CLINICAL
REPORT

RICHARD WOLF
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Bipolar Hysteroscopic Resection Using the 21 Fr. Princess Resectoscope and HF-GENERATOR 2260

DR. PHILLIP A. ROMANSKI

INTRODUCTION

Hysteroscopic myomectomy remains the gold standard for the surgical management of symptomatic submucosal myomas, offering a minimally invasive approach that optimizes fertility and restores normal uterine anatomy. While several mechanical and energy-based modalities exist, bipolar resectoscope hysteroscopy continues to stand as a highly versatile and effective cornerstone in gynecological surgery. This report describes the case of a 34-year-old patient who presented to the clinic with menorrhagia and a 12-month history of infertility. A 2 cm FIGO Type 2 fibroid located at the fundus was identified on saline infusion sonography (Figures 1-3). The patient consented to a hysteroscopic myomectomy and was taken to the operating room, where the procedure was performed using the Richard Wolf Princess Resectoscope in combination with the HF-GENERATOR 2260 using a bipolar loop electrode.

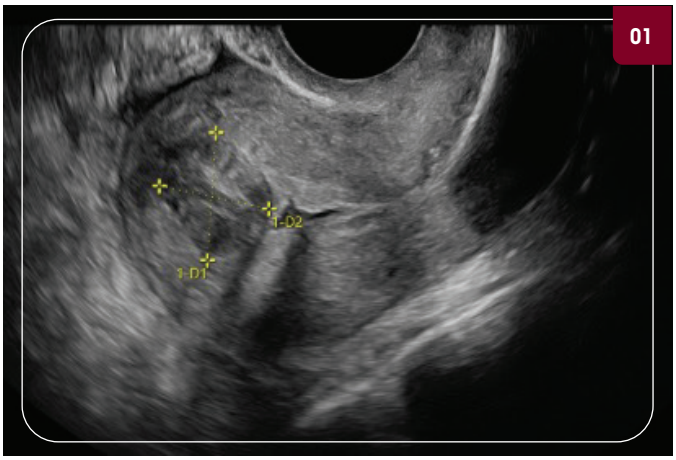

Figure 1: Mid-sagittal transvaginal ultrasound with fibroid measuring 2.0 cm x 1.7 cm.

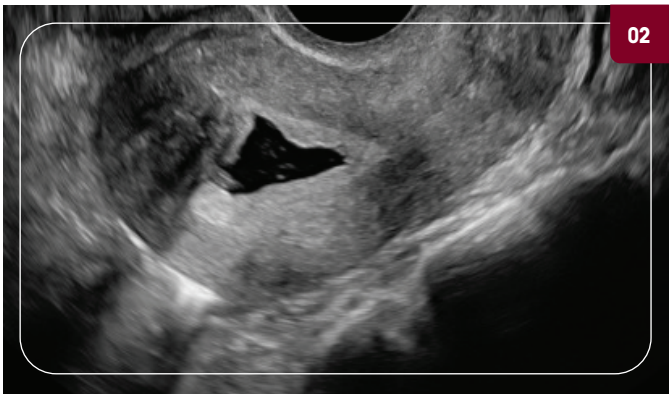

Figure 2: Mid-sagittal transvaginal saline ultrasound identifying the fibroid to be International Federation of Gynecology and Obstetrics (FIGO) Type 2 with a submucosal component but ≥ 50% of the fibroid located intramural.

Figure 3: Coronal transvaginal saline ultrasound identifying the fibroid to be International Federation of Gynecology and Obstetrics (FIGO) Type 2 with a submucosal component but ≥ 50% of the fibroid located intramural.

PATIENT SELECTION

Hysteroscopic myomectomy is indicated for the removal of symptomatic submucosal fibroids, particularly when patients present with heavy or prolonged menstrual bleeding, pelvic pain, or infertility. To maximize surgical success and prioritize safety, careful preoperative mapping of the uterine cavity is essential. The most suitable candidates for a hysteroscopic approach are those with FIGO Type 0, 1, or 2 fibroids that are less than 5 cm in diameter.

While many procedures can be completed in a single setting, certain cases carry an increased chance of requiring more than one hysteroscopic procedure to achieve complete resection. These complex scenarios include deeper FIGO Type 2 fibroids with significant intramural extension, fibroids greater than 3 cm in diameter, and the presence of multiple submucosal fibroids. For patients who present with larger or more deeply embedded fibroids, specifically FIGO Type 3 and above or fibroids measuring 5+ cm in diameter, an approach via laparoscopy or laparotomy is usually preferred to ensure complete, safe removal and to reduce the risk of intraoperative complications.

SURGICAL PREPARATION AND TECHNIQUE

In the dorsal lithotomy position, generally under monitored anesthesia care (MAC) or total intravenous anesthesia (TIVA), a tenaculum is placed on the anterior lip of the cervix. Placing the tenaculum vertically allows the prongs to grasp perpendicular to the circumferential muscle fibers. Compared to a horizontal grasp, which places the prongs parallel to the muscle fibers, the vertical placement reduces the risk of tearing the cervical tissue, an injury more likely to occur in a nulliparous or stenotic cervix when dilation to a large diameter is required.

- **Cervical Dilation:** The cervix is dilated just enough to accommodate the outer sheath of the Princess Resectoscope. If the cervix is under-dilated, the narrow caliber opening increases mechanical friction, making the passage of the resectoscope in and out of the cervical canal significantly more difficult. If the cervix is over-dilated, distension media will leak around the resectoscope, making it more difficult to maintain adequate distension of the uterine cavity.

To ensure a safe entry, the camera focus should be adjusted for near-distance viewing (typically within 1 cm of the lens), allowing for precise visualization of the endocervical canal directly in front of the scope. Opening the fluid inflow prior to insertion is highly recommended, as the fluid exiting the instrument at the distal tip provides immediate hydrodilation of the cervix. This opens the canal ahead of the instrument and optimizes visibility during entry.

Once the resectoscope enters the uterine cavity, the outflow valve should be gently opened to begin clearing any blood or debris. Once visual clarity is established, the outflow is gradually dialed down until a stable equilibrium is reached, where the uterine cavity remains fully distended and the fluid remains clear without pooling blood. Mastering the balance between fluid inflow and outflow is a critical skill for maintaining a clear operative field and ensuring a successful, efficient surgery.

- **The Balance of Flow:** Insufficient outflow often results in the ineffective clearance of blood, causing the distension medium to quickly cloud and limit visualization. Conversely, excessive outflow drops intrauterine pressure below the optimal threshold, resulting in poor uterine distension and a collapsed operative field.

At this point, the camera should be refocused on the fundus and a full cavity survey should be completed. The bilateral ostia should be identified to orient the surgeon and to confirm the instrument is in the correct location, and the endometrial walls should be completely surveyed, noting any expected or unexpected pathology. Finally, attention is focused on the fibroid to begin the planned procedure (Figures 4-5).

Figure 4: Hysteroscopic image of the uterine fundus which identifies the submucosal component of the fibroid in relation to the left ostium.

Figure 5: Hysteroscopic image of the submucosal component of the fibroid in relation to the right ostium.

Before activating the electrocautery, the blunt distal tip of the cold loop electrode is utilized to palpate both the proximal and distal borders of the fibroid. Applying gentle, targeted pressure and traction at these anatomical junctions initiates the mechanical dissection of the fibroid, gradually separating it away from the pseudocapsule and surrounding normal myometrium (Figure 6). Exercising patience during this initial, non-thermal step provides two critical clinical advantages:

- **Border Delineation:** It allows the surgeon to clearly map the true margins of the fibroid, ensuring precise resection margins once energy is applied.
- **Fibroid Delivery:** Mechanical traction often encourages a portion of the intramural component of the fibroid to deliver or "protrude" out of the underlying myometrium and into the uterine cavity. This makes the subsequent resection considerably easier, faster, and safer.

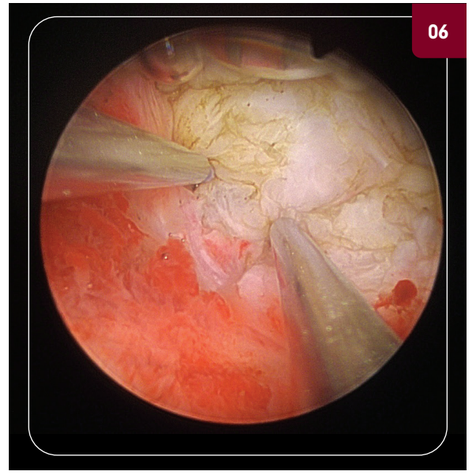

Figure 6: The extended loop electrode is used without electrocautery to palpate and bluntly establish the surgical plane between the fibroid and the surrounding myometrium.

SURGICAL PREPARATION AND TECHNIQUE
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For smaller submucosal fibroids, this mechanical dissection technique can occasionally be used to completely enucleate and remove the fibroid intact without the need for any electrocautery.

Once the true borders of the fibroid are clearly delineated, the loop electrode is advanced to the distal edge of the fibroid. With the cutting energy activated, the surgeon executes sequential, steady passes of the loop electrode from the distal to the proximal fibroid edge, creating thin, manageable strips (Figure 7).

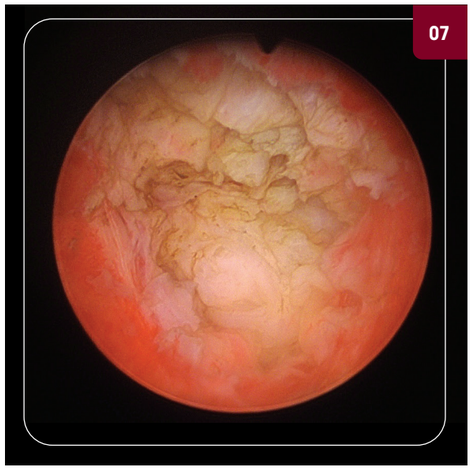

Figure 7: The submucosal fibroid midway through the hysteroscopic resection. Fibroid strips have been resected with electrocautery but a portion of fibroid still remains intact.

- **Optimizing Efficiency in Initial Passes:** To maximize tissue retrieval, the initial passes should be made relatively deep, continuing uninterrupted until the loop reaches the proximal edge of the fibroid. For larger fibroids where the diameter exceeds the distance of the extended loop electrode, the surgeon can gently pull the entire resectoscope back toward themselves while making the cut. This dynamic movement allows the loop to cover the necessary distance between the distal and proximal margins in a single, continuous sweep.
- **Tissue Chip Accumulation:** Successive passes are made repeatedly as long as visualization remains clear and unobstructed. This allows the resected fibroid chips to temporarily accumulate within the uterine cavity without requiring frequent instrument withdrawals.

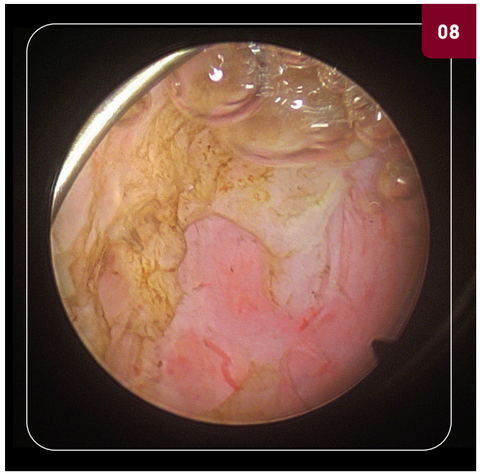

Figure 8: The pseudocapsule distal to the fibroid has been reached with thin portions of fibroid remaining attached in a few areas.

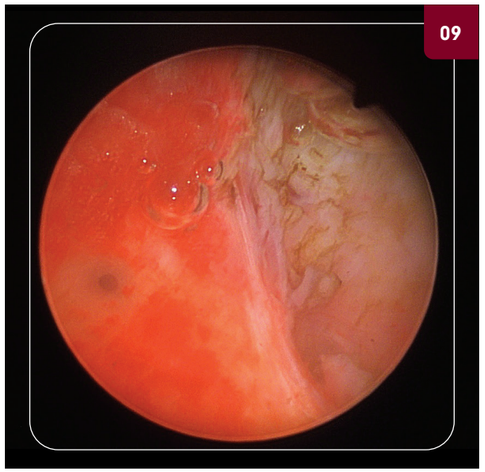

Figure 9: The pseudocapsule and myometrial border on the right side of the fibroid is seen in relation to the right ostium.

- **Approaching the Myometrial Margin:** As the resection progresses deeper toward the myometrial borders and down to the base of the fibroid, the surgical approach must adapt. The passes must become progressively more superficial and controlled, shifting the focus to precision to prevent any accidental cutting into the surrounding healthy myometrium (Figures 8-9).

During the resection, blood vessels within the fibroid are likely to be disrupted, which can cloud the distending media and limit visualization. When this occurs, the loop electrode can be pivoted immediately from cutting to coagulation mode to seal the bleeding vessel. This real-time hemostasis prevents the distension medium from clouding and restores visual clarity. This direct, intraoperative control over bleeding represents a distinct advantage of bipolar resectoscopes over purely mechanical tissue removal devices, which lack energy capabilities and often require the operator to pause or change modalities to manage active bleeding.

- **Fibroid Chip Management:** To efficiently clear the field when accumulated tissue chips begin to limit visualization, the resectoscope is temporarily withdrawn, and polyp forceps are introduced to grasp and extract multiple chips at a time until reaching diminishing returns. At this point, the resectoscope is reinserted to capture the remaining fragments by pinning them with the loop electrode against the distal tip of the sheath. To maximize surgical efficiency and avoid the need for complete instrument withdrawal, the resectoscope can be pulled back only into the proximal half of the cervix, where the chip is released. At that point, it flows out of the cervix and falls directly into the under-buttocks drape. Because the tip of the resectoscope remains safely within the cervical canal, it can be immediately advanced back into the uterine cavity, allowing the surgeon to perform multiple quick extraction passes without having to fully exit and re-enter the external cervical os each time.

For deeper, FIGO Type 2 fibroids, the brief pause in resection required to clear the tissue chips serves a distinct physiological advantage. During the few minutes spent removing the resected debris from the cavity, the underlying uterine myometrium naturally contracts. This mechanical contraction pushes the remaining intramural portion of the fibroid inward, effectively delivering it out of the deep uterine wall and into the cavity. As a result, the surgeon can continue with a safe, complete resection of the newly exposed tissue while maintaining a reassuring margin from the outer myometrial borders.

As the procedure nears completion, the surgeon can continue to alternate between activated passes and mechanical palpation using the cold loop electrode. This continuous tactile feedback is highly advantageous; the operator can directly feel when they are approaching the true base of the fibroid, as the tissue becomes noticeably more mobile and distinct from the underlying myometrium. Using this precise combination of visual and mechanical markers, the remaining portions of the fibroid are resected until only the smooth, intact myometrial bed remains. Once the fibroid is fully removed, the cavity is thoroughly inspected for bleeding vessels that may require coagulation until definitive hemostasis has been achieved. With the operative field clear and the myometrial margins preserved, the procedure is successfully concluded (Figure 10).

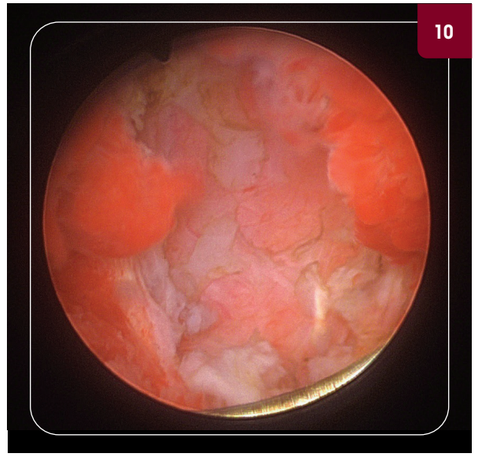

Figure 10: Nearing the completion of the procedure, the cavity which previously contained the fibroid and its myometrial base can be visualized. Normal endometrium located to the right and left of the fibroid cavity can also be seen.

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ADVANTAGES OF THE PRINCESS RESECTOSCOPE AND HF-GENERATOR 2260

The surgical synergy of the Richard Wolf Princess Resectoscope and the HF-GENERATOR 2260 offers a highly efficient and versatile system that addresses the primary objectives of the hysteroscopic surgeon: **precision, safety, and operational control.**

The Princess Resectoscope distinguishes itself with an ultra-slim outer diameter that significantly reduces the need for aggressive cervical dilation, thereby minimizing cervical trauma and optimizing patient comfort. The Princess Resectoscope is available in a 7 mm/21 French outer diameter sheath and an 8 mm/24 French outer diameter sheath that can be paired with a larger loop electrode, which may be more efficient for fibroids that measure 3+ cm in diameter. Combined with a high performance, continuous flow irrigation system, it ensures excellent visual clarity by rapidly flushing out blood and debris.

When paired with the advanced HF-GENERATOR 2260, the surgeon gains access to stable and responsive bipolar energy that allows for clean, effortless cutting and immediate coagulation in an isotonic saline medium. When the *"Mode: Resection Bipolar"* and the *"Profile: Hysteroscopy Standard"* are selected, the power settings of the HF-GENERATOR 2260 are pre-set to optimal voltage and wattage to handle nearly all hysteroscopy procedures. While these settings can be easily adjusted by the surgeon when needed to alter the depth and lateral spread of the cutting and coagulating current, the preset power settings are optimized for hysteroscopic surgery in tandem with the Princess Resectoscope and very rarely need to be adjusted. This capability not only virtually eliminates the risk of severe hyponatremia but also grants the operator the distinct advantage of managing intraoperative bleeding in real-time. Ultimately, this integration delivers a highly tactile, ergonomic, and reliable platform that shortens operative times and enhances procedural safety, even when navigating the most challenging intrauterine pathology.

DISCUSSION

After 47 minutes of operating time, the submucosal fibroid was completely resected down to the underlying myometrial bed, definitive hemostasis was achieved, and the procedure was successfully concluded. The fluid deficit was 1680 mL of normal saline and the estimated blood loss was 20 mL. The pathology resulted as benign muscular tissue consistent with leiomyoma. A repeat saline ultrasound approximately one month after the procedure showed normal appearing myometrium and a normal uterine cavity absent of intra-cavitary pathology (Figures 11-12). The patient then proceeded with infertility treatment which included ovarian stimulation for in vitro fertilization followed later by a frozen embryo transfer.

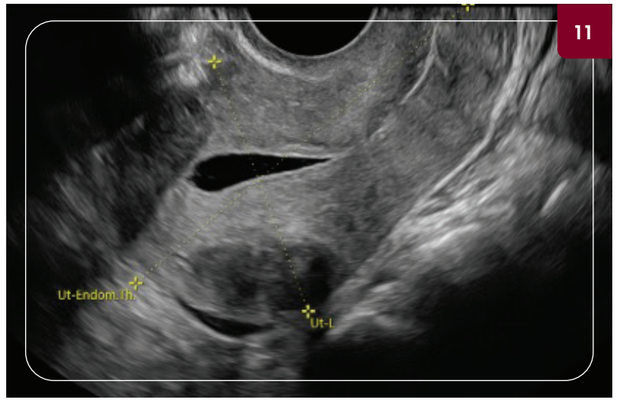

Figure 11: One-month post-operative mid-sagittal transvaginal saline ultrasound identifying the resected fibroid cavity to be well healed. The uterine cavity is now normal size and shape without intrauterine pathology.

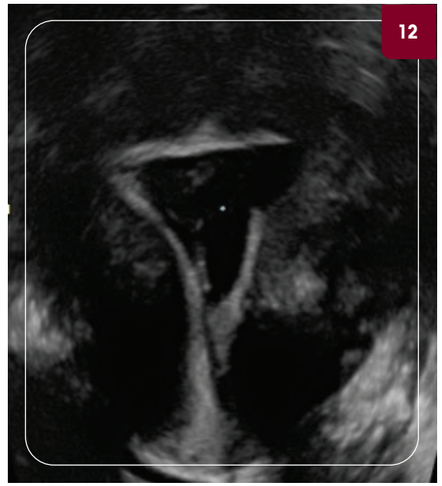

Figure 12: One-month post-operative coronal transvaginal saline ultrasound identifying the resected fibroid cavity to be well healed. The uterine cavity is now normal size and shape without intrauterine pathology.

Several specialized features of the Richard Wolf Princess Resectoscope and the HF-GENERATOR 2260 were particularly advantageous in managing this case successfully:

1. **Superior Maneuverability in Challenging Anatomy:**
   The extendable loop electrode proved highly beneficial for navigating difficult anatomical regions, particularly when operating at the uterine fundus or near the cornual regions. Using the distal tip of the loop to manipulate the tissue with cold mechanical dissection was critical for safely mobilizing the fibroid to allow for a safer, more controlled resection in these challenging areas. In contrast, alternative devices with closed or rigid tip profiles offer less flexibility, making it harder to access and treat fibroids in these specific locations without increasing the risk of uterine perforation.

2. **Rotatable Sheath System:**
   The resectoscope's dual sheath design allowed the inner working element to rotate 360 degrees freely. Because the outer sheath remained stationary within the cervical canal, there was no twisting force applied to the cervix itself. This provided exceptional maneuverability while preventing unnecessary friction and trauma against the endocervical tissue as the loop was continuously repositioned throughout the case.

3. **Bipolar Electrode:**
   The sophisticated bipolar output of the HF-GENERATOR 2260 was instrumental in the successful completion of this case. Operating near the fundus requires high precision to ensure complete tissue clearance without compromising the myometrial wall. The voltage and wattage power settings of the HF-GENERATOR 2260 optimized for use with the Princess Resectoscope resulted in precise current delivery such that the loop electrode was able to glide effortlessly through dense fibroid tissue with minimal thermal spread, ultimately allowing for a single stage, complete removal of the fibroid.

4. **Immediate Hemostatic Control:**
   The ability to quickly toggle between cutting and coagulation modes on the HF-GENERATOR 2260 whenever a bleeding vessel was encountered allowed the surgeon to immediately seal the vessel and continue with the resection. This helped to minimize the fluid deficit and eliminated the need to withdraw the scope or introduce a separate instrument, maintaining excellent visibility and a seamless efficiency of motion during the resection.

5. **Versatility in Instrument Caliber:**
   The availability of both 21 French and 24 French options offers critical clinical versatility. Utilizing the larger loop on a bulkier fibroid maximizes tissue yield per pass and reduces total operative time. Conversely, the smaller caliber option can be selected for smaller fibroids, requiring significantly less cervical dilation and minimizing postoperative patient discomfort.

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CONCLUSION

Hysteroscopic surgery offers a compelling, minimally invasive alternative to traditional abdominal procedures by allowing direct visual access to the uterine cavity, which preserves the structural integrity of the myometrium, reduces recovery times, and optimizes reproductive outcomes. When this approach is paired with advanced bipolar surgical tools such as the Princess Resectoscope and the HF-GENERATOR 2260, both procedural safety and operative efficiency are significantly enhanced. Bipolar energy allows for precise, controlled tissue cutting and simultaneous coagulation within an isotonic medium such as normal saline, virtually eliminating the risks of severe hyponatremia and electrolyte imbalance traditionally associated with the non-conductive distension fluids used in monopolar systems. By utilizing this dual action modality, surgeons can achieve rapid, high yield tissue removal while maintaining excellent visual clarity and patient safety, ultimately resulting in the successful restoration of normal uterine anatomy.

PHILLIP A. ROMANSKI, MD, MSc

Dr. Romanski is a reproductive endocrinologist and infertility specialist who currently serves as an Assistant Professor of Obstetrics, Gynecology, and Reproductive Science at the Icahn School of Medicine at Mount Sinai. He specializes in the surgical management of complex intrauterine pathology including mullerian anomalies, intrauterine adhesions, and submucosal leiomyomas, with a focus on optimizing endometrial receptivity and subsequent reproductive outcomes.

Richard Wolf Medical Instruments Corporation
353 Corporate Woods Parkway, Vernon Hills, IL 60061- 3110
www.richard-wolf.com/en-us/

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