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Impact of a Multidisciplinary Continuous Quality Improvement Program on the Positive Surgical Margin Rate after Laparoscopic Radical Prostatectomy

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Abstract

Objective: Outcome after radical prostatectomy is highly sensitive to fine nuances in the surgical techniques. We sought to determine the impact of a process of continuous control and monitoring on the positive surgical margin rate in a contemporary series of laparoscopic radical prostatectomy.
Methods: Between January 2003 and October 2004, 301 men underwent laparoscopic radical prostatectomy for clinically localized prostate cancer (cT1–cT3a). A weekly case review conference involving surgeons, radiologists, and uropathologists was held to discuss the preoperative, intraoperative, and pathologic findings of significant cases. We analyzed the trend of positive surgical margins and compared the clinical and detailed pathologic characteristics of the cancer during the study period.
Results: We created logistic regression models with positive margin as the dependent variable and surgical experience as the predictor, adjusting for possible secular changes in disease severity (prostate-specific antigen, pathologic stage, and Gleason grade). There was a decrease in the rate of surgical margins: odds ratio 0.68/100 patients treated (95% confidence interval [CI] 0.44, 1.05; $p = 0.08$). The predicted probability for a positive surgical margin falls from 17.3% for the first patient to 7.5% for the 301st. These values are close to the observed rates for the first and last 50 patients. There was no important change in surgical risk over the course of the study, and the rate of nerve sparing remained stable throughout the study period.
Conclusions: In this contemporary series, which is unaffected by downward stage migration, the decreasing rate of positive surgical margins can be explained by subtle surgical technique modifications and a continuous multidepartmental effort for quality improvement.

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1. Introduction

Positive surgical margin after radical prostatectomy is associated with higher rates of biochemical, local, and systemic progression [1–4]. Along with quality of life preservation, achieving negative surgical margins is one of the key outcomes measures after radical prostatectomy. In the last two decades, a significant trend toward a decrease in positive surgical margin rates has been demonstrated in large experiences of radical prostatectomy [5,6], and positive surgical margin rates as low as 5% for pT2 and 11% for pT3 patients are more frequently reported [7]. Many factors may have contributed to this trend, among them a tremendous stage shift in prostate cancer toward confinement of clinical disease [8–11], increased experience on the part of the surgeons, and advances in the surgical technique. Regarding the impact a surgeon may have on the pathologic results, it has been established that the surgeon is an independent predictor of outcome [12,13]. But the technique a surgeon uses is also a dynamic process, evolving with time, and many modifications have been proposed to improve postoperative outcomes [14,15].

For a recent technique, such as laparoscopic radical prostatectomy, regularly performed since 1998, these technical modifications along with the increased surgical experience are certainly the major factors that may have an impact on the positive surgical margin rate. In the reported initial experience of laparoscopic radical prostatectomy, positive surgical margin rates ranged from 19.2% to 26.3% and this represented a period during which the technique was being tested [16,17]. Now 7 yr beyond the developing phase, we sought to evaluate the rate of positive surgical margins in a contemporary series of 301 consecutive laparoscopic radical prostatectomies performed by one surgeon at the same institution and analyzed the effect of surgical technique modifications and continuous quality improvement efforts on the results.

2. Materials and methods

2.1. Patient population

Between January 2003 and October 2004, 308 consecutive patients underwent laparoscopic radical prostatectomy (LRP) performed by one surgeon at Memorial Sloan-Kettering Cancer Center. Seven patients who received neoadjuvant hormone therapy were excluded from this analysis, leaving a total of 301 patients as the population of this study. Preoperative prostate-specific antigen (PSA), biopsy Gleason score, and clinical stage according to the 2002 International Union Against Cancer TNM system were prospectively recorded in the prostate cancer database.

2.2. Surgical technique

The LRP performed was an evolution of the previously described Montsouris technique [18]. The first modification involved the apical dissection, with transection of the urethra at the end of the prostatectomy once the neurovascular bundles have been dissected off the apex and completely freed; the second modification is the intraoperative gross examination of the specimen before completion of the urethrovesical anastomosis, allowing frozen section examination of suspicious areas.

The extent of preservation of each neurovascular bundle (NVB) was planned by the surgeon preoperatively based on the results of the digital rectal examination, serum PSA, grade, location, and extent of cancer in each biopsy core as well as the results of endorectal coil magnetic resonance imaging. A final decision regarding the extent of NVB preservation that was to be performed was made depending on the intraoperative findings and eventually frozen section results, when required. The quality of the NVB preservation (preserved versus damaged versus resected) was recorded immediately postoperatively.

2.3. Pathologic examination

The surgical specimen was coated with India ink to delineate the surgical margins then fixed in 10% formalin. Prostate and seminal vesicles were step sectioned transversely at intervals of 3–4 mm. The prostate's most apical tissue (distal apex) was sectioned in the sagittal plane. Gleason score, pathologic stage, cancer maximum diameter, total tumor volume, number of cancer foci, and positive surgical margin status and site were prospectively recorded. The cancer characteristics were determined in total number of cancer foci per specimen, cancer maximum diameter in centimeters, total tumor volume in cubic centimeters, and surgical margins status (positive or negative).

A positive surgical margin was defined as presence of cancer at the inked margin of resection in the prostatectomy specimen, regardless of whether additional tissue was resected or not.

The incidence of indolent cancer was determined and assessed throughout this series; indolent cancer was defined as a cancer with a total tumor volume <0.5 cc, confined to the prostate (no focal or established extracapsular extension [ECE], and with no lymph nodes metastases) and no Gleason pattern 4 or 5 [19].

2.4. Quality improvement

The preoperative and intraoperative data of the cases with positive surgical margins were reviewed in a quality assurance conference involving genitourinary pathologists, radiologists, and surgeons. In parallel, correlation between the results of the whole mount sections of the surgical specimen and the intraoperative findings seen on the video was studied to help