How I do it: Aquablation in very large prostates (> 150 mL)

Brian T. Helfand, MD,[1] Ali Kasraeian, MD,[2] Steve Sterious, MD,[3] Alexander P. Glaser, MD,[1] Pooja Talaty, MD,[1] Miguel Alcantara, MD,[2] Kaitlyn Mola Alcantara, MD,[2] Andrew Higgins, MD,[3] Eric Ghiraldi, MD,[3] Dean S. Elterman, MD[4]

[1]Department of Surgery, NorthShore University Health System, Evanston, Illinois, USA
[2]Kasraeian Urology, Jacksonville, Florida, USA
[3]Department of Urology, Albert Einstein Healthcare Network, Philadelphia, Pennsylvania, USA
[4]University Health Network, University of Toronto, Toronto, Ontario, Canada

HELFAND BT, KASRAEIAN A, STERIOUS S, GLASER AP, TALATY P, ALCANTARA M, ALCANTARA KM, HIGGINS A, GHIRALDI E, ELTERMAN DS. How I do it: Aquablation in very large prostates (> 150 mL). *Can J Urol* 2022;29(2): 11111-11115.

Aquablation has been well-studied in prostates sizes up to 150 mL. Recently, American Urological Association guidelines distinguish surgical interventions for men with large prostates (80 mL-150 mL) and now very large prostates (> 150 mL). Readers will gain an understanding of how to use Aquablation in the very large prostate size category.

Key Words: Aquablation, BPH, LUTS, prostate surgery, robotics, urology

Introduction

The management of LUTS has become increasingly complex based upon a number of variables including a plethora of medical and surgical interventions that are available for the treatment of benign prostatic hyperplasia (BPH). The choice of treatment option can be influenced by many factors including most severe urinary symptom, degree of patient bother, need for anticoagulation, desire for preservation of anterograde ejaculatory function, length of surgical recovery period, as well as the shape and volume of the prostate. In regard to the latter, the American Urological Association (AUA) guidelines now recommend a volume estimate study prior to intervention. This recommendation was based in part on the fact that available treatment options may be more suited for men with different shaped prostates. Specifically, guidelines distinguish surgical interventions for men with large prostates (80 mL-150 mL) and very large prostates (> 150 mL).[1]

Accepted for publication January 2022

Address correspondence to Dr. Brian T. Helfand, Division of Urology, NorthShore University HealthSystem, 2650 Ridge Avenue, Evanston, IL 60201 USA

Current surgical management options for men with very large prostates (> 150 mL) are limited. Simple prostatectomy, whether done open or laparoscopically/robotically, carries increased surgical risks and transurethral resective procedures for very large prostates can lead to increased operative time[2] with increased risk of bleeding, transfusions, sexual dysfunction and a relatively prolonged indwelling catheter time and recovery period. Anatomic enucleation of the prostate (AEEP) is endorsed by the AUA guidelines using both holmium and thulium lasers. However, the proliferation of AEEP has been relatively limited amongst urologists due to changes in training and skill acquisition. By leveraging imaging, software, and robotics, Aquablation has standardized the procedure regardless of prostate size that results in a short learning curve and reproducible, consistent operating times.[3] We describe the steps to treat a very large prostate (> 150 mL) with Aquablation.

Patient selection

Men evaluated for lower urinary tract symptoms (LUTS) undergo a standard assessment that include an International Prostate Symptoms Score (IPSS) questionnaire, sexual health inventory questionnaire, post void residual and transrectal ultrasound volumetric study. Some men undergo uroflowmetry measurements. Because Aquablation is agnostic to size, some of these studies were performed in the clinic preoperatively and some were performed in the operating room based on patient preference.

Figure 1a. Aquablation treatment planning interface. Image courtesy of PROCEPT BioRobotics.

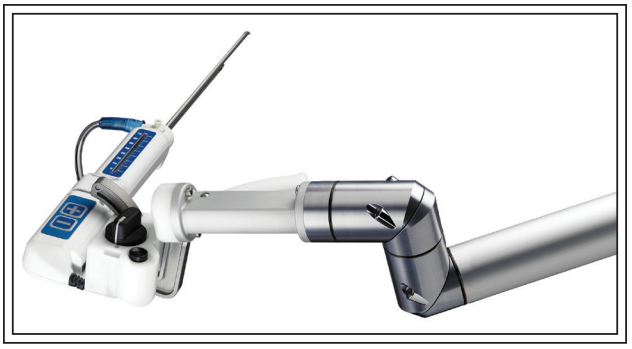

Figure 1b. Aquablation single-use handpiece connected to motorpack and mounted on articulating arm. Image courtesy of PROCEPT BioRobotics.

Aquablation procedure

Aquablation therapy performed by the AquaBeam System (PROCEPT BioRobotics, Redwood City, California, USA) has been previously described, Figures 1a and 1b.[4] Prior to the procedure all anticoagulation medications were stopped before surgery and were not restarted for approximately 3-4 days postoperatively. Once in the operating room, the patient is placed in the lithotomy position where general or spinal anesthesia is initiated, Figure 1c. An Apogee

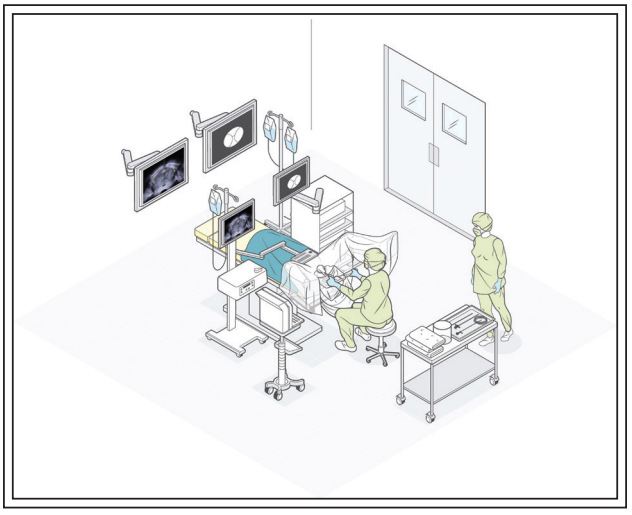

Figure 1c. Operating room layout for Aquablation procedure. Image courtesy of PROCEPT BioRobotics.

2300 biplane transrectal ultrasound (SIUI, Guangdong, China) is inserted and positioned for optimal imaging of the prostate. The 24F handpiece probe is then inserted into the prostatic urethra and secured using a bed-mounted articulating arm. With real-time prostate visualization, the surgeon uses the planning software on the CPU, the monitor screen, to mark the target resection contour. Under the surgeon's control, the ablation of tissue is robotically executed using a high-velocity waterjet to resect adenomatous tissue while avoiding the verumontanum and the ejaculatory ducts. Hemostasis is then performed using a focal bladder neck cautery technique.[5] Finally, a 3-way urinary hematuria catheter is inserted. Postoperatively the patient was observed on continuous bladder irrigation (CBI). Gentle catheter traction was used at the discretion of the urologist and clinical team. The patient was discharged on the same day or POD1 with or without a catheter depending upon surgeon preference and the color of urine in the catheter graded from I-III.[6]

Description of additional considerations and technique for men with very large prostates

Some additional procedural steps are required for men with very large prostates (> 150 mL). This is based upon the current limits of the length of the handpiece (maximum ablation length of 7 cm) and depth of penetration (maximum depth of destruction 2.4 cm). Since very large prostate glands often have a longer length and/or greater depth, the surgeon will often need to perform multiple passes with the waterjet.

The approach for a very large prostate begins the same as an average or large volume prostate. Specifically, the handpiece is positioned as anterior as possible in the bladder outlet with the tip of the handpiece approximately 1 cm beyond the most proximal aspect of the median bar or lobe. For men with prostate lengths greater than 7 cm, the scope tip will not reach the external sphincter, Figure 2. Although the scope tip does not reach the external sphincter, the surgeon should proceed with additional planning. To this end, surgical planning will continue in the transverse view. If there is an intravesical median lobe, the surgeon can plan the angle accordingly, Figure 3. The surgeon continues by rolling the TRUS probe to mid prostate and planning the appropriate angle (not shown). However, often the prostate adenoma volume is too great to be covered in one pass. Therefore, multiple passes should be considered.

The TRUS probe is advanced forward to bring the sagittal view into full view. The first contour plan is then set to the maximum dimensions of 2.4 cm deep and 7 cm in length, Figure 4. However, as discussed, this will not be sufficient to ablate the adenoma on a

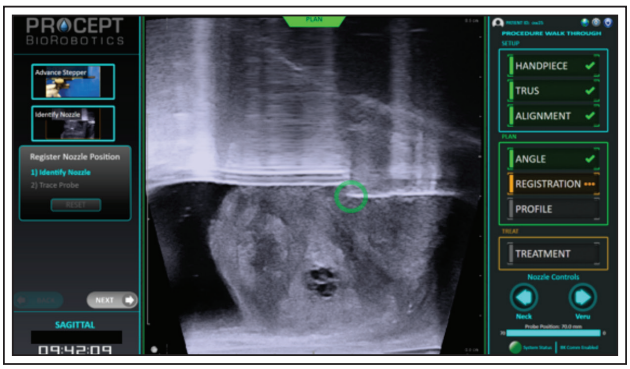

Figure 2. Initial anterior handpiece positioning. The green circle marks the scope tip.

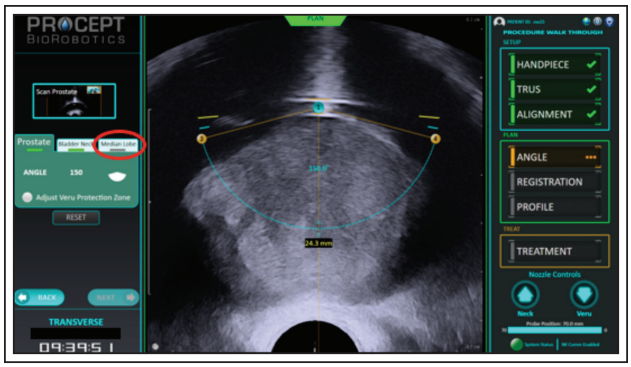

Figure 3. Intravesical median lobe planning. In this step, the surgeon will click on the "median lobe" tab to set the angle.

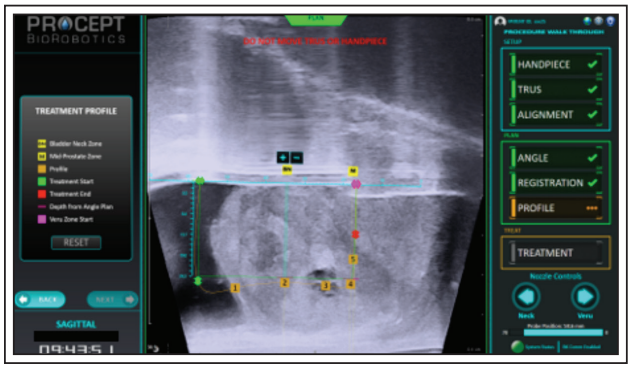

Figure 4. The contour plan is done in the sagittal view. Of note, the veru protection zone is minimized because the current ablation zone is not covering that particular anatomy in this first treatment pass.

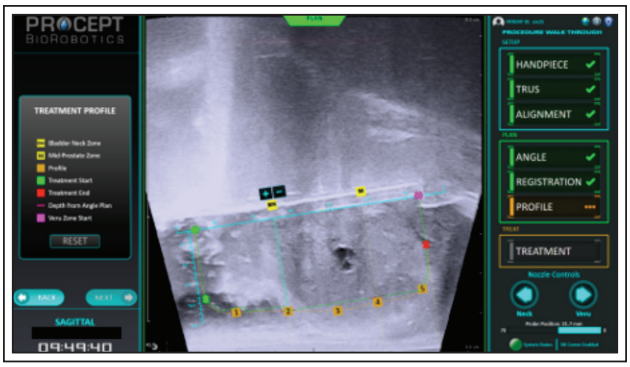

Figure 5. To achieve a deeper cut, the surgeon can dip the handpiece and replan the contour for the second treatment pass.

single pass. Of note, the veru protection zone feature of Aquablation is removed at this point since the scope tip has not been positioned at the external sphincter for the initial passes. The surgeon will execute this treatment plan and then setup for a second contour plan. Prior to starting the second pass, the handpiece position should be adjusted. To maximize depth of the waterjet and permit destruction of the residual adenoma, the surgeon will need to dip the tip of the handpiece down, Figure 5. Care should be taken not to move the handpiece proximally or distally during this repositioning. As such this should be accomplished under real-time ultrasound imaging. Adjustment of the treatment plan, including confirmation of the angle plan, should then be performed. A second pass of the waterjet is then completed.

Next, a third treatment plan is performed to address the length of the prostate. To treat long prostates (> 7 cm

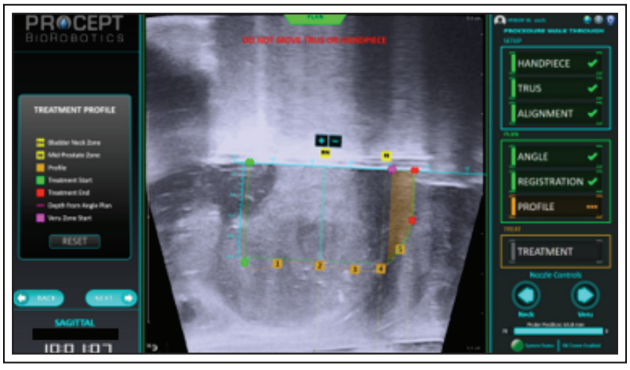

Figure 6. The final treatment plan is done by pulling the handpiece out of the body a few centimeters to cover the external sphincter with the scope. The third, and final, treatment contour is mapped.

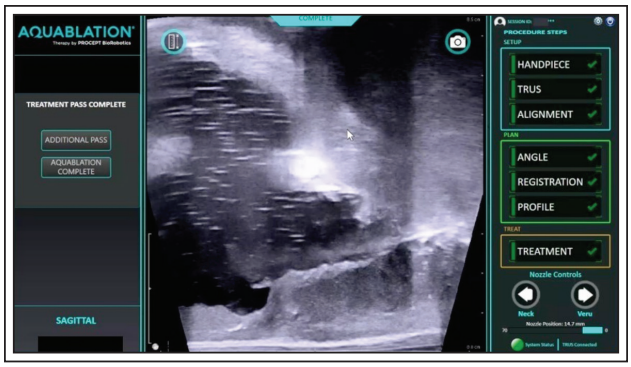

Figure 7. Following the hemostasis step, the surgeon can visualize the obstructive tissue that has been removed.

in length), the handpiece will have to be first leveled back to the horizontal position. Next, the handpiece will require physical re-positioning. As such, the handpiece will need to be pulled back several centimeters to cover the residual adenoma that exists from the distal portion of the first two treatment plans to the edge of the peripheral zone. The scope tip should be visually placed at the edge of the peripheral zone by covering the external sphincter. A final treatment plan, including angle planning, is then performed to remove the residual adenoma, Figure 6. In this treatment plan, the surgeon will utilize the veru protection zone planning feature.

Following removal of the handpiece and performing clot evacuation, the surgeon will then perform the recommended focal bladder neck hemostatic technique, as previously described.[5] The method addresses the remnant tissue, which has a cloud-like "fluffy" appearance that is 8 mm-15 mm in depth. Briefly, a monopolar or bipolar resectoscope is inserted. This device is then used to remove the "fluffy" ablated tissue to access deeper arterial vessels. Hemostasis then occurs after identification of bleeding vessels around the bladder outlet. Once satisfied with hemostasis and removal of the resectoscope, the surgeon can confirm the large channel created from removing much of the obstructive tissue on live ultrasound, Figure 7.

Clinical outcomes

Helfand et al[7] previously reported a cohort of treating 34 very large prostates with a mean age of 69 ± 8 (range 54-83). The average prostate volume was 209 mL ± 56 (range 151 mL-362 mL). There were no reports of transfusions in this cohort of patients and most patients were discharged POD1. Symptoms at baseline evaluated with IPSS and an average 19 ± 6. With a mean

follow up of 7 ± 9 months, the IPSS score was 7 ± 5. Peak urinary flow rate, Qmax, were 7 ± 4 mL/s and 19 ± 5 mL/s for baseline and follow up, respectively. There were no reports of incontinence, erectile dysfunction, or ejaculatory dysfunction.

Discussion

Most prostates greater than 150 mL typically require repositioning of the handpiece for either depth or length as described above. These maneuvers are simple and incorporate the exact planning steps used for smaller prostates. The ultrasound guidance provides a clear picture as to the complexities of the prostate to which the surgeon can adapt a treatment plan to resect the obstructive tissue. If repositioning is necessary, the surgeon can use both the ultrasound view as well as the cystoscopic view to ensure proper positioning of the handpiece.

Disclosures

Drs. Helfand, Kasraeian, Sterious, and Elterman have had or currently have a consulting agreement with PROCEPT BioRobotics. No funding was received for this manuscript. □

References

1. Lerner LB, McVary KT, Barry MJ et al. Management of lower urinary tract symptoms attributed to benign prostatic hyperplasia: AUA guideline part II—surgical evaluation and treatment. *J Urol* 2021;206(4):818-826.
2. Riedinger CB, Fantus RJ, Matulewicz RS et al. The impact of surgical duration on complications after transurethral resection of the prostate: an analysis of NSQIP data. *Prostate Cancer Prostatic Dis* 2019;22(2):303-308.
3. Nguyen D-D, Misraï V, Bach T et al. Operative time comparison of aquablation, greenlight PVP, ThuLEP, GreenLEP, and HoLEP. *World J Urol* 2020;38(12):3227-3233.
4. MacRae C, Gilling P. How I do it: Aquablation of the prostate using the AQUABEAM system. *Can J Urol* 2016;23(6):8590-8593.
5. Elterman DS, Foller S, Ubrig B et al. Focal bladder neck cautery associated with low rate of post-Aquablation bleeding. *Can J Urol* 2021;28(2):10610-10613.
6. Stout TE, Borofsky M, Soubra A. A visual scale for improving communication when describing gross hematuria. *Urology* 2021;148:32-36.
7. Helfand BT, Glaser AP, Kasraeian A et al. Men with lower urinary tract symptoms secondary to BPH undergoing Aquablation with very large prostates (> 150 mL). *Can J Urol* 2021;28(6):10884-10888.