Radical surgical procedure (Radical Retropubic Prostatectomy) is treatment of choice for patients with localized (T1, T2) prostatic cancer. By radiologists, radical radiotherapy (brachi and external beam or only brachi therapy) could, also, be rational radical option for T1, T2. But, long term survival is better after surgical procedure which is confirmed by many authors. Nerve sparing radical prostatectomy should be considered as a step to better life in all cases where it could be done. With this presentation we would like to point out the critical moments (the places of our—surgical mistakes), where Neurovascular Bundle (NVB) could be injured during the procedure (RRP).

If those injures could be avoided urologist would be able to enhance the quality of life of these patients. The possible injures of NVB may happen during:
1. Dissection of the posterior wall of urethra
2. Separation-dissection of external urethral sphincter
3. Putting of sutures on urethra
4. Preparation of the posterior side of prostate
5. Dissection of the seminal vesicles

Conclusion: Careful surgical work of experienced urologist concerning all surgical tips mentioned above will result in an excellent continence (100%), preserved potency (more than 70%), and better quality of life for patients with localized prostate cancer.

Key words: Neurovascular bundle (NVB), Radical Retropubic Prostatectomy (RRP), and quality of life.

INTRODUCTION:

Although the first radical perineal prostatectomy in diagnosed prostate cancer was performed in 1904 (Hugh H. Young), and the retropubic procedure in treating benign prostatic hyperplasia was introduced in 1947 (T. Millin), to be later used into radical prostatectomy in localized prostate cancer, the prostate cancer could not have been adequately treated, with maintaining the quality of life on a normal level, until anatomically oriented radical retropubic prostatectomy (Patric C. Walsh, 1987) was introduced.

In the past two-three decades, the application of new diagnostic procedures such as ultrasound, transrectal ultrasound, ultrasound-guided prostate biopsy, prostate sextant biopsy, numerical markers of cell anaplasia (Gleason score), levels of PSA and its fractions being tumor-specific indicators of possible prostate cancer, together with better knowledge in anatomy, increased surgical skills, and usage of better suture (stitches) materials— they all facilitated early detection and better treatment in prostate cancer, preservation of urinary continence and sexual function in patients, and a dramatic decrease in mortality rates that once followed Radical retropubic Prostatectomy (RRP).

The person most responsible for this great step forward is Patric C. Walsh, who has explained the vein drainage of penis in the prostate area, and demonstrated how to control dorsal vein complex and eliminate excess blood during surgery. Also, he described in detail the autonomic innervation of the corpora cavernosa and developed the nerve-sparing procedure.

On the other hand, R.P. Mayers is responsible for excellent knowledge of the external sphincter mechanism, which resulted in significant decrease of urinary incontinence.

Let me remind you of some anatomical details that will help us explain and better understand the problem, and, of course, to better demonstrate the procedure itself.

Endopelvic fascia with its parietal layer covers levator ani muscle; visceral layer continues on the prostate and bladder, and their junction makes a white line, arcus tendineus, which spreads anterior giving puboprostatic ligaments. Inferiorly it covers the prostate as laterally extended pelvic fascia, with a neurovascular bundle (NVB) below it. On the back side its continuation is the Denonvillier’s fascia- hard fibrous fascia located between the...
rectum and the prostate with seminal vesicles located in the duplicature – which should also be removed because in 19% of reported cases it is involved in the Prostate Cancer.

Artery blood supply starts from hypogastric artery, via its branch, inferior vesicle artery. It gives lateral branches to seminal vesicles and terminating capsular and urethral branches. Capsular branches extend laterally through the pelvic fascia where they merge with cavernous nerves to form NVB. A deep dorsal vein that arises from the vein tributaries of penis (subalbuginose veins, perforant veins, circumflex veins, and, finally, deep dorsal vein) leaves the urethra and detach it from the prostatic tissue (from which the former clearly differentiates) in order to preserve the complete urethra. This procedure may be performed when the prostate gland is still small and when tumor is well differentiated, without fear of leaving positive margins, because the prostate may be removed completely. Hutch and Fischer (1968) proved that incontinence was involved with the urethra being from 0.7-1.6 cm long (5 patients), whereas continence was involved with the urethra being from 2.6-3.4 cm (the remaining 7 patients).

That means that NVB comprises: cavernous nerves, lymph vessels, artery branches from prostatic arteries, nervous fibers from pelvic plexus, and veins from the dorsal penile vein.

Striated sphincter is located at the bottom of the pelvis and is innervated with the pudendal nerve which runs behind the levator ani muscle, above the division of obturator muscle aponeurosis, and into a special canal (Alcock’s canal), and then passes through the pelvic base and reaches penis dorsally.

After we have established anatomy details, let me demonstrate the nerve sparing RRP procedure. Lower midline incision. Approach to the retropubic space. Preparation of the bladder and Retzius’s space. Lymphadenectomy is performed first (not necessarily; it depends on the current protocol adopted). Fat perivesical tissue is separated. Superficial penile vein is ligated. Incision of the endopelvic fascia behind the white arcus to carefully separate the prostate gland. Endopelvic fascia is incised up to the ligaments. On the other side, interior endopelvic leaf is incised to separate rectum more easily with gauze.

Preparation and separation of urethra laterally (palpated with a catheter) follows. Gauze is inserted (haemostasis, dilatation); dorsal puboprostatic ligaments are partially incised (1/3). Next, dorsal vein on the bladder neck is ligated to prevent blood back flow. Surgical clamps or stitches (suture) are applied below the deep dorsal vein to make the operating area free of blood. This is a crucial moment because there follows a fine preparation of the above mentioned continence-related mechanism.

1. In order to avoid damaging of NVB, urethra and urethra sphincter are not dissected too close to the apex, because in some patients NVB is located too close to the prostate apex – medial NVB angle. (It is parallel with the urethra and only several millimeters away from the apex.) It should be retracted with small clips or stitches, and

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definitely not with electric power which will provoke irreversible damage of the nerve. At this point, NVB may be damaged due to careless work and wide dissection close to the prostate apex.

2. When urethra is incised, the resectourethralis muscle and Denonvillier's fascia (posterior) are also cut to separate urethra from the rectum, and to avoid pulling and damaging of the nerve. Below Denonvillier’s fascia travels NVB which spreads as it runs to penis. At this point, NVB may be damaged due to careless work, pulling and damaging NVB or by setting the clamp, above which the cut is made, too deeply so as to also include NVB. Transversal stitches should never be made here in order to avoid stitching NVB as well.

3. Orientation of stitches is also crucial: you make 5 or 6 or 7 stitches. Never position them at the 5 and 7 o'clock, because this is the traveling route of NVB. Orient the stitches at the 6, 4 and 8 o’clock, as well as on the 2 and 10 and 12 o’clock. At this point, damage of NVB occurs as a result of improperly oriented stitches which then go through NVB.

4. Let me remind you that NVB is placed inside lateral pelvic fascia and that it is located between the prostatic fascia and levator ani fascia. Therefore, we shall now expose the fascia, but only its exterior part, and carefully ligate vascular branches, cut them, and slowly separate NVB laterally and caudally. At this point, NVB may be damaged by electric power (hence small clips or stitches are applied), so it is separated laterally with great care. If NVB cannot be separated from the prostate gland and retracted downwards even after the vascular branches had been cut, it means that it has grown together with the gland and should not be separated; cut the nerve bundle instead and remove NVB from that side.

5. Separation of the prostate gland and preservation of NVB follows.

6. In order to avoid NVB damage close to seminal vesicles, dissection should proceed just alongside the seminal vesicles, because there is the pelvic plexus beneath. At this point, NVB is frequently damaged, although we have managed to preserve it well until this point.

7. When the prostate gland is detached from the bladder, stitches are applied on the bladder neck which is modeled in a "racket shape" fashion Anastomosis of the bladder and the urethra over the the Foley catheter placed into the bladder.

THE PRIMARY GOAL IS TO CONTROL DISEASE, THE SECONDARY GOAL IS TO PRESERVE SEXUAL FUNCTION

Walsh and Epstein report that the nerve sparing procedure does not compromise disease control. Out of 507 patients only 4.7% experienced positive margins, and exclusively on the side of the damaged NVB.

Indications for Normal Sexual Function Preservation

Preoperative existence of normal sexual function;
Prostate localized tumor;
There is no induration or nodus on apex or posterolateral side of prostate;
PSA below 10 ng/ml.

NVB Preservation Side Effects

There was no (or minimum) sexual function preoperatively;
Tumor spreads into NVB
Induration of lateral prostatic sulcus during preoperative examination;
Induration of lateral pelvic fascia intraoperatively;
Fixation of NVB to the prostate.

Urethra Preservation

Younger patients;
Well differentiated tumor;
Surrounding tissue is tumor-free;
If there is a good space between urethra and prostate gland, separate the bladder neck muscle, do not perform preservation of urethra.

The Procedure Efficiency Depends on the Following:

Disease control;
Patient survival rates;
Is a patient satisfied or not?

Disease Control

Walsh (1994): 10 years (955 patients)
70% PSA not detected;
23% Detectable PSA levels;
4%Local recurrence;
7% Metastasis to distant tissues and organs.
Catalona and Smith (1994): 5 years (925 patients)
78% of a total number did not experience disease progression;
90% did not experience progression in Tla and Tlb;
97% for Tlc.

Survival Rates after RRP for localized disease is as follows:

In 10 years’ time – 75%; in 15 years’ time – 60%
(Mayo Clinics: 1143 patients)

Specific Survival Rates:

In 10 years’ time – 90%; in 15 years’ time – 83%

Erection Recovery After Unilateral Preservation of NVB


Erection Recovery After Bilateral Preservation of NVB

According to Huland H. and Noldus J. (2002) - 90% of patients are mostly satisfied, while 50-60% achieved erection without assistance (medications).

Walsh (1994) – 72% of patients achieved satisfactory erection, out of which 33% used Viagra.

Time in Which Erection Recovery is Expected

In most patients after performed RRP: potency recovery between 12 and 18 months and in some cases even later.

Walsh: Potency is being recovered in 72-86% of patients between 12 and 18 months following the surgery.

Rabbini: Potency is being recovered after 11.8 months in 75% of patients; after that period, another 25% of patients out of a total number recovered potency.

Potency Recovery is Influenced by Patient’s Age

In patients under 50 years of age, there is no difference in potency recovery after RRP procedure between those who have undergone unilateral and bilateral NVB preservation procedure.

As for the 50-60 age group, there is a difference between those who have undergone unilateral and bilateral NVB preservation procedure, the type of which significantly influences erection (bilateral NVB preservation has better results).

In patients over 70 years of age, unilateral NVB preservation has caused tumescence, and only 22% of patients having undergone bilateral NVB preservation reached full erection.

The following parameters also influence the postoperative erection recovery:

1. Quality of preoperative erection - recovery is faster with those who had been sexually active preoperatively (quality is more important than frequency of sexual intercourse. Geary (1995)).

2. PH stage of the disease - debatable, although it has been proved (Rabbani, 2000) that extension (in NVB, extracapsular, Vse semin, l, node) does not decrease the recovery with regard to the organ confined disease. On the other hand, the size of tumor would be an independent potency recovery factor, but is that only because of that, or because of the selection of patients and selection of tumors?

3. Surgeon’s experience – It has a significant positive effect on the sexual function recovery.

Catalona reports that a surgeon who performs up to 500 surgical operations has 61% of patients with preserved erectile function (EF); 500-1000 operations; - 68%; 1000-1500 operations; - 70% erection recovery.

Of course, the results are also influenced by the way in which data have been collected, by subjectivity of a surgeon or a patient, and whether those studies have been made by surgeons or on the basis of questionnaires filled in by patients.

Nerve Sparing RRP Also Influences Contingence Preservation

Michael U.H.G. and Holland H. report that there are 90.2% of continent patients following the unilateral or bilateral NVB preservation procedure, in correlation with 77.6% of continent patients who have not undergone NVB preservation procedure.

They also report increased uroflow.

Urinary control recovery is reached within 6 weeks – most often; up to 12 months – in general (92-95%, Scardino 2000), but could also be expected within 24 months after RRP.

Also, this anatomically oriented nerve sparing RP significantly reduced the mortality rates, hence postoperative complications are decreased to 10%.

Catalona reports stricture anastomose – 10%; thromboembolism - 2%; 1/5000 damage of rectum, and no one died.

Blood Loss is Somewhat Increased (which is understandable; preparation and bleeding). The blood loss is greater in RRP than with the perineal procedure. The laparoscopic procedure (Guillonneau B, 2000) further eliminates complications which gives advantage of LP over RRP or perineal RP.

CONCLUSION:

Anatomically oriented radical retropubical prostatectomy, and in particular its modified version, the nerve sparing procedure, is a realistic treatment procedure which has earned its place by its indications, and which has excellent results in survival rates, almost full disease control, minimum mortality rates and which has enhanced the quality of life, rising it to the normal level, following the mutilating surgery (complete return to a normal life routine). Therefore, this is, at the moment, a preferential surgical procedure for localized prostate cancer treatment.

SUMMARY

NERVE SPARING RADIKALNA RETROPUBIČNA PROSTATEKOMIJA-KORAK KA KVALITETNIJEM ŽIVOTU-HIRURŠKI ASPEKTI

Radikalna retropubična prostatektomija je terapija izbora u bolesnika sa lokalizovanim karcinom prostate (T1,T2 stadijum). Prema radiolozima i radioterapija (brahi i spoljne zračenje ili samo brahi terapija) je takodje radikalna terapijska opcija. Ipak, prema većini autora, dugo-godišnje preživljavanje je duže u bolesnika nakon hirurške procedure. "Nerve sparing" radikalana prostatektomija bi se mogla shvatiti kao korak koju bilo koliko životu u svim slučajevima gde se može uraditi. Ovom prezentacijom mi želimo da istaknemo kritične momente (naše greške) kada se neurovaskularni snop (NVB) može povrediti u tok hirurške procedure. Ako bi se ove povrede mogle izbaci urolog bi na taj način podigao kvalitet života tih bolesnika nakon radikalne retropubične prostatektomije.

Najčešće povrede NVB se dešavaju:
1. Za vreme presecanja zadnjeg zida uretre
2. Za vreme preparacije i odvajanja spoljneg sfinktera uretre
3. Za vreme postavljanja šavova na uretri
4. Za vreme preparacije zadnjeg zida prostate
5. Za vreme odvajanja semenih kesica.

Zaključak: Pažljiv hirurški rad, poštujuci sve što smo napred naveli, rezultiraše eksecentnom 100% kontinenci-
jom, prezentacijom potencije u preko 70% bolesnika i boljim kvalitetom života bolesnika sa lokalizovanim karcinomom prostate.

Ključne reči: neurovaskularni snop (NVB), radikalna retropubična prostatektomija (RRP), kvalitet života.

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