

CASE SELECTION AND OUTCOME OF RADICAL PERINEAL PROSTATECTOMY IN LOCALIZED PROSTATE CANCER

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ABSTRACT

Radical prostatectomy continues to play a central role in the management of localized prostate cancer. The majority of patients diagnosed with prostate cancer will undergo radical prostatectomy. A decrease in the morbidity of this surgical procedure has been accomplished through an improved understanding of pelvic anatomy and a greater understanding of the natural history of prostate cancer. Recently, minimally invasive techniques have been applied to radical prostatectomy (laparoscopic prostatectomy) in order to further decrease the morbidity of this operation. What remains to be determined is whether this approach confers the same long term surgical outcomes as the open approach. One method which offers known long term outcomes coupled with decreased morbidity is the radical perineal prostatectomy. The purpose of this paper is to review the criteria for patient selection as well as outcomes of the radical perineal prostatectomy.

Key words: prostatic neoplasms; prostatectomy; perineal; outcomes; surgical technique
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INTRODUCTION

Perineal prostatectomy is the oldest means of prostate resection and has its origins from the perineal lithotomy which was first described in 400 BC (1). In 25 AD, Celsus developed a curved perineal incision which would eventually become the basis for the incision used in the perineal prostatectomy today (1). Covillard is credited with performing the first removal of a portion of the prostate during removal of a bladder stone through the perineum in 1639, although he and other surgeons, at the time, used a median incision in the perineum rather than the curved incision described by Celsus (2). Throughout the 18th and 19th centuries, several surgeons reported the removal of portions of the prostate similar to Covillard; however, the first planned prostate enucleation through a median perineal incision was performed by Guthrie in 1834 (2). This subsequently led to the use of the median perineal incision for the

removal of prostatic carcinoma. In 1866, Kuchler was the first to suggest that the entire prostate could be removed using this approach, but it was Billroth, in 1867, who first described the perineal prostatectomy for the treatment of prostate cancer in a professional journal (3).

In 1901, Dr. Hugh Hampton Young employed the curved perineal incision to perform a prostatectomy for the removal of the entire prostate for benign prostatic hyperplasia (1). Dr. Young stressed the importance of performing all portions of the procedure under direct visualization and developed such tools as the Young retractor and the perineal table to facilitate visualization (Figures-1, 2 and 3). While removing the prostate for benign disease, Dr. Young noted that some of the prostates were involved with cancer. He then performed a series of autopsies in men with prostate carcinoma to identify the pattern of spread of the cancer. This led him to believe that prostate cancer spread along the ampullae of the vasa to the

RADICAL PERINEAL PROSTATECTOMY

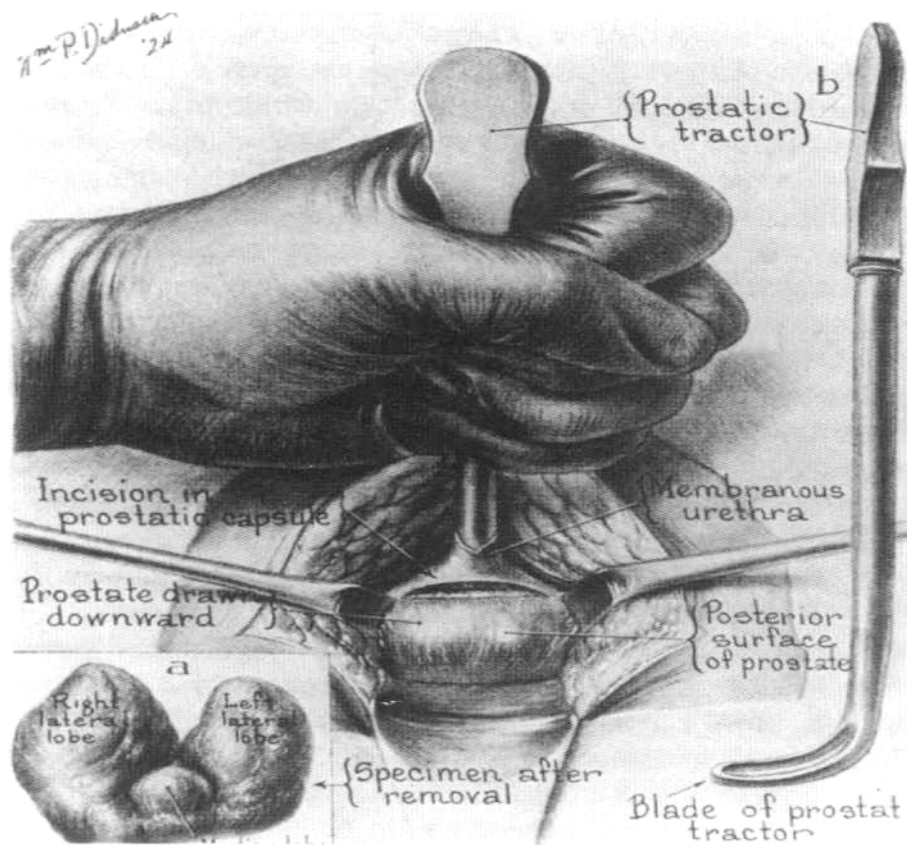


Figure 1 – Dr. Young’s original depiction of prostatic tractor used for enucleation of the hypertrophied lobes of the prostate

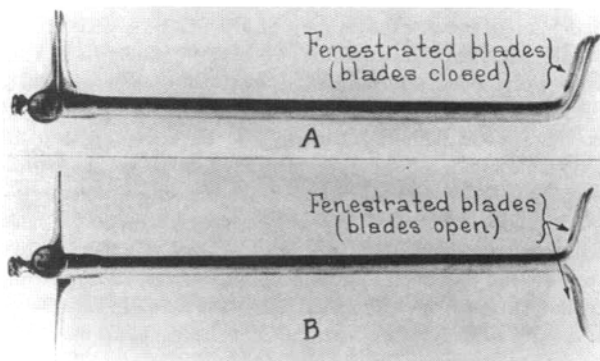


Figure 2 – The Young retractor which is still used today for the perineal prostatectomy.

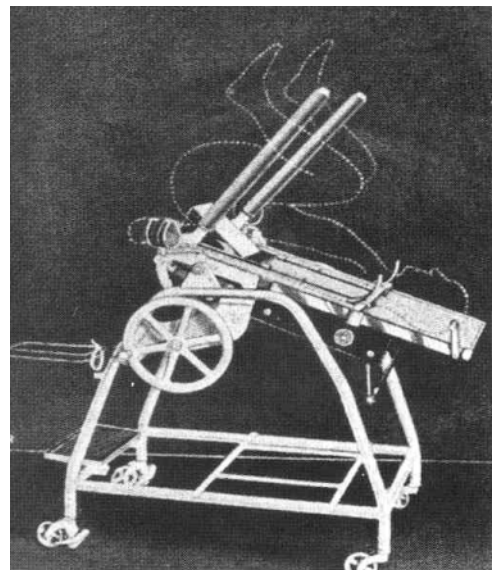


Figure 3 – The Young perineal table

seminal vesicles, and that the cancer was usually contained within Denovillier's fascia (4). During this same time period, Dr. Halsted was performing the radical mastectomy for the treatment of breast cancer. Together they developed a radical operation to remove the prostate, the fascia of Denovillier, the seminal vesicles, ampullae of the vasa, and the vesical neck with a portion of the trigone, and thus performed the first "radical" perineal prostatectomy in 1904 (5). This radical perineal prostatectomy has remained virtually unchanged in regards to technique since it was first described by Dr. Young.

Minor modifications of Young's original procedure have been made in order to reduce the morbidity of the operation. First, after the development of urinary calculi on the silk sutures used for the vesicourethral anastomosis, Dr. Young began using chromic catgut rather than silk (5). Next, Dr. Hans Wildbolz described a technique to preserve the tissue surrounding the external urinary sphincter to reduce the incidence of urinary incontinence (1). Also, prior to 1928, gauze pads were routinely packed into the perineal wound with a portion of the pad exposed for later removal. In 1928, Gibson recommended that these pads be omitted during closure. This modification significantly decreased wound problems as well as fistula formation (6). Another significant contribution was introduced by Dr. Elmer Belt in 1939. Dr. Belt described a new approach to the prostate through the perineum between the longitudinal fibers of the rectum and the circular fibers of the external anal sphincter (7). This approach dramatically decreased blood loss. However, Dr Belt also recommended leaving behind the apex of the prostate to achieve better urinary control, and opening the anterior layer of Denonvillier's fascia during the dissection. Dr. Young considered these last 2 changes in violation of the principals of cancer surgery and discouraged their use in radical perineal prostatectomy (RPP) (5).

In 1945, the development of the retropubic approach for the removal of the benign prostate would soon lead to the use of the radical retropubic prostatectomy for the treatment of prostate cancer (8,9). However, the procedure was soon abandoned due to the adoption of radiation therapy for prostate cancer, as it was thought to have less morbidity. Through the

1960's and early 1970's, literature began to accumulate on the morbidity associated with radiation, but it continued to play a significant role in the treatment of prostate cancer due to the significant morbidity, especially blood loss, associated with radical prostatectomy. Finally, in 1979 Reiner & Walsh reported early meticulous ligation of the dorsal vein during the radical retropubic approach which greatly decreased the blood loss associated with the procedure (10). In addition, Walsh et al., after performing detailed anatomical dissections in the male pelvis, published the first description of the nerve-sparing radical retropubic prostatectomy leading to wide acceptance of this procedure for the treatment of prostate cancer (11).

In recent years there has been renewed interest in the radical perineal prostatectomy technique for a number of reasons. First, the research of Weldon & Tavel in the late 1980's demonstrated that nerve-sparing techniques could be also be applied to the perineal approach (12). Second, with predictive models such as the Partin tables and the Kattan nomogram, patients at low risk for pelvic lymph node metastases can be identified, thus allowing for the safe exclusion of a pelvic lymph node dissection (13). Finally, with the advent of minimally invasive techniques and a focus on decreasing the morbidity of radical prostatectomy, perineal prostatectomy has had resurgence. In addition, as opposed to laparoscopy, the perineal prostatectomy has long-term data on outcomes available (14).

PATIENT SELECTION

Critical to performing a successful RPP is the proper selection of patients. The urologist who performs the RPP must have a clear understanding of which patients as well as what stages of disease are appropriate for RPP. One concern that has been raised regarding perineal prostatectomy is that it is a more difficult approach to learn. However, Mokulis & Thompson studied this in a group of chief residents. Using operative time, estimated blood loss, transfusion requirements, and postoperative stay as surrogate markers for ease of the operation they demonstrated that RPP was learned more quickly than the

retropubic approach (15). The only significant complication particular to learning the perineal approach was that of rectal injury. However, all of these rectal injuries were closed primarily at the time of RPP and resulted in no long term sequelae. This study contradicts the commonly held belief that the perineal approach is more difficult to teach and learn.

EXTENT OF DISEASE

Any form of prostatectomy, whether it is laparoscopic, radical retropubic, or radical perineal is curative only if all of the cancer can be removed during the procedure. In the RPP approach it is imperative that patients have organ confined disease in order for the procedure to be curative. This includes patients with clinical stages T1b, T1c, or T2 disease diagnosed by digital rectal examination. Furthermore, using predictive models such as the Kattan nomogram may help exclude patients who are at high risk for extra-capsular disease (13). For example, a patient who has a clinical stage T1c cancer, but a PSA of 12 and Gleason score of 9 has a high chance of extra-capsular disease and may be best served by an alternative form of treatment (13).

As patients who undergo RPP do not routinely have pelvic lymph nodes sampled, patients at high risk for nodal metastases are typically not candidates for this approach. Some surgeons have combined laparoscopic pelvic lymph node dissections with RPP for patients at greater risk for lymph node metastases. The drawback of this is of course the increased operative time as well as the expertise required to perform laparoscopic lymph node dissection. As mentioned previously, with the predictive models available, patients with a low probability of lymph node metastases can be selected (16). Furthermore with the stage migration that has been seen in prostate cancer since the introduction of PSA, patients can be accurately selected to undergo RPP with the exclusion of a pelvic lymph node dissection (17).

PATIENT CHARACTERISTICS

There are practical considerations in regards to the patients who may or may not be candidates for

RPP. Patient size is one such consideration. Typically, obese patients have less subcutaneous fat on the perineum as compared to the lower abdominal area making RPP a better approach than the retropubic approach. However, if the patient is morbidly obese then the positioning required for RPP may pose a problem. Patients are placed in an exaggerated lithotomy position in order to place the perineum in a position which is essentially parallel to the floor (Figure-4). In morbidly obese patients this may increase the ventilatory pressures to > 40 cm of H_2O resulting in poor oxygenation and inability to perform the procedure. A simple office test that demonstrates the patient's ability to tolerate the exaggerated lithotomy position from a respiratory standpoint involves having the patient lie supine on the exam table and bring his knees to his chest. If the patient is able to tolerate this test, then he will likely tolerate the positioning required for RPP.

If the patient's body habitus is such that the base of the prostate gland is not palpable on digital rectal examination this may make dissection during RPP very difficult due to the depth of the wound. Also, if the patient has a narrow distance between his ischial tuberosities such that the prostate gland is wider than this distance then perineal removal of the prostate is very difficult. As a general rule, prostate glands greater than 100 g are difficult to remove through the perineal approach. If this approach is to be used in large prostates, one many consider downsizing of the prostate with an LH-RH agonist prior to prostatectomy. Other patient characteristics that may exclude them from the perineal approach are hip ankylosis, patients who have had lower extremity amputations, and patients with hip prostheses. These are relative contraindications and should be individualized to each patient.

ADVANTAGES OF RPP

Typically, patients who have undergone previous pelvic surgery are excellent candidates for RPP. In particular, patients who have had meshed hernia repairs, renal transplantation, and pelvic/abdominal vascular bypass grafts, are better candidates for the perineal approach than for the retropubic or



Figure 4 – The exaggerated lithotomy position for radical perineal prostatectomy.

laparoscopic approach, as the perineal dissection is through virgin tissue. Furthermore, in patients who have had prior pelvic irradiation for their prostate cancer and undergo prostatectomy (salvage prostatectomy) the perineal approach has tended to be technically advantageous as compared to the retropubic approach.

OUTCOMES

To date there has been no direct comparison of laparoscopic prostatectomy versus radical perineal prostatectomy. Most of the comparisons have been between perineal prostatectomy and the radical retropubic approach, although there are only a few studies which can be found directly comparing these approaches. One of the first published reports directly comparing retropubic versus perineal prostatectomy was from Boxer et al. in 1977 (18). In this study of

329 patients, Boxer et al. examined several variables including mortality due to the procedure, overall survival rates, incontinence, and long term complications. The authors found no significant differences between the two groups in the variables examined except for an increased blood loss of 700 ml in the retropubic group versus the perineal group. This study was a poor comparison for efficacy as many patients in the study had received estrogen therapy either pre or post operatively. In addition, only 20% of the patients had undergone pelvic lymphadenectomies leading to staging inaccuracies and difficulties in comparing the true cancer control rates of the 2 techniques.

A more contemporary series is that by Frazier et al. who compared 122 patients who underwent RPP versus 51 patients who underwent radical retropubic prostatectomy (RRP) (19). Variables examined were operative times, blood loss, hospital stay, short and long-term complications (including incontinence and

impotence), length of catheter drainage, weight of the specimen, and disease extent. For the purposes of operative time, only those patients who underwent a pelvic lymphadenectomy in conjunction with RPP were included. The authors concluded that there were no statistically significant differences between the 2 groups in terms of positive margin rates, short-term or long-term complications, and urethral or bladder neck involvement. Seventeen of the 22 patients (77.3%) in the RPP group who underwent nerve sparing procedures were potent after surgery. Unfortunately, no data on the potency rates in the RRP group were available making a direct comparison impossible in this study. Again, the only significant differences seen were in the estimated blood loss and transfusion requirements with both being significantly greater for the RRP group. Criticisms of the study include the lack of potency data in the RRP group, and the failure to match patients in the 2 groups by preoperative data. Furthermore, all RPP's were performed by 1 surgeon while 3 different surgeons performed the RRP's.

A smaller study by Haab et al. compared 71 patients who underwent either RRP (36 patients) or RPP (35 patients) for clinically localized cancer of the prostate (20). In this study, patients were matched by their preoperative data including PSA. Similar variables to the Frazier study were examined, including: operative time, number of blood transfusions, peri-operative complications, sexual and urinary function, positive margin rates, and specimen weights. The only significant differences noted were in the transfusion requirements (100% RRP vs. 54% RPP) and anastomotic strictures (2 RRP and 0 RPP). The incidence of rectal injuries and wound infections was the same between the groups as was the incidence of positive margins, biochemical recurrence rates, and continence. The conclusions were that the 2 procedures provide similar disease control outcomes but with significantly less blood loss in the RPP group. This study brings to light one of the major criticisms of any study comparing RRP with RPP, which is the lack of a pelvic lymph node dissection in the RPP patients making true disease control outcomes difficult to measure due to staging inaccuracies. However, with predictive nomograms patients can be accurately

selected in which the risk of node positivity is minimal. Therefore, this criticism should not preclude a meaningful and accurate comparison of the 2 procedures such as was performed in this study.

These trials indicated that margin positivity and biochemical failure rates are equivalent between the 2 procedures. However, a more recent article by Boccon-Gibod et al. compared the incidence of positive surgical margins in patients undergoing RRP versus RPP (21). Ninety-four patients (48 RRP and 46 RPP) with clinically localized prostate cancer were retrospectively reviewed. The patients were stratified according to clinical stage, extra-capsular extension with and without positive margins, and iatrogenic positive margins (incision into the prostate). The authors reported a 56% incidence of positive margins in the perineal group versus 61% in the retropubic group. Biochemical recurrence rates at a mean follow-up of 25 months were the same for each group (33%). What was surprising in this study was the incidence of positive margin rates in patients with pT2 tumors which was significantly higher in the RPP group (43% versus 29%, $p < 0.05$). In addition, the incidence of iatrogenic margins was dramatically higher in the RPP group (90%) versus the RRP group (37%) ($p < 0.05$). Their conclusions were that RRP is a better approach for the treatment of prostate cancer, as it affords a lower likelihood of capsular incision. Problems with these conclusions are that despite the reported incidence of positive margins biochemical recurrence rates were the same. Furthermore, the RPP's in this study were not performed by surgeons experienced in this technique. In other studies utilizing data from surgeons with significant experience in the RPP technique, positive margin rates and iatrogenic positive margin rates are similar to those reported for RRP (20).

The largest comparison trial to date is that of the Uniformed Service Urology Research Group (22). This was a pooled analysis of data from 5 military institutions of 1,698 men who had undergone radical prostatectomies between 1988 and 1997. Of this group, 1,382 underwent RRP and 316 underwent RPP. Patients were retrospectively stratified according to race, clinical stage, Gleason sum, and preoperative PSA. The authors showed that there were no statisti-

cally significant differences between the groups for PSA failures, margin positivity, or organ confined rates. The only significant differences shown were a higher blood loss in the RRP group ($p < 0.001$) and a higher rectal injury rate in the RPP group ($p < 0.03$). There was no difference in the rates of incontinence, impotency, bladder neck contractures, or post-operative complications. All of the aforementioned studies are reviewed in Table-1.

COMPLICATIONS

Rectal injuries have been shown to occur more frequently in RPP than in RRP (22). Although,

the experience of the surgeon plays a role in the frequency of rectal injuries with very low rectal injury rates being reported by surgeons experienced in RPP (14). In fact, at our institution we have seen no rectal injuries within the last 5 years. Rectal injuries usually occur as the rectourethralis is divided or as the plane of dissection changes from vertical to horizontal just before the apex of the prostate. Typically, these injuries are not exceedingly problematic if they are noted at the time of surgery, are repaired intraoperatively, and the patient received an adequate bowel preparation (23). The rectal injury is typically closed in 2 layers, with absorbable suture (we prefer 3-0 Vicryl™) for the first layer followed by 3-0 silk su-

Table 1 – Comparison studies.

Study	Patient Population	Significant Findings	Study Problems
Boxer et al. 1977	329 patients (265 RPP vs. 64 RRP)	Increased blood loss (average 700 ml) in RRP group	Patients received estrogen pre or post operatively Only 20% had pelvic lymphadenectomy
Frazier et al. 1992	173 patients (122 RPP vs. 59 RRP)	Increased blood loss (average for RPP = 565 ml vs. 2000 ml for RRP)	All RPP's performed by 1 surgeon vs. 3 surgeons for RRP Patients not matched on pre-operative data
Haab et al. 1994	71 patients (35 RPP vs. 36 RRP)	Increased blood loss in RRP group vs. RPP group. Increased anastomotic strictures in RRP (2) vs. RPP (0).	Lack of pelvic lymph node dissections lead to staging inaccuracies
Boccon-Gibbod et al. 1998	94 patients (48 RPP vs. 46 RRP)	Increased incidence of positive surgical margins for patients with pT2 disease in RPP group. Increased capsular incision in RPP group.	Lack r experienced RPP surgeons Biochemical recurrence rates the same despite more positive margins
Uniformed Services Urology Research Group 2001	1,698 patients (316 RPP vs. 1,382 RRP)	Increased blood loss in RRP group. Increased incidence of rectal injuries in RPP group.	Retrospective

RPP – radical perineal prostatectomy; RRP – radical retropubic prostatectomy

tures in a Lembert fashion for the second layer. The surgical field is then copiously irrigated with 1 L of antibiotic irrigation and then two-finger anal dilation is performed to reduce sphincter tone. Broad spectrum antibiotics are given for 48 hours and a low residue diet encouraged for 5 days post-operatively.

Fecal soilage after radical prostatectomy is a particular complication that was not reported until relatively recently. In 1998, Bishoff et al. reported a significant rate of fecal incontinence in patients after prostatectomy (24). Patients were mailed a questionnaire asking about both fecal and urinary incontinence. From these questionnaires, 3, 9, 3, and 16 percent reported daily, weekly, monthly, or less than monthly fecal incontinence respectively after RPP. This was less although still present in the RRP group who reported rates of 2, 5, 3, and 8 percent, daily, weekly, monthly, or less than monthly fecal incontinence. This experience is different from the authors' experience as well as the experience of other experienced surgeons employing radical perineal prostatectomy. Also, this study did not employ a validated quality of life questionnaire for prostate cancer, once again calling in to question the validity of the data. We are currently reviewing data from a nationwide database to determine the incidence of bowel bother and bowel dysfunction after RRP and RPP.

A unique morbidity to RPP is lower extremity neuropraxia. The etiology is presumed to be to

undue pressure on the sural nerve due to positioning. Price et al. reported that 43 of 111 patients (38.7%) undergoing RPP experienced some degree of lower extremity neuropraxia (25).

Fortunately, these cases of neuropraxia were of short duration (2-3 days) and resolved in all cases. We also experienced this problem at our institution until recently when we began using the Yellofins Stirrups™ (Figure-5) and subsequently we have not seen this complication again. This is due to the fact that the stirrups support the entire leg from the calf down to the foot in a boot like support. This minimizes any pressure on the fibular head and ankle which prevents the neuropraxia.

CONCLUSION

Radical perineal prostatectomy is an example of a surgical technique which has stood the test of time. With only a few technical modifications since its original description, it offers outcomes similar to radical retropubic prostatectomy, the standard approach for the treatment of localized prostate cancer. Its advantages include decreased pain, blood loss, and convalescence, the same arguments currently being made in favor of laparoscopic prostatectomy. In addition, it is the optimal approach for obese patients, patients with prior pelvic surgery, or patients with prior pelvic radiation. As shown in this paper, proper patient selection is critical to the success of the procedure and the minimization of complications. Furthermore, a detailed understanding of the perineal anatomy combined with surgeon experience make RPP necessary for success, but for the experienced surgeon RPP is an attractive option for the selected patient with localized prostate cancer.

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Figure 5 – Yellofins™ stirrups.

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