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REVIEW ARTICLE

“Aquabeam® System” for benign prostatic hyperplasia and LUTS: birth of a new era. A systematic review of functional and sexual outcome and adverse events of the technique

Reale Giulio[1] · Cimino Sebastiano[1] · Bruno Giorgio[2] · Palmieri Fabiano[2] · Giardina Raimondo[1] · Russo Giorgio Ivan[1] · Grimaldi Enrico[1] · Voce Salvatore[2] · Morgia Giuseppe[1]

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Abstract

Purpose Aim of this systematic review is to evaluate functional outcomes (Qmax, QoL, IPSS, PVR), sexual outcome (erectile dysfunction and anejaculation rate), and adverse events evaluated according to the Clavien–Dindo classification.
Methods The bibliographic search with the included terms (prostate, benign prostatic hyperplasia, benign prostatic enlargement, lower urinary tract symptoms, water jet dissection, aquablation, Aquabeam®) produced a literature of 32 articles altogether. After removing papers of not interest or articles which the outcomes could not be deduced, nine studies were examined for a total of 664 patients screened.
Results The functional outcomes, evaluated after water jet dissection, have shown improvement with respect to the baseline in all the selected articles. In the comparison papers with the TURP, the Aquablation has been statistically not inferior regarding functional outcomes. The sexual outcomes have highlighted a better ejaculation rate for water jet dissection than TURP. Regarding the adverse events, water jet dissection documented low rates of adverse events and, in comparison studies, were not statistically superior than TURP.
Conclusions In our systematic review, the Aquabeam® System for the treatment of LUTS/BPH has proven to be a safe technique that provides functional outcomes comparable to TURP. About sexual outcomes, the most important data is certainly the low rate of retrograde ejaculation. However, other multicenter randomized trials with larger cohorts and longer follow-up are still needed.

Introduction

Benign prostatic hyperplasia (BPH) is today one of the most common benign diseases in male subjects: it is estimated that 50–75% of men over 50 years experience a symptom of BPH/lower urinary tract symptoms (LUTS) [1]. The incidence of the pathology would therefore be estimated in men over 55 years of about 34.4 cases per 1000 person-years [1]. BPH/LUTS may negatively affect the sleep of patients and in an advanced stage it can result in serious complications such as hematuria, bladder lithiasis, bladder diverticulosis up to serious consequences of chronic renal failure. For these reasons, surgery is advised in patients who do not respond to medical therapy in order to avoid the mentioned complications. For several decades, surgical treatment of benign prostatic pathology, for prostate volumes between 30 and 80 g, has been related to the transurethral resection of prostate (TURP), a technique that is safe and with relevant functional outcomes in terms of reduction of International Prostate Symptoms Score (IPSS), increase of Qmax, increase of quality of life (QoL), and reduction of post voiding residue (PVR) [2]. Previous data reported intraoperative complications (bleeding, perforation of the capsule, need for transfusion, TUR syndrome) that exceeded 3% and postoperative complications (risk of acute retention of urine and need for catheterization, clot retention, hematuria, urosepsis, UTI) that settled at just over 18% of cases [2]. The technological research has therefore been pushed towards new technologies such as the introduction of laser treatments (Holmium laser, Thulium laser, Greenlight laser)

✉ Reale Giulio
dottorgreale@gmail.com

1 Department of Surgery, Urology Section, University of Catania, Catania, Italy

2 Urology Division, S. Maria delle Croci Hospital, Ravenna, Italy

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which have shown significant benefits in terms of reducing complications with functional outcomes not inferior to the TURP [3–5]. Moreover, emergent techniques are taking place in the landscape of the surgical treatment of BPH/LUTS. One of the most promising techniques is the "water jet dissection" on the prostatic parenchyma [6] performed by Aquabeam® System (PROCEPT BioRobotics, Redwood Shores, CA, USA), introduced for the first time in clinical practice in 2013 with a single non-randomized trial by Gilling et al. on 15 patients [7] and afterwards examined by two international, multicenter, prospective, randomized clinical trials WATER I [8] AND WATER II [9]. The aim of this systematic review is to evaluate functional outcomes (Qmax, QoL, IPSS, PVR), sexual outcome (erectile dysfunction and anejaculation rate), and adverse events evaluated according to the Clavien–Dindo classification

Methods

This review has been conducted according to the Preferred Reporting Items for Systematic Reviews and Meta-analysis guidelines [10].

Search

An electronic search of the PubMed, Medline, and Scopus was undertaken until October 2018 without restriction on year of publication. The search was limited to English-language articles. The search terms included prostate, benign prostatic hyperplasia, benign prostatic enlargement, lower urinary tract symptoms, water jet dissection, aquablation, Aquabeam®. Citation lists of retrieved articles were screened manually to ensure sensitivity of the search strategy. References of the included papers were hand searched to identify other potential relevant studies.

Data collection process

Studies were reviewed by two independent reviewers (G.R. and G.I.R.); differences in opinion were discussed in consultation with the last author (M.G.). Figure 1 shows the flowchart of included studies.

Data items

In our systematic review we studied three main fields: functional outcomes, adverse events, and sexual outcomes. Regarding functional outcomes we evaluated the median age of the patient (years), median prostate volume (cc), median operative time (min), median resection operative time (min), IPSS decrement (point), Qmax improvement (mL/s), post voiding residue decrement (cc), and quality of life improvement (point). The adverse events have been collected following the Clavien–Dindo classification (Grade I, Grade II, Grade III, Grade IV). Finally, for sexual outcomes, IEEF-5 decrement (%) and anejaculation rate (%) have been evaluated (for all the parameters, the standard deviation (SD), where detectable, or event percentage have been evaluated).

Study selection and data

The bibliographic search with the included terms produced a literature of 32 articles altogether. There were no duplicates, so these studies were initially divided into three categories: excluded, included, and possibly relevant. Twenty-one studies were excluded from the review for not meeting inclusion criteria. Subsequently, the remaining studies were revised with the exclusion of 2 studies from which the outcomes could not be deduced. It is important to underline how, among the selected papers, an analysis of Water I cohort [11], a pooled analysis on WATER I and WATER II cohort [12], and a WATER II subpopulation analysis [13] have been included. The patients present in the aforementioned papers were not included in the final calculation of the total number of patients included in the systematic review. However, we maintained the results of these studies because they evaluated the parameters included with longer follow-up. Nine studies were examined for a total of 445 patients screened.

Functional outcomes

The Water I trial [8], with a 6-month follow-up, showed that there was no statistically significant difference between Aquabeam® and TURP in terms of increase of Qmax and QoL, reduction of IPSS and PVR (Table 1). However, it has a lower effective resection time for aquablation than for TURP (3.9 ± 1.4 min vs 27.4 ± 12.5 min; $p < 0.0001$). The results obtained in WATER I were preparatory for a subsequent analysis [11] on the WATER cohort that allowed to extend the follow-up of the WATER (6 months) to a 1 year follow-up, obtaining identical results in terms of Qmax, QoL, IPSS, and PVR (Table 1). However, WATER evalued prostate volumes of less than 80 g. The challenge of WATER II (NCT03123250) was precisely to evaluate whether the aquablation technique was safe even in patients with prostate volumes above 80 g, but the functional outcomes were evaluated on a subpopulation of 19 patients of WATER II from Zorn et al. [13]. Even for large-volume prostates, a 3-month statistical significance of follow-up compared to baseline was highlighted for what concerns the increase of Qmax and the reduction of IPSS and PVR. These data have been also confirmed by Chughtai and Thomas [12], since in the pooled analysis they recorded an

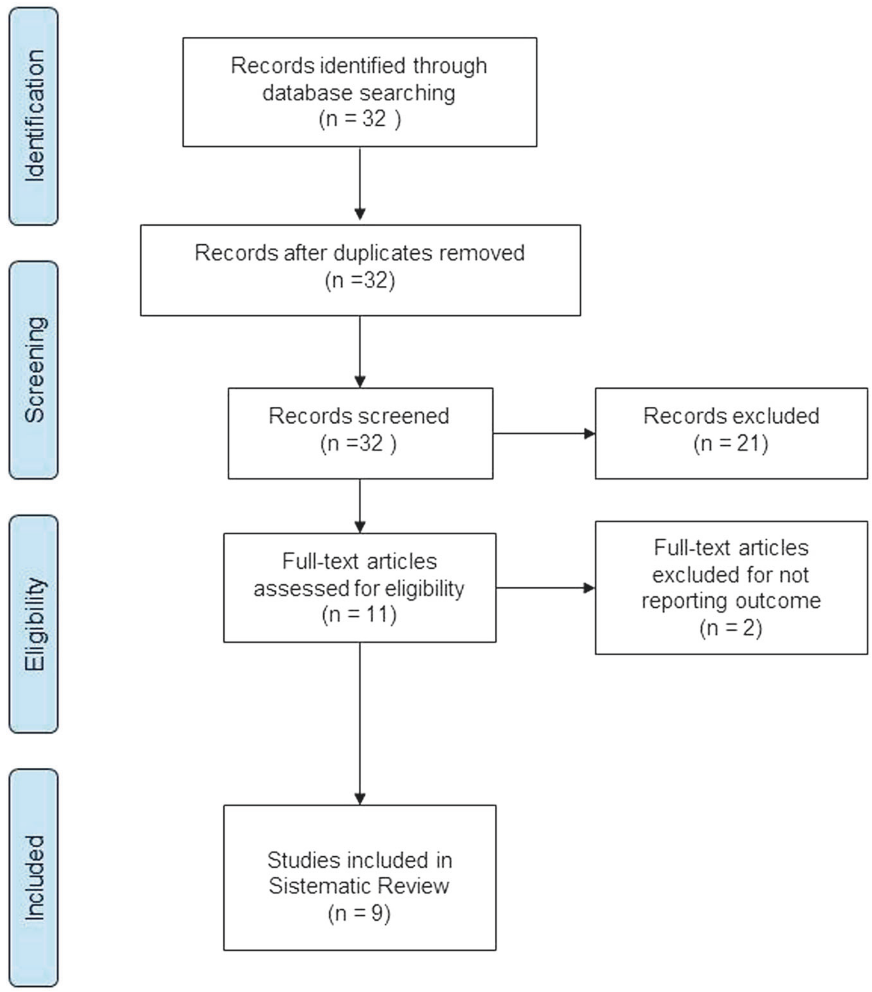

Fig. 1 Flowchart of included studies

increase in Qmax by 11.2 ± 12.4 mL/s ($p < 0.0001$). The largest series of treated patients ($n = 118$) with the water jet dissection technique has been reported by Bach et al. [14]: with a 3-month follow-up they showed an improvement in all the examined functional outcomes taken into consideration ($p < 0.0001$). Other studies were conducted on smaller cohorts [15, 16] up to initial studies [7] out of 15 patients, and these studies also reported a significant improvement in the functional outcomes object of the present review.

Adverse events

As shown in Table 2, the complications of grade 4 were mainly arrhythmias or heart disease [8, 9], a case of multiple organ failure (MOF) following a cerebrovascular accident [9], and one study [16] reported a Grade IV blood transfusions in two patients. To this regard, should be considered that in the only study comparing Aquablation vs TURP [8], the difference between Grade IV adverse events was not statistically significant ($p = 1.000$). No deaths have been reported in any study examined. Among the type III complications, studies examined reported primarily bleeding [8, 9, 12, 14, 16] (range 2.4–19%) urethral stricture [9] (0.99%), urinary retention [8] (7.7%), with clots retention for which surgery was necessary [12]. Other complications of type III have been managed without the need for surgery such as dysuria [8, 9] (range 0.99–10.34%), incontinence [9] (0.99%). Complications of type II and type I have been documented in all the studies examined: the most frequent, among the complications of type II, have had infections of the urinary tract [8, 9, 12] (range 0.8–18%), bleeding [9, 12, 16] (range 3.82–18%), and bladder spasm [8] (3.4%). Other Grade II complications, found less frequently or clinically manageable, have been pain, voiding dysfunction (as urinary urgency, frequency, difficulty), and urinary retention (with the necessity of recatheterization) [12]. Among the complications of type I, in the WATER [8] the percentage of complications have been reported for Aquablation and TURP, respectively in 33.6% vs 41.5% of cases ($p = 0.3350$). Moreover, bleeding (9.4%), dysuria (range 7.9–10.3%), and urinary retention (7.7%) were the

Table 1 Functional outcomes of water jet dissection of prostate

Author	Year	Topology of study	Procedure evaluated	Patient (*n*)	Age Median ± SD (years)	Prostate volume ± SD (cc)	Operative time Median ± SD (min)	Resection operative time Median ± SD (min)	IPSS decrement ± SD (point)	Qmax improvement ± SD (mL/s)	PVR decrement ± SD (cc)	QoL ± SD improvement (point)
Gilling et al.	2018	Double blind, multicentric, prospective, randomized controlled trial	Aquablation vs TURP	Aquablation (117) TURP (67)	Aquablation 66.0 ± 7.3 TURP 65.8 ± 7.2 ($p = 0.87$)	Aquablation 54.1 ± 16.2 TURP 51.8 ± 13.8 ($p = 0.3026$)	Aquablation 32.8 ± 16.5 TURP 35.5 ± 15.3 ($p = 0.2752$)	Aquablation 3.9 ± 1.4 (SD) TURP 13.1 ± 6 (SD) ($p < 0.0001$)	Aquablation 22.9 ± 6.1 (baseline) 5.9 ± 5.0 (6 months) TURP 22.2 ± 6.1 (baseline) 6.8 ± 5.5 (6 months) ($p = 0.14$)	Aquablation 22.9 ± 6 (baseline) 5.9 ± 5.0 (6 months) TURP 22.2 ± 6.1 (baseline) 6.8 ± 5.5 (6 months) ($p = 0.14$)	Aquablation 22.9 ± 6 (SD) (baseline) 5.9 ± 5.0 (6 months) TURP 22.2 ± 6.1 (SD) (baseline) 6.8 ± 5.5 (SD) (6 months) ($p = 0.14$)	Aquablation 4.8 ± 1.1 (baseline) 1.3 ± 1.4 (6 months) TURP 4.8 ± 1.0 (baseline) 1.5 ± 1.5 (6 months) ($p = 0.14$)
Desai et al.	2018	Prospective, multicenter, international clinical trial	Aquablation	(101)	67.5 ± 6.6	107 (range 80–150)	37 (range 15–97)	7.8 (range 3–15)	NV	NV	NV	NV
Kasivisvanathan and Hussain	2018	Analysis of Water I cohort 8 (1 year follow-up)	Aquablation vs TURP	Aquablation (61) TURP (32)	Aquablation 64.5 ± 7.4 TURP 65.3 ± 7.1	Aquablation 54.2 ± 16.3 TURP 50.8 ± 13.9	Aquablation 27.6 TURP 37.4 ($p = 0.00372$)	Aquablation 3.9 TURP 29.8 ($p < 0.0001$)	Aquablation 14.5-point improvement TURP 13.8 point improvement ($p = 0.7117$)	Aquablation + 11 mL/s (1 year follow-up) TURP + 10 mL/s (1 year follow-up)	Aquablation −54 cc (1 year follow-up) TURP −39 cc (1 year follow-up)	Aquablation −3.1 (1 year follow-up) TURP −3.4 (1 year follow-up) ($p = 0.576$)
Chughtai and Thomas	2018	Pooled analysis on WATER I and WATER II cohort (Pts with 60–150 cc prostate size)	Aquablation	(107)	67.3 ± 6.5	99.4 ± 24.1	35.6 ± 14.9	7 ± 3.3	23.4 ± 6.5 (baseline) 6.7 ± 4.9 (3 months) ($p < 0.0001$)	8.9 ± 3.1 (baseline) 19.6 ± 12.4 (3 months)	114.5 ± 111.2 (baseline) 49.7 ± 57.3 (3 months)	4.7 ± 3.1 (baseline) 3.0 ± 2.0 (3 months)
Bach et al.	2018	Single-center results of a non-selected, consecutive	Aquablation	(118)	69 (range 88–52)	64.3 ± 32	20 ± 7.91	3.2 (1.48–7.31)	21.09 ± 6.85 (baseline) 7.25 (0–20) (3 months) ($p < 0.0001$)	10.75 ± 5.84 (baseline) 21.62 ± 5.6 (3 months) ($p < 0.0001$)	158.9 ± 282.9 (baseline) 13.15 (0–60) (3 months) ($p < 0.0001$)	10.75 (5.84, 2.3–40) (baseline) 21.62 (5.6–53.7) (3 months) ($p < 0.0001$)
Zorn et al.	2018	WATER II subpopulation analysis	Aquablation	(19)	66 ± 6.9	105.6 ± 16.6	33.7 ± 7.8	9.0 ± 2.4	21.2 ± 5.5 (baseline) 5.0 ± 4.5 (3 months) ($p < 0.0001$)	6.6 ± 3.1 (baseline) 23.1 ± 9.2 (3 months) ($p < 0.0001$)	174.9 ± 142.9 (baseline) 77.7 ± 73.6 (3 months) ($p < 0.0001$)	4.3 ± 1.2 (baseline) 1.5 ± 2.1 (3 months) ($p < 0.0001$)
Yafi et al.	2018	Prospective multicenter clinical trial	Aquablation	92	68 ± 6.46	107.8 ± 21.1	38.2 ± 14.4	7.7 ± 3.3	23.7 ± 6.4 (baseline) 7.1 ± 5.1 (3 months) ($p < 0.05$)	9.2 ± 3.3 (baseline) 19.5 ± 13 (3 months) ($p < 0.05$)	120.6 ± 119.1 (baseline) 50.6 ± 61.6 (3 months) ($p < 0.05$)	4.6 ± 1 (baseline) 1.9 ± 1.7 (3 months) ($p < 0.05$)
Desai et al.	2018	Single-center prospective clinical trial	Aquablation	(47)	66 (range 50–79)	48 (range 20–118)	35 (range 13–128)	4 (range 1–10)	19-point improvement on baseline	9 mL/s improvement on baseline	76-mL improvement on baseline	4.1-point improvement on baseline ($p < 0.01$)

Table 1 (continued)

Author	Year	Topology of study	Procedure evaluated	Patient (*n*)	Age Median ± SD (years)	Prostate volume ± SD (cc)	Operative time Median ± SD (min)	Resection operative time Median ± SD (min)	IPSS decrement ± SD (point)	Qmax improvement ± SD (mL/s)	PVR decrement ± SD (cc)	QoL ± SD improvement (point)
Gilling et al.	2015	Prospective, non-randomized, single-center trial	Aquablation	(15)	73 (range 59–86)	54 (range 27–85)	Generation 1.0 11.9 (range 5–22) Generation 1.6 4.5 (range 2–13)	Generation 1.0 56.3 (range 37–94) Generation 1.6 40.3 (range 30–54)	23.1 (16–33) (baseline) 8.6 (5.1, 2–20) (6 months) ($p < 0.001$)	8.6 (2.0, 4.8–12.1) (baseline) 18.6 (7.0–31.5) (6 months) ($p < 0.001$)	91 (7–294) (baseline) 30 (18, 6–65) (6 months) ($p = 0.013$)	5.0 ± 0.9 (baseline) 2.5 ± 1.8 (6 months) ($p < 0.001$)

n number of patients, *IPSS* International Prostate Symptom Score, *PVR* post void residual, *min* minutes, *QoL* quality of life, *SD* standard deviation

most frequently observed complications. The dysuria was the most frequent in the Water II trial (8 patients). Among the other Grade I complications, pain, urethral damage, acute urinary retention, scrotal edema, meatal stenosis [8, 9, 16], hematuria [7] have been observed. It should be noted that in the only comparative study with TURP [8] and in the analysis of a subgroup of Water I [11] the difference in adverse events, between the two techniques, was not significant for each Clavien–Dindo category examined.

Sexual outcomes

Sexual outcomes were available in 5 papers (Table 3). Examining the Water I trial [8] it shows that in the sexually active subjects, the appearance reduction in the International Index of Erectile function (IEEF-5) for aquablation arm was 33% and for TURP was 56% ($p = 0.025$). Interestingly, any patient, after 1 follow-up, was affected by erectile dysfunction, as reported in the subgroup analysis of water I [11]. In other studies, no post-treatment erectile dysfunction [12, 13] cases have been reported. Lastly, one article [16] reported no statistically significant differences in terms of IIEF-5 decrement from baseline to 3 months from the procedure (14.6 ± 7.8 vs 14.6 ± 7.9). As concerning the ejaculation rate, all the included articles have shown a maintenance of this function after aquabeam: anejaculation affected patients from the Water I trial [8] by 2% after aquablation vs 51% of patients undergoing TURP ($p < 0.0001$) and, at 1 year of follow up, only 9% against 45% ($p = 0.006$) [11]. In a population of 92 patients [16] undergoing water jet dissection, there was no significant decrease in Male Sexual Health Questionnaire-Ejaculatory Dysfunction (MSHQ-EjD) 3 months after treatment. Other studies also showed minimal rates of anejaculation after treatment [12, 13].

Discussion

The water jet dissection is, today, one of the most promising techniques for the treatment of BPH/LUTS. It is a technique recently introduced in clinical practice [7] that, thanks to the association of “real time” imaging and the robotic automation of an adjustable high-speed jet of saline solution, allows a careful removal of the prostatic adenoma. Given its recent introduction into clinical practice, the EAU 2018 guidelines considered it an “under evaluation” method [17] emphasizing how further clinical trials are needed to compare water jet dissection with other methods (TURP, laser therapy, simple prostatectomy). Herein, we investigated the main functional outcomes, sexual outcomes, and adverse events of the technique. At this point, it should be underlined that the articles included in this systematic review are,

Table 2 Adverse events after water jet dissection of the prostate

Author	Year	Clavien–Dindo I Pts (%)	Clavien–Dindo II Pts (%)	Clavien–Dindo III Pts (%)	Clavien–Dindo IV Pts (%)
Gilling et al.	2018	Aquablation® 63/39 (33.6) TURP 41/27 (41.5) ($p = 0.3350$)	Aquablation® 20/19 (16.4) TURP 15/11 (16.9) ($p = 1.0000$)	Grade 3a: Aquablation® 4/4 (3.4) TURP 2/2 (3.1) ($p = 1.0000$) Grade 3b: Aquablation® 3/3 (2.6) TURP 3/3 (4.6) ($p = 0.6684$)	Aquablation® 1/1 (0.9) TURP 0/0 ($p = 1.0000$)
Desai et al.	2018	57/31 (30.7)	21/19 (18.8)	12/11 (10.9)	6/5 (5)
Kasivisvanathan and Hussain	2018	Aquablation® NV (6.7) TURP NV (30) (1 year follow-up)	Aquablation® NV (20) TURP NV (47) (1 year follow-up) ($p = 0.0132$)	Aquablation® 0 TURP 0	Aquablation® 0 TURP 0
Chughtai and Thomas	2018	12/107 (11.2)	NV (29)	NV (19)	Grade 4b: 1/107 (1.07)
Bach et al.	2018	0	9/118 (7.6)	Grade 3b: 4/118 (3.3)	0
Zorn et al.	2018	0	6/19 (31.6)	0	0
Yafi et al.	2018	0	3/92 (3.2)	3/92 (3.2)	1/92 (1.08)

pts patients

mainly, studies with limited populations compared to other standard techniques.

The most complete information on the functional outcomes of water jet dissection comes from the two largest clinical trials on aquablation, WATER (NCT02505919) [8] and WATER II (NCT03123250) [9] and from pooled analyzes performed on trial cohorts [11, 12]. The WATER study consists of a double-blind, multicenter, prospective, randomized, controlled trial comparing the water jet dissection technique ($n = 117$) vs TURP ($n = 67$), in men affected by LUTS/BPH aged between 45 and 80 years and by prostate volume between 30 and 80 g. All the functional outcomes reported by the Water trial have documented that the water jet dissection of the prostate was not inferior to the TURP.

Although it is not associated with functional outcomes, we believe it is necessary to underline that, in the face of promising functional results, the water jet dissection technique shows very short operating times. In the only comparison with the TURP [8] the mean resection time (3.9 ± 1.4 vs 13.1 ± 6.6; $p < 0.0001$) was lower than in the TURP arm and this result has been subsequently confirmed in the analysis on the cohort of the WATER I [11] (3.9 vs 29.8; $p < 0.0001$). However, it is important to underline how, during the elaboration of the present systematic review, there have been many difficulties in highlighting, in many papers, the various investigated outcomes. This is primarily due to extreme heterogeneity in describing the various outcomes in the different articles and the lack of standardized validated questionnaires, such as the BPH6 [18]. In the nine studies examined in the present review, adverse events, classified according to Clavien–Dindo classification, have been also evaluated [19]. However, the evaluation of adverse events has been difficult by the lack of homogeneity in the studies respecting the classification of Clavien–Dindo. Furthermore, in some papers, adverse events related to the patient's sexual outcome have been reported, which were treated separately in our systematic review. Was found that in reality the most serious complications (Clavien–Dindo III and IV) were relatively low. If a good safety profile had already been achieved in the WATER I trial, the main problem was to check whether for prostate volumes higher than 80 g the aquablation was equally safe: the challenge of WATER II (NCT03123250) was precisely to assess the safety of aquablation technique even in patients with prostate volumes above 80 g and indeed only 10.9% of patients had CD III adverse events

Table 3 Sexual Outcomes of water jet dissection of prostate

Author	Year	IEEF-5 decrement Pts (%)	Anejaculation rate Pts (%)
Gilling et al.	2018	Aquablation	Aquablation
		31/93 (33)	2%
		TURP	TURP
		30/54 (56)	51
		($p = 0.025$)	($p < 0.0001$)
Desai et al.	2018	1(1%)	1 (1%)
Kasivisvanathan and Hussain	2018	Aquablation	Aquablation
		0	NV(9)
		TURP	TURP
		0	NV(45)
		(1 year follow-up)	(1 year follow-up)
			($p = 0.006$)
Chughtai and Thomas	2018	0/107	9/107
Bach et al.	2018	NV	NV
Zorn et al.	2018	0	1 (32%)
Yafi et al.	2018	IEEF-5 baseline	MSHQ baseline
		14.6 ± 7.8 (SD)	8 ± 4.1(SD)
		IEEF-5 (3 months)	MSHQ (3 months)
		14.6 ± 7.9 (SD)	7.4 ± 4.8 (SD)
Desai et al.	2018	NV	NV
Gilling et al.	2015	NV	NV

IEEF-5 International Index of Erectile Function, *pts* = patients

and 5% CD IV. The other most frequent complications were hematuria, dysuria, and UTI.

During collecting the data on sexual outcomes some difficulties have been encountered concerning the lack of homogeneity of the examined papers: in some studies, to evaluate the percentage of erectile dysfunction in the patients, IEEF-5 was not reported. In other articles was simply reported "no erectile dysfunction", in others was difficult to recover the number of sexually active subjects before the procedure, and some articles, included in this systematic review, did not report the sexual outcomes on the cohort examined [7, 14, 16]. Finally, in other studies, sexual outcomes have not been investigated with validated questionnaires, but have been reported as adverse events and classified according to Clavien–Dindo. However, as far as possible to document, the rate of erectile dysfunction/IEEF-5 decrement was not different between Aquabeam vs TURP in the studies examined [8, 11]. A particularly surprising results was the rate of anejaculation: Gilling et al. [7] and Kasivisvanathan and Hussain [11] have shown that the anejaculation rate is significantly higher in patients undergoing TURP and Yafi et al. [16] have shown that the MSHQ-EjD does not decrease from baseline to 3 months from the procedure. The possibility of carrying out a preplanning on the parenchyma subjected to water jet dissection and the possibility to save from the dissection the area near the veru montanum is, from a sexual point of view, a big advantage of the Aquabeam® on preservation of the ejaculatory function. As reported by Lebdai et al. [20] ejaculation maintenance depends not so much on the integrity of the bladder neck during surgery, but on the saving of the "high-pressure ejaculatory area", a zone adjacent the veru montanum area. These data have an important significance in relation to the possibility of performing water jet dissection, especially on young patients, who wish to preserve ejaculation and fertility. The water jet dissection, however, has a limit, shared also with other techniques such as laser therapy, the lack of histological specimen for histopathological analysis. Therefore every patient who is eligible for aquablation should be subjected to careful evaluation to avoid misdiagnostic prostate cancer.

Conclusion

To the best of our knowledge, ours is the first systematic review performed on the technique of aquablation. It is an innovative and fascinating surgery that provides functional outcomes (increase Qmax and QoL, reduction of IPSS and PVR) comparable to TURP. It proved to be a safe technique, with a rate of adverse events similar to TURP. From the point of view of sexual outcomes, the most important data is certainly the low rate of retrograde ejaculation. However, multicenter randomized trials with larger cohorts and longer follow-up are still needed. Further comparison studies are necessary, both with the TURP and with the other techniques used today as laser therapy.

Compliance with ethical standards

Conflict of interest The authors declare that they have no conflict of interest.

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