

Laparoscopic Radical Prostatectomy versus Open Retropubic Radical Prostatectomy in the Treatment of Localized Prostate Cancer

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ABSTRACT

The objective of this systematic review is to assess the perioperative, functional, and oncological outcomes of laparoscopic radical prostatectomy in comparison with open retropubic radical prostatectomy in the treatment of localized prostate cancer. The primary outcomes evaluated were operative time, intraoperative bleeding, transfusion rates, postoperative pain and analgesia, length of hospital stay, duration of bladder catheterization, perioperative complications, postoperative convalescence, costs, urinary continence, erectile function, quality of life, positive surgical margins rate, and biochemical recurrence rate. Based on the current scientific studies available, at the price of increased costs, longer operative time, and a steep learning curve, laparoscopic radical prostatectomy provides similar intermediate and long-term functional and oncological results with the advantage of decreased perioperative morbidity, making it an acceptable alternative in the treatment of localized prostate cancer.

Key words: Prostatectomy; Surgical procedure, laparoscopic; Prostatectomy, retropubic; Assessment, outcomes; Review, systematic.

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INTRODUCTION

Prostate cancer is the most frequent cause of non-cutaneous neoplasia among men and the second leading cause of cancer death in men, just behind lung cancer.

The treatment guidelines of prostate cancer, updated in 2007 by the American Urological Association, include the active vigilance, interstitial braquitherapy, external radiotherapy and radical prostatectomy as therapeutic options for the patient with clinically localized prostate cancer.

Radical prostatectomy is a surgical proceeding in which the whole prostate gland, seminal vesicles and adjacent deferential ampoules are moved with the primary objective of curing the cancer with the least possible morbidity, preserving the urinary continence and the erectile function.

The traditional surgical approach to the treatment of prostate cancer has been radical retropubic prostatectomy (RRP). Radical prostatectomy was initially described as a curing treatment for prostate cancer by Hugh Hampton YOUNG in 1905,¹ by perineal access. In 1945, MILLIN and cols.² described the retropubic

approach, which was vastly applied around the world, especially after the introduction of the anatomical concept with the preservation of the vasculonervous bundles, by WALSH and DONKER, in 1982.³

In the last years, a quick progression has been taking place on urological surgical techniques, with emphasis on the minimally invasive treatment. Patients who have been submitted to laparoscopic nefrectomy, nefroureterectomy and adrenalectomy have benefited from shorter hospital stay, shorter postoperative pain and quicker recovery than patients submitted to an open surgery. In 1992, SCHUESSLER and cols.⁴ performed the first laparoscopic radical prostatectomy (LRP). In 1997, the same authors concluded that such technique, though possible, did not offer significant advantages over the open conventional surgery. Since 1998, however, different groups have continuously improved the laparoscopic technique, turning it into a safe, efficient and replicable procedure.⁶

In face of the diagnosis of prostate cancer and having chosen radical prostatectomy as the primary treatment to the disease, patients and doctors question if laparoscopic prostatectomy is currently as safe and efficient as the open surgery.

In order to be considered an acceptable alternative in the treatment of prostate cancer, laparoscopic surgery must show equivalent functional and oncological results, present comparable perioperative and late morbidity and, above all, be replicable by other groups.^{7,8}

With the intention of helping the orientation of patients and health professionals about the current state of laparoscopic radical prostatectomy, we are carrying out a systematic review, together with the Urological Neoplasias and Prostatic Diseases Group from The Cochrane Collaboration, evaluating all the comparative studies published between retropubic radical prostatectomy and laparoscopic one in relation to perioperative, functional and oncological results. The preliminary results reported in this article include the articles published until the first semester of 2007.

PERIOPERATIVE RESULTS

Operative time

Operative time is significantly greater for LRP in relation to RRP.^{7,9-16} On average, operative time was 4.3 hours (between 2.4 and 6.7 hours) to LRP and 2.9 hours (between 1.7 and 3.8 hours) to RRP. The longer operative time with the use of the laparoscopic technique might be explained by the reduced tactile sensibility, limited instrumentation and shorter field of view, which demand slower dissection.^{17,18} Similarly to what has been observed in the open surgery, however, operative time tends to decrease in laparoscopic series, as experience grows along the learning curve.^{14,15}

Intraoperative Bleeding and Transfusion Rates

Intraoperative bleeding is significantly lower in LRP than in RRP,^{7,12-15,19-22} presenting an average of 504.2 mL (between 189 and 1100 mL) in the laparoscopic group and 1049.9 mL (between 385 and 1559 mL) in the open group. In general, transfusion rates are also lower in LRP.^{13,14,16,20} The average transfusion rate was 13.2% (between 0 and 63%) in LRP and 28.8% (between 9 and 56%) in RRP.

The pressure exercised by the pneumoperitoneum over the small venous capillaries and the meticulous hemostasis under optical magnification of the operative field, especially during the dissection of the dorsal venous complex and of the prostate side pediculus, are the main issues involved

with lower blood loss and reduced transfusion rates associated with LRP.^{7,10,12-16,18-20,22,23}

Postoperative Pain and Analgesia

The intensity of postoperative pain is measured by the visual analog scale, varying between 0 (no pain) to 10 (severe pain), has shown that LRP presents lower levels of both early and late postoperative pain, if compared to RRP.^{7,13,22} The average pain intensity on the first postoperative day was 3.1 (between 1.7 and 4.5) in the laparoscopic group and 5.2 (between 2.6 and 7.8) in the open group.

Nonetheless, pain intensity estimated by the need of postoperative analgesic medication was greater for RRP in some studies,^{14,22} although it has also been reported as similar for both LRP and RRP in other studies.^{11,19} Such discrepancy may be partially explained because the median infra-umbilical incision in the open surgery might not be significantly more debilitating than the multiple incisions used for the portals of the laparoscopic surgery,^{11,24} and the urinary extravasation to within the peritoneum might be associated to a greater postoperative discomfort in patients submitted to transperitoneal LRP.¹⁵

Length of Hospital Stay

The length of hospital stay is a hard parameter to be evaluated, since it is associated to social and economic pressures in different geographical areas.¹⁰ In the United States, the length of hospital stay after radical prostatectomy has been reduced to less than 3 days.^{10,24} In Europe, the length of hospital stay is longer, for the patient discharge depends on their complete recovery, not on hospitalization costs.¹⁵

Comparative studies between LRP and RRP have shown the length of hospital stay to be similar^{7,14,19}, or reduced^{10,11,15,16,25} in favor of those patients submitted to laparoscopic treatment. The average length of hospital stay was 2.2 days (between 1.7 and 3 days) and 8.7 days (between 7 and 12 days) for LRP in the United States and Europe, respectively. For RRP, the average length of hospital stay was 2.8 days (between 2.4 and 3 days) in the United States and 12.4 days (between 10 and 16 days) in Europe.

Duration of Bladder Catheterization

Bladder catheterization was shorter in patients submitted to laparoscopic prostatectomy than in those submitted to open retropubic prostatectomy.^{9,12,14,16,19,21,22} The average

catheterization time was 7.6 days (between 5.8 and 14 days) after LRP and 14.1 days (between 7.8 and 22 days) after RRP. The significantly greater percentage in the laparoscopic group suggests the higher quality of the laparoscopic urethrovesical anastomosis.^{13,18} The advantage of the urethrovesical anastomosis lies on the better optical magnification view of the operative field.^{13,18,26}

Perioperative Complications

Unclear and non-systematic reports make it difficult to compare LRP and RRP complication rates.⁶ Several comparative studies have shown equivalent medical and surgical complication rates for LRP and RRP,^{7,9,10,16,20} with an average of 19% (between 5.1 and 37%) and 15% (between 8.3 and 20%), respectively. Other studies have shown that slight and early complications were more frequent after RRP than after LRP,^{14,21,22} but the spectrum of complications was different.¹⁴ In the laparoscopic group, there were more rectal injuries, urinary fistulas and prolonged ileo, if compared to the open group.^{7,14} On the other hand, the incidence of anastomotic stenosis (sclerosis of the bladder neck), complications associated with incision, lymphoceles and pulmonary embolism was greater after the open surgery than after the laparoscopic one.^{14,21,22}

Postoperative Convalescence

Patients submitted to LRP show quicker partial convalescence – understood as the capacity to perform daily activities by oneself – and total convalescence – the total recovery of physical power, as it was before the surgery – in comparison with patients submitted to RRP.^{14,19,22} Partial and total recovery have been achieved after an average of 13 days (between 12 and 14 days) and 32 days (between 27 and 39 days) for patients submitted to LRP, and 23 days (between 21 and 25 days) and 53 days (between 47 and 61 days) for those submitted to RRP.^{19,22}

Costs

RRP is significantly cheaper than LRP.^{8,25} The main reason for this is the higher cost of both surgical material and surgery room for LRP.²⁵ The shorter length of hospital stay after LRP has reduced hospitalization costs, but such difference is not enough to compensate for the higher costs of surgical material and surgery room.²⁵ The shorter length of hospital stay would only match RRP costs if LRP were

performed as an outpatient surgery (less than 1 day of hospital stay).^{8,27}

Refinements in the laparoscopic technique and improvements on the laparoscopic instruments available, which potentially reduce operative time, could permit costs equivalence between LRP and RRP.^{8,25} The reduced operative time to a range between 159 and 174 minutes would match LRP to RRP in terms of costs.^{8,27} Another way to reduce costs would be to reduce the costs of laparoscopic equipment,⁸ especially disposable trocars and scissors.²⁷

Complications certainly produce an impact on the total costs of any surgical procedure. If LRP lower complication rates prove to be replicable,^{14,21,22} the difference in costs between LRP and RRP may be substantially reduced.²⁷

Considering the costs resulting from the number of working days missed during the postoperative convalescence, and the fact that the average time for total recovery after LRP is 32 days, and after RRP, 53 days, the 21-day difference to get back to work is significant to society. Such results may dissipate, or even reverse, RRP cost advantage.

FUNCTIONAL RESULTS

Urinary Continence

Some baseline factors to predict the continence level following radical prostatectomy include patient age, preoperative continence, previous background of transurethral resection of the prostate, surgical technique used and the surgeon expertise.

Several technical improvements on radical prostatectomy have significantly reduced postoperative urinary incontinence. These include the preservation of pubo-prostatic ligaments, meticulous control of the dorsal venous complex, delicate dissection of the prostate's apex, bladder neck preservation, avoidance of electrical, thermal or harmonic energy near the vasculonervous bundles, and performance of an hermetic urethrovesical anastomosis.^{9,12,26,28}

Urinary continence rates following radical prostatectomy may vary significantly depending on the data collection technique and the different continence criteria used.¹⁰ The rates of urinary continence, defined as the total absence of urinary protectors, were similar between LRP and RRP 12 and 18 months after the surgery.^{7,9,14,15,21,26,29} After LRP, the average continence rate was 81.7% (between 60 and 91.7%)

in 12 months and 94.3% (between 92.8 e 95.8%) in 18 months. After RRP, the average continence rate was 83.5% (between 66.7 and 92.9%) and 92.6% (between 92 and 93.2%) in 12 and 18 months, respectively.

Erectile Function

Patient age, quality of preoperative erections, relationships stability, cardiovascular comorbidities, degree of preservation of vasculonervous bundles during the surgery and surgeon expertise are important issues to the recovery of sexual function after radical prostatectomy.^{9,18,24} The objective evaluation of the erectile function is hard to be done, though, due to the existence of several evaluation methods and different definitions of sexual power.²⁸

Sexual power rates, defined as the presence of enough erections to keep satisfactory sexual intercourse, are similar between LRP and RRP 12 and 18 months after the surgery.^{7,9,21} Preserving both vasculonervous bundles, sexual power rates after 12 months were 67.6% (between 53 and 79.5%) after LRP and 57.4% (between 44 and 72.4%) after RRP.

Quality of Life

Studies through validated questionnaires evaluating quality of life have not found differences before or after open radical prostatectomy and laparoscopic radical prostatectomy concerning functional level, urological symptoms, physical comfort, psychological stress and social activity.^{26,30} One study has shown significantly higher quality of life coefficients until one year after the surgery in patients submitted to LRP, if compared to patients submitted to RRP.²² Patients in the laparoscopic group have also expressed a more favorable attitude towards the surgery than those submitted to the retropubic surgery, and a significantly higher number of patients submitted to LRP would have chosen the same treatment once more, if compared to the ones submitted to RRP.^{18,30}

ONCOLOGICAL RESULTS

Positive Surgical Margins Rates

Positive surgical margins rates are defined by the presence of a tumor in the resection margin of the surgical specimen, highlighted nanjing ink. The presence of positive surgical margins rates may predict higher biochemical progression risk, both local and systemic.^{10,13,24,31-35} Significant factors to positive

surgical margins rates include PSA preoperative serum value, clinical and pathological state, Gleason score, preservation of vasculonervous bundles and surgeon expertise.¹⁸

LRP does not increase positive surgical margins rates in comparison with RRP.^{6,7,10,14,16,25,20-23,26,32-34,36} The average positive surgical margins rates were 23.5% (between 7.8 and 50%) for LRP and 25.1% (between 7.3 and 42%) for RRP.

Biochemical Recurrence Rate

The main objective of radical prostatectomy is curing prostate cancer.²⁴ The biochemical recurrence rate may be considered the equivalent prognostic of the disease-specific survival. Interpreting the results, however, requires taking into account the cut-off value of PSA used to define failure or recurrence. Different authors report biochemical recurrence rates with PSA values varying from 0.1 to 0.4 ng/ml.⁶ Most biochemical recurrences become evident within the first 5 postoperative years.²⁴ Despite, because of its slow growth, a characteristic of prostate cancer, its recurrence may take 10 other years to be clinically detected.²⁴

Postoperative LRP biochemical recurrence rates seem to be similar to those reported for RRP. SALOMON and cols. reported statistic rates free of biochemical recurrence after 3 years: from 84.1 to 86.2% for LRP and 75.0 to 89.3% for RRP (PSA < 0,2 ng/ml).^{16,23} PARK and cols. calculated probability free of biochemical recurrence after 5 and 7 years, using KATTAN's multivariate postoperative nomogram, and were not able to find differences between LRP and RRP.³⁴ Probability free of biochemical recurrence after 5 and 7 years was 97% and 96% for LRP and 96% and 95% for RRP (PSA < 0,4 ng/ml).³⁴

CONCLUSIONS

Radical prostatectomy is an effective treatment to localized prostate cancer. Since LRP allows the duplication of all surgical steps and changes carried out during open radical prostatectomy, it is not surprising that the results obtained by RRP may be duplicated by the laparoscopic approach.

Despite the lack of well-designed prospective and randomized studies comparing both laparoscopic and open techniques, based on scientific studies currently available, and at the expense of more

expensive surgical equipment, longer operative time and steeper learning curve, LRP offers similar intermediate and late functional and oncological results, with the advantage of allowing reduced perioperative morbidity. Several services are being able to replicate such excellent results, making radical laparoscopic prostatectomy an acceptable alternative to the treatment of localized prostate cancer. The best choice to treat prostate cancer must be based on surgeon expertise and patient preference.

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SUMMARY (BULLET FORMAT)

- Operative time is lower in open than in laparoscopic prostatectomy
- Intraoperative bleeding is lower in laparoscopic than in open prostatectomy
- Transfusion rates are reduced during laparoscopic prostatectomy
- The intensity of postoperative pain after laparoscopic prostatectomy is similar or reduced in

relation to the postoperative pain after open prostatectomy

- The length of hospital stay is similar or shorter in patients submitted to laparoscopic prostatectomy

- Duration of bladder catheterization is reduced in patients submitted to laparoscopic prostatectomy

- Open and laparoscopic prostatectomies present similar perioperative complication rates, but the spectrum of complications is different

- Partial and total postoperative convalescence are more quickly achieved after laparoscopic prostatectomy than after open surgery

- Open prostatectomy is cheaper than laparoscopic prostatectomy

- Laparoscopic and open prostatectomies present similar rates of urinary continence 12 and 18 months after the surgery

- Laparoscopic and open prostatectomies present similar rates of sexual power 12 and 18 months after the surgery

- Laparoscopic and open prostatectomies present similar positive surgical margins

- Biochemical recurrence rates after laparoscopic prostatectomy seem to be similar to the ones in open prostatectomy

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