Minimally invasive is the current buzz-word in medical care. In regard to treatment of cancer however, the ultimate goal for the patient has to be kept in mind, the eradication or “cure” of the disease with the least adverse effect on quality of life. Within urology the use of cryoablation, also referred to as cryosurgery or cryotherapy, offers effective and minimally invasive treatment options for localized (organ confined) prostate cancer and also for definitive, nephron sparing treatment of small renal carcinomas.

Scientific Background and Technology
Cryodestruction of tissue, benign or malignant, is based upon the cellular response to freezing which includes cell death, freeze rupture, necrosis and apoptosis. Increasing the rapidity of the freeze (reaching lethal temperatures of -40 degrees C), and careful monitoring of the freeze process induced in the target organ (with real-time ultrasound imaging and thermocouple monitoring), is now possible with 3rd generation argon-based freezing technology. (Galil Medical and Endocare) Instead of a scalpel, the surgeon inserts an array of several 1.5 mm needle-like cryoprobes into the target organ, and with appropriate monitoring by image and thermocouple readout, initiates the freeze cycle to destroy the target tissue. The freeze cycle is often completed within 10 minutes. The tissue is thawed in a similar process then refrozen to enhance the killing effects on the margins of the freeze. The cryoneedles are removed. The tumor or tissue which has been frozen to such temperatures is immediately rendered nonviable, is left in situ and gradually atrophies and is replaced by mostly acellular fibrous matrix.

Cryosurgical Ablation of Prostate Cancer
Prostate cancer represents a serious health hazard for men. With prostate-specific antigen (PSA) screening for prostate cancer in the past decade, many more men are now diagnosed with early stage, organ confined disease. However, the optimal treatment for localized disease is unclear. Randomized, prospective clinical trials comparing the efficacy of primary prostate cancer therapies are lacking. The standard treatment options have been radical prostatectomy (RP) and radiation therapy (RT) either external beam or brachytherapy. Based upon Best Practice Policy Panel of the American Urological Association (2008), primary cryosurgery is also an option when treatment is appropriate, for men with organ-confined non metastatic disease of any grade. I find that the most suitable patients are those who prefer a minimally invasive therapy, wish to avoid RP due to risk aversion, or who are not good candidates for RP because of morbidities such as obesity, prior pelvic surgery, heart disease or coagulation disorders. It may also appeal to an individual who already has erectile dysfunction. Patients who may predictably be intolerant of RT (inflammatory bowel disease, etc.) or wish to avoid radiation, are also good candidates. Salvage cryosurgery can be considered a good treatment option for curative intent in men who have failed RT. The most appropriate candidates in this group have biopsy-proven persistent post-radiotherapy cancer, PSA of less than 10, and negative metastatic evaluation.

Cryoablation of the prostate is conducted as an outpatient procedure under general or regional anesthesia. The patient is positioned as for cystoscopy, an ultrasound transducer is inserted into the rectum for imaging during the process. On average, 8 cryoneedles and 5 thermocouples are placed percutaneously via the perineum into the prostate. A urethral warming catheter is placed and then two freeze and thaw cycles are completed. This takes about 45 minutes. The needles and warming catheter are then removed, a Foley catheter placed, and the patient discharged to home a few hours later. In my experience, patients have very little post operative pain, but are encouraged to remain mostly supine for the initial 48 hours to reduce peno-
scrotal edema which may occur. After one week the catheter is removed. At the three month visit the initial or “nadir” PSA is drawn. It is not unusual to see initial PSA post-cryo of 0.0 to 0.3 compared to preoperative values of 5 to 15. This is reflective of the extent of prostate destruction by the cryo process. If the patient indeed has organ confined disease and no occult micrometastatic disease, one could expect the PSA to remain low long term.

Recent publications with 10-year cryo data demonstrate durable efficacy (as measured by PSA free progression) equivalent to other therapies for low-risk disease and possibly superior for moderate and high-risk prostate cancer. With technological advances of argon-based freezing, the side effect profile associated with cryo of the 1990s has been markedly improved. Urinary urgency is common but transient. Rectal injury is now extremely rare. Erectile dysfunction as a consequence of ability to expand the freeze zone beyond the prostate for higher stage disease can be expected but often improves after 24 months. Patient reported quality of life measures after cryo return to baseline levels by one year, again with the exception of erectile function. This is an important item. Patient reported side effects of prostate cancer treatments (primarily urinary incontinence and ED) notoriously exceed physician reported. A recent Duke University Department of Surgery study, “Satisfaction and Regret after Open Retropubic or Robot Assisted Laparoscopic Radical Prostatectomy” (RALP) highlights this issue. Due to quality of life issues, patients who underwent RALP were more likely to be regretful and dissatisfied, possibly because of higher expectations of an “innovative” procedure. Counseled preoperatively, some patients may choose a minimally invasive cryoablation, if they are willing to accept the side effect of ED, or if they already have it.

Nephron Sparing Cryoablation of Small Renal Tumors

With increasing use of diagnostic imaging studies, particularly CT, more asymptomatic small renal neoplasms are being discovered. The reference standard for treating small renal tumors includes open or laparoscopic or robot assisted partial nephrectomy if feasible. Total nephrectomy should be avoided when possible for preservation of renal function. Small (3cm or less) tumors that are cortical, exophytic and not hilar may be treated by the cryoablation process. The cryoneedles can be applied to the tumor via laparoscopy, open surgical exposure or for certain tumors on the posterior, retroperitoneal surface of the kidney, a percutaneous CT-guided procedure. The frozen renal lesion is left in situ, a partial nephrectomy is not done. The cryobiology of tumor destruction is identical, and the morbidity of the cryoablative procedure seems to be less than that of partial nephrectomy. Although outcomes data are not mature, studies at three years with meticulous imaging show tumor free recurrence rates to be comparable to partial nephrectomy, with low rates of tumor residual or recurrence. This is a therapeutic option to discuss with the patient depending on the details of tumor size, location, and risk of alternative surgical options.

(Inquiries or questions are invited and literature citations provided: bfarber@farberpearsonurology.com)