Original Research Article

UJ Urologia Journal

Urologia Journal
1–5

DOI: 10.1177/0391560317749425
journals.sagepub.com/home/urj
SAGE

Comparative results of cryoablation and laparoscopic radical prostatectomy in the treatment of localized prostate cancer

Denis Vladimirovich Chinenov[1], Leonid Mikhailovich Rapoport[2], Evgeniy Valerievich Shpot[1], Dmitry Victorovich Enikeev[1], Yaroslav Nikolaevich Chernov[1], Mark Sergeevich Taratkin[1] and Dmitry Olegovich Korolev[1]

Abstract

Aim: To evaluate early prostate cancer cryoablation functional and oncological results in comparison with results of extraperitoneoscopic radical prostatectomy.

Materials and methods: We analyzed early results of surgical treatment of 285 patients with prostate cancer: 42 of them had undergone total cryoablation (Group 1) while the rest of them had been treated by radical laparo- and extraperitoneoscopic prostatectomy. For comparative assessment of prostate cryoablation results, 42 patients from Group 2 randomized in accordance with their age, stage of disease, Gleason, prostate-specific antigen, and prostate volume were selected. In compliance with the results of pre-surgical examination, all the patients had low oncological risk and were not concerned in sexual function. Volume of prostate was from 22 to 65 cm^3, prostate-specific antigen level was from 4.1 to 10 ng/mL, and level of neoplastic process differentiation using Gleason grading system was from 6 to 7a (3 + 4) scores.

Results: Patients after prostate cryoablation in early post-surgical period felt lower intensity of postoperative pain compared with those who had undergone prostatectomy. Follow-up period up to 12 months manifested significant true reduction of prostate-specific antigen level in both groups of patients. Frequency of stress-induced enuresis in Group 1 was not observed.

Conclusion: Radical prostatectomy is still the traditional treatment of choice in the case of localized prostate cancer. But we can draw the conclusion that cryoablation is an effective low-invasive method for treatment of low oncological risk patients, which gives the opportunity both to achieve good oncological results and to preserve high life quality.

Keywords

Prostate cancer, cryoablation, laparoscopic, extraperitoneoscopic radical prostatectomy, urine continence

Date received: 24 October 2017; accepted: 6 November 2017

Introduction

Prostate cancer (PC) during the past decades has ranked very high taking leading positions in the structure of male malignant neoplasm death rate both in Russia and worldwide.

Initial PC disease rate is traditionally higher in northern countries.[1] Thus, in 2012, initial PC disease rate in Finland and Norway was 145.2 and 193.2 per 100,000 of male population, respectively, and in Greece and Poland it was just 34.2 and 55.3 per 100,000 of male population respectively.[2]

Initial PC disease rate in Russia during the past years has been growing consistently. In 2005 it was only 25.6 per 100,000 of male population,[3] and by 2015 it grew 2.2 times up to 57.3 per 100,000 of male population.[4] At the same time, the share of patients with morphologically approved PC diagnosis also grew (out of patients with

[1]I.M. Sechenov First Moscow State Medical University, Moscow, Russia
[2]Clinic of Urology, I.M. Sechenov First Moscow State Medical University, Moscow, Russia

Corresponding author:
Dmitry Olegovich Korolev, I.M. Sechenov First Moscow State Medical University, Bolshaya Pirogovskaya street 2-1, 119435 Moscow, Russia.
Email: demix84@inbox.ru

Table 1. Patients' main characteristics.

	Cryoablation ($n=42$)	Extraperitoneoscopic radical prostatectomy ($n=42$)
Average age	69 (from 55 to 79)	65 (from 52 to 77)
Average volume of prostate (cm^3)	40	49
Gleason 6	21 (87.5%)	16 (66.7%)
Gleason 7a (3 + 4)	3 (12.5%)	8 (33.3%)
Average level of PSA before operation (ng/mL)	6.5 (from 4.1 to 9.1)	6.7 (from 4.16 to 9.4)
Average score of IPSS	10	12

PSA: prostate-specific antigen; IPSS: International Prostate Symptom Score.

initially diagnosed diseases during the year under review) from 83.6% in 2005 up to 94.5% in 2015.[4] PC-caused mortality in Russia has grown consistently: in 2000 it was 13.1 per 100,000 of male population; by 2011 mortality grew by 42.7% and became 18.7 per 100,000 of male population.[5]

At present, radical prostatectomy is considered to be the "gold standard" in treatment of localized PC (open, laparo-extraperitoneoscopic, robot-assisted operation). But recently, minimally invasive operations have become more and more prevailing such as brachytherapy, cryodestruction, and high-intensity focused ultrasound (HI-FU). The main target of surgical treatment is maximal tumor eradication, on the one hand, and securing patient's high life quality after the operation, on the other hand.[6,7]

We have assessed evaluation of early PC cryoablation functional and oncological results compared with results of extraperitoneoscopic radical prostatectomy. The following targets were posed: to evaluate the degree of urine continence, postoperative pain intensity, term of in-patient treatment, average operation term, and postoperational level of prostate-specific antigen (PSA) after 6 and 12 months.

Figure 1. SeedNet gold cryomachine.

Materials and methods

Surgical treatment results of 285 patients operated on the subject of verified PC within 2015–2017 in Urological Clinic UKB No. 2 of the First Moscow State Medical University (MSMU) named after I.M. Sechenov were analyzed: 42 of them had undergone total cryoablation (Group 1), while the rest had undergone radical laparo- and extraperitoneoscopic prostatectomy (Group 2).

A total of 42 patients from Group 2 were selected for comparative assessment of prostate cryoablation results; they were randomized per their age, disease stage, Gleason score, PSA, and prostate volume (Table 1). In accordance with the data of preoperational examination, all the patients manifested low oncological risk and were not concerned about sexual function. Volume of prostate was from 22 up to 65 cm^3, PSA was from 4.1 to 10 ng/mL, and degree of neoplastic process differentiation as per Gleason grading system was from 6 to 7a (3 + 4) scores.

Therefore, two groups of patients were selected: one group had undergone PC cryoablation ($n=42$); the second group had undergone extraperitoneoscopic radical prostatectomy without lymphadenectomy ($n=42$). The main criteria for assessment were short-term oncological and functional results, duration of hospital stay, and life quality (it was estimated as per pain scale, International Prostate Symptom Score (IPSS) scale, and Quality of Life (QoL) in Group 1).

Thus, in this study initial level of PSA as well as PSA after 6 and 12 months after operation, histological Gleason gradation, patients' age, prostate volume, term of catheter removal and urine continence, pain scale assessment, and operation time were taken into account. All the patients were not concerned about sexual function. Radical prostatectomy had been performed through extraperitoneoscopic access without lymphadenectomy. Cryoablation had been accomplished by SeedNet gold apparatus manufactured by Galil Medical Co. (Figure 1).

Three cryoprobe couples were introduced into prostate tissue under control of two-dimensional (2D) transrectal ultrasound via a special grid through the perineum in accordance with the special plot so that a glacial sphere could envelope the whole prostate. The fourth couple of cryoprobes were introduced into the intestine wall and they were used only for warming and never for freezing (Figure 2). We used IceRod needles for this treatment, which gave the opportunity to form a glacial sphere of maximal diameter. All the patients flexible urethrocystoscopy in order to avoid urethra and urinary bladder neck perforation; after that a special catheter was inserted through the urethra and warm liquid of up to 43°C was circulated through it (Figure 3). All the patients had undergone two cycles of freezing down to temperature under 40°C under ultrasonic control (Figures 4 and 5).

Results and consideration

All the patients had endured operative treatment satisfactorily. The average time of extraperitoneoscopic radical prostatectomy operation was 140 min (from 70 to 210 min); cryoablation was respectively performed on an average during 127 min (from 95 to 165 min). Hemorrhage was not observed when cryoablation technique was performed. In the group that had undergone prostatectomy, the average hemorrhage value was 216 mL. The average term of catheter removal was 8 days after extraperitoneoscopic radical prostatectomy (maximal term was 11 days). In the group that had undergone cryoablation, catheter was removed on an average on the fifth day after operation (from 3 to 10 days). After cryoablation all the patients manifested urine continence; at the same time 21% of the patients who had undergone extraperitoneoscopic radical prostatectomy showed stress-induced urine incontinence after 6 months and 15% after 12 months. Average postoperational PSA level after 6 months was 0.051 ng/mL in the group that had undergone extraperitoneoscopic radical prostatectomy, and after cryoablation it was 0.62 ng/mL. Besides, the criterion of pain scale was taken into account; it was lower in the case of cryoablation than in the case of laparoscopic radical prostatectomy (0.7 compared with 1). The average PSA level 12 months after cryoablation for all the patients was <0.5 ng/mL compared with 0.016 ng/mL after laparoscopic radical prostatectomy. The results of patients' treatment are given in Table 2.

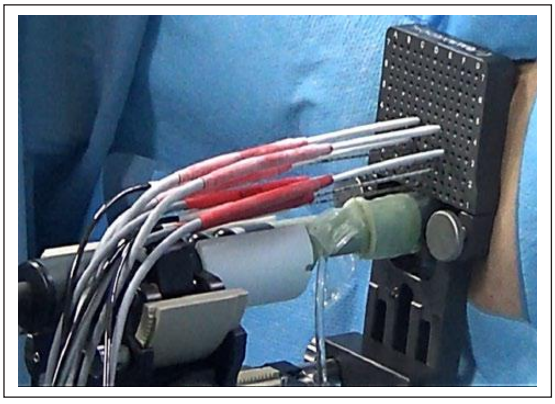

Figure 2. Cryoprobes introduced into the prostate under control of ultrasonic navigation.

Conclusion

Apparently, radical prostatectomy is still the traditional treatment of choice in the case of localized PC. But performing the first comparative analysis, we can draw the conclusion that cryoablation is an effective low-invasive method for treatment of these kinds of patients, which gives the opportunity both to achieve good oncological results and to preserve high life quality. At present, we continue to assess oncological and functional results of prostate cryoablation.

Figure 3. (a) Inserting into the urethra through a special catheter. (b) Warm liquid is circulating along the special urethral catheter.

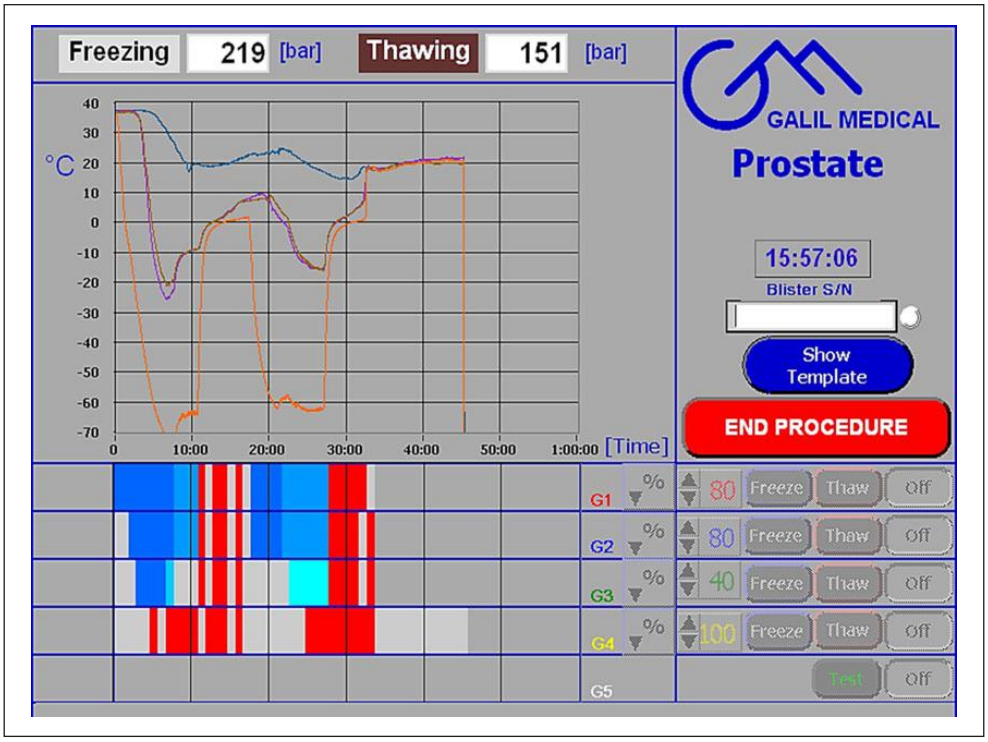

Figure 4. Temperature control.

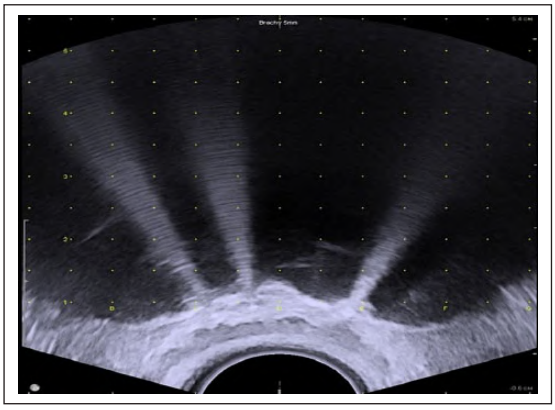

Figure 5. Ultrasonic control.

Table 2. Comparative assessment of patients after operation.

	Cryoablation ($n=42$)		Extraperitoneoscopic radical prostatectomy ($n=42$)	
Pain scale after operation (average score)	0.7		1	
Term of catheter removal (days)	5		8	
Observation term	6 months	12 months	6 months	12 months
PSA level (ng/mL)	<0.62	<0.5	<0.051	<0.016
Stress-induced urine incontinence (%)	0	0	21	15
Average IPSS score	12	8	–	–

PSA: prostate-specific antigen; IPSS: International Prostate Symptom Score.

Declaration of conflicting interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The author(s) received no financial support for the research, authorship, and/or publication of this article.

References

1. Mottet N, Bellmunt J, Briers E, et al. *Guidelines on prostate cancer*. Arnhem: European Association of Urology, 2015.
2. World Health Organization: International Agency for Research on Cancer. Prostate cancer: estimated incidence, mortality & prevalence, 2012, http://eco.iarc.fr/eucan/CancerOne.aspx?Cancer=29&Gender=1
3. Malignant neoplasm morbidity in the Russian Federation regions FGU CNIIOIZ Ministry of social development of RF. FGBU Central NII for public health organization and informatization of Ministry of public health of RF, 2007, http://mednet.ru/images/stories/files/statistika/Zabolevaemost_zlokachestvennymi_novoobrazovaniyami_v_subektah_RF.pdf
4. Socially significant diseases of Russian population in 2015. FGBU Central Scientific and Research Institute for Organization and Informatization of Public Health attached to

the Ministry of Public Health of Russia. *FGBU Central NII for organization and informatization of public health Ministry of public health of RF*, 2016, http://mednet.ru/images/stories/files/statistika/socialno-znachimie_zabolevaniya/ssz2015.pdf
5. World Health Organization. Mortality indicator database: standardized death rates per 100000, malignant neoplasm of prostate (European mortality database), 2016, http://data.euro.who.int/hfamdb/
6. Wendler JJ, Ganzer R, Hadaschik B, et al. Irreversible electroporation. Current value for focal treatment of prostate cancer. *Urologe A* 2015; 54(6): 854–862.
7. Van De Bos W, De Bruin DM, Muller BG, et al. The safety and efficacy of irreversible electroporation for the ablation of prostate cancer: a multicentre prospective human in vivo pilot study protocol. *BMJ Open* 2014; 4(10): e006382.