

LE LASER GREENLIGHT ARRIVE AU CANADA

Auteurs:

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RÉSUMÉ

Le laser Greenlight – un laser haute puissance utilisé pour le traitement de l'hyperplasie bénigne de la prostate – a été utilisé pour la première fois au Canada en 2003 à Newmarket, Ontario par Dr Liquornik, baccalauréat ès sciences, MDCM, FRCSC. Le laser se révèle utile en éliminant le besoin de séjourner à l'hôpital, en réduisant la période d'utilisation de la sonde à demeure d'une semaine à moins de 28 heures, en diminuant la douleur et en rendant rare la répétition du traitement. Le laser enlève le tissu prostatique sans effets néfastes sur l'urètre parce que le faisceau ne fixe que le surcroissement de tissu de la prostate. Les patients sont très satisfaits et peuvent reprendre leurs routines normales dans une ou deux jours.

THE CANADIAN INTRODUCTION TO THE GREENLIGHT LASER

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ABSTRACT

The Greenlight laser – a high powered laser used for Benign Prostate Hyperplasia – was used for the first time in Canada in Newmarket, Ontario by Dr. Liquornik BSc MDCM FRCSC in 2003.

The laser is proving to eliminate hospital stay, decrease the catheter indwelling time from one week to less than 28 hours, decrease pain and suffering and make repeat procedures something rare. The laser melts away the prostate and leaves a urethra that is unscathed by the effects of the laser because the beam concentrates on the overgrown prostatic tissue only. The patients are very satisfied and back to normal routines in one to two days.

For the men of York Region the days of continuous bladder irrigation (CBI) are becoming a thing of the past. This is relieving news for the aging population and the health care system. The introduction of the Greenlight Laser into Canada by Dr. Liquornik, Urological Surgeon, in Newmarket, Ontario, on November 12, 2003 was just in time for the large increase in cases of Benign Prostatic Hyperplasia (BPH) resulting from an aging baby boomer population. BPH is a condition of prostatic overgrowth in men. Approximately 50% of human males will have symptoms as a result of BPH in their lifetimes.¹

The past gold standard treatment, the Transurethral Resection of the Prostate (TURP) has proven to be effective in the long term but causes injury to the tissue that requires in-hospital healing time (two or three days on average) involving Continuous Bladder Irrigation (CBI). During TURP the surgeon scrapes out the prostate tissue that has overgrown into the urethra. He uses electrocautery that cuts away the tissue and coagulates small vessels. The area is much like an open wound post-operatively and must heal, as any wound would, by creating scar tissue. The catheter *insitu* stops the wound from swelling the urethra shut during the healing process.

GREENLIGHT LASER (cont.)

Laser alternatives have been tried in an attempt to create a better treatment option for the patient. But, until recently, the TURP has remained the most effective way of treating the often uncomfortable and debilitating condition of BPH.

Since its arrival the Greenlight laser has proven itself an exciting and less painful treatment in which patients receive much less tissue injury and are able to be discharged from the post surgical recovery area on the same day. There is only a 50% chance that patients will need a catheter for a short period of time after surgery, and they are able to work and perform other regular activities in only two days. With this treatment there is no need for CBI at any time.

The elimination of the post operative CBI and catheter in BPH patients coupled with the minimal, if any, length of stay, decreases much of the trauma to the patient. Furthermore, large amounts of money expended by the health care system on post-operative care and treatment of complications from TURPs can be reallocated to other areas of patient care.

THE ANATOMY AND PHYSIOLOGY OF THE PROSTATE GLAND

The Prostate Gland is a walnut shaped organ composed of fibromuscular and glandular components. It is located at the base of the bladder neck and completely surrounds the urethra. It is supported by the puboprostatic ligaments anteriorly and by the urogenital diaphragm inferiorly.² The normal prostate

measures 2.5cm long and 4 cm in diameter (3) and weighs approximately 20g.² The prostate has four glandular regions-two major regions which are the peripheral and the central zone and the two minor regions which are the transitional and the periurethral zone.⁴

Lowsley's classification of the prostate identifies five lobes: anterior; posterior; median; right lateral and left lateral.² Many clinicians prefer to divide the prostate into the intraurethral, lobe, which is the right and left lateral lobes, and the extraurethral lobe, which is the posterior and the median lobes.⁴ The posterior lobe is palpable on rectal examination and is prone to cancerous degeneration while BPH generally occurs in the transitional zone.²

The true prostatic capsule is a fibrous sheath that covers smooth muscle fibers and collagenous tissue that surrounds the urethra as an involuntary sphincter. The prostatic stroma lies deep to this layer and is composed of connective and smooth muscle fibers that are embedded in the epithelial glands. These epithelial glands drain into the major excretory ducts that open on the floor of the urethra. The prostatic urethra is the segment of the urethra that passes through (traverses) the prostate. This urethra is lined with an inner longitudinal layer of muscle. The periurethral glands are located just beneath the prostatic urethra.²

The prostate gland is supplied arterially by the inferior vesical, internal pudendal and middle

rectal arteries. The prostate veins drain into the periprostatic plexus which is connected to the deep dorsal vein of the penis and the internal iliac veins.² The sympathetic and parasympathetic nerve plexuses supply the prostate gland. The prostate lymphatics drain into the internal iliac, sacral, vesical and external iliac lymph nodes.²

For several centuries BPH has been a known cause of urinary dysfunction. Around the age of 35 years the first changes of BPH can be identified. These changes include the development of microscopic stromal nodules around the periurethral glands. Glandular hyperplasia begins to form around these small nodules. This process takes many years. The microscopic incidence of BPH is consistent amongst the male gender, which is suggestive that BPH is not environmentally or genetically influenced. The prevalence of microscopic BPH increases with age in all male populations (2).

The cause of BPH is unknown, however it has been determined that two factors must be present for BPH to occur. These two factors are the presence of dihydrotestosterone (DHT) and aging. The testes produce the hormone testosterone which is converted into DHT and estradiol (estrogen) in certain tissues. Although, hormonal involvement is believed to induce BPH, the role is considered to be complex and is not completely understood.²

The earliest changes of BPH are found in the periurethral glands surrounding the verumontanum. The development of BPH occurs over a long period of time therefore changes affecting the urinary tract are slow and insidious. Symptoms can be either obstructive, irritative or both in nature. One of the early and constant obstructive symptoms is a decrease in the force of the urine stream related to urethral compression. Pathophysiological changes to the detrusor muscle, resulting in poor tone causes both hesitancy and intermittency to occur. The detrusor takes a longer period of time to overcome urethral resistance and it is unable to

maintain the required pressure until the end of voiding. Incomplete bladder emptying and dribbling can also be attributed to the weakened detrusor muscle and/or obstructive prostatic tissue at the bladder neck.²

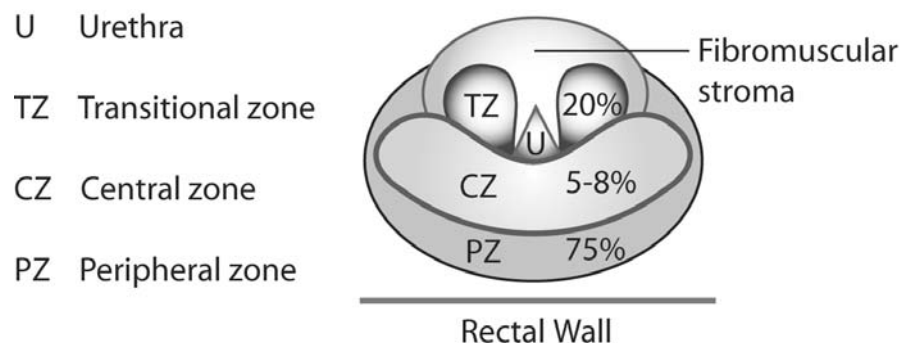
Irritating symptoms include nocturia and frequency. These symptoms occur for a variety of reasons. Incomplete bladder emptying decreases the period of time between voids. The presence of an enlarged prostate causes the bladder to initiate a voiding response more frequently than normal, this is especially true if the prostate grows intravesically and compromises bladder volume. These symptoms are more apparent at night due to normal cortical inhibitions being lessened and normal urethral and sphincter tone being decreased during sleep.²

In advanced stages of BPH, large amounts of residual urine cause the weakened sphincter to open and allow urine to escape. Dilation of the upper urinary tract and urinary stasis in the ureters related to detrusor muscle decompensation occurs. Dilation of both the ureter and the pelvis leads to functional renal damage that may develop into ascending infection and pyelonephritis. Acute urinary retention may occur in patients with BPH related to an increased prostate gland.

Systemic symptoms related to the urinary tract are upper abdominal discomfort and flank pain. This occurs in patients with BPH related to vesicoureteral reflux with dilation of the upper urinary tract and hydronephrosis. Symptoms such as chronic fatigue, decreased appetite and malaise are related to uremia resulting from renal failure.²

Symptoms not related to the urinary tract include hernias and hemorrhoids due to increased abdominal pressure during voiding.

In the later stages of BPH the patients are predisposed to developing cystitis and pyelonephritis related to the high residual urine volume, urinary stasis, and vesicoureteral reflux. Patients present with symptoms that are



GREENLIGHT LASER (cont.)

related to complications of BPH such as flank pain, fever and dysuria. Urinary stasis may develop into the formation of bladder calculi resulting in obstruction, frequency, dysuria and hematuria.²

TREATMENT OPTIONS

The history of treatment options includes the TURP, the use of the Nd: YAG laser, the Holmium laser, and now the advent of the Greenlight laser. The most tried and true is the TURP but the Greenlight is emerging, with only five years of statistics, as a plausible replacement treatment option.

TURP

The perioperative considerations of TURP patients are control of bleeding and time limitations due to the risk of transurethral resection (TUR) syndrome. With it the patient becomes hyponatremic and

hypovolemic and could develop hyperammonemia (when using glycine). Possible extreme effects can be cerebral edema and seizures with a serum sodium less than 120meq/L.² TUR syndrome can result from the use of excessive amounts of fluid as required for the continuous irrigation needed during the TURP procedure and usually occurs in surgeries that last more than one hour. The condition, transurethral resection syndrome (TUR syndrome), can become apparent when absorption of chemicals and water found in the irrigation occurs through the open wound left by the surgery. When great volumes are absorbed there are fluid imbalances that take place. The patient that becomes hyponatremic and hypervolemic could develop hyperammonemia (when using glycine).

The patient will have a one to two day hospital stay and 4-6 week recovery time. Immediate complications include the fact that

6.5% fail to void, 2% have postoperative hemorrhage, 3% have clot formation and 2% have urinary tract infections. There is an 80 to 90% chance that, post-operatively, patients have resolved the overgrowth of prostate tissue – and therefore the narrowing of the urethra that was caused by the overgrowth. 60 to 75% of patients have no re-growth of the prostate tissue (to the degree that it would impede their voiding) after five years. There is an 80 to 90% chance that patients will have resolved voiding problems postoperatively and a 60 to 75% chance that patients will have resolved voiding problems after five years. Five percent of the population needs to have a repeat procedure done after five years.²

Post-operative nursing considerations are care of the patient following spinal or general anaesthesia, CBI care, assessment for TUR syndrome, (dilutional hyponatremia), preventing sepsis, monitoring for vaso-vagal reactions, monitoring the patient for bladder spasms and assessing the patient's ability to void post-catheterization. The patient is discharged with instructions not to resume non-steroidal anti-inflammatories or aspirin for one week, information regarding the potential for retrograde ejaculation and the potential for impotence and incontinence, and with details on how to watch for the signs and symptoms of urinary tract infections.⁵

PREVIOUS LASER TREATMENTS

Lasers such as the Nd:YAG laser have been tried but the statistical results are not as solid as the TURP treatment option. The main problem with the Nd:YAG laser is that the energy is absorbed by cellular proteins and the effected area is much too deep, approximately 7mm. In addition, the beam heats too slowly and is not precise. There was a higher incidence of postoperative dysuria and urinary retention with the Nd:YAG laser. The Holmium laser has also been tried as a treatment for BPH but it has failed because of a longer learning curve and the holmium takes a longer surgical time. The procedure is not enough of an improvement to compensate for these two factors. These drawbacks in laser

surgery have made surgeons reluctant to replace the traditional TURP with the available lasers.

GREENLIGHT LASER

By doubling the power of the Nd:YAG laser by using Potassium-titanyl-phosphate (KTP) crystals to receive the wavelength of 532nm (the wavelength of green light) and setting the power to 80W the laser created becomes less damaging and more precise. The higher absorption rate of the laser to hemoglobin allows only a 1 to 2 mm tissue absorption.

The heat is more concentrated and rapidly vaporizes the cellular water. It leaves a small 2mm rim of coagulation. The Nd:YAG heals with a large area of scar tissue whereas the Greenlight laser has virtually no scars. A larger, non-contracted, pliable and relatively smooth cavity is created and sustains its virtues after healing. The procedure is essentially bloodless therefore patients on anticoagulants are able to continue taking them before and after the surgery. The tissue is not subject to absorption therefore there is no fear of TUR syndrome. The catheter, if needed at all, is removed within twenty-four hours. There is no need for bladder irrigation and the patient is able to return to work within 1-2 days.⁶

In a study done by Mahood and Malek complications were minimal.⁷ A few patients reported a mild irritation that resolved quickly, most voided in the recovery room and a few had mild dysuria that resolved without treatment. Temporary, two-way, catheters were inserted in 50% of the patients and removed before the patient left (or less than 28 hours later). The patient usually left after recovering from anaesthesia and later reported on average an 88.8% increase in satisfaction score. The average was a 198.1% improvement in urinary flow that seems thus far not to diminish markedly over time. There had been no readmission, recatheterization, reoperation, urinary retention, infection or incontinence in the follow up of one year.⁷

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The only shortcoming with this laser is the brief time that it has been used. So far we have only five years worth of statistics. The procedure is sustaining its own worth in the statistics that we have but the long-term efficacy is unknown.

Dr. Liquornik, Urological Surgeon, in Newmarket, Ontario performed this groundbreaking procedure on three patients on November 12, 2003 as the first surgeon to perform the procedure in Canada. He had traveled to the Oakwood Annapolis Hospital in Detroit to learn the procedure from Dr. Hai. The three prostates were 40, 65 and 110gms respectively. With his extensive experience in the traditional TURP and in the Nd:YAG procedure Dr. Liquornik quickly and easily picked up the nuances of the new laser. All three patients had their catheter removed within a couple of days and had no postoperative problems.

From a nursing perspective the Greenlight laser follows the same laser protocol as the Nd:YAG and the Holmium laser yet because of the 532nm wavelength different glasses are required. The glasses are orange rather than clear and the laser warning signs are different than the Holmium and the Nd:YAG lasers, which have wavelengths of 2100nm. There is an initial set up of the Operating room as the laser needs a higher voltage of electricity and an external water irrigation system to cool the unit. A water outlet and drainage system must be installed in the room along with the new 50AMP electrical outlet before you are able to use the system. Prior to surgery the system is simply hooked up and the cooling system counteracts the high-powered flow of energy. There are no fibres to cleave or test and there are no tips to connect or exchange during the surgery. The one-piece probe is disposable and the system comes equipped with a light filter to protect your video unit from the distorting green light.

The advent of the Greenlight laser is proving to be very exciting news for all that have access to it, the health care system that funds it and the surgeons who may now offer it to

their community. Traditionally, the treatment option was to make the patient initially worse by cutting away the prostate and then having it heal while staying in hospital and being subject to CBI. The new option, through the use of the Greenlight laser, is to melt away the prostate in a virtually bloodless surgery, cause no damage, treat a patient as an outpatient and have the same low risk of complications. It is definitely a breakthrough in prostate surgery!

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Continued from Page 16

also suggestions around the SLN arranging a specific time and location to meet family members. However, this lends itself to increasing parent's anxiety levels because if the SLN is delayed for any reason the parents tend to relate the reason to their family member only.

DISCUSSION

The researchers wanted to understand the impact of the Surgical Liaison Nurse role on the anxiety levels of parents who had a child undergoing a surgical procedure. For this group of families Spielberger's State-Trait Anxiety Scale¹ did not appear to be a sensitive enough measure of parents worries either pre- or post-operatively.

The total anxiety score for this instrument was 4, indicating high anxiety. The mean for each group, pre-operatively, was 2 on a 4 point scale. Post-operatively the mean dropped to 1.52 for the SLN group and 1.78 for the routine care group.

Despite the fact that there appeared to be a greater overall reduction in the variance around the mean from the routine care group to the SLN group, the results did not achieve statistical significance. Families were indeed experiencing increased anxiety as indicated by their written feedback and results on the Family Rating Scale (FRS). The FRS and qualitative results supported the hypothesis that the Surgical Liaison Nurse reduced family members' anxiety levels, and also indicated that families were more informed about their child's surgery. In addition, health care professionals validated these findings by describing, more often in the SLN group than in the routine care group, behaviours that are consistent with reduced anxiety.

In one month of 2003 20% of cases that had been booked in this study site's paediatric OR lasted longer than the booked time (OR Booking Database, 2003). For this group of families the statistics indicated a higher percentage of cases that exceeded their booked time (25-31%). In addition to this, it was discovered that for those families who had to wait longer, anxiety levels were higher. This is consistent with findings by Donnell.³ Clinically, a surgical liaison should be able to have

a direct influence on relaying accurate information to families regarding delay of surgery.

IMPLICATIONS

The Surgical Liaison Nurse had an impact on reducing family members' anxiety levels, and increasing their knowledge level re: surgery.

The surgical liaison nurse role will be continued at the study site. Solutions are being explored for the issues raised by parents and healthcare staff. Now that we recognize the impact that the sharing information has on parents we are exploring different strategies that will help meet the needs of families while remaining within our existing budgets. Key factors in making this research possible included a supportive Program Director, Health Service Manager, nurses and healthcare team members who were committed to seeking new and creative ways to support families.

FUTURE CONSIDERATIONS

Both family members and health care professionals were supportive of the introduction of this role. Both groups suggested the role be extended past the elective surgery block time. When implementing this role the team must be flexible with the hours of work to accommodate the families' needs.

A firm commitment is needed to sustain the position on a daily basis. If the position is seen as less important than the circulating or scrub nurse it will likely not be offered on a daily basis. If the position is not offered consistently the pre-op nurses cannot guarantee its existence to the families who are anxious about upcoming surgery for their child. It also makes it difficult for the surgeons and anaesthesia staff to see the SLN as a consistent member of the team.

Communication within the perioperative care team has been enhanced with the introduction of this role. Initially communication between the OR and the in patient units suffered with the introduction of this role. It is important to maintain communication with family members from in-patient units but this should be done without tying up the nurses from the in-patient units. If a nurse from an in-patient unit has to stop what he/she is doing to help the SLN locate a