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INVITED REVIEW

Do patients have to choose between ejaculation and miction? A systematic review about ejaculation preservation technics for benign prostatic obstruction surgical treatment

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Abstract

Purpose Ejaculatory dysfunction is the most common side effect related to surgical treatment of benign prostatic obstruction (BPO). Nowadays, modified surgical techniques and non-ablative techniques have emerged with the aim of preserving antegrade ejaculation. Our objective was to conduce a systematic review of the literature regarding efficacy on ejaculatory preservation of modified endoscopic surgical techniques, and mini-invasive non-ablatives techniques for BPO management.

Methods A systematic review of the literature was carried out on the PubMed database using the following MESH terms: "Prostatic Hyperplasia/surgery" and "Ejaculation", in combination with the following keywords: "ejaculation preservation", "photoselective vaporization of the prostate", "photoselective vapo-enucleation of the prostate", "holmium laser enucleation of the prostate", "thulium laser", "prostatic artery embolization", "urolift", "rezum", and "aquablation".

Results The ejaculation preservation rate of modified-TURP ranged from 66 to 91%. The ejaculation preservation rate of modified-prostate photo-vaporization ranged from 87 to 96%. The only high level of evidence studies available compared prostatic urethral lift (PUL) and aquablation versus regular TURP in prospective randomized-controlled trials. The ejaculation preservation rate of either PUL or aquablation compared to regular TURP was 100 and 90 versus 34%, respectively.

Conclusions Non-ablative therapies and modified endoscopic surgical techniques seemed to be reasonable options for patients eager to preserve their ejaculatory functions.

Keywords Benign prostatic hyperplasia · Ejaculation preservation · Endoscopic surgery · Ejaculatory dysfunction · Lower urinary tract symptoms · Retrograde ejaculation

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Introduction

Ejaculatory dysfunction (EjD) is the most common side effect related to surgical treatment of benign prostatic obstruction (BPO) [1–3]. It has been considered for decades as a tribute to pay to restore micturition comfort [4] and even sometimes as a surrogate marker of complete obstruction relief. More recently, a better understanding of ejaculation physiology has enabled the emergence of modified surgical techniques with the aim of preserving antegrade ejaculation [5–8]. In addition, non-ablative techniques, such as prostatic urethral lift (PUL), Rezum ®, and prostatic artery embolization (PAE), have also emerged showing promising results on ejaculatory function preservation [9–12].

Our objective was to conduce a systematic review of the literature to assess the efficacy of modified endoscopic surgical techniques and mini-invasive non-ablatives techniques in preserving ejaculation function.

Methods

Evidence acquisition

The search process was carried out according to the PRISMA criteria (Fig. 1). A systematic review of the literature was carried-out on the PubMed database by two independent reviewers (SL and AC). The search was conducted from 1998 through 2018. We included English language articles only. The following MESH terms in isolation or in combination were used: "Prostatic Hyperplasia/surgery" and "Ejaculation", in combination with the following keywords: "ejaculation preservation", "photoselective vaporization of the prostate", "photoselective vapo-enucleation of the prostate", "holmium laser enucleation of the prostate", "thulium laser", "prostatic artery embolization", "urolift", "rezum", and "aquablation". Article cross-referencing was done to complete articles acquisition.

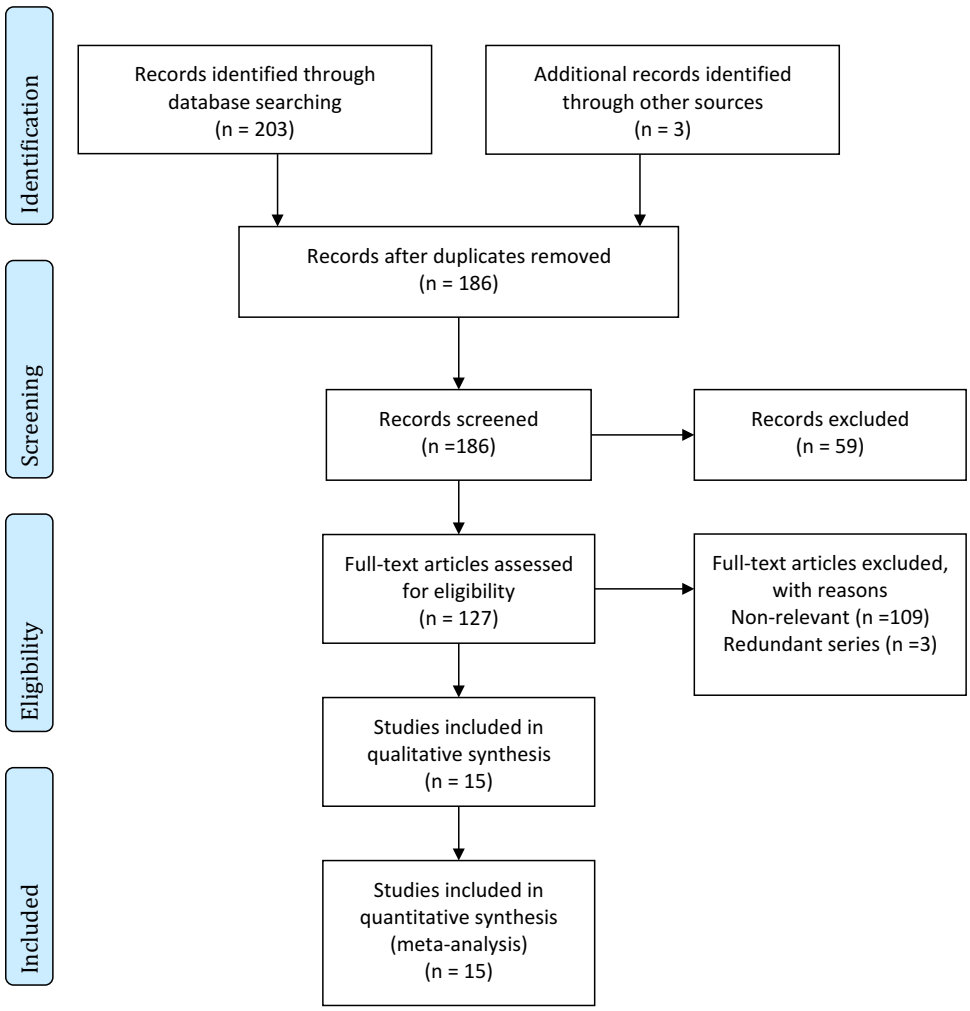

Fig. 1 PRISMA diagram

Evidence selection

First selection was based on title and abstract reviews. All relevant original articles were selected; literature reviews, editorials, and animal model experimentations were excluded. Minimum criteria for inclusion were the rate of EjD and the period of assessment. Papers reporting data from already included studies were excluded unless they reported additional relevant information. Full-text review was then performed to refine article selection and exclude duplicates. Two authors (SL, AC) independently screened all the abstracts identifying a total of 15 articles. Disagreement was resolved by a consultation amongst the senior authors (GR and NBDL) until a consensus was reached. The level of evidence of selected publications was then established according to the Oxford Centre for Evidence-Based Medicine criteria [13].

Evidence synthesis

EjD after standard ablative procedures

Transurethral resection of the prostate (TURP)

It has been established for decades that TURP causes EjD, although it remains one of the gold standards for the treatment of BPO. A recent review of 30 RCTs reported a 66.1% rate of EjD [1]. Brookes et al. reported sexual outcomes in a randomized study of 220 patients comparing TURP versus conservative management with a median follow-up of 7 months [14]. Ejaculatory function was significantly deteriorated for both TURP and conservative management. As expected, there was significantly more retrograde ejaculation after TURP (OR 3.27; $p = 0.0017$). However, erectile dysfunction and ejaculation discomfort were significantly reduced after TURP compared to conservative management. Chen et al. published a series of 100 patients randomized between monopolar and bipolar-TURP. The retrograde ejaculation rates were 50 versus 36% for monopolar and bipolar-TURP, respectively, without any significant difference [15]. It also seemed that the volume of resection did not impact the incidence of EjD [16].

Holmium laser enucleation (HoLEP)

Ahyai et al. reported a randomized study of 200 patients comparing HoLEP versus TURP with a 3-year follow-up. They showed that HoLEP micturition outcomes compared favorably with TURP [17]. However, the rates of EjD were similar between both techniques with no significant difference: 74 versus 70% for HoLEP and TURP, respectively [17, 18].

Placer et al. focused on sexual outcomes in a retrospective analysis of 419 patients treated by HoLEP [19]. After a 12-month follow-up, 70.3% of patients reported no ejaculation versus 10.7% at baseline. The rate of patients reporting an ejaculation with normal quantity of semen decreased from 29.4% at baseline to 8.7% at 12 months. Pain or discomfort during ejaculation raised from 73.7% at baseline to 91.3% at 12 months. Similarly, Kim et al. reported a 73.7% rate of anejaculation after a 9-month mean follow-up [8].

In summary, HoLEP achieved equivalent outcomes compared to TURP, but also deteriorated antegrade ejaculation in the same extend.

Greenlight XPS laser photoselective vaporization of the prostate (PVP)

The GOLIATH study compared TURP and PVP [20]. PVP was non-inferior to TURP for IPSS improvement, Q_{max}, and complications. The study reported similar EjD rates for both technics with now significant difference: 67.1 versus 65.1% for PVP and TURP, respectively.

Thulium laser enucleation of the prostate (ThuLEP)

Yee et al. focused on sexual function after ThuLEP vaporesection in a retrospective study on 54 patients and reported a retrograde ejaculation rate of 56% [21]. In a randomized trial, Xia et al. compared ThuLEP and TURP in 100 patients. They reported EjD rate of 55% with ThuLEP and 65% with TURP [22].

Transurethral incision of the prostate (TUIP)

TUIP involves incising the bladder neck without tissue removal. This technique may replace TURP for younger patients eager to avoid EjD, with a prostate size < 30 ml and without middle lobe [1, 3]. Yang et al. published a meta-analysis including nine randomized-controlled trials (RCT) comparing TURP and TUIP. The rate of EjD was significantly lower for TUIP (21 versus 73%, respectively) [23]. However, re-intervention was more common after TUIP than after TURP (18.4 versus 7.2%, respectively) [24]. Regarding functional results for small prostates, TUIP effectiveness was comparable to TURP during the first year after procedure. However, there is poor evidence on the long-term effectiveness. Furthermore, re-intervention rates were clearly lower after TURP compared to TUIP (2.6 vs. 15.9%, respectively) [24, 25].

In summary, TUIP is an effective option for ejaculation preservation (EP) for small prostates. However, there is an increased risk of re-intervention.

Impact of EjD on quality of life (QoL)

Does EjD have an impact on QoL? Very little data in the literature are available, which suggests that this question has mostly been eluded until now. When it comes to sexuality, the main concern is erectile function, which is usually assessed by the IIEF-5 or IIEF-15 scores. However, the main sexual side effect of BPO surgery is not erectile dysfunction but EjD [26]. Despite its widespread use in the current clinical settings, the IIEF score has some limitations in evaluating the relationship between EjD and QoL [27]; furthermore, EjD are better assessed with the Male Sexual Health Questionnaire Ejaculatory Dysfunction (MSHQ-EjD) [28], which is sparsely used in BPO surgery studies. This brings us to the following question: is lower urinary tract symptoms (LUTS) relief worth the bother related to EjD? It has been demonstrated by Rosen et al. that sexual activity was common in a majority of men over 50 years and was an important component of overall QoL [29]. Erectile dysfunction and EjD can have a substantial deleterious effect on the QoL of men who have previously maintained regular sexual activity, inducing significantly increased levels of anxiety and depression [30]. According to Kim et al., an unfavorable perception of decreased ejaculatory volume might contribute to decrease orgasmic intensity and satisfaction. It has been reported in a series of 91 patients who underwent HoLEP for BPO that: 76.9% of the patients had total anejaculation, 18.7% had decreased volume and only 4.4% had no modification of their ejaculatory function. Among the 87 patients who reported an ejaculatory volume reduction: 73.6% were "disappointed, but able to tolerate, owing to improvement of voiding symptoms", and 8% were "dissatisfied and wanted to reverse the situation". Decreased orgasmic intensity was present in 52.8% of the patients. Consequently, decreased orgasmic intensity was closely related to an unfavorable perception of decreased ejaculatory volume, and even the improvement of voiding symptoms was offset by decreased orgasmic intensity. The preserved IIEF-15 score at 3 months postoperatively also supported the fact that decreased orgasmic intensity was derived from decreased ejaculatory volume rather than decreased erectile function [31]. Similarly, Elshal et al. compared a group of 80 patients who underwent HoLEP versus a control group of 70 patients with a 12-month follow-up [32]. There was a significant reduction in orgasm perception following HoLEP compared to control (5.3 ± 1.4 vs. 8.6 ± 1.3, $p = 0.001$). Each of the seven assessed items in the Ej-MSHQ domain was affected in the HoLEP group (dryness, pleasure, volume, pain, latency, force, and frequency).

This shows that EjD might have an impact on QoL, and that BPO treatment strategy has to take in account patient's expectations about sexual outcomes.

The concept of ejaculatory preservation

Postoperative ejaculatory disorders have long been explained by the absence of closure of the bladder neck resulting in retrograde emission of the sperm. Paradoxically, the preservation of ejaculations observed during TUIP has questioned the impact of the closure of the bladder neck in the ejaculation mechanism [33, 34]. Vernet et al. showed that contraction of the bladder neck was not important for anterograde ejaculation [35]. Using endorectal ultrasound videos performed during masturbation in 30 men, it was possible to visualize the bladder neck, the prostate, and the bulbar urethra during ejaculation. They observed that during ejaculation, the verumontanum underwent a slight caudal shift, momentarily making contact with the opposite urethral wall and sperm emitted from the ejaculatory ducts was directed distally by contractions of the external sphincter coordinated with contractions of the bulbar urethra, thus demonstrating the importance of the muscular tissue around the verumontanum and particularly its proximal part. They described this area as a "high-pressure ejaculatory area". The closure of the bladder neck did not seem to play a role in this mechanism. As a result, one can conclude that as long as the tissues around the verumontanum are not injured, ejaculation should still occur even with a well-open bladder neck [36].

Results of ejaculation-preserving (EP) techniques (Table 1)

Ablatives procedure

EP-TURP Alloussi et al. showed in a prospective study on 89 patients that the preservation of the ejaculatory ducts in the prostatic urethra allowed the preservation of anterograde ejaculation [6]. They performed the standard monopolar resection except that they ensured the preservation of the verumontanum and the surrounding tissues. The resection of the median lobe had to stop at 1 cm above the verumontanum. As, for the lateral lobes, they were resected to the verumontanum level, but without damaging the paracollicular tissue. The bladder neck was resected in a standard manner. Using these anatomical landmarks to preserve the apical area, 91% of the patients had preserved ejaculatory functions. Functional results were satisfactory with significant improvements in maximum flow rate (+ 14.3 ml/s), PVR (− 59 ml), and IPSS (− 18.3) at 3 months ($p < 0.002$). These improvements were maintained at 60 months. No serious adverse events were reported, but 13% patients received a second TURP due to the development of bladder neck scar tissue during long-term follow-up.

Ronzoni et al. reported similar results in a prospective controlled study [5]. After 2 years of follow-up, 80% of the patients who had partial resection presented conserved

Table 1 Data summary

Authors	Technic	Study type	Control group	Population	Ejaculation preservation rate (%)	IPSS improvement from baseline	Follow-up (months)	Re-intervention rate (%)	Bias and limitations	Level of evidence
Alloussi et al.	ep-TURP	Prospective	None	89	91	18	60	13	No control group	3
Ronzoni et al.	ep-TURP	Prospective	None	45	80	18	24	7	No control group	3
Rhouma et al.	ep-TURP	Prospective	vs TURP	35 vs 35	66 vs 29 ($p<0.05$)	14 vs 14 (NS)	3	–	Short follow-up	2a
Leonardi et al.	ep-PVP	Prospective	None	52	96	12	12	0	No control group Short follow-up	3
Talab et al.	ep-PVP	Retrospective	None	160	87	15	28	–	No control group Retrospective	4
Miyauchi et al.	ep-PVP	Prospective	None	24	91	–	6	–	No control group Short follow-up	3
Kim et al.	ep-HolEP	Prospective	vs HolEP	26 vs 26	46 vs 27 (NS)	12 vs 8 (NS)	3	0	Short follow-up	2a
Roehrborn et al.	PUL	Prospective	vs placebo	140	100	7.8	60	13.6	–	1
Gratzke et al.	PUL	Prospective	vs TURP	40 vs 40	100 vs 34	9.2 vs 15.3 ($p=0.001$)	24	13.6 vs 5.7	Short follow-up	1
Carnevale et al.	PAE	Prospective	vs TURP	15 vs 15	–	12.5 vs 21.5 ($p=0.01$)	12	0	Short follow-up EjD not compared	1
Gao et al.	PAE	Prospective	vs TURP	57 vs 57	–	15.3 vs 16.3	24	0	EjD not compared	1
Amouyal et al.	PAE	Prospective	None	32	100	7.4	6	0	No control group Short follow-up	3
Roehrborn et al.	Rezum	Prospective	vs placebo	136 vs 61	100	9.8 vs 3.9 ($p=0.004$)	3	3.7	Short follow-up	1
Dixon et al.	Rezum	Prospective	None	65	–	12.5	12	–	No control group Short follow-up	3
Gilling et al.	Aquablation	Prospective	TURP	117 vs 67	90 vs 64	16.9 vs 15.1 (NS)	6	–	Short follow-up	1

ep-TURP ejaculation preservation transurethral resection of the prostate, *ep-PVP* ejaculation preservation photo selective vaporization of the prostate, *ep-HolEP* ejaculation preservation holmium enucleation of the prostate, *PUL* prostatic urethral lift, *PAE* prostatic artery embolization, *NS* non significant, *EjD* ejaculation dysfunction

ejaculatory function. Therefore, it appears that modified-TURP allowed the preservation of antegrade ejaculation with equivalent functional outcomes to the conventional TURP.

Rhouma et al. reported a prospective, randomized, single-blind, comparative study between modified-TURP (preservation of 1 cm tissue around the supramontanal prostate) versus conventional TURP ($n=70$ patients) [37]. Average prostate volume was 60 and 58 cc, respectively. The operative time and hospital stay were comparable for both groups. No serious adverse events were reported with the two techniques. Significant improvements in urinary function were similar, assessed by decreased IPSS scores and PVR (IPSS: from 21.4 to 7.06 and from 21.06 to 7.54, respectively, $p=0.7$. PVR: from 211 to 26 cc and from 204 to 49 cc, respectively; $p=0.2$). The ejaculation was preserved in 65.7% with the modified-TURP versus 28.6% with the conventional TURP ($p<0.05$). Unfortunately, the follow-up was only 3 months.

EP-PVP Leonardi et al. reported a modified vaporization technic in which they spared the triangle of urethral mucosa, which had the bladder neck at its base and ended with the seminal colliculus. The muscle fibers at the level of the bladder neck were preserved. At 6 months, antegrade ejaculation was maintained in 50/52 patients; two patients reported anejaculation and two reported a reduced volume of ejaculate [38]. The issue with this study was its very short follow-up that does not provide any mid- or long-term data.

Talab et al. reported a multicentric retrospective series of 160 patients treated with EP-PVP with a 28-month average follow-up [7]. The technique involved: the preservation of bladder neck muscle fibers, the preservation of the precollicular tissue and the preservation of paracollicular prostate tissue. Mean prostate volume was 64 cc (17–230 cc). Average laser energy was 162 kJ (9.5–735 kJ). The success rate was 86.6% without compromising functional voiding results. IPSS scores pre- and post-procedure were 20.3 and 5.3, respectively. The mean pre-operative Q_{max} was 8.4 ml/min, which significantly improved to 20.6 ml/min. Post-op ejaculatory function evaluation showed that 88 (56%) patients had normal antegrade ejaculation and 48 (30.6%) patients had diminished ejaculation after surgery, while 21 (13.4%) patients reported no ejaculations.

Miyauchi et al. reported similar results with a 92% success rate on a prospective series of 24 patients [39]. Ten (45%) patients had a decreased quantity of sperm. The technique was slightly different; all the tissues located at the apex at 10 mm from the verumontanum level were preserved. Mean prostates' volume was 44.7 ± 13.9 cc. The mean energy applied was 215 ± 118 kJ. IPSS, QOL score, and Q_{max} were significantly improved at 6 months. The reduction rate of PSA and prostate volume were 57 and 47%. The follow-up was too short to assess the re-treatment rate.

In summery, it appears that modified-PVP also allowed EP with equivalent functional outcomes to the conventional PVP.

EP-HoLEP Only Kim et al. evaluated EP-HoLEP in a prospective controlled study [8]. They tried to preserve the ejaculatory hood defined as the paracollicular and supracollicular tissue up to 1 cm proximal to the verumontanum. Patients were alternatively allocated to the standard HolEP group and the EP-HoLEP group. Twenty-six patients received the ejaculatory hood sparing technique and twenty-six patients underwent the conventional HoLEP. The success rate of ejaculation preservation was 46% in the preservation-group versus 27% in the conventional-HoLEP group ($p=0.2$). The difference was not significant, likely because the technique only focused on the preservation of the ejaculatory hood without sparing the apical tissues located less than 1 cm from the verumontanum, thus making the preservation insufficient. Therefore, another modified HoLEP technique preserving apical tissue should be assessed.

Minimal invasive non-ablatives techniques

Minimally invasive surgical therapies have been developed as an alternative for BPO treatments [9–12]. These non-tissue ablative therapies aim to reduce EjD related to invasive surgical procedures and medical therapies. These techniques are ideally performed in an ambulatory setting and under peri-prostatic nerve block. These therapies need validation of their efficacy and durability of effect, in particular the rates of re-intervention at long term.

Prostatic urethral lift Urolift ® (PUL) The PUL procedure involves transurethral placing of small permanent implants (UroLift® System) to compress the tissues, enlarge the urethral lumen, and reduce obstruction [9].

Roehrborn published, in 2017, the results of a multicentric study including 140 PUL implantations versus 69 control patients. Patients were followed-up for 5 years. The 1-year mean IPSS improvement was 9.9 points. However, this improvement decreased progressively to 8.6 points at 3 years and to 7.8 points at 5 years. The re-treatment rate was 13.6% at 5 years. Erectile function evaluated by IIEF-5 score remained completely stable during the follow-up. Ejaculatory function evaluated by MSHQ-EjD showed a significant improvement during the first years of follow-up; however, this improvement disappeared afterwards. Nevertheless, no EjD was reported [9, 40].

Gratzke et al. compared PUL versus TURP in 80 patients with a 2-year follow-up [10]. Re-treatment rate was significantly higher for the PUL-group than the TURP-group

(13.6 versus 5.7%, respectively). The IPSS improvements were almost equivalent at 6 months, but a worsening in the PUL-group at 2 years was reported, while the results in the TURP-group remained stable (9.2 versus 15.3, respectively). Erectile function was preserved in both arms. The main difference was about ejaculatory function with 100% of preserved ejaculation in the PUL-group versus 34% in the TURP-group at 2 years ($p < 0.001$).

In summary, PUL preserved ejaculatory and erectile functions, but maximum IPSS improvement was around ten points. This improvement was lower than with TURP and eventually decreased with time.

Prostatic artery embolization (PAE) PAE consists in unilateral or bilateral embolization of prostatic arteries by polyvinyl alcohol particles performed under local anesthesia by femoral approach [11]. The issue with the following studies is that the consequences on ejaculations are not reported in most of them.

Carnevale et al. published an RCT comparing TURP and PAE including 15 patients in each group with a 1-year follow-up [41]. At inclusion, patients had severe LUTS (IPSS > 19) and prostate volumes between 30 and 90 cc. At 1 year, IPSS and Q_{max} improvement were significantly better for TURP than PAE (12.8 versus 6, and 27 versus 10, respectively). Regarding sexual outcomes, only IIEF score was reported and was significantly decreased in TURP-group but not in PAE group.

Gao et al. published a randomized trial including 114 patients comparing TURP and PAE with a 24-month follow-up [42]. IPSS and Q_{max} improvement were significantly higher with TURP in the first 3 months. At 24 months, the IPSS improvements were similar (− 16.3 for TURP and − 15.3 for PAE).

Only one study reported results on ejaculatory function. It was a single center study of 32 patients with a 7-month follow-up reporting no cases of retrograde ejaculation [43].

Regarding erectile function, the meta-analysis of Kuang showed a significant decreased of 5.7 points of IIEF score after a 2-year follow-up (from 16.8 at baseline to 11.09 at 2 years, $p = 0.02$) [44].

In summary: available data are insufficient. PAE seemed to preserve antegrade ejaculation while decreasing erectile function.

Rezum ® Rezum system is a water–vapor delivery device that is inserted into the transition zone of the prostate under direct visualization, under local anesthesia. The water vapor is delivered during 9-s injections into the adenoma at the 3 and 9 o'clock positions. When present, the median lobe is also treated. The total number of water vapor injections in each lobe of the prostate is determined by the size of the adenoma [12].

Roehrborn et al. published a prospective study on 130 patients with a 3-year follow-up [45, 46]. The re-treatment rate was 3.7%. Mean IPSS improvement was 12 points at 6 months, 11 points at 24 months, and 11 points at 36 months. Mean Q_{max} improvement was 6 ml/s at 6 months, 5.9 ml/s at 24 months, and 3.5 ml/s at 36 months. IIEF score remained stable for 36 months. Ejaculation was also preserved with a stable MSHQ-EjD score during 36 months.

Dixon et al. published another series of 65 patients who underwent a Rezum® procedure [47]. Mean IPSS improvement was 13.4 points at 3 months and 12.5 points at 12 months. Erectile function was significantly improved with an IIEF score of 38.4 at 1 year versus 32.9 at baseline.

In summary, despite the absence of comparative studies, the early results are very promising. The Rezum® system seemed to respect the ejaculatory function while providing good urinary functional results for at least 3 years.

Aquablation Aquablation (AQUA BEAM System, PROCEPT BioRobotics Corporation, Redwood Shores, California, USA) is a robotic-guided ablative technique. Gilling et al. reported the results of 21 procedures with a 1-year follow-up [48, 49]. Aquablation combines image guidance with high-pressure saline jet for heat-free ablation of prostate tissue. A bi-plane TRUS probe is inserted into the rectum. By integrating the live TRUS image into the aquablation system, the operating surgeon identifies the target resection area in real time and maps the resection contour directly on the planning station. This allows precise surgical mapping with preservation of key anatomic structures (bladder neck and tissue around verumontanum). At the end of procedure, an optional step of monopolar cauterization for hemostasis can be performed. One patient required a secondary treatment during the follow-up. Nor incontinence neither erectile dysfunction were reported. They reported no retrograde ejaculation; however, they used the IIEF-15 score, which is not specific enough for this assessment. Three patients required a re-catheterization, and 1 presented hematuria. Mean IPSS score decreased by 16.1 points at 1 year. Mean Q_{max} improved from 8.6 to 18.3 at 1 year. Very recently, Gilling et al. reported the results of the WATER trial which was a double-blinded RCT comparing Aquablation versus TURP [50]. Aquablation showed non-inferior symptom relief compared to TURP but also a lower rate of anejaculation (10 vs 36%, $p = 0.003$). In conclusion, these primary results are interesting but insufficient to recommend this procedure at this time.

Discussion

A very important question to be raised is: do we really have a better understanding of ejaculation physiology? The answer is obviously that we still do not know everything;

however, we learned enough to identify the major anatomical structures needed to maintain ejaculation in case of prostatic surgery [35]. Contrary to what was believed for a very long time, the closure of the bladder neck is not needed for antegrade ejaculation. On the contrary, the tissues around the verumontanum (described as a "high-pressure ejaculatory area") should be preserved to maintain normal ejaculation, even with a wide-open bladder neck [36].

Another major issue is the shift towards maximum QoL preservation in patients' expectations and practitioners' approach of health care. We already know that sexual activity is common in a majority of men over 50 years old and that it is an important component of overall QoL [29]. We also know that EjD can have a substantial deleterious effect on the QoL inducing decreased orgasmic intensity but also increased levels of anxiety and depression [30].

This is the reason of the emergence of both modified endoscopic surgical techniques and mini-invasive non-ablatives techniques [1, 36]. Are these technics able to preserve normal ejaculation? The answer seems to be "yes" for modified-PVP and TURP. EP-TURP has been assessed by three prospective studies; one was controlled versus regular TURP [5, 6, 37]. The EP rate of EP-TURP ranged from 66 to 91%. EP-PVP has been assessed by two prospective studies and one retrospective study [7, 38, 39]. None of them was controlled. The EP rate ranged from 87 to 96%. The only high level of evidence studies available compared PUL and Aquablation versus regular TURP in a RCT [10, 45, 50]. Results are very encouraging: the EP rate of either PUL or aquablation compared to regular TURP was 100 and 90 versus 34%.

Non-ablative therapies and modified endoscopic surgical techniques seem to be reasonable options for patients eager to preserve their ejaculatory functions.

For non-ablative therapy, it is important, in the current knowledge, to select patients with moderate prostate volume (30–80 cc) because of the lack of data for large prostates (> 80 ml). We also lack data regarding the mid-term re-intervention risk for these technics, and thus, it is mandatory to inform patients of the theoretical risk of re-intervention. It also seems reasonable to propose these therapies to patients with a moderate discomfort because of an expected IPSS improvement of 10 points and a moderate expected improvement for Q_{max} (5 ml/s); therefore, patients with a very low Q_{max} (< 5 ml/s) should not undergo these technics because of a risk of insufficient treatment. However, available data are not enough to draw firm recommendations. In conclusion, non-ablative therapies could be proposed to young patients with a small prostate, moderate symptoms, and strong desire to preserve our sexuality.

Conclusion

Non-ablative therapies and modified endoscopic surgical techniques seemed to be reasonable options for patients eager to preserve their ejaculatory functions. Despite the increasing concern about EP in BPO treatment, high-quality studies have only addressed LUTS so far, and ejaculation dysfunction was ignored as a primary outcome. Future studies need to assess the EjD impact of BPO treatments rather than only describe it. We also should discuss ejaculation and orgasms with all patients before any BPO surgery: patients might accept a reduction in treatment efficacy to preserve ejaculation. We should also start using validated instruments, such as the MSHQ-EjD in everyday practice.

Author contributions SL: project development, data collection, and manuscript writing. AC: project development, data collection, and manuscript writing. NBD, AB, JNC, AD, SD, MF, BP, VM, GR, and PET: project development and reviewing.

Compliance with ethical standards

Conflict of interest Armand Chevrot: none. Nicolas Barry Delongchamps: none. Amin Benchikh: none. Jean Nicolas Cornu: none. Aurélien Descazeaud: consultant for Bouchara Recordati, Pierre Fabre Medicament, Lilly, investigator pour EDAP TMS. Steeve Doizi: none. Marc Fourmarier: consultant for GSK and EDAP TMS. Souhil Lebdai: none. Benjamin Pradère: none. Vincent Misraï: none. Gregoire Robert: consultant for Pierre Fabre Medicament, investigator for EDAP TMS. Pierre Etienne Theveniaud: none.

Research involving human participants and/or animals Not applicable.

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