UroGold I: Ενδοουρολογία

Χαράλαμπος Κ. Μαμουλάκης

Επίκουρος Καθηγητής Ουρολογίας

Ιατρική Σχολή Πανεπιστημίου Κρήτης

Department of Urology, University of Crete, Medical School, Heraklion, Crete, Greece

Conflict of interest

Type of affiliation / financial interest	Name of commercial company
Receipt of grants/research supports:	Ariti, Porge-Coloplast, Boston Scientific, Medical Supplies “Cook”, GSK, Astellas, Takeda, Janssen, Karl Storz Endoscope, Olympus
Receipt of honoraria or consultation fees/ Company speaker honorara:	Astellas, GSK, Eli Lily and Co
Other support (Trial participation):	Astellas, Eli Lily and Co, Medivation, Karl Storz Endoscope

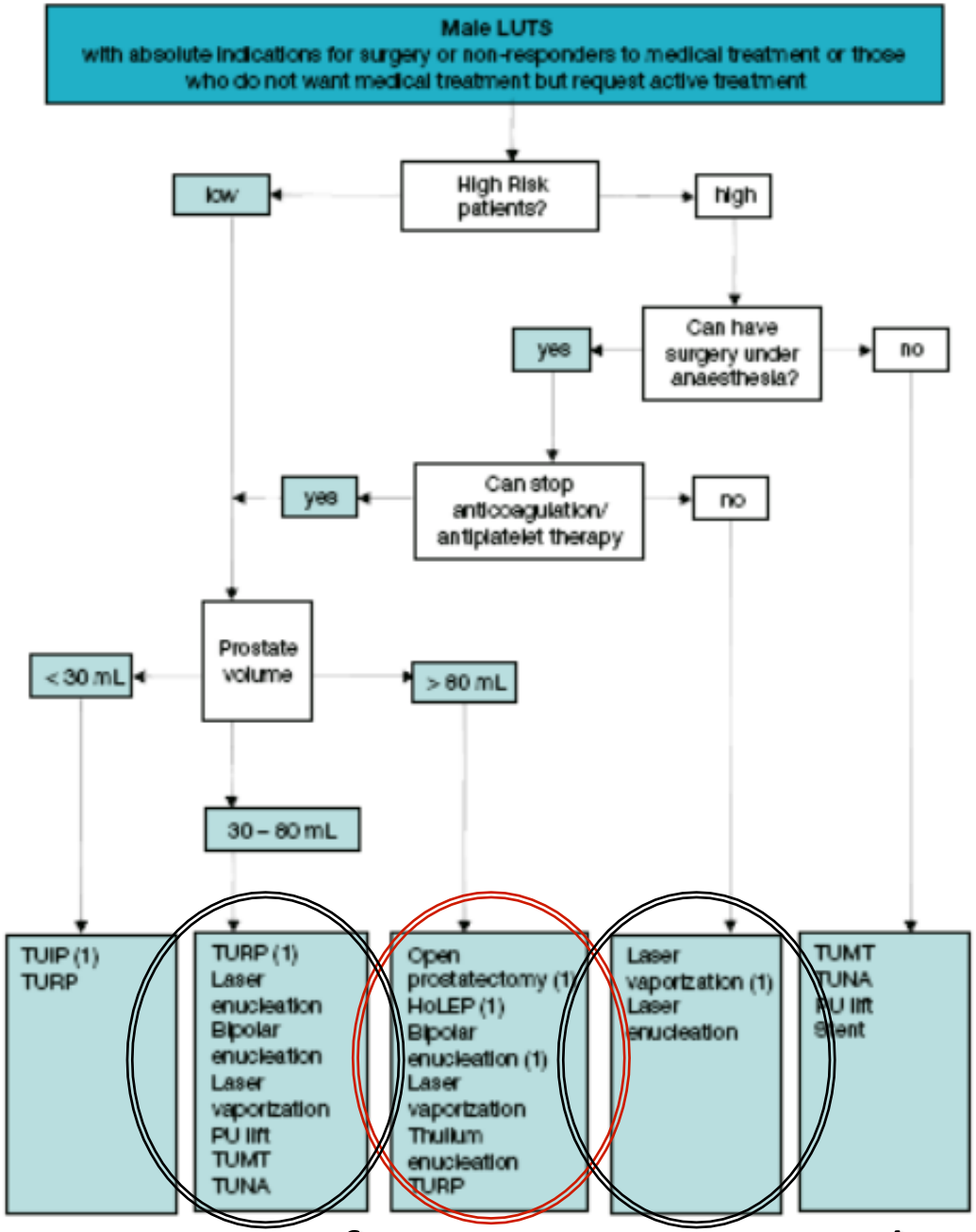
http://uroweb.org/my-eau/conflict-of-interest/

Department of Urology, University of Crete, Medical School, Heraklion, Crete, Greece

Agenda

- Position of Enucleation: EAU Guidelines algorithm (overview)
- Recent key publications in the field (n = 2 meta-analyses)
- Transurethral (Endoscopic) Enucleation of the Prostate (EEP)

Department of Urology, University of Crete, Medical School, Heraklion, Crete, Greece



EAU Guidelines on Management of Non-Neurogenic Male Lower Urinary Tract Symptoms (LUTS), incl. Benign Prostatic Obstruction (BPO)

S. Gravas (Chair), T. Bach, A. Bachmann, M. Drake, M. Gacci, C. Gratzke, S. Madersbacher, C. Mamoulakis, K.A.O. Tikkinen
Guidelines Associates: M. Karavitakis, S. Malde, V. Sakkalis, R. Umbach

European Association of Urology

EAU guidelines on Management of non-neurogenic male LUTS, 2016

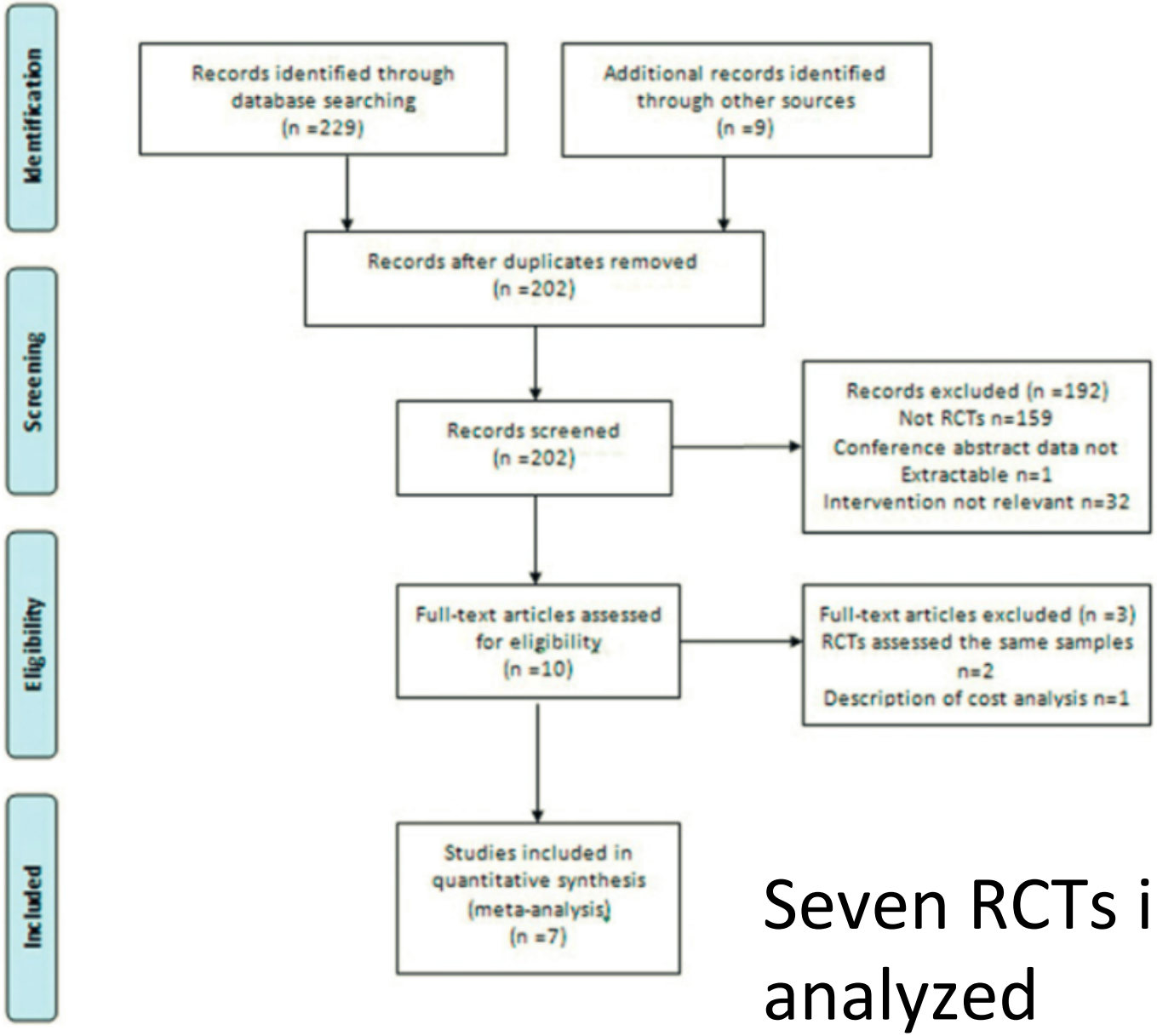
Department of Urology, University of Crete, Medical School, Heraklion, Crete, Greece

Endoscopic Enucleation versus Open Prostatectomy for Treating Large Benign Prostatic Hyperplasia: A Meta-Analysis of Randomized Controlled Trials

Maoyin Li[1☯], Jianguang Qiu[1☯], Qi Hou[2], Dejuan Wang[1], Wentao Huang[1], Cheng Hu[1], Ke Li[1], Xin Gao[1*]

Li et al. PLoS One. 2015;10:e0121265.

Department of Urology, University of Crete, Medical School, Heraklion, Crete, Greece



Seven RCTs involving 735 patients analyzed

Fig 1. Flowchart. Flowchart of the selection of randomized controlled trials (RCTs) for the meta-analysis.

Li et al. PLoS One. 2015;10:e0121265.

Department of Urology, University of Crete, Medical School, Heraklion, Crete, Greece

Table 1. Characteristics from the included RCTs comparing endoscopic enucleation of the prostate with open prostatectomy.

Reference	Publication year	Follow-up mo	Comparator	Trial size	Prostate volume, mL	PSA ng/mL	IPSS	Qmax mL/s	PVR mL	IIEF
Kuntz et al. [7,34,35]	2002, 2004, 2008	1,3,6,12,18,24,36,48,60	HoLEP	60	114.6±21.6	NA	22.1±3.3	3.8±3.6	280.0±273.0	NA
			OP	60	113.0±19.2	NA	21.0±3.6	3.6±3.8	292.0±191.0	NA
Naspro et al. [6]	2006	1,3,12,24	HoLEP	41	113.3±35.3	6.3±3.5	20.1±5.8	7.8±3.4	NA	20.3±6.6
			OP	39	124.2±38.5	7.0±4.3	21.6±3.2	8.3±2.4	NA	21.1±5.3
Zhang et al. [21]	2007	3	HoLEP	32	139.6±26.4	NA	27.4±5.5	6.1±2.9	197.8±33.6	NA
			OP	28	157.2±35.1	NA	25.1±6.4	6.7±2.8	172.7±21.4	NA
Geavlete et al. [25]	2013	1,3,6,12,36	BPEP	70	132.6±50.0[a]	8.5±6.8	25.3±3.5	5.9±1.8	164.0±185.5	NA
			OP	70	129.7±48.8[a]	8.4±6.9	25.6±3.8	5.7±1.8	168.0±183.0	NA
Rao et al. [22]	2014	1,3,6,12	PKEP	43	116.2±32.4	4.8±2.2	24.8±3.1	5.8±2.0	83.4±11.8	20.6±3.1
			OP	40	110.2±32.1	4.5±2.1	24.5±3.6	5.9±2.3	81.4±15.7	20.3±3.4
Chen et al. [24]	2014	1,6,12,24,36,48,60,72	PKEP	80	110.0±20.7	2.9±0.9	25.6±3.3	4.0±2.2	240.0±170.4	22.0±3.0
			OP	80	114.5±17.8	3.1±0.7	25.7±3.3	4.0±2.0	249.0±163.0	22.0±3.7
Ou et al. [23]	2013	3,12	PKEP	47	132.2±36.9	5.9±0.7	23.2±5.7	5.9±2.1	89.6±52.7	NA
			OP	45	139.5±36.2	5.6±0.8	25.1±5.4	5.1±2.3	81.3±48.6	NA

Li et al. PLoS One. 2015;10:e0121265.

Department of Urology, University of Crete, Medical School, Heraklion, Crete, Greece

Table 3. Summary of perioperative outcomes

Outcome	No. of studies	Trial size EP/OP	WMD(95% CI)	P value	Heterogeneity		Favors
					I^2	P value	
Operative time, min	/	/	/	/	/	/	/
HoLEP vs OP	6, 21, 35	133/127	32.15 [8.87, 55.42]*	0.01	93%	0.00	OP
BEEP vs OP	22–25	240/235	5.21 [-8.94, 19.35]*	0.47	93%	0.00	None
EP vs OP total	6, 21–25, 35	373/362	16.21 [3.72, 28.70]*	0.01	94%	0.00	OP
Hemoglobin decrease, g/dL	/	/	/	/	/	/	/
HoLEP vs OP	6, 35	101/99	-0.95 [-1.35, -0.56]*	0.00	0%	0.75	HoLEP
BEEP vs OP	22–25	240/235	-1.22 [-2.12, -0.33]*	0.01	97%	0.00	BEEP
EP vs OP total	6, 22–25, 35	341/334	-1.14 [-1.81, -0.47]*	0.00	96%	0.00	EP
Resected prostate weight, g	/	/	/	/	/	/	/
HoLEP vs OP	6, 21, 35	133/127	-14.17 [-28.33,-0.02]*	0.05	70%	0.03	None
BEEP vs OP	22–25	240/235	-8.09 [-12.90,-3.28]*	0.00	0%	0.91	OP
EP vs OP total	6, 21–25, 35	373/362	-9.63 [-14.46, -4.81]*	0.00	24%	0.24	OP
Catheterization, days	/	/	/	/	/	/	/
HoLEP vs OP	6, 21, 35	133/127	-3.83 [-7.17, -0.48]*	0.02	99%	0.00	HoLEP
BEEP vs OP	22–25	240/235	-3.78 [-4.51, -3.04]*	0.00	92%	0.00	BEEP
EP vs OP total	6, 21–25, 35	373/362	-3.80 [-5.11, -2.48]*	0.00	99%	0.00	EP
Hospital stay, days	/	/	/	/	/	/	/
HoLEP vs OP	6, 21, 35	133/127	-5.84 [-9.51, -2.17]*	0.00	99%	0.00	HoLEP
BEEP vs OP	22–25	240/235	-4.43 [-5.03, -3.84]*	0.00	85%	0.00	BEEP
EP vs OP total	6, 21–25, 35	373/362	-4.93 [-5.96, -3.89]*	0.00	97%	0.00	EP

Li et al. PLoS One. 2015;10:e0121265.

Department of Urology, University of Crete, Medical School, Heraklion, Crete, Greece

Table 4. Summary of postoperative outcomes

Outcome	No. of studies	Trial size EP/OP	WMD(95% CI)	P value	Heterogeneity		Favors
					I^2	P value	
IPSS 3 mo HoLEP vs OP	6, 21, 35	133/127	0.29 [-0.36, 0.93]	0.38	30%	0.24	None
IPSS 3 mo BEEP vs OP	22, 23, 25	160/155	0.15 [-0.45, 0.75]	0.63	0%	0.84	None
IPSS 3 mo total	6, 21–23, 25, 35	293/282	0.21 [-0.23, 0.65]	0.34	0%	0.65	None
IPSS 6 mo HoLEP vs OP	35	60/60	-0.40 [-1.50, 0.70]	0.48	/	/	None
IPSS 6 mo BEEP vs OP	22, 24, 25	191/189	0.04 [-0.52, 0.59]	0.90	0%	0.95	None
IPSS 6 mo total	22, 24, 25, 35	251/249	-0.05 [-0.55, 0.44]	0.83	0%	0.90	None
IPSS 12 mo HoLEP vs OP	6, 35	101/99	0.00 [-0.64, 0.65]	0.99	0%	0.97	None
IPSS 12 mo BEEP vs OP	22–25	237/233	-0.15 [-0.50, 0.21]	0.42	0%	0.98	None
IPSS 12 mo total	6, 22–25, 35	338/332	-0.11 [-0.42, 0.20]	0.48	0%	1.00	None
Qmax 3 mo HoLEP vs OP	6, 21, 35	133/127	-0.35 [-2.51, 1.81]*	0.79	21%	0.28	None
Qmax 3 mo BEEP vs OP	22, 23, 25	160/155	-0.70 [-3.08, 1.68]*	0.56	77%	0.01	None
Qmax (mL/s) 3 mo total	6, 21–23, 25, 35	293/282	-0.65 [-2.28, 0.98]*	0.44	64%	0.02	None
Qmax 6 mo HoLEP vs OP	35	60/60	2.90 [0.67, 5.13]	0.01	/	/	HoLEP
Qmax 6 mo BEEP vs OP	22, 24, 25	191/189	0.45 [-0.89, 1.78]	0.51	0%	0.92	None
Qmax 6 mo total	22, 24, 25, 35	251/249	1.09 [-0.05, 2.24]	0.06	17%	0.31	None
Qmax 12 mo HoLEP vs OP	6, 35	101/99	-1.53 [-3.40, 0.34]	0.11	0%	0.62	None
Qmax 12 mo BEEP vs OP	22–25	237/233	-0.31 [-1.40, 0.78]	0.58	0%	0.47	None
Qmax 12 mo total	6, 22–25, 35	338/332	-0.62 [-1.56, 0.32]	0.20	0%	0.55	None
QoL 3 mo HoLEP vs OP	6,21	73/67	0.24 [-0.06, 0.53]*	0.11	71%	0.06	None
QoL 3 mo BEEP vs OP	22, 23, 25	160/155	-0.15 [-0.37, 0.07]*	0.19	0%	0.75	None
QoL3 mo total	6, 21–23, 25	233/222	0.05 [-0.18, 0.27]*	0.69	63%	0.03	None
QoL 6 mo HoLEP vs OP	/	/	/	/	/	/	/
QoL 6 mo BEEP vs OP	22, 24, 25	191/189	-0.07 [-0.32, 0.19]	0.60	0%	0.94	None
QoL 6 mo total	22, 24, 25	191/189	-0.07 [-0.32, 0.19]	0.60	0%	0.94	None
QoL 12 mo HoLEP vs OP	6	41/39	-0.07[-0.46, 0.32]	0.72	/	/	None
QoL 12 mo BEEP vs OP	22–25	240/233	-0.08 [-0.25, 0.09]	0.38	0%	0.74	None
QoL 12 mo total	6, 22–25	281/272	-0.08 [-0.23, 0.08]	0.35	0%	0.87	None
PVR 3 mo HoLEP vs OP	21, 35	92/88	-0.75 [-10.93, 9.43]*	0.88	83%	0.02	None
PVR 3 mo BEEP vs OP	22, 23, 25	160/155	-0.46 [-2.27, 1.35]*	0.62	0%	0.89	None
PVR (mL) 3 mo total	21–23, 25, 35	252/243	-0.47 [-3.32, 2.38]*	0.75	35%	0.19	None
PVR 6 mo HoLEP vs OP	35	60/60	2.30 [-0.87, 5.47]	0.16	/	/	None
PVR 6 mo BEEP vs OP	22, 24, 25	191/189	-0.29 [-1.64, 1.07]	0.68	0%	0.99	None
PVR 6 mo total	22, 24, 25, 35	251/249	0.11 [-1.13, 1.36]	0.86	0%	0.54	None
PVR 12 mo HoLEP vs OP	35	60/60	-0.60 [-5.85, 4.65]	0.82	/	/	None
PVR 12 mo BEEP vs OP	22–25	237/233	-0.20 [-1.39, 0.99]	0.74	0%	0.61	None
PVR 12 mo total	22–25, 35	297/293	-0.22 [-1.38, 0.94]	0.71	0%	0.76	None
IIEF-5 3 mo EP vs OP	6, 22	84/79	0.47 [-0.64, 1.59]	0.41	0%	0.68	None
IIEF-5 6 mo EP vs OP	6, 22, 24	162/158	-0.44[-2.03, 1.14]*	0.58	61%	0.08	None
IIEF-5 12 mo EP vs OP	6, 22, 24	161/157	1.00[0.21, 1.78]	0.01	9%	0.33	EP
IIEF-5 24 mo EP vs OP	6, 24	121/119	0.89 [-0.01, 1.80]	0.05	0%	0.62	None

Li et al. PLoS One. 2015;10:e0121265.

Department of Urology, University of Crete, Medical School, Heraklion, Crete, Greece

Table 5.| Summary of complications.

Outcome	No. of studies	Trial size EP/OP	RR(95% CI)	P value	Heterogeneity		Favors
					I^2	P value	
Blood transfusion	/	/	/	/	/	/	/
HoLEP vs OP	6, 34	101/99	0.16 [0.04, 0.58]	0.01	0%	0.32	HoLEP
BEEP vs OP	22–25	240/235	0.27 [0.10, 0.72]	0.01	16%	0.31	BEEP
EP vs OP total	6, 22–25, 34	341/334	0.22 [0.10, 0.47]	0.00	0%	0.42	EP
Recatheterization	/	/	/	/	/	/	/
HoLEP vs OP	6, 34	101/99	1.56 [0.53, 4.62]	0.42	0%	0.44	None
BEEP vs OP	22–25	240/235	0.39 [0.12, 1.22]	0.10	17%	0.30	None
EP vs OP total	6, 22–25, 34	341/334	0.78 [0.37, 1.63]	0.51	25%	0.26	None
Urinary tract infection	/	/	/	/	/	/	/
HoLEP vs OP	/	/	/	/	/	/	/
BEEP vs OP	22–25	240/235	0.60 [0.31, 1.18]	0.14	0%	0.93	None
EP vs OP total	22–25	240/235	0.60 [0.31, 1.18]	0.14	0%	0.93	None
Urinary incontinence	/	/	/	/	/	/	/
HoLEP vs OP	6, 21	73/67	0.86 [0.53, 1.40]*	0.55	0%	0.40	None
BEEP vs OP	22–25	162/228	1.45 [0.19, 11.25]*	0.72	83%	0.00	None
EP vs OP total	6, 21–25	235/295	1.35 [0.42, 4.37]*	0.62	85%	0.00	None
BNC/urethral strictures	/	/	/	/	/	/	/
HoLEP vs OP	6, 21, 34	133/127	0.78 [0.24, 2.49]	0.67	0%	0.91	None
BEEP vs OP	22–25	234/228	0.69 [0.31, 1.54]	0.36	0%	0.47	None
EP vs OP total	6, 21–25, 34	367/355	0.71 [0.37, 1.39]	0.32	0%	0.84	None
Reintervention	/	/	/	/	/	/	/
HoLEP vs OP	6, 7, 21, 34	133/127	1.06 [0.49, 2.29]	0.89	0%	0.96	None
BEEP vs OP	22–25	234/228	0.71 [0.33, 1.53]	0.38	0%	0.46	None
EP vs OP total	6, 7, 21–25, 34	367/355	0.86 [0.50, 1.48]	0.58	0%	0.81	None

Li et al. PLoS One. 2015;10:e0121265.

Department of Urology, University of Crete, Medical School, Heraklion, Crete, Greece

Conclusions

This meta-analysis revealed statistically comparable efficacy and safety for EP vs OP, although only a limited number of RCTs with relatively limited follow-up are available. EP had an efficacy similar to that of OP in terms of the IPSS, Qmax, QoL, PVR and PSA and offered several advantages over OP in terms of the catheterization time, hospital stay, hemoglobin decrease, blood transfusion and IIEF-5 score. By contrast, OP was superior in terms of the operation time and the resected tissue weight. Furthermore, no differences were evident regarding the rates of complications such as recatheterization, urinary tract infection, urinary incontinence, bladder-neck/urethral strictures and reintervention. In general, EP is an effective and safe minimally invasive option for the treatment of large prostates.

Li et al. PLoS One. 2015;10:e0121265.

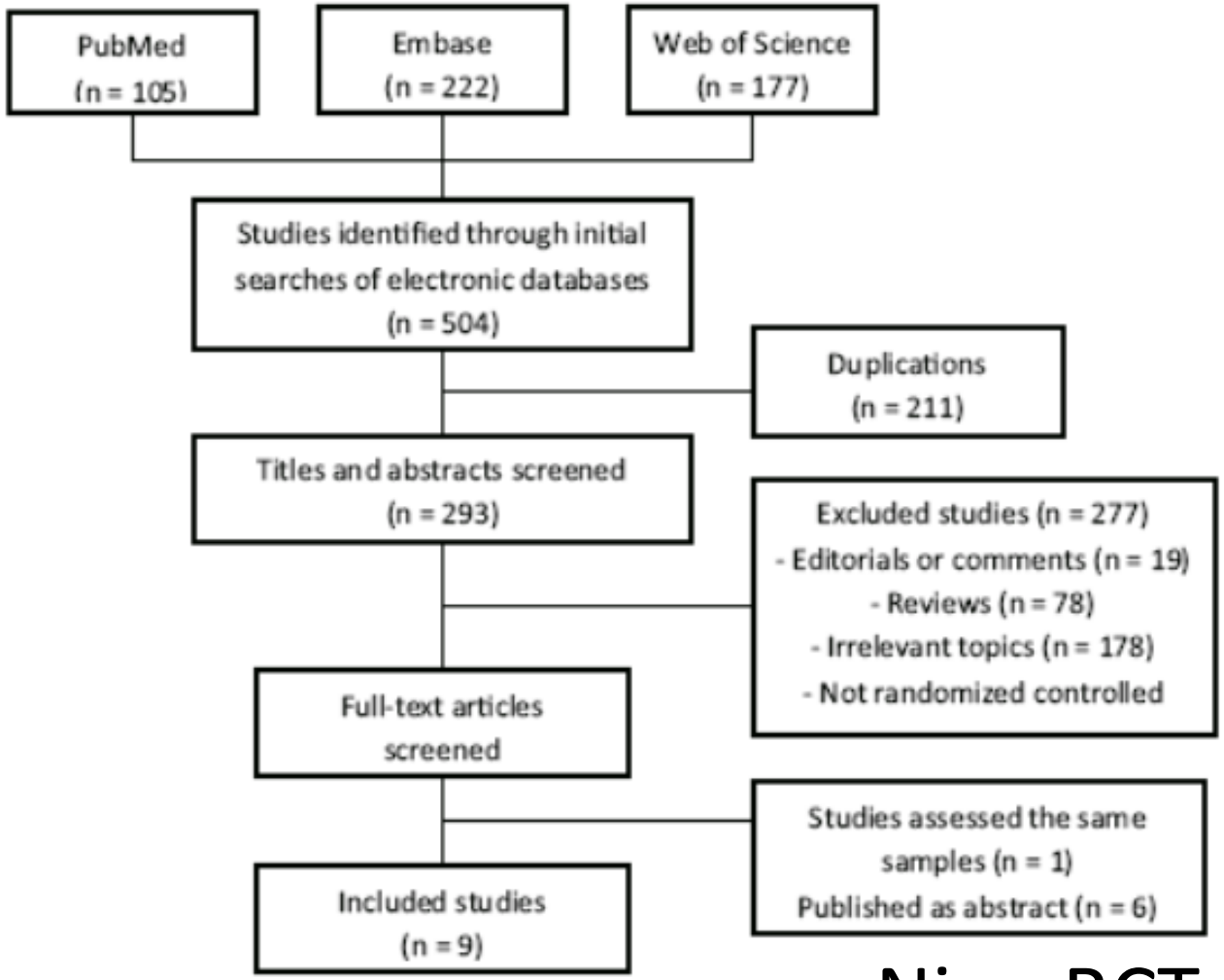
Department of Urology, University of Crete, Medical School, Heraklion, Crete, Greece

Transurethral enucleation of the prostate versus transvesical open prostatectomy for large benign prostatic hyperplasia: a systematic review and meta-analysis of randomized controlled trials

Youcheng Lin[1,2] · Xun Wu[3,4] · Abai Xu[1] · Rui Ren[5] · Xueqiong Zhou[6] · Yong Wen[1] · Yong Zou[1] · Mancheng Gong[5] · Chunxiao Liu[1] · Zexuan Su[3,4] · Thomas R. W. Herrmann[7]

Lin et al. World J Urol. 2016;34:1207-19.

Department of Urology, University of Crete, Medical School, Heraklion, Crete, Greece



Nine RCTs involving 758 patients analyzed

Fig. 1 Flow diagram of studies identified, included and excluded from analysis

Lin et al. World J Urol. 2016;34:1207-19.

Department of Urology, University of Crete, Medical School, Heraklion, Crete, Greece

Table 1 Characteristics of the included randomized controlled trials (RCTs)

Studies	Publication (year)	Treatments	TUEP device	No. of patients	Definition of "large prostate"	Age (years)	Qmax (mL/s)	PVR (mL)	QoL	IPSS	Prostate size	Follow-up (mo)	Jadad score
Chen et al. [10]	2014	PKEP	Gyrus generator	80	>100 g	64.7 ± 3.7	4 (3–6)	240 (160–390)	4 (4–5)	25.6 ± 3.3	110 (102–130) g	72	3
		OP		80		63.7 ± 4.5	4 (2.25–5)	240 (180–400)	5 (4–6)	25.7 ± 3.3	114.5 (104–128) g		
Geavlete et al. [16]	2015	PKEP	SurgMaster HES-40 generator	80	>80 mL	68.5 ± 8.5	6.6 ± 1.6	134.1 ± 86.8	4.1 ± 1.1	24.7 ± 3.3	122.6–30.7 mL	12	2
		OP		80		68.7 ± 8.6	6.5 ± 1.7	142.1 ± 93.1	4.0 ± 1.2	24.9 ± 3.0	128.7 ± 32.7 mL		
Kuntz et al. [14]	2008	HoLEP	VersaPulse PowerSuite	60	>100 mL	69.2 ± 8.4	3.8 ± 3.6	280 ± 273	NA	NA	114.6 ± 21.6 mL	60	3
		OP		60		71.2 ± 8.3	3.6 ± 3.8	292 ± 191	NA	NA	113.0 ± 19.2 mL		
Kuntz et al. [18]	2004	HoLEP	VersaPulse PowerSuite	60	>100 g	69.2 ± 8.4	3.8 ± 3.6	280 ± 273	NA	NA	114.6 ± 21.6 mL	18	3
		OP		60		71.2 ± 8.3	3.6 ± 3.8	292 ± 191	NA	NA	113.0 ± 19.2 mL		
Kuntz et al. [17]	2002	HoLEP	VersaPulse PowerSuite	60	>100 g	69.2 ± 8.4	3.8 ± 3.6	280 ± 273	NA	NA	114.6 ± 21.6 mL	6	3
		OP		60		71.2 ± 8.3	3.6 ± 3.8	292 ± 191	NA	NA	113.0 ± 19.2 mL		
Naspro et al. [19]	2006	HoLEP	VersaPulse PowerSuite	41	>70 g	66.26 ± 6.55	7.83 ± 3.42	NA	4.07 ± 0.98	20.11 ± 5.84	113.27 ± 35.33 g	24	2
		OP		39		67.27 ± 6.72	8.32 ± 2.37	NA	4.44 ± 0.96	21.60 ± 3.24	124.21 ± 38.52 g		
Ou et al. [20]	2013	PKEP	Gyrus generator	47	>80 mL	69.8 ± 10.2	5.9 ± 2.1	89.6 ± 52.7	4.1 ± 0.4	23.2 ± 5.7	132.2 ± 36.9 mL	12	2
		OP		45		71.5 ± 9.5	5.1 ± 2.3	81.3 ± 48.6	4.3 ± 0.5	25.1 ± 5.4	139.5 ± 36.2 mL		
Rao et al. [21]	2013	PKEP	Gyrus generator	43	>80 mL	NA	5.8 ± 2.0	83.4 ± 11.8	5.2 ± 0.7	24.8 ± 3.1	116.2 ± 32.4 mL	12	2
		OP		40		NA	5.9 ± 2.3	81.4 ± 15.7	5.1 ± 0.9	24.5 ± 3.6	110.2 ± 32.1 mL		
Sakeris et al. [22]	2006	HoLEP	VersaPulse PowerSuite	34	70–220 g	67.4 ± 6.7	8.9 ± 4.2	87.4 ± 83.5	4.6 ± 1.0	19.6 ± 7.0	113.8 ± 37.0 mL	NA	2
		OP		29		68.0 ± 6.4	8.4 ± 2.4	105.3 ± 71.8	4.4 ± 1.0	21.6 ± 3.5	121.0 ± 34.9 mL		

Lin et al. World J Urol. 2016;34:1207-19.

Department of Urology, University of Crete, Medical School, Heraklion, Crete, Greece

Conclusions

We identified nine randomized trials that compared TUEP with OP in the management of large prostates. No differences between TUEP and OP were observed in the short- and intermediate-term functional outcomes. Perioperative outcomes of irrigation time, catheterization time and length of hospital stay were shorter with TUEP. Postoperative complications of blood transfusion were significantly fewer with TUEP, whereas no difference was noted in the complications of recatheterization, UTI, reintervention for clots and bleeding control, incidence of pneumonia and infarction, transient incontinence, bladder neck contracture, urethral stricture or recurrent adenoma. We consider that TUEP as a current-based technique could evolve as the next-generation gold standard of transurethral surgery for large BPE.

Lin et al. World J Urol. 2016;34:1207-19.

Department of Urology, University of Crete, Medical School, Heraklion, Crete, Greece

Transurethral (endoscopic) enucleation of the prostate (EEP)

Department of Urology, University of Crete, Medical School, Heraklion, Crete, Greece

Birth of EEP (Hiraoka, 1983)

Monopolar current-based enucleation–resection (blueprint for all subsequent EEP techniques) but remained a local phenomenon in Japan

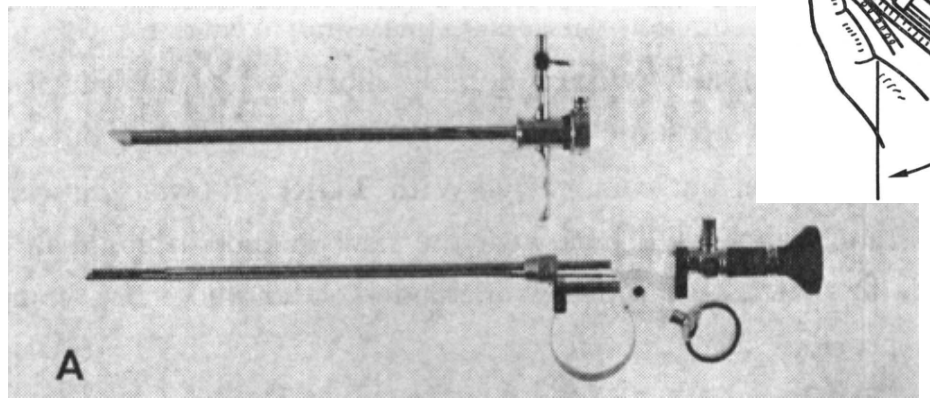
—122— (896) J. Nippon Med. Sch., Vol. 50, No. 6 (1983)

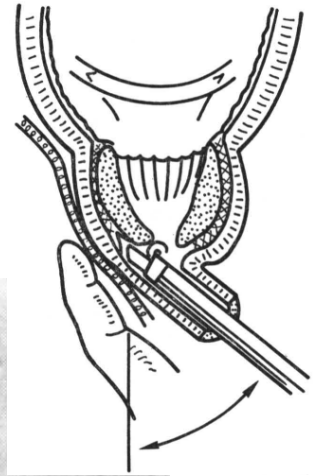
—Preliminary Note—

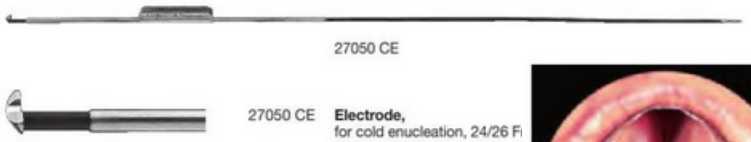
A new method of prostatectomy, transurethral detachment and resection of benign prostatic hyperplasia

Yasunori Hiraoka

Department of Urology (Director : Prof. Masao Akimoto), Nippon Medical School

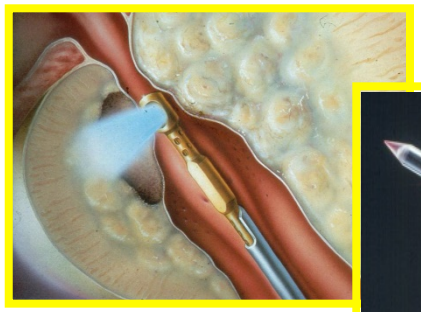




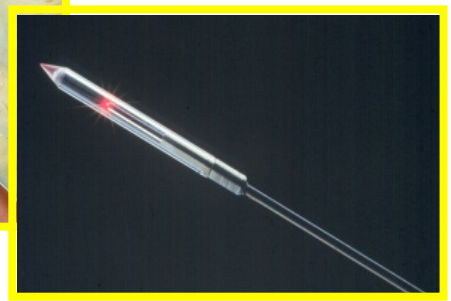


Department of Urology, University of Crete, Medical School, Heraklion, Crete, Greece

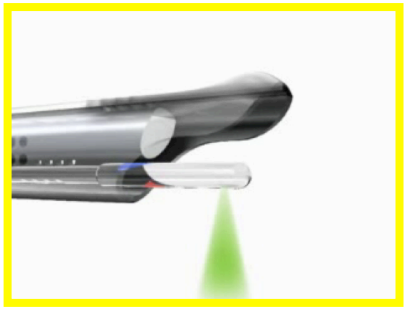
EEP teamed up with laser technology



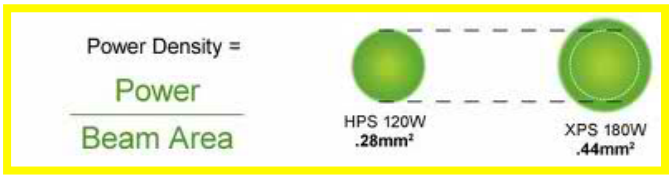
Costello



Muschter



Malek

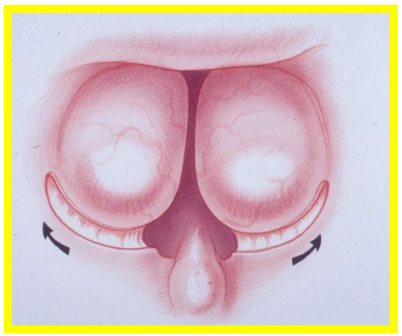


LBO 180 W

1991 1992 1996 1998 2003 2006 2010

Roth

Gilling



LBO 120 W

KTP 80 W

Department of Urology, University of Crete, Medical School, Heraklion, Crete, Greece

BJUI
BJU INTERNATIONAL

Critical review of lasers in benign prostatic hyperplasia (BPH)

TABLE 1 Main characteristics of different lasers

Type of laser	Wavelength, nm	Chromophore	Penetration depth, mm	Mode	Application
Nd : YAG	1064	Water and haemoglobin	10	Pulsed or continuous	Coagulation
Ho : YAG	2140	Water	0.4	Pulsed	Vaporization, resection, enucleation
KTP (LBO)	532	Haemoglobin	0.8	Quasi-continuous	Vaporization
Tm	2000	Water	0.25	Continuous	Vaporization, resection, enucleation
Diode	940	Water and haemoglobin	Various	Pulsed or continuous	Vaporization
	980				
	1470				

Gravas et al. BJU Int. 2011;107:1030-43

Department of Urology, University of Crete, Medical School, Heraklion, Crete, Greece

EEP teamed up with mechanical tissue morcellator

Department of Urology, University of Crete, Medical School, Heraklion, Crete, Greece

Evolution of EEP

- Ho:YAG Laser Enucleation of the Prostate (HoLEP) [1998]
- Plasmakinetic Enucleation of the Prostate (PkEP) [2006]
- Tm:YAG Vapoenucleation (ThuVEP) [2009]
- Tm:YAG Laser Enucleation of the Prostate (ThuLEP)[2010]
- Bipolar Plasma Enucleation of the Prostate (BPEP) [2013]
- Diode Laser Enucleation of the Prostate (DiLEP) [2014]
- Lithium-Borate “Greenlight” enucleation of the prostate (GreenLEP) [2015]

Herrmann. World J Urol. 2016;34:1353-5

Department of Urology, University of Crete, Medical School, Heraklion, Crete, Greece

HoLEP (Fraunder & Gilling, 1998)

Eur Urol. 1998;33(1):69-72.

Holmium:YAG laser enucleation of the prostate combined with mechanical morcellation: preliminary results.

Fraundorfer MR[1], Gilling PJ.

Author information

Abstract

OBJECTIVES: To determine the feasibility of holmium laser enucleation of the prostate (HoLEP) combined with mechanical morcellation to surgically treat bladder outflow obstruction due to the larger prostate.

METHODS: The first 14 patients treated with this new combination technique are described. Standard preoperative investigations were performed and all patients were assessed at 1 month postoperatively with an AUA symptom score and peak urinary flow rate (Qmax). Both transurethral (8 patients) and suprapubic (6 patients) morcellation was utilised.

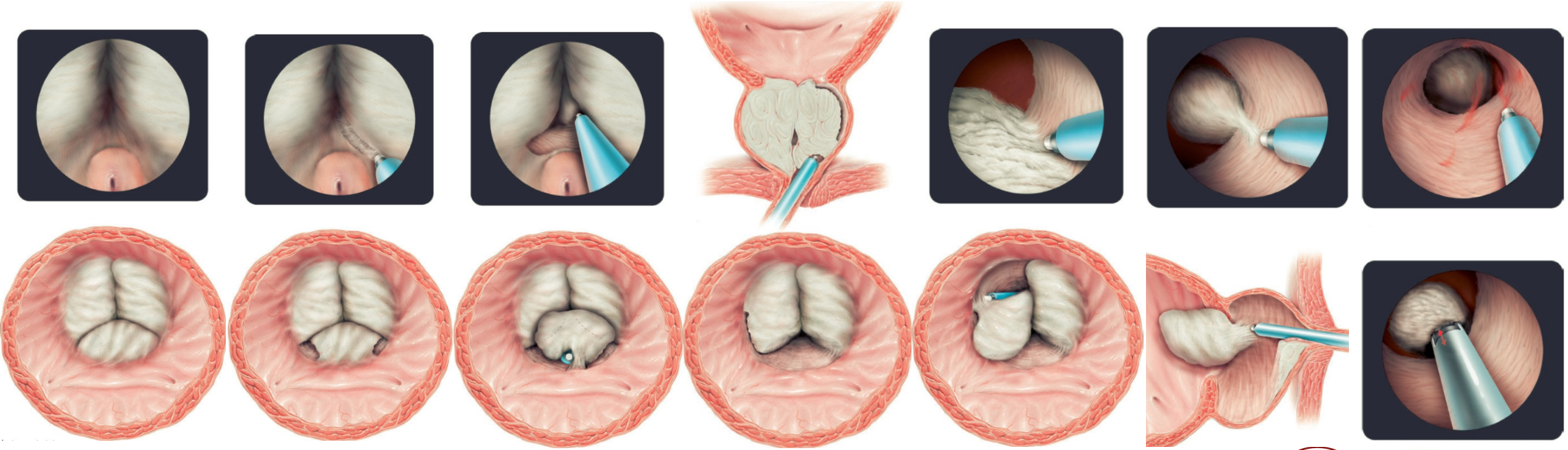
RESULTS: The mean ultrasound volume of the prostate was 98.6 ml (55-200). The mean total operating room time was 98 min (64-190). No patient required blood transfusion but 2 patients required postoperative bladder irrigation. Twelve of the patients were discharged catheter-free the following day. The only significant complication was extraperitoneal extravasation from the suprapubic site in 2 patients. At 1 month the mean Qmax was 25.2 ml/s and the mean AUA score was 7.2.

CONCLUSIONS: This combination of techniques offers a minimally morbid method of treating the larger prostate gland.

Department of Urology, University of Crete, Medical School, Heraklion, Crete, Greece

HoLEP (Technique)

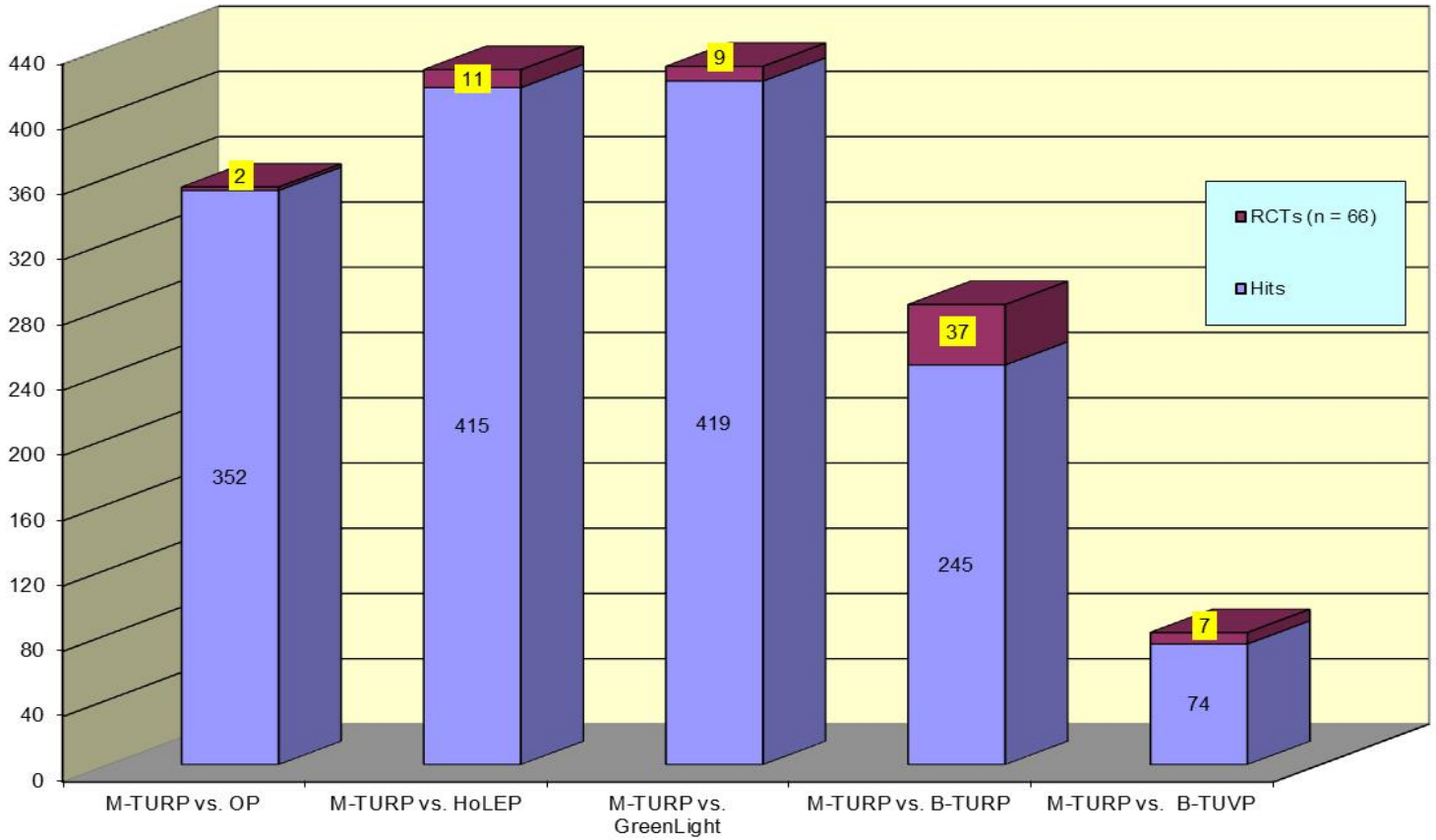
High-powered holmium laser (>60 W); 6 F ureteric catheter;
550μm laser fiber; Laser resectoscope continuous-flow (26 F)
30^{o} telescope - large bridge - endoscopic camera - morcellator



Gilling. BJU Int. 2008;101:131-42

Department of Urology, University of Crete, Medical School, Heraklion, Crete, Greece

HoLEP vs. TURP



3 Meta-analyses:

similar results

Tan et al. Br J Surg. 2007;94:1201-8

(4 RCTs; n=460)

Yin et al. J Endourol. 2013;27:604-11

(6 RCTs; n=541)

Cornu et al. Eur Urol. 2015;67:1066-96

(6 RCTs; n=570)

Department of Urology, University of Crete, Medical School, Heraklion, Crete, Greece

Current Level of Evidence (1a): Summary

- Similar or better efficacy (Yin et al; Cornu et al) for HoLEP
- Similar safety (Tan et al & Yin et al; Cornu et al)
- HoLEP: Better perioperative profile:
  - Less hemorrhage - transfusions (Yin et al)
  - Shorter catheter-hospital duration (Yin et al; Cornu et al)
- TURP: Shorter OR duration (Tan et al; Yin et al; Cornu et al)
  - Less dysuria (Tan et al & Yin et al)

Department of Urology, University of Crete, Medical School, Heraklion, Crete, Greece

Potential limitations of the meta-analyses

- Relative low number of RCTs
- Relatively low quality of RCTs
- Relative heterogeneity among RCTs
- Relatively short follow-up (12 mo)

Department of Urology, University of Crete, Medical School, Heraklion, Crete, Greece

Long term results I

Holmium Laser Enucleation versus Transurethral Resection of the Prostate: 3-Year Follow-Up Results of a Randomized Clinical Trial

Objectives: To report 3-yr follow-up results of a randomised clinical trial comparing holmium laser enucleation of the prostate (HoLEP) with transurethral resection of the prostate (TURP).

Methods: A total of 200 patients with urodynamic obstruction and a prostate volume of less than 100 cc were prospectively randomised and assigned to HoLEP or TURP. All patients were assessed preoperatively and followed at 1, 6, 12, 18, 24, and 36 mo postoperatively. American Urological Association Symptom Score (AUA SS), maximum flow rate (Q_{max}), and postvoid residual (PVR) [urine] volume were obtained at each follow-up. Perioperative data and postoperative outcome were compared. All complications were recorded.

Results: AUA SS were significantly better 2 yr postoperatively in the HoLEP group (1.7 vs. 3.9, $p < 0.0001$) and similar at 3 yr (2.7 vs. 3.3, $p = 0.17$). PVR volume was significantly better 2 yr (5.6 vs. 19.9 ml, $p < 0.001$) and 3 yr (8.4 vs. 20.2 ml, $p = 0.012$) postoperatively in HoLEP patients. Q_{max} was similar in the HoLEP and TURP groups at 2 yr (28.0 vs. 29.1 ml/s, $p = 0.83$) and at 3 yr (29.0 vs. 27.5 ml/s, $p = 0.41$) postoperatively. Late complications consisted of urethral strictures, bladder-neck contractures, and BPH recurrence; reoperation rates were 7.2% in the HoLEP and 6.6% in the TURP group ($p = 1.0$).

Conclusions: After 2 and 3 yr of follow-up, HoLEP micturition outcomes compare favourably with TURP. Late complications are equally low. HoLEP may be a real alternative to TURP.

Ahyai et al. Eur Urol. 2007;52:1456-63

Department of Urology, University of Crete, Medical School, Heraklion, Crete, Greece

Long term results II

Long-term results of a randomized trial comparing holmium laser enucleation of the prostate and transurethral resection of the prostate: results at 7 years

OBJECTIVE

- To assess the durability of holmium laser enucleation of prostate in comparison to transurethral resection of the prostate (TURP).

PATIENTS AND METHODS

- Patients were enrolled in the present study between June 1997 and December 2000 and followed per protocol.
- All patients were urodynamically obstructed with a prostate volume of between 40 and 200 mL.
- At long-term follow-up, variables assessed included Benign Prostatic Hyperplasia Impact Index (BPHII), International Continence Society Short Form Male questionnaire (ICSmale-SF) and the International Index of Erectile Function (IIEF).
- Adverse events, including the need for retreatment, were specifically assessed.

RESULTS

- Thirty-one (14 holmium laser enucleation of the prostate [HoLEP] and 17 TURP) of the initial 61 patients were available, with 12 deceased and 18 lost to follow-up.
- The mean (range) follow-up was 7.6 (5.9–10.0) years and the mean (±SD) age at follow-up was 79.8 (±6.2) years.
- The mean (±SD) values (HoLEP vs TURP) were as follows: maximum urinary flow rate (Q_{max}), 22.09 ± 15.47 vs 17.83 ± 8.61 mL/s; American Urological Association (AUA) symptom score, 8.0 ± 5.2 vs 10.3 ± 7.42; quality of life (QOL) score 1.47 ± 1.31 vs 1.31 ± 0.85; BPHII, 1.53 ± 2.9 vs 0.58 ± 0.79; IIEF-EF (erectile function), 11.6 ± 7.46 vs 9.21 ± 7.17; ICSmale Voiding Score (VS), 4.2 ± 3.76 vs 3.0 ± 2.41; ICSmale Incontinence Score (IS), 3.07 ± 3.3 vs 1.17 ± 1.4.
- There were no significant differences in any variable between the two groups beyond the first year.
- Of the assessable patients, none required re-operation for recurrent BPH in the HoLEP arm and three (of 17) required re-operation in the TURP arm .

CONCLUSION

- The results of this randomized trial confirm that HoLEP is at least equivalent to TURP in the long term with fewer re-operations being necessary.

Gilling et al. BJU Int. 2012;109:408-11

Department of Urology, University of Crete, Medical School, Heraklion, Crete, Greece

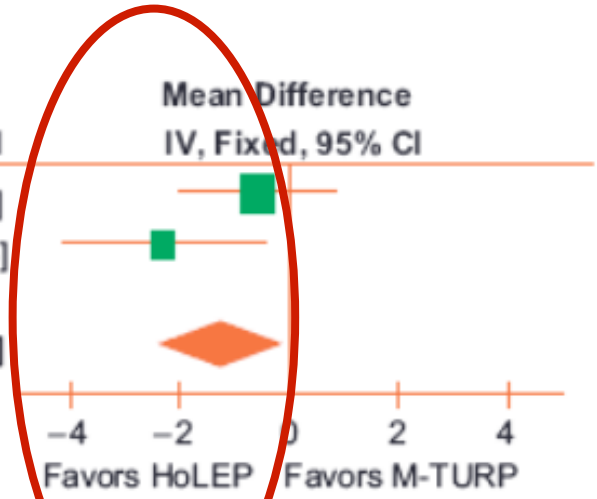
Long term results: Meta-analysis (IPSS-Qmax)

E.

Study or Subgroup	HoLEP Mean	HoLEP SD	HoLEP Total	M-TURP Mean	M-TURP SD	M-TURP Total	Weight	Mean Difference IV, Fixed, 95% CI
Ahyai 2007	2.7	3.2	36	3.3	3	36	62.5%	–0.60 [–2.03, 0.83]
Gilling 2012	8	5.2	92	10.3	7.42	92	37.5%	–2.30 [–4.15, –0.45]
Total (95% CI)			**128**			**128**	**100.0%**	**–1.24 [–2.37, –0.10]**

Heterogeneity: $\chi^2 = 2.03$, df = 1 ($p = 0.15$); $I^2 = 51\%$

Test for overall effect: Z = 2.14 ($p = 0.03$)

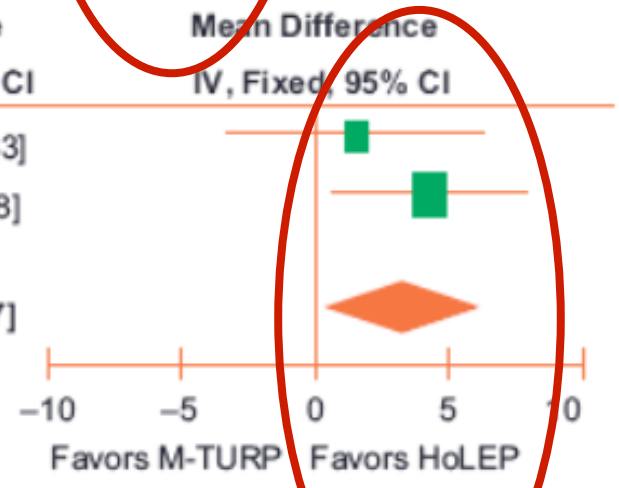


F.

Study or Subgroup	HoLEP Mean	HoLEP SD	HoLEP Total	M-TURP Mean	M-TURP SD	M-TURP Total	Weight	Mean Difference IV, Fixed, 95% CI
Ahyai 2007	29	11	36	27.5	9.9	36	35.9%	1.50 [–3.33, 6.33]
Gilling 2012	22.09	15.47	92	17.83	8.61	92	64.1%	4.26 [0.64, 7.88]
Total (95% CI)			**128**			**128**	**100.0%**	**3.27 [0.37, 6.17]**

Heterogeneity: $\chi^2 = 0.80$, df = 1 ($p = 0.37$); $I^2 = 0\%$

Test for overall effect: Z = 2.21 ($p = 0.03$)



Cornu et al. Eur Urol. 2015;67:1066-96

Department of Urology, University of Crete, Medical School, Heraklion, Crete, Greece

HoLEP vs. OP

3 meta-analyses (4 RCTs-Pvol>100 ml; n= 323; FU: 12 (1-60) mo

Large heterogeneity - Relatively low quality of RCTs

- Significantly shorter OR time for OP
- Significantly shorter catheter/hospital duration for HoLEP
- Significantly lower transfusion rate for HoLEP
- No difference in efficacy or any other outcome

Cornu et al. Eur Urol. 2015;67:1066-96
Li et al. PLoS One. 2015;10:e0121265
Lin et al. World J Urol. 2016;34:1207-19

Department of Urology, University of Crete, Medical School, Heraklion, Crete, Greece

EAU Guidelines on

Management of Non-Neurogenic Male Lower Urinary Tract Symptoms (LUTS), incl. Benign Prostatic Obstruction (BPO)

S. Gravas (Chair), T. Bach, A. Bachmann, M. Drake, M. Gacci, C. Gratzke, S. Madersbacher, C. Mamoulakis, K.A.O. Tikkinen
Guidelines Associates: M. Karavitakis, S. Malde, V. Sakkalis, R. Umbach

European Association of Urology

Recommendations	LE	GR
OP or EEP such as holmium laser or bipolar enucleation are the first choice of surgical treatment in men with a substantially enlarged prostate (e.g. > 80 mL) and moderate-to-severe LUTS.	1a	A
OP has a high operative morbidity.	1b	A

Recommendations	LE	GR
HoLEP and 532-nm laser vaporisation of the prostate are alternatives to TURP in men with moderate-to-severe LUTS leading to immediate, objective, and subjective improvements comparable with TURP.	1a	A
The long-term functional results of HoLEP are comparable with TURP or open prostatectomy.	1b	A

EAU guidelines on Management of non-neurogenic male LUTS, 2016

Department of Urology, University of Crete, Medical School, Heraklion, Crete, Greece

HoLEP vs. Other techniques

Scarce RCTs; no firm statement can be made at present:

HoLEP vs.	n	PV (ml)	FU (mo)	IPSS/ Qmax	OR Time	Catheter Time	Hospital Time
B-TURP (TURis)[1]	120	70	12	HoLEP	B-TURP	HoLEP	HoLEP
B-TURP (PK; Gyrus)[2]	280	50	24	NS	B-TURP	HoLEP	HoLEP
PVP[3]	80	90	12	NS/HoLEP	NS	NS	NS

1. *Fayad et al. Urology. 2015;86:1037-41;*
2. *Chen et al. J Urol. 2013;189:217-22;*
3. *Elmansy et al. J Urol. 2012;188:216-21*

Department of Urology, University of Crete, Medical School, Heraklion, Crete, Greece

PkEP (Neill, 2006)

HoLEP vs.	n	PV (ml)	FU (mo)	IPSS/ Qmax	OR Time	Catheter Time	Hospital Time
PKEP	40	55	12	NS	HoLEP	NS	NS

ABSTRACT

Objectives. To compare the alternative energy sources of the holmium:yttrium-aluminum-garnet laser and bipolar plasmakinetic energy for endoscopic enucleation.

Methods. A prospective, randomized controlled trial was undertaken, with 20 patients assigned to each group. The preoperative and postoperative measures included transrectal ultrasound-assessed prostate volume, postvoid residual urine volume, and urodynamic evaluation findings. The intraoperative measures included procedure length, energy use, and specimen weight. All adverse events were recorded at each postoperative visit in a 1, 3, 6, and 12-month protocol.

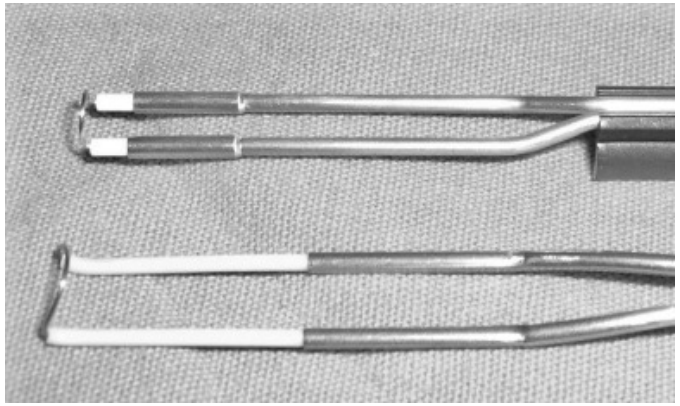
Results. No differences were found in the preoperative characteristics between the two groups. The significant differences favoring holmium laser enucleation of the prostate compared with plasmakinetic enucleation of the prostate were seen in the operative time (43.6 versus 60.5 minutes), recovery room time (47.1 versus 65.6 minutes), and bladder irrigation requirement (5% versus 35%). The outcomes after holmium laser enucleation of the prostate and plasmakinetic enucleation of the prostate were in all other respects similar by the postoperative outcome measures assessed.

Conclusions. Plasmakinetic enucleation of the prostate is a safe and technically feasible procedure for the enucleation of prostatic adenomata. Plasmakinetic enucleation of the prostate is limited by the longer operative and recovery room times, as well as a more pronounced postoperative irrigation requirement because of reduced visibility and a greater propensity for bleeding. The transfusion rates and catheterization and hospitalization times were similar. The optimal energy source for enucleation should still be considered the holmium laser, but bipolar energy can be considered by users already experienced with holmium laser enucleation of the prostate. UROLOGY **68:** 1020–1024, 2006. © 2006 Elsevier Inc.

Neill et al. Urology. 2006; 68:1020-4

Department of Urology, University of Crete, Medical School, Heraklion, Crete, Greece

PkEP (Technique)



Gyrus Plasmakinetic SuperPulse System (Gyrus Medical, Cardiff, UK), PlasmaSect electrode; power (cut):130-160W;(coagulation):60-80 W 26F continuous-flow resectoscope (K Storz, Tuttlingen, Germany)

Neill et al. Urology. 2006; 68:1020-4
Chen et al. Eur Urol. 2014; 66: 284–291
Hiraoka. Nihon Ika Daigaku Zasshi. 1983;50:896-8

Department of Urology, University of Crete, Medical School, Heraklion, Crete, Greece

PkEP vs. OP

2 meta-analyses (3 RCTs-Pvol>110 ml; n= 335; FU: 12 (12-72) mo

Large heterogeneity - Relatively low quality of RCTs

- Significantly shorter OR time for OP
- Significantly shorter catheter/hospital duration for PkEP
- Significantly lower transfusion rate for PkEP
- No difference in efficacy or any other outcome

Cornu et al. Eur Urol. 2015;67:1066-96
Li et al. PLoS One. 2015;10:e0121265
Lin et al. World J Urol. 2016;34:1207-19

Department of Urology, University of Crete, Medical School, Heraklion, Crete, Greece

BPEP (Geavlete, 2013)

BPEP vs.	n	PV (ml)	FU (mo)	IPSS/ Qmax	OR Time	Catheter Time	Hospital Time
OP	140	130	12	NS	NS	BPEP	BPEP

BJU Int. 2013 May;111(5):793-803. doi: 10.1111/j.1464-410X.2012.11730.x. Epub 2013 Mar 7.

Bipolar plasma enucleation of the prostate vs open prostatectomy in large benign prostatic hyperplasia cases - a medium term, prospective, randomized comparison.

Geavlete B[1], Stanescu F, Iacoboaie C, Geavlete P.

Author information

[1]Department of Urology, 'Saint John' Emergency Clinical Hospital, Bucharest, Romania. bogdan_geavlete@yahoo.com

Abstract

OBJECTIVES: To evaluate the viability of bipolar plasma enucleation of the prostate (BPEP) by comparison with open transvesical prostatectomy (OP) in cases of large prostates with regard to surgical efficacy and peri-operative morbidity. To compare the medium-term follow-up parameters specific for the two methods.

PATIENTS AND METHODS: A total of 140 benign prostatic hyperplasia (BPH) patients with prostate volume >80 mL, maximum flow rate (Qmax) <10 mL/s and International Prostate Symptom Score (IPSS) >19 were randomized in the two study arms. All cases were assessed preoperatively and at 1, 3, 6 and 12 months after surgery by IPSS, Qmax , quality of life score (QoL) and post-voiding residual urinary volume (PVR). The prostate volume and prostate specific antigen (PSA) level were measured at 6 and 12 months.

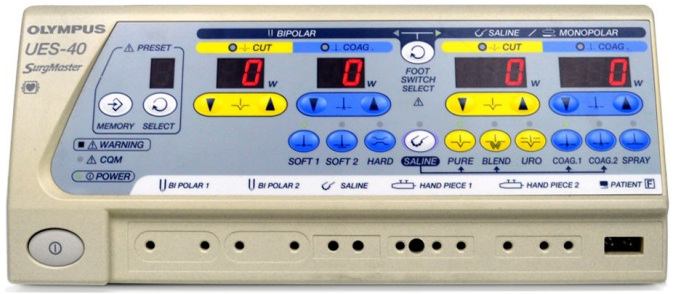
RESULTS: The BPEP and OP techniques emphasized similar mean operating durations (91.4 vs 87.5 min) and resected tissue weights (108.3 vs 115.4 g). The postoperative haematuria rate (2.9% vs 12.9%) as well as the mean haemoglobin drop (1.7 vs 3.1 g/dL), catheterization period (1.5 vs 5.8 days) and hospital stay (2.1 vs 6.9 days) were significantly improved for BPEP. Recatheterization for acute urinary retention was more frequent in the OP group (8.6% vs 1.4%), while the rates of early irritative symptoms were similar for BPEP and OP (11.4% vs 7.1%). During the follow-up period, no statistically significant difference was determined in terms of IPSS, Qmax , QoL, PVR, PSA level and postoperative prostate volume between the two series.

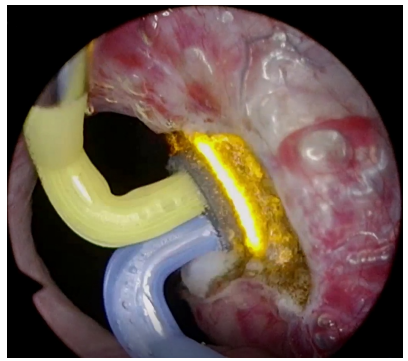
CONCLUSIONS: BPEP represents a promising endoscopic approach in large BPH cases, characterized by good surgical efficiency and similar BPH tissue removal capabilities compared with standard transvesical prostatectomy. BPEP patients benefited from significantly reduced complications, shorter convalescence and satisfactory follow-up symptom scores and voiding parameters.

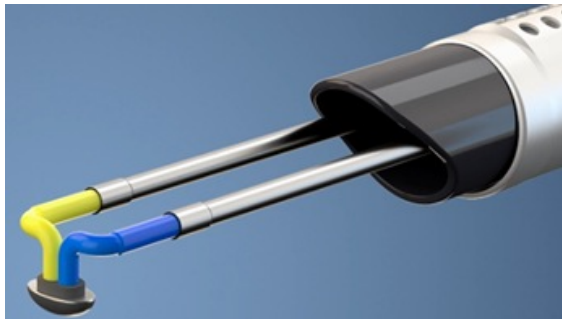
Geavlete et al. BJU Int. 2013; 111:793-803

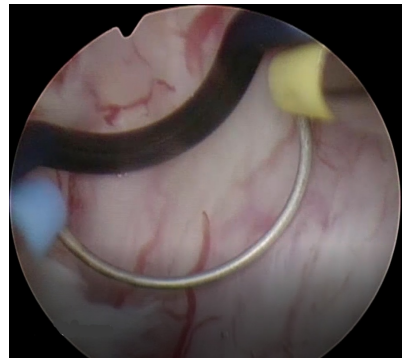
Department of Urology, University of Crete, Medical School, Heraklion, Crete, Greece

BPEP (Technique)







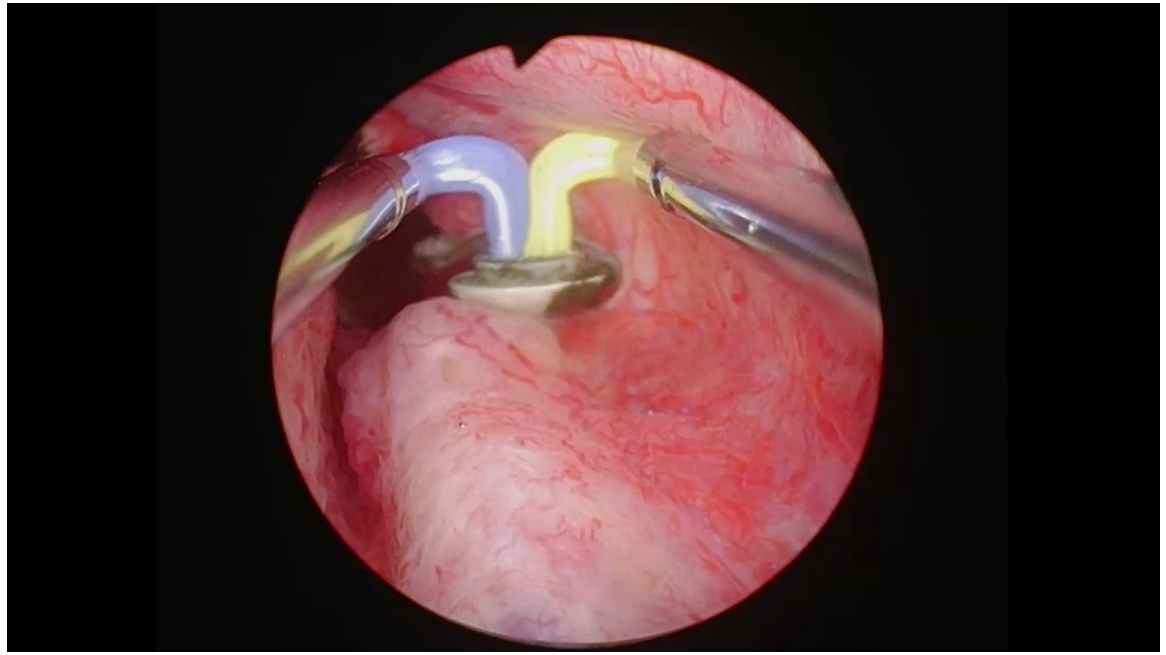


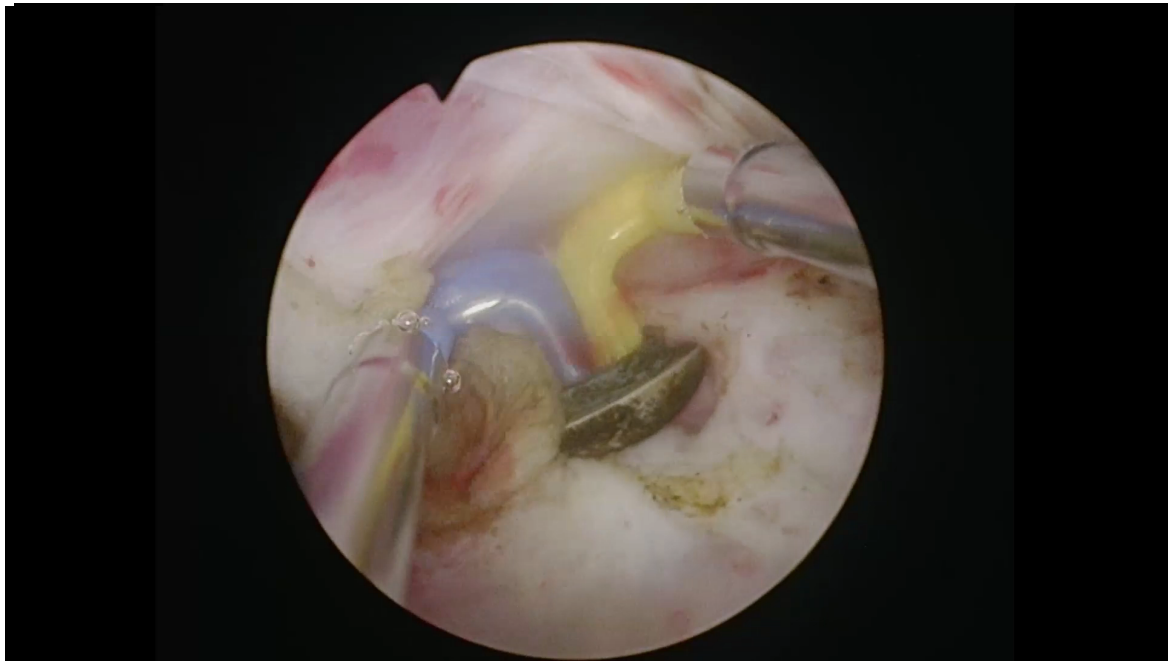
SurgMasterUES-40/ESG 400 (Olympus Europe, Hamburg, Germany), PlasmaButton/OvalButton electrode, OES-Pro bipolar resectoscope, Piranha morcellator (R.Wolf GmbH, Knittlingen, Germany)

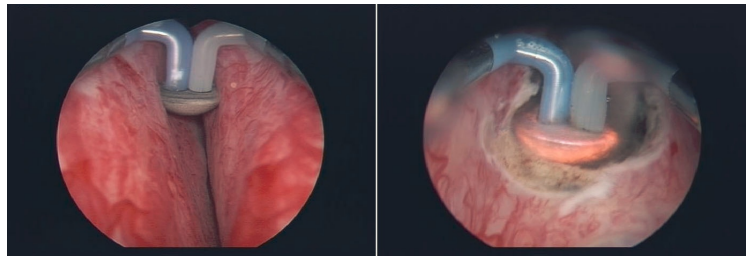
Geavlete et al. Eur Urol Today. 2011;23:37

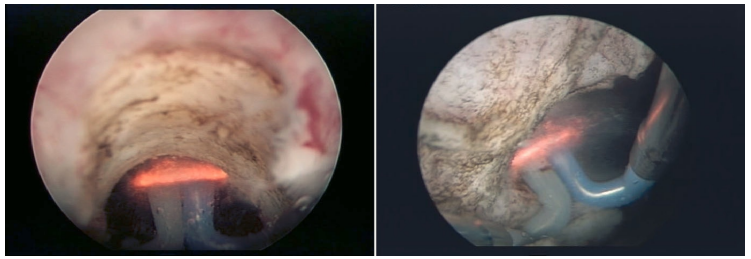
Department of Urology, University of Crete, Medical School, Heraklion, Crete, Greece

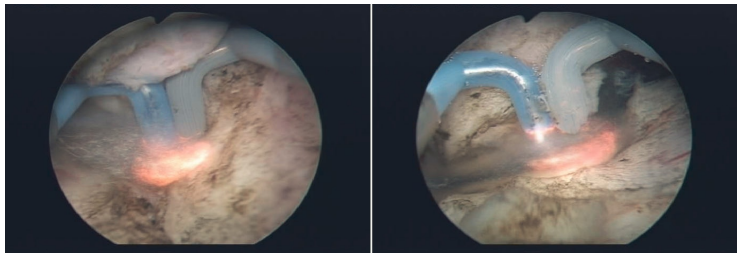
BPEP (Technique)

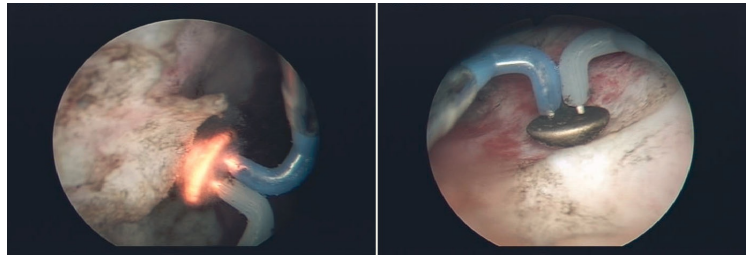


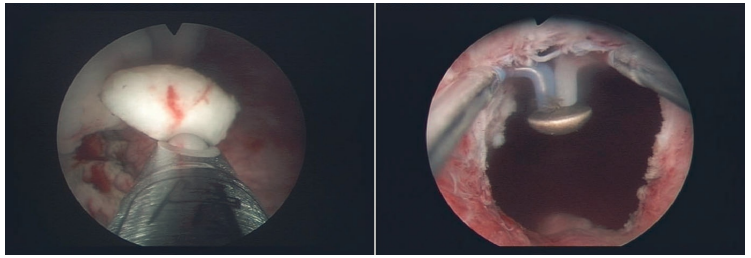










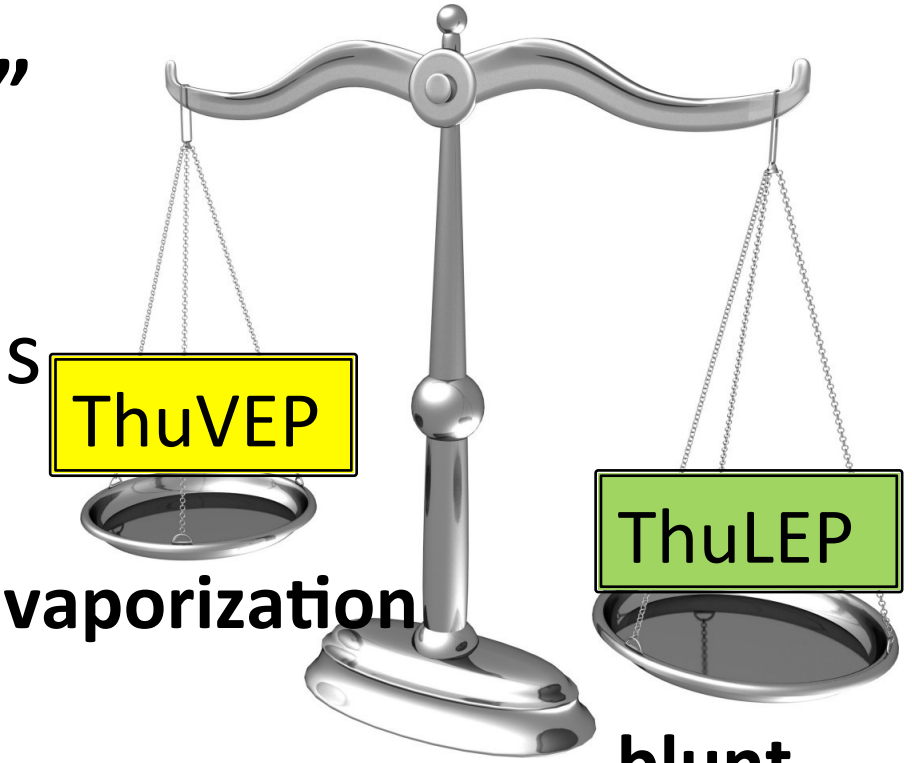


Geavlete et al. BJU Int. 2013;111:793-803

Department of Urology, University of Crete, Medical School, Heraklion, Crete, Greece

ThuVEP & ThuLEP

- ThuVEP and ThuLEP: **“surgical twins”**
- ThuVEP focuses on the favorable **vaporization effect** of the continuous -wave laser to perform a fast, effective and safe enucleation
- ThuLEP focuses on almost **blunt mechanical enucleation** using the laser only for dissection of adherences and mucosa



vaporization

blunt mechanical enucleation

Department of Urology, University of Crete, Medical School, Heraklion, Crete, Greece

ThuVEP (Bach, 2009)

World J Urol. 2009 Aug;27(4):541-5. doi: 10.1007/s00345-008-0370-0. Epub 2009 Jan 28.

Feasibility and efficacy of Thulium:YAG laser enucleation (VapoEnucleation) of the prostate.

Bach T[1], Wendt-Nordahl G, Michel MS, Herrmann TR, Gross AJ.

Author information

[1]Department of Urology, Asklepios Hospital Barmbek, Hamburg, Germany. thorsten.bach@uro.ma.uni-heidelberg.de

Abstract

PURPOSE: Thulium:YAG (Tm:YAG) vaporesection has been introduced and efficiency was shown on smaller prostates. Criticism mainly referred to prolonged operation time in larger prostates, which appears to be a potential limitation compared to HoLEP. Aim of the study was to evaluate feasibility and efficiency of Tm:YAG VapoEnucleation in larger prostates.

METHODS: VapoEnucleation was performed using a 70 W continuous wave-laser. After enucleation tissue was morcellated within the bladder. Prospectively assessed outcomes were improvement in urodynamic parameter and the intra- and postoperative course. Complications were recorded.

RESULTS: A total of 88 consecutive patients with prostatic enlargement underwent VapoEnucleation. Prostatic volume was 61.3 +/- 24.0 cc (30-160). OR-time was 72 min +/- 26.6 (35-144) and laser-time 32.4 +/- 10.1 min (16.3-59.3). Applied laser energy was 123.7 +/- 40.6 kJ (67.8-240.9). An average of 31.7 +/- 18.3 g of tissue was retrieved. Pathology revealed four patients with incidental carcinoma. Foley catheter-time was 2 days and the suprapubic tube, if placed, was removed on the third postoperative day on average. Twelve complications were recorded, including bleeding (3), urinary tract infection (6), second-look procedure, due to insufficient deobstruction (2). Re-catherization after successful initial voiding trial was necessary in one patient. Mean peak flow rate improved from 3.5 +/- 4.7 to 19.8 +/- 11.6 ml/s and post-voiding residual urine decreased from 121.4 +/- 339.9 to 22.4 +/- 32.7 ml.

CONCLUSION: The functional outcomes demonstrate efficiency of Tm:YAG VapoEnucleation for patients with larger prostates. From our experience, learning curve in VapoEnucleation is short and complications are minimal. Theoretically, no limitation in prostate size occurs. Long-term follow-up is needed to prove durability.

ThuVEP (Thechnique)

70 W Tm:YAG laser; 550μ laser fiber
(Revo-Lix®, LISA Laser products, Katlenburg, Germany)
26 Fr. continuous-flow laser resectoscope & morcellator
(R. Wolf, Knittlingen, Germany)

Technique similar to the three lobe technique in HoLEP (5-7-12h incisions)

Department of Urology, University of Crete, Medical School, Heraklion, Crete, Greece

Transurethral anatomical prostatectomy with laser support (ThuLEP [Hermann, 2010])

World J Urol. 2010 Feb;28(1):45-51. doi: 10.1007/s00345-009-0503-0.

Thulium laser enucleation of the prostate (ThuLEP): transurethral anatomical prostatectomy with laser support. Introduction of a novel technique for the treatment of benign prostatic obstruction.

Herrmann TR[1], Bach T, Imkamp F, Georgiou A, Burchardt M, Oelke M, Gross AJ.

Author information

[1]Department of Urology and Urological Oncology, Hannover Medical School, Carl-Neuberg-Str. 1, 30625 Hannover, Germany.
herrmann.thomas@mh-hannover.de

Abstract

BACKGROUND: Transurethral removal of prostatic tissue is the treatment choice for benign prostatic enlargement and benign prostatic obstruction. Urodynamic results are directly linked to the amount of removed tissue which, however, is directly associated with intra- and postoperative morbidity. Transurethral laser operations of the prostate offer the advantage of decreased bleeding complications and the possibility to treat patients with bleeding disorders or anticoagulative treatment. The aim of the article is to present a novel technique of complete transurethral removal of the transition zone (enucleation) with the support of the Thulium laser to combine complete anatomical enucleation and maximum urodynamic efficacy with minimal side-effects.

MATERIALS AND METHODS: We present five distinct surgical steps for transurethral complete removal of the transition zone of the prostate (Thulium laser enucleation of the prostate, ThuLEP). Surgical steps are presented in chronological order with the help of intraoperative pictures. Laser energy of 70-90 W is only used for the incision at the verumontanum and bladder neck for removal of the middle lobe, whereas laser energy of 30 W was only used for coagulation of small vessel crossing the surgical capsule towards the transition zone and bladder neck for dissection of the lateral lobes. The lobes themselves are liberated by blunt dissection.

CONCLUSIONS: ThuLEP offers complete removal of the transition zone no matter what prostatic size. The techniques combine maximum efficacy with minimal side-effects. Clinical results comparing ThuLEP with open prostatectomy or transurethral resection are awaited.

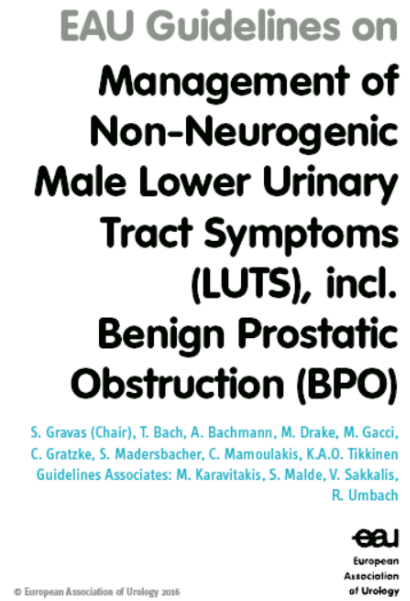
Department of Urology, University of Crete, Medical School, Heraklion, Crete, Greece

ThuVEP & ThuLEP: RCTs

Comparison	n	PV (ml)	FU (mo)	IPSS/ Qmax	OR Time	Catheter Time	Hospital Time
ThuVEP vs. (TURP)[1]	59	60	12	NS	ThuVEP	ThuVEP	ThuVEP
ThuLEP vs. PKRP[2]	158	70	60	NS	PKRP	ThuLEP	ThuLEP
ThuLEP vs. TURis[3]	208	80	3	NS	NS	ThuLEP	ThuLEP
ThuLEP vs. HoLEP[4]	133	45	18	NS	HoLEP	NS	-
ThuLEP vs. PKEP[5]	127	90	12	NS	NS	ThuLEP	NS

Department of Urology, University of Crete, Medical School, Heraklion, Crete, Greece

ThuVEP & ThuLEP: References and Conclusions



1. *Hong et al. Chin Med J (Engl). 2015;128:884-9*
2. *Yang et al. Lasers Med Sci. 2016;31:1797-802*
3. *Bozzini et al. Actas Urol Esp. 2017 Jan 3. pii: S0210-4806(16)30198-X*
4. *Zhang et al. Urology. 2012;79:869-74*
5. *Feng et al. J Endourol. 2016;30:665-70.*

Thulium enucleation may be an alternative to TURP and HoLEP in men with moderate-to-severe LUTS leading to immediate and mid-term objective and subjective improvements.	1b	A

Department of Urology, University of Crete, Medical School, Heraklion, Crete, Greece

Thank you very much for your attention

Department of Urology, University of Crete, Medical School, Heraklion, Crete, Greece