Hysteroscopic Endomyometrial Resection

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ABSTRACT

Objective: To determine the efficacy of hysteroscopic endomyometrial resection in treating women with intractable uterine bleeding.

Methods: A retrospective analysis was carried out on 304 women with intractable uterine bleeding treated between August 1, 1991, and December 31, 1997. The average patient was 41.3 ± 8.0 years old and was followed for a mean of 31.8 ± 22.1 months (range 6-75 months).

Results: Eighty-three percent of women were amenorrheic at the time of their one-year follow-up. The overall amenorrhea rate was 85.5%. Only 0.8% of subjects reported no improvement during the study period. Histologic analysis of the endomyometrial specimens revealed that 17 (5.6%) women were found to have significant endometrial pathology not previously identified with routine preoperative screening. There was a total of 20 complications (6.6%), although only 2 (0.7%) were considered severe. Twenty-seven women (8.9%) eventually required subsequent surgery during the study period. Finally, 69 (22.7%) women with adenomyosis were identified. They did not appear to be at increased risk for subsequent surgery.

Conclusions: Hysteroscopic endomyometrial resection produces superior results as measured by amenorrhea rates, the need for subsequent surgery and its low incidence of associated complications; and it produces an important histologic specimen. For patients with significant comorbidity, endomyometrial resection can be adapted to a single-stage procedure incorporating the diagnostic and treatment phases in women with abnormal uterine bleeding.

Key Words: Hysteroscopic, Endomyometrial resection.

INTRODUCTION

The last 20 years have seen the development of many new techniques for accomplishing endometrial destruction as a treatment choice for women with menorrhagia and other forms of intractable uterine bleeding who respond poorly to medical therapy. Prior to the emergence of these techniques, women’s choices were often limited to hysterectomy or difficult lifestyle adjustments.

Endometrial destruction can be accomplished by either coagulation or resection methods. The former has been accomplished utilizing a hysteroscope to accomplish endometrial destruction under direct visual control. Recently, several “blind,” or non-hysteroscopic, methods have emerged with the thermal balloon being the first to gain FDA approval.

Currently available coagulation methods utilize laser energy,1-4 electrosurgery,5-13 thermal balloon ablation14,15 and cryoablation.16 All suffer the same three drawbacks. First, they do not provide a tissue specimen for histologic analysis. Second, they generally require the use of some form of preoperative medical therapy to produce endometrial thinning. Third, the success rates, as measured by amenorrhea and the need for subsequent surgery, is suboptimal, ranging from a low of 15.2%15 to a maximum of 55.4%.10 Only Taylor,13 who combined the use of Nd:YAG laser for treatment of the uterine fundus and the electrosurgical ball-end electrode for the remainder of the uterine cavity, reported a series of patients in whom the amenorrhea rate at one year was 90%.

The emergence of endometrial resection, first discussed by DeCherney and Polan,17 and later by Magos et al,18,19 offered another surgical approach in which endometrial tissue was actually removed. The resection techniques have the advantage of destroying tissue to a known depth equal to the thickness of the specimen excised; equivalent predictability of tissue destruction has yet to be demonstrated with any coagulation methods. Endometrial resection also provides an important histologic specimen for analysis.18-22 At least three authors have confirmed the presence of endometrial adenocarcinoma in the resection specimens of women with previously unsuspected disease.12,20,22 Finally, unlike the
coagulation methods, the resection methods may be performed without utilizing expensive medical preparation of the endometrium. The major drawback of the resection methods lay in the poor amenorrhea rate reported. Magos et al\textsuperscript{19} reported an amenorrhea rate of only 25% on women followed to one year.

In 1994, the authors\textsuperscript{23} reported the technique of hysteroscopic endomyometrial resection. We described the first systematic and geometrically efficient approach to excise uterine endomyometrium to a depth of at least 3 mm. Endomyometrial resection, like its forerunner endometrial resection, produces an excellent histologic specimen that is readily oriented and does not require the use of expensive medical preparatory agents. The capacity to avoid medical preparatory agents make it well suited to the medically unstable patient in whom one may wish to combine both diagnostic and operative hysteroscopy into a single procedure, which limits the patient’s exposure to anesthetic agents. However, the aggressiveness of this procedure in removing at least 3 mm of endomyometrium achieved a very high rate of amenorrhea (84% in our first series of patients at six months of follow-up\textsuperscript{23}).

This paper reviews the immediate and long-term outcomes of the first 304 women to undergo endomyometrial resection. For the purposes of this study, women with leiomyomas presenting with intractable uterine bleeding have been excluded, since they represent a very heterogeneous group whose results have already been reported by the authors.\textsuperscript{24}

### MATERIALS AND METHODS

Three hundred and four women with menorrhagia were treated between August 1, 1991, and December 31, 1997. All of the patients reported are derived either from the authors’ private practice or referred from their gynecologists or family practitioners. Each of the women in this study underwent a complete history and physical examination. Patients with clinical stigmata of thyroid disease or hyperandrogenism had appropriate laboratory evaluation. The inclusion criteria for this study were women with menorrhagia who wished to avoid hysterectomy and appeared to have an anatomically normal uterus. Women with endometrial polyps were included in this study. All women with known leiomyomas or endometrial carcinoma were excluded from this study as were women with known thyroid disease or hyperandrogenism. Prior to July 1, 1993, all patients underwent a diagnostic hysteroscopy. After July 1, 1993, all patients underwent a screening transvaginal ultrasound examination. Women who were suspected of having an anatomic abnormality, such as polyps or fibroids, also underwent sonohysterography. In all cases in which an endometrial polyp or a fibroid was suspected, a diagnostic hysterectomy was performed. Patients with leiomyomas of any classification were excluded from this study; those with endometrial polyps were not excluded. Endometrial biopsies were carried out in 296 women. Eight women had significant comorbidity, including severe coronary artery disease, recurrent thromboembolic episodes, unstable angina, cardiomyopathy, marked obesity and disabling arthritis. In these eight women, endomyometrial resection was performed on an unprepared uterine lining. This approach enabled the authors to combine the diagnostic and treatment phases of their therapy without causing histologic alteration to the specimen.

Office diagnostic hysteroscopy was carried out in 284 patients. Ultrasound exams were carried out in 127 women, of whom 32 also underwent a sonohysterogram. One hundred and fifteen patients underwent both a transvaginal ultrasound and a diagnostic hysteroscopy.

All candidates for hysteroscopic endomyometrial resection were given a videotape and a pamphlet to review at home that detailed the risks, consequences and alternatives to this form of treatment. A total of 304 patients elected to undergo the procedure.

The endometrium was medically prepared in 215 of 304 (70.7%) patients. Two hundred and one women (66.2%) received an GnRH agonist one month prior to surgery; the vast majority of them received leuprolide depot 3.75 mg IM. Several patients received oral contraceptives, deponedroxyprogesterone acetate, megestrol acetate and danazol as a medical preparatory agent. The remaining 89 (29.3%) patients received no endometrial preparation whatsoever. In general, patients did not receive leuprolide depot in the earlier years of the study because of financial considerations. During the earlier years, insurance companies would not pay for the endometrial preparatory agent. Additionally, any woman with menorrhagia who was taking hormone replacement therapy (HRT) was asked to discontinue her HRT prior to surgery.
Two hundred and forty-two (79.67%) procedures were carried out in a free-standing ambulatory surgery center while the remaining 62 were performed in a hospital outpatient department. All eight patients with significant medical morbidities were scheduled at a hospital outpatient department. The remaining patients were assigned to an ambulatory surgery center or a hospital outpatient department based solely on operating room availability. All procedures were performed by the first author.

Twenty-seven (20.4%) procedures were performed with simultaneous sonographic guidance; employed whenever a minimum uterine wall thickness (Figure 1) fell below 12 mm, as noted on sagittal ultrasound scan. All ultrasound guidance was performed using either a 5200 S Invision equipped with a 3.5 MHz abdominal transducer (Acoustic Imaging Technology Corp; Phoenix, AZ) or a similarly equipped Ultramark IV (ATL; Bothell, WA) in a technique previously described by the authors.24 General anesthesia was used in all but a handful of cases. Several patients requested and received a spinal anesthetic. In each case, a maximum allowable fluid absorption limit (MAFA\text{limit}) was established for each patient based on the formula MAFA\text{limit} = 17.6 \text{ mL/kg}.\textsuperscript{25} Adherence to the MAFA\text{limit} provides adequate reassurance that serum sodium concentrations will decrease no more than 10 mEq/L whenever glycine 1.5% is utilized as a distention medium.

The original technique of endomyometrial resection was reported on a series of 35 patients\textsuperscript{23} who had not received any form of endometrial preparation. All of these patients are included in this report.

Cervical dilatation was performed exclusively with mechanical dilators until January 1, 1997. After that date, all patients underwent placement of a laminaria japonica (2 or 3 mm) 15-24 hours prior to surgery. In our original paper, we describe the use of intraoperative vasopressin administered by intracervical injection. After January 1995, we reduced the total dose from 10 units to 5 units. Various resectoscopes were used throughout this series, most commonly a 26 Fr continuous flow resectoscope (Karl Storz Endoscopy model no 27040 SL; Culver City, California) fitted with an 8 x 5-mm loop electrode or a 25 Fr (Circon, Stamford Connecticut) fitted with a 24 Fr loop electrode.

A gravity-fed system was used throughout the series. A Level 1 Fluid Warmer (Level 1 Technologies; Marshfield, MA) was employed in more than half of all cases. Glycine 1.5% was used in 256 (84.2%) patients. Mannitol 5% was employed in 48 (15.8%) patients. Various fluid collection systems were used throughout our series. The most efficient, however, was the Urocatcher system (MDT Castle No. S4004FTB MDT Corp; Rochester, NY) and supporting hoop (Amatech Accessory S-N18006; Amatech Corp; Acton, MA) in conjunction with a series of 2 L containers connected to wall suction set at 150 mm Hg. A variety of electrosurgical generators were used to produce a pure cutting waveform in power settings ranging from 30-210 watts (x = 118 watts). Settings were judged adequate when the loop could be moved at 3 cms/sec without the sensation of tissue drag.

Dissection began on either the anterior or posterior uterine wall (Figure 2). The 8-mm loop electrode was extended 1 cm and brought to the mid-fundus, then buried into the endomyometrium to its full 5-mm depth. The entire assembly was held in that position and brought through the endocervical canal to the excervix.

**Figure 1.** Demonstration of minimum uterine wall thickness.
in approximately half of all patients. During the last few years, the dissection was terminated at the internal os. The dimensions of each strip were checked to be certain that at least 3 mm of uterine endomyometrium had been removed. Each strip was individually removed from the uterine cavity prior to proceeding with the next step. The anterior cardinal strip of tissue was followed by resection of the posterior and the two lateral cardinal strips. The anterior and posterior strips might join at the fundus or be separated by 5-8 mm of endomyometrium. The lateral cardinal strips begin 5 mm proximal to each tubal ostia. The removal of all four cardinal strips produces a hysteroscopic and sonographic appearance of a “four leaf clover” (Figure 3). The resultant anterolateral and posterolateral triangles (Figure 4) are resected followed by removal of the “ridge tissue.” This process is continued until at least 3 mm of endomyometrium have been removed from all but the fundus. Various methods were used to remove the remaining fundal tissue. Most often, the loop was reconfigured to 160 degrees and narrowed as required. In this configuration, the loop was used to resect all of the remaining endometrial tissue beginning at the midline and sweeping laterally past each tubal ostium. All remaining ridge tissue was sculpted so that at least 3 mm of tissue was removed, allowing 2 mm of resection at the tubal ostia (Figure 5).

The first 130 patients (42.8%) underwent rollerball coagulation of the exposed myometrium at power settings ranging from 70 to 120 watts of coagulation current. The next 174 patients did not undergo any coagulation using a rollerball electrode. In 25/174 cases, however, the wire loop was used with power settings ranging from 50-120 watts (x = 97.6 watts) of coagulation current to fulgurate isolated bleeder. All patients received prophylactic antibiotics. Patients who were not penicillin-allergic received cefonicid 1 gram IVSS or cefazolin sodium 1 gram IVSS intraoperatively. The remaining subjects received either doxycycline 100 mg IVSS or gentamicin 80 mg IVSS. Patients were discharged on a five-day
course of doxycycline 100 mg bid and ibuprofen 800 mg q 6 h prn. Some patients required acetaminophen and codeine.

All patients were seen two weeks postoperatively. During the last year of the study, routine ultrasound examinations were carried out at a six-month postoperative visit. Additionally, all of our patients were asked to return for a transvaginal ultrasound examination as part of their annual follow-up in order to identify any evidence of hematometra or endometrial regrowth.

Follow-up data was obtained at the time of routine annual exams on the majority of patients. For those patients who were followed by their referring physicians, such data was obtained by telephone calls at specified intervals. Amenorrhea, hypomenorrhea and moderate improvement have been defined in our original paper.23

Finally, all of the pathology specimens, including the preoperative endometrial biopsies, were reviewed by one of two pathology departments: the University of Rochester Department of Pathology or the Highland Hospital Department of Pathology (the latter is an affiliate of the U of R). A statistical analysis was carried out in order to compare the outcomes of patients found to have adenomyosis, diagnosed at the time of their initial surgery, with patients whose pathology specimens did not reveal adenomyosis.

RESULTS

A total of 304 women underwent hysteroscopic endometrial resection. Their average age was 41.3 ± 8 years (range 26-77 years). They were followed for an average of 31.8 ± 22.1 months (range 6-75 months). The average surgical time was 23.4 ± 12.6 minutes (range 4-90 minutes). The average amount of distention fluid used was 8,959 ± 4,575 mL (range 1,000-24,900 mL). The average amount of fluid absorbed was 472 ± 504 mL (0-2500 mL)

The menstrual outcomes as a result of their initial surgical procedures are presented in Figure 6. The overall amenorrhea rate was 85.5%.

Two hundred and seventy-seven patients (91.1%) required no additional procedures during the study period. Twenty-seven women (8.9%) underwent subsequent retreatment or hysterectomy; the mean interval between the initial and subsequent therapy was 31.8 ± 16.3 months (range 8-66 months). Thirteen women (4.3%) underwent repeat hysteroscopic procedures; the reasons are summarized in Table 1. The average age at the time of initial surgery among these 13 women was 41.0 ± 5.5 years (range 28-52 years). Six of 13 patients undergoing retreatment had continued vaginal bleeding; 4 had symptomatic hematometra without vaginal bleeding. An additional 8 patients had uterine pain of unknown etiology. As a result of retreatment, 4 of 6 patients with continued vaginal bleeding (66.7%) became amenorrheic and 2 (33.3%) became hypomenorrheic. Three of the 8 women with pain of unknown etiology eventually had hysterectomies. The remaining 5 became pain free.

A total of 17 (5.6%) subjects ultimately required hysterectomies (Table 2); two were performed because of previously unsuspected adenocarcinoma of the endometrium. Thus, only 15 (5.0%) required hysterectomy because of method failure.

An analysis of repeat procedures and hysterectomies as a function of age revealed that 4 repeat procedures and 8 hysterectomies were performed in the 131 women who were less than 40 years old at the time of their initial sur-

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**Figure 4.** Demonstration of both anterolateral and both posterolateral triangles.
surgery (9.61%). Of the 173 women who were 40 or older at the time of their initial surgery 9 patients had subsequent repeat hysteroscopic procedures, and 6 women had subsequent hysterectomies (8.67%).

There were immediate complications in 12 (3.9%) patients. Seven patients (2.3%) suffered an inadvertent uterine rupture or perforation. In 5 of the 7 patients, however, the procedure was completed without difficulty. The other two had an incomplete procedure resulting in only moderate menstrual improvement; one eventually did require a hysterectomy. When complications were stratified according to patient age, it was noted that 9 of the complications occurred in the 131 women who were less than 40 years of age (6.87%), while 3 of the complications occurred in the 173 women whose age was equal to or greater than 40 (1.73%). Interestingly, 6 of the 7 uterine ruptures or perforations happened in the younger age group.

Two patients had excessive fluid absorption with sodium concentrations of 116 and 127 mEq/L. Both patients were treated with diuretics and fluid restriction. Each was discharged within six hours postoperatively. Three women required uterine tamponade with a foley catheter because of excessive postoperative bleeding. One of these women required admission for 24 hours and was discharged without sequelae. None of these complications were judged to be severe.

There were six delayed complications. These included two patients with confirmed myometritis. One was hospitalized and treated with parenteral antibiotics, and the other responded well to outpatient therapy with oral antibiotics. There were two other women who presented with low grade fever, increased vaginal bleeding and pelvic pain. Myometritis was suspected, but neither had a leukocytosis or positive cervical culture; however, both improved rapidly with oral antibiotic therapy. A fifth patient presented two weeks postoperatively with diarrhea secondary to Clostridium difficile toxin. She responded well to oral metronidazole. A sixth patient presented with a tubo-ovarian abscess during her 7th postoperative week and underwent an exploratory laparotomy and left salpingoophorectomy. Two of the six patients did require hospitalization. Both of these

Figure 5. Resection of “ridge tissue.”
Table 1.
Indications for repeat hysteroscopic procedures.
N = 13

| Salpingeal bleeding | Cyclic spotting | Constant vaginal spotting | Pain relieved with metrotrexate | Hematometra | Cervical stenosis |
|---------------------|----------------|---------------------------|-------------------------------|-------------|------------------|
| 1                   | x              |                           |                               |             |                  |
| 2                   |                |                           |                               |             |                  |
| 3                   |                |                           |                               |             |                  |
| 4                   | x              |                           |                               |             |                  |
| 5                   |                |                           |                               |             |                  |
| 6                   |                |                           |                               |             |                  |
| 7                   |                |                           |                               |             |                  |
| 8                   |                |                           |                               |             |                  |
| 9                   |                |                           |                               |             |                  |
| 10                  |                |                           |                               |             |                  |
| 11                  |                |                           |                               |             |                  |
| 12                  |                |                           |                               |             |                  |
| 13                  |                |                           |                               |             |                  |

Figure 6. Menstrual outcomes of 304 women undergoing endomyometrial resection (EMR).

The results of the 296 preoperative endometrial biopsies are summarized in Table 3. Seven women (2.4%) were diagnosed with simple hyperplasia. Two were treated with depot-leuprolide acetate 3.75 mg IM one month prior to surgery; one woman was treated with oral contraceptives, while the remaining four patients were not treated with any form of medical preparation. None of these women had any residual hyperplasia at the time of their endomyometrial resection. There were two other women whose endometrial biopsies revealed complex hyperplasia, both of whom received leuprolide acetate and both of whom were subsequently found to have adenocarcinoma of the endometrium after their endomyometrial resection (Table 4).

Postoperative histological analysis was carried out on all 304 women’s tissue specimens (Table 4), the mean weight of which was 12.3 ± 8.6 g (range 2-63 g). Adenomyosis was discovered in 69 patients (22.7%), 7 of whom were considered to have severe adenomyosis, defined as adenomyosis extending to the resection margin. Of the 69 women whose initial specimens revealed adenomyosis, 9 (13.0%) had some form of subsequent surgery. Of the 235 women whose initial specimens
were devoid of adenomyosis, 18 (7.7%) went on to require additional treatment. The presence of adenomyosis did not increase the risk of subsequent surgery ($P = 0.17$).

Fourteen (4.6%) of the 304 subjects had endometrial hyperplasia; none of these were suspected preoperatively. Eleven patients (3.6%) had simple hyperplasia and 3 (1.0%) had complex hyperplasia. Another 3 (1%) patients were found to have adenocarcinoma of the endometrium. Preoperative biopsies revealed that one of the three had focal complex hyperplasia, a second had focal areas of complex adenomatous hyperplasia without atypia, and a third had a benign endocervical polyp. The first two patients had well-differentiated adenocarcinoma of the endometrium and were treated with hysterectomy and bilateral salpingo-oophorectomy. They both remain free of disease at

| Cyclic bleeding | Cyclic spotting | Constant vaginal bleeding | Pain | Hematometra | Cervical stenosis | Well differentiated | Continued bleeding after repeat ultrasound | Adeno carcinoma |
|-----------------|-----------------|----------------------------|------|-------------|-------------------|---------------------|---------------------------------------------|----------------|
| 1               |                 |                             |      |             |                   |                     |                                             |                |
| 2               |                 |                             |      |             |                   |                     |                                             |                |
| 3               |                 |                             |      |             |                   |                     |                                             |                |
| 4               |                 |                             |      |             |                   |                     |                                             |                |
| 5               |                 |                             |      |             |                   |                     |                                             |                |
| 6               |                 |                             |      |             |                   |                     |                                             |                |
| 7               |                 |                             |      |             |                   |                     |                                             |                |
| 8               |                 |                             |      |             |                   |                     |                                             |                |
| 9               |                 |                             |      |             |                   |                     |                                             |                |
| 10              |                 |                             |      |             |                   |                     |                                             |                |
| 11              |                 |                             |      |             |                   |                     |                                             |                |
| 12              |                 |                             |      |             |                   |                     |                                             |                |
| 13              |                 |                             |      |             |                   |                     |                                             |                |
| 14              |                 |                             |      |             |                   |                     |                                             |                |
| 15              |                 |                             |      |             |                   |                     |                                             |                |
| 16              |                 |                             |      |             |                   |                     |                                             |                |
| 17              |                 |                             |      |             |                   |                     |                                             |                |

Table 3.
Results of 296 preoperative endometrial biopsies.

| Endometrial Type                  | Count | Percentage |
|-----------------------------------|-------|------------|
| Proliferative endometrium         | 147   | (49.7%)    |
| Secretory endometrium             | 97    | (32.8%)    |
| Menstrual endometrium             | 14    | (04.7%)    |
| Other                             | 38    | (12.8%)    |
| Simple hyperplasia                | 7     | (02.4%)    |
| Complex hyperplasia               | 2     | (00.7%)    |

*disorganized, pseudodecidual, inactive endometrium, blood, mucous, fragments of benign endometrial polyp
their one- and two-year follow-up, respectively. The third patient was diagnosed with a FIGO Stage Ib grade II adenocarcinoma of the endometrium infiltrating into the superficial one-third of the myometrium following an endomyometrial resection and polypectomy on September 15, 1994. Because of numerous incapacitating medical problems, she was treated with radiation therapy alone. In August of 1995, she presented with a large pelvic mass consistent with a poorly differentiated adenocarcinoma of the endometrium and died in April 1996.

DISCUSSION

This new method of hysteroscopic endomyometrial resection, first reported in 1994, removes a specimen at least 3 mm in depth. Unlike the methods of DeCherney and Magos et al., the specimens are long continuous strips of uniform depth and width. Mago’s technique seeks “to excise tissue to include 1-2 mm of myometrium.” This difference is underscored by comparing the mean specimen weight obtained from our procedure, 12.3 g (range 2-63 g), and Magos’, 6.67 g (range 0.98-45 g).

The size of the specimen is important, as it provides adequate material for histologic analysis. In this series of 304 women, 17 (5.6%) had significant endometrial pathology that were missed on preoperative endometrial sampling. These abnormalities ranged from simple hyperplasia (3.6%) and complex hyperplasia (1%) to adenocarcinoma (1%). In addition, 69 women (22.7%) were found to have adenomyosis that was previously unsuspected. The completeness of the histologic specimen allows this procedure to be adapted to women with significant comorbidity. The surgeon may, in selected cases, perform both a diagnostic and operative hysteroscopy provided that the patient has not received any medications capable of altering endometrial histology.

The aggressiveness of this procedure did not appear to adversely affect its complication rate. The short-term and long-term complication rate was found to be 6.2%, with only 3.9% occurring immediately. The rate of severe complications was 0.66%, a figure quite acceptable given the nature of these complications.

The procedure is very efficacious in treating intractable uterine bleeding. In our first study, we reported an amenorrhea rate, at 6 months, of 84%. The present study reveals an overall amenorrhea rate of 85.5% in a large group of women who have been followed for an average of 31.8 months. As shown in Table 5, this is the highest rate among all of the major endometrial ablation or resection studies published to date.

Several authors have published their results by incorporating measures of “patient satisfaction.” It is worth noting that we do not include such subjective measures, which are unreliable and of limited value. The measurement of 'patient satisfaction' allows for the introduction of a selection bias when offering a particular treatment modality. If operative candidates realize that a particular method of endometrial ablation or resection produces a 25% likelihood of overall amenorrhea, many will select themselves out of this treatment regimen leaving a study population likely to be less fastidious and more easily satisfied about the requirements of their menstrual outcomes compared to ones that opted out of the study. By measuring amenorrhea rates, we may compare the outcomes of different operative modalities provided that the populations under consideration are similar in terms of age and pathology (e.g., the presence or absence of fibroids). The authors prefer to compare different modalities by measuring amenorrhea rates at a

| Table 4. | Histologic analysis of endomyometrial resection specimens. N = 304 |
|----------|----------------------------------------------------------|
|          | Endometrium                                             |
| Proliferative | 175 (57.2%)                                      |
| Secretory     | 79 (29.6%)                                       |
| Menstrual      | 5 (01.7%)                                        |
| Other          | 26 (08.6%)                                       |
| No significant pathology | 19 (06.5%)                    |
| Simple hyperplasia | 11 (03.6%)                             |
| Complex hyperplasia | 3 (1.0%)                               |
| Adenocarcinoma  | 3 (1.0%)                                        |
| Myometrium     |
| Adenomyosis    | 69 (22.7%)                                       |
| Severe adenomyosis | 7 (02.3%)                           |
| Unremarkable   | 235 (77.3%)                                     |

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specific time interval (6, 12, 24 months) on populations with similar age characteristics and on women with anatomically normal uteri—that is, without fibroids.

The importance of comparing groups with similar age characteristics cannot be overstated. Pyper et al21 noted that the “success rate [of endometrial resection] was lower in the 13 women under 40 years old (46%), in contrast to 55% for the 58 women between 40 years and 49 years and 78% for the 9 women who were 50 years or more.” Vilos12 and Garry3 also observed a positive correlation between age and increasing amenorrhea rates. Thus, Brooks et al27 were able to report a one-year amenorrhea rate of 88% by performing resectoscopic endometrial ablation in a study population whose average age was 54 (range 50-71).

The length of follow-up must also be considered when comparing the success rates of different modalities. Seeras et al28 reported a resumption of menstruation, after a 6-12 month interval of amenorrhea, in 27.2% of amenorrheic patients undergoing either endometrial ablation or resection. Rutherford et al16 showed a dramatic fall in amenorrhea rates from 6 months (75.5%) to 22 months (50.3%) of follow-up. Based on Rutherford’s data, as well as our own, it might be reasonable to surmise that at least three years are required to draw conclusions about the eventual success of any procedure. In our study, three years was the mean time for follow-up on the retreatment cases.

The high rate of amenorrhea coupled with the low rates of retreatment and subsequent hysterectomy in the present study of 304 patients, followed for up to 6 years, demonstrate that hysteroscopic endomyometrial resection is far more efficacious than other methods of endometrial destruction in women with menorrhagia that

Table 5. Comparing the major studies on endometrial ablation, endometrial resection and endomyometrial resection.

|                        | N follow-up mean (range) | mean age yr. | Amen rate | Repeat proced% | Hyst % |
|------------------------|--------------------------|--------------|-----------|----------------|-------|
| **Endometrial ablation techniques, hysteroscopic** |                        |              |           |                |       |
| Laser                  | 3Garry et al 600 15 mos (6-42) | 43±N. A.     | 28.9%     | 14.3%          | 6.8%  |
|                        | Rollerball               |              |           |                |       |
|                        | 11Chullapram et al 128 n.a. (12-52 mos) | 40.9 ± 6.1   | 25%       | 8.5%           | 8.5%  |
|                        | 9Paskowitz 200 30 mos (n.a.) | n.a.         | 40%       | 4.0%           | 5.0%  |
|                        | 10Wortman 65 12 mos      | 38.2         | 55.4%     | N.A.           | N.A.  |
| **Endometrial ablation techniques, non-hysteroscopic (“global”)** |                        |              |           |                |       |
| Cryoablation           | 16Rutherford et al 15 22 mos (22 mos) | 47.0 ± N.A.  | 50.3%     | 6.7%           | ---   |
| Thermal balloon        | 14Vilos et al 68 12 mos | 39 ± 6       | 20.6%     | 20.6%          | 4.2%  |
|                        | 15 Meyer WR et al 125 12 mos | 40.5        | 15.2%     | ----           | 1.6%  |
| **Endometrial Resection (TCRE)** | 19Magos et al 113 12 mos | 42.3         | 25%       | 7.0%           | 4.0%  |
| 20Rankin L et al 363 3-4 mos | 45 (24-72) | N.A.      | 7.5%      | 6.8%           |       |
| **Combination ablation and resection techniques** | 12Vilos GA 728 12 mos | 41 ± 7      | 60%       | 4.4%           | 2.5%  |
| **Endomyometrial Resection (EMR)** | 1Wortman et al 304 31.8 (6-75 mos) | 41.3 ± 8.0 | 85.5%     | 4.3%           | 5.0%  |

a = author’s series

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have thus far been described. Moreover, this method is no less safe than other methods.

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