous data. Confidence intervals for difference in means were calculated. Pearson's chi-square was also used to analyze differences of preference among the study groups. A paired-samples *t* test was used to compare expected visual analog scale scores for both investigations. All tests were two-sided and *P* values < .05.

## 3.3 Results

One hundred fourteen women underwent hysteroscopic examination in case of larger than 1/4 of the uterine size septum a resection was performed, with a mean age of 31 (19–42 years). Eight small septum was found to be small and not in need of resection. Uterine septa were found as part of the workup for the following events: infertility workup (33.3 %), first trimester miscarriage (22.8 %), three or more miscarriages (22.8 %), Cesarean section (11.4 %), premature delivery (7.9 %), normal delivery (1.8 %) (Table 3.1). We evaluated the septum size in the 114 women. Ten (8.8 %) had a septum consisting one-quarter of their uterus, 18 (15.8 %) a septum one-half of their uterus, and 86 (75.4 %) a septum larger than one-half of their uterus. Six women had a total septum and were included in the septum larger than one-half of their uterus group. The different diagnostic events leading to diagnosis of the uterine septum per septum size is presented in Table 3.2. The uterine septum was successfully resected in all 106 women. No intra- or postoperative complications were noted. One hundred and three out of 114 women desired a future pregnancy. Seventy-two (69.9 %) of these women achieved a successful pregnancy after metroplasty, with 63 (87.5 %) subsequent term deliveries, and 9 (12.5 %) premature deliveries. Twenty-two (30.6 %) of the 72 women who had live births delivered by Cesarean section. Twenty-four (23.3 %) women who desired future fertility did not become pregnant, and 7 (6.8 %) had a spontaneous miscarriage. Eleven women were not interested in future fertility; however, they opted for surgery at time of diagnosis. In examining the outcomes in women divided up by group of septum diagnosis, we found the following rates of live birth following metroplasty: infertility workup (56.3 %), miscarriage (77.6 %), normal/premature delivery (80 %), and Cesarean section (66.7 %) (Table 3.1). We found different pregnancy outcomes after metroplasty of the various septum sizes as is presented in Table 3.2. To compare the pregnancy outcome after metroplasty of a different septum size the material was divided in two groups: one group with a septum size of

**Table 3.1** Pregnancy outcome after metroplasty

| Diagnosis following | Infertility workup | Miscarriage[a] | Normal/premature delivery | C-section | Total group |
|---|---|---|---|---|---|
| Pregnancy outcome: | 38 (33.3 %) | 52 (45.6 %) | 11 (9.7 %) | 13 (11.4 %) | 114 |
| Live birth | 18 (56.3 %) (3 premature) | 38 (77.6 %) (4 premature) | 8 (80 %) (1 premature) | 8 (66.7 %) (1 premature) | 72 (69.9 %) |
| Miscarriage | 3 | 4 | – | – | 7 (6.8 %) |
| No pregnancy | 11 | 7 | 2 | 4 | 24 (23.3 %) |
| Desired fertility | 32 | 49 | 10 | 12 | 103 (100 %) |
| Undesired fertility | 6[b] | 3 | 1 | 1 | 11 |

[a]Twenty-six women were diagnosed following a first miscarriage and 26 following three or more miscarriage
[b]No desired fertility at that time, but opted for surgery

**Table 3.2** Event leading to diagnosis and pregnancy outcome after metroplasty for different septumw sizes, $n = 114$

| | Septum size ¼ | Septum size ½ | Septum size >½ |
|---|---|---|---|
| Diagnostic event: | 10 (8.8 % of *n*) | 18 (15.8 % of *n*) | 86 (75.4 % of *n*) |
| Infertility workup | 4 (40 %) | 7 (39 %) | 27 (31 %) |
| First trimester miscarriage | 4 (40 %) | 4 (22 %) | 18 (21 %) |
| Premature delivery | – | 2 (11 %) | 7 (8 %) |
| Normal delivery | – | 1 (6 %) | 1 (1 %) |
| Three or more miscarriage | 1 (10 %) | 3 (17 %) | 22 (26 %) |
| C-section | 1 (10 %) | 1 (6 %) | 11 (13 %) |
| Pregnancy outcome after metroplasty: | | | |
| No pregnancy | 7 (70 %[a]) | 6 (40 %[a]) | 11 (14.1 %[a]) |
| Live birth | 3 (30 %[a]) | 5 (33.3 %[a]) | 64 (82 %[a]) |
| Miscarriage | – | 4 (26.7 %[a]) | 3 (3.8 %[a]) |
| Desired fertility | 10 (100 %) | 15 (100 %) (3 had no desire) | 78 (100 %) (8 had no desire) |

[a]The percentages are derived from the 100 % value of desired fertility

one-quarter or one-half and one other group with a septum size larger than one-half of their uterus. The pregnancy outcome of a septum size one-quarter or one-half is significantly different from the pregnancy outcome after metroplasty of septum larger than one-half of the uterus (chi-square: $P < .001$). There were only four women in our study with the combination of a septum consisting one-quarter of their uterus and the diagnosis following a first trimester miscarriage. After metroplasty none of these women became pregnant, although all four had desired fertility. ANOVA linear regression showed no significant difference of age in the different events leading to diagnosis (P¼.708) and no significant difference in age and pregnancy outcome (P¼.160).

## 3.4 Discussion

In our study we performed hysteroscopic metroplasty solely based on ULS findings. No patients underwent laparoscopy. No intra or postoperative complications occurred. Based on our experience in this study we believe metroplasty of the uterine septum can be safely performed as an office procedure. This corresponds to the study of Ghi et al. (2009), demonstrating ULS and 3DULS to be extremely accurate (positive predictive value 96.3 % and negative predictive value 100 %) for the diagnosis and classification of congenital uterine anomalies. They suggest women diagnosed with malformations amenable to treatment with a resectoscope may avoid a diagnostic pelviscopy

by using operative hysteroscopy with the addition of 3DULS. In the present study we used this strategy of diagnosis and management as 3DULS was followed by operative hysteroscopy. Our findings indicated an excellent prognosis for successful pregnancy after metroplasty of the uterine septum. Seventy-two women (69.9 %) delivered a healthy baby. This was consistent with previous studies. Homer et al. (2000) found in their review a live birth rate of 64 % in a total of 658 patients. In our study the live birth rate was different per diagnostic event. We found a lower live birth rate after metroplasty when the septum was diagnosed during infertility workup (56.3 %), thus indicating multiple factors were contributing to the patient's infertility. In approximately 40 % of these patients other factors (e.g., male factor, tubal factors) were found during infertility workup. The lower live birth rate with unexplained infertility and a uterine septum is seen in other studies as well: Homer et al. (2000) found a crude pregnancy rate of 48 %, Pabuccu and Gomel (2004) found a live birth rate of 29.5 %, and Mollo et al. (2009) a live birth rate of 34.1 %. The overall live birth rate of 64 % observed by Homer et al. and our live birth rates with the other diagnostic events. This suggests again that when the uterine septum is diagnosed during infertility workup, there are coexisting factors such as genetic, infective, endocrine, immune, or thrombophilic factors that play a role in their infertility (Rai and Regan 2006). Therefore, in the past, removal of the uterine septum in these cases was subject to debate. The lower live birth rate after metroplasty makes it questionable to perform correction of the uterine septum, as these patients may benefit from concentrating on other infertility treatments. However, in certain cases, prophylactic resection of the uterine septum continues to be recommended: women with long-standing (>6 months) unexplained infertility in whom an extensive workup has ruled out other factors, women above 35 years of age, women undergoing laparoscopy and hysteroscopy for other reasons (septal incision at the same time is opportune and appears logical), and women pursuing assisted reproductive technologies (Homer et al. 2000). Mollo et al. (2009) have recently addressed this question. They concluded metroplasty in women with unexplained infertility and a uterine septum improved their live birth rate compared with women with unexplained infertility and no septate uterus. The live birth rate was 34.1 % after metroplasty in the septate uterus group compared with 18.9 % when there was no uterine septum present (chi-square: $P < .05$). We found women with prior miscarriages leading to diagnosis of a uterine septum had the highest live birth rate after metroplasty. Previous studies also reported a significant improvement after metroplasty in this group. Homer et al. (2000) found the overall miscarriage rate dropped from 88 to 5.9 % after hysteroscopic metroplasty. In our study, four women had a septum size of one-quarter of their uterus diagnosed after a first trimester miscarriage; despite desired fertility, none of these four women achieved a live birth following metroplasty. Further studies with larger numbers are required to evaluate the need of metroplasty in this group of women. The highest rate of live births after metroplasty in our study was in the group of women with the largest septum (larger than one-half of the uterus). In this group, 82 % had a live birth compared with 33.2 and 30 % when the septum is one-half or one-quarter of their uterus, respectively (chi-square: $P < .05$). If a septum extends over more than one-half of the uterine cavity we strongly recommend metroplasty. There is no reason to wait for these women to prove bad obstetric outcome before surgical management. Outpatient hysteroscopic metroplasty of the uterine septum is a minor procedure with rare complications. In conclusion, our data demonstrate three-dimensional ultrasound followed by hysteroscopic metroplasty of uterine septa to be a safe and effective office procedure. Women with a septum more than one-half of their uterus have a very high chance of developing a successful pregnancy after metroplasty. Women with miscarriages leading to diagnosis of a uterine septum have the highest live birth rate after metroplasty.

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