

A comparative evaluation of radical prostatectomy using laparoscopic and open method in view of surgical margins

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Introduction A positive surgical margin (PSM) in the radical prostatectomy (RP) specimen is associated with biochemical recurrence (BCR) and the need for adjuvant radiation therapy, and is an analysis of surgical procedure quality. We present data describing the identification, anatomy, and management of PSM after RP performed via an open operation and laparoscopically. The aim of the study was to compare assessment of RP (open vs. laparoscopic) in terms of analysis of PSM in postoperative histopathological tissue.

Material and methods Patients with pT1 to pT3b prostate cancer with detailed surgical margin parameters and BCR status were analysed. The patients were divided into groups depending on the stage of neoplastic disease and the choice of operative procedure.

Results In total, we obtained data from 140 PC patients. Positive surgical margins were confirmed in 11 cases treated with open surgery and in 7 cases treated with laparoscopic procedure. There was no statistically significant ($p > 0.05$) relationship between the frequency of positive margins and the type of procedure. There was no statistically significant ($p > 0.05$) relationship between the frequency of positive margins and the type of procedure in subgroups according to the Gleason score. There was a statistically significant ($p < 0.05$) relationship between the clinical stage of the tumor and the type of margin. This particularly refers to tumours with stage T3b (more numerous in the group of open surgeries) and T2c (more numerous in the laparoscopic group).

Conclusions There was no statistically significant correlation between the type of surgery and the incidence of a positive surgical margin.

Key Words: positive surgical margins ◊ prostate cancer ◊ radical prostatectomy

INTRODUCTION

Prostate cancer (PC) in Poland is the second most prevalent cancer in men, following lung cancer. According to the Polish National Register of Cancers, annually, 12162 new cases of PC are diagnosed, and approximately 5000 men with early diagnosed disease die. Most incidences of malignant PC occur in the seventh and eighth decade of life [1].

During surgical treatment it is crucial to achieve negative surgical margins as most authors state that positive surgical margins predispose to local recurrence of disease and therefore increase risk of mortality [2 – 5].

Positive surgical margins (PSM) status has been shown to increase the risk of biochemical relapse (BCR) after radical prostatectomy (RP) [6, 7]. Moreover, surgical margins status after RP has been shown to be a predictor of disease progression and may be useful in making decisions about the need for adjuvant treatment. [8, 9] However, many studies have shown that in the absence of other high-risk features, PSM alone may not be an indication for adjuvant radiotherapy [10].

A number of important studies on PSM in RP suggest that the Gleason score in PSM may improve prognosis and decision-making accuracy [11].

So far, no high-quality evidence has been demonstrated to support comparable efficacy of laparoscopic radical prostatectomy (LRP) compared to open radical prostatectomy (ORP) in terms of oncological outcomes [12].

MATERIAL AND METHODS

The research material consists of the medical data collected during 2014–2019 and related to patients suffering from organ-confined PC, treated with RP in one center. The patients were divided into groups depending on the stage of neoplastic disease and the choice of operative procedure: radical laparoscopic prostatectomy versus the open operation.

Both the open and laparoscopic prostatectomies in all observed patients were carried out by the same surgeons. Biopsy in most of the patients qualified to RP was carried out by the same physician. In most cases it was a multiple biopsy of the prostate supervised by transrectal ultrasonography, and in some patients multiple transperineal biopsy of the prostate, supervised by a fusion of magnetic resonance image and transrectal ultrasonography was carried out. Patients were selected randomly for the operation method.

The analyzed subgroups of treated patients were chosen after prostate biopsies with the same Gleason scores as well as staging of the tumors through imaging examinations.

In the analysis of the postoperative histopathological result, attention was paid to: infiltration by the tumour of the prostate's capsule and occasionally surpassing it, lack or presence of neuroinvasion, as well of one or both seminal vesicles, localization of cancerous lesions in relation to the surgical section line and lack of metastases in lymphatic nodes.

The patients with PC from two basic groups, i.e. the surgeries made by the open method and those made by laparoscopy, were divided into three consecutive groups in view of evaluation of malignancy of the neoplasm according to Gleason score. Considered in the division into groups was the postoperative Gleason score which often differed from the biopsy result. Group 1 consisted of patients with Gleason 6, Group 2 with Gleason 7 and Group 3 with Gleason >7.

The patients' groups were subjected to statistical analysis. In the methodological approach mainly the lists in multipartite tables were used, which presented numbers in particular divisions, percentages and checking of the hypothesis about independence using the Chi-square (or in justified cases the precise Fischer test. Additionally, to visualize the frequency, the so-called bubble charts were used to present the numbers in particular divisions.

Fisher I Chi-square statistical analysis confirmed that the groups were homogenous.

The research was performed with the approval of the Bioethical commission of the Medical University (approval no RNN/391/17/KE).

RESULTS

In summary, we obtained data from 140 PC patients. One patient treated by open radical prostatectomy was excluded from the statistical analysis because of the hormonal treatment that was administered before radical treatment. In one histopathological result of the operated patients the therapy (Tx) appears in the description of the progression of cancer.

In 70 patients, a RP was carried out using the open method (Table 1). In 70 other patients, a RP was carried out by laparoscopy (Table 1). Positive surgical margins were confirmed in 11 cases treated with open surgery and in 7 cases treated with laparoscopic procedure (Table 2, Figure 1). There was no statistically significant ($p > 0.05$) relationship between the frequency of positive margins and the type of procedure. The distribution of the appropriate grade of malignancy is presented in Table 3 and Figure 2. There was no statistically significant ($p > 0.05$) relationship between the frequency of positive margins and the type of procedure in subgroups

Table 1. Histopathological characteristics of prostate cancer

Open RP	
Group 1 – Gleason 6	20
Group 2 – Gleason 7	38
Group 3 – Gleason 8/9	12
	70
LAP RP	
Group 1 – Gleason 6	20
Group 2 – Gleason 7	38
Group 3 – Gleason 8/9	12
	70

RP – radical prostatectomy; LAP RP – laparoscopic radical prostatectomy

Table 2. Margins and the method of surgery

Margins	Open RP	LAP RP
Positive	11	7
Negative	59	62

RP – radical prostatectomy; LAP RP – laparoscopic radical prostatectomy

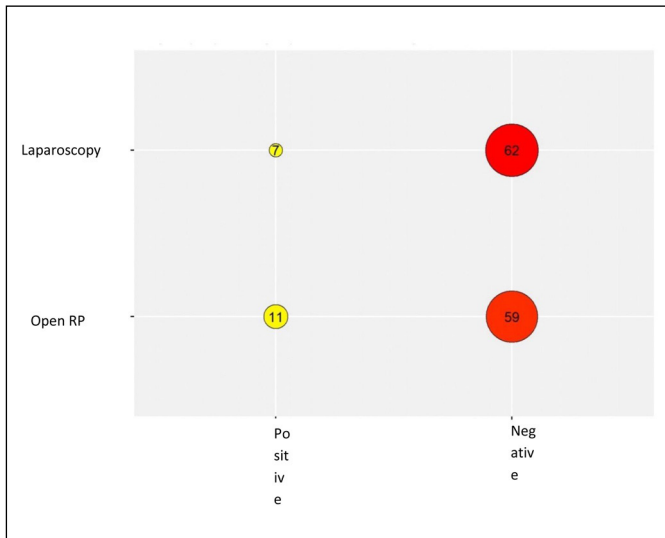


Figure 1. Margins and the method of surgery.

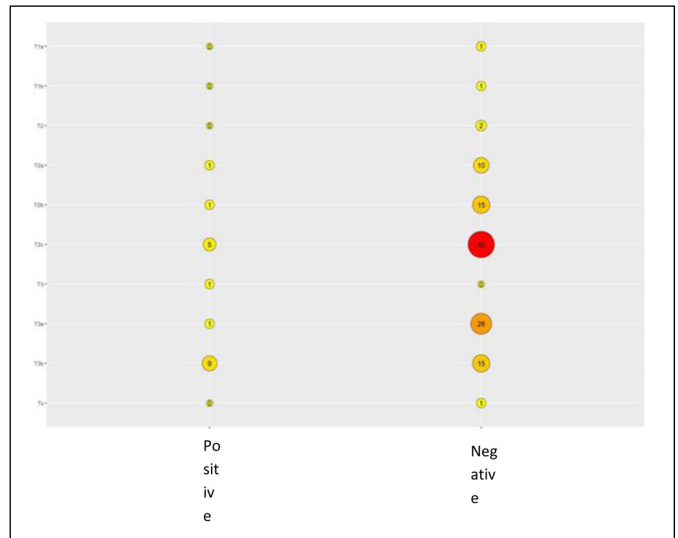


Figure 3. Margins in particular types of the tumour.

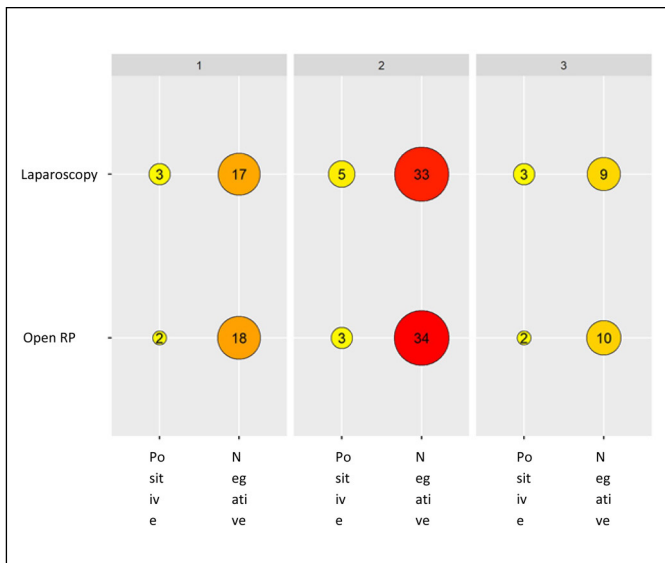


Figure 2. Margins in particular methods and groups.

according to the Gleason score. Taking into consideration the disease stage (after operation) in particular types of operations, there are no differences in distributions of the frequency of disease stage within the types of operations ($p > 0.05$) which confirmed homogeneity of groups proved in chi-squared test (Table 4, Figure 3). There was a statistically significant ($p < 0.05$) relationship between the clinical stage of the tumor and the type of margin. This particularly refers to tumours stage T3b (more numerous in the group of open surgeries) and T2c (more numerous in the laparoscopic group).

DISCUSSION

Open radical prostatectomy had been the first line surgical treatment at our department for 25 years. However, since 2014, laparoscopic radical prostatectomy has become the first line treatment in organ

Table 3. Margins and the method of surgery in subgroups

Margins	Group 1 – Gleason 6		Group 2 – Gleason 7		Group 3 – Gleason 8, 9	
	Open RP	LAP RP	Open RP	LAP RP	Open RP	LAP RP
Positive	3	2	5	3	3	2
Negative	17	18	33	34	9	10

RP – radical prostatectomy; LAP RP – laparoscopic radical prostatectomy

Table 4. Margins and the clinical stage of the tumor

Margins	T1a	T1b	T2	T2a	T2b	T2c	T3	T3a	T3b	Tx
Positive	0	0	0	1	1	5	1	1	9	0
Negative	1	1	2	10	15	50	0	26	15	1

confined cancers of the prostate, in our center. The advantage of laparoscopic procedures when compared with open procedures are less postoperative pain, shorter postoperative hospital stay, faster return to physical activity and through advanced optical systems, better vision of the operative field [13]. It has been shown that the laparoscopic procedures generate less acute-phase reaction activity (measured through, for example C-reactive protein, IL-65, IL-10) when compared with open surgery, which results in increased intraoperative safety and shorter postoperative period of convalescence [14]. Due to the growing demand of patients for this modern method of surgical procedure, a new project was created to purchase appropriate equipment for our clinic and after completing a six-month practical fellowship, endoscopic extraperitoneal radical prostatectomy was introduced in August 2014 [15]. In a short time, the number of radical laparoscopic prostatectomies was equal to the number of radical prostatectomies using the open method, and then in recent years it has significantly exceeded it. Due to this situation, while analyzing the effects of surgical treatment of prostate neoplasms, questions were raised whether there are fundamental differences in the effectiveness of these methods in patients. Many parameters related to our procedures were analyzed, such as: the duration of the procedure, blood loss, complications, the length of the hospitalization and especially, in order to demonstrate the superiority of one of the methods in terms of completeness of the procedure, the surgical margins in postoperative histopathological tissue. The surgical margins are so important due to the fact that in radical surgical treatment it is important to achieve a negative surgical margin, because most authors present the opinion that a positive surgical margin causes a local recurrence of neoplasm and hence an increased risk of mortality [2–5]. Every effort has been made to ensure that the analyzed groups of patients operated with these two methods were comparable in terms of disease advancement. When comparing the groups of patients undergoing open surgery and laparoscopic

procedures, the learning curve was also taken into account, which in laparoscopic procedures is longer and significantly influences possible positive surgical margins [16]. Significant differences were expected between the two methods. However, there was no statistically significant correlation between the incidence of a given type of margin and the type of surgery. Comparing the results of patients operated for prostate cancer in terms of surgical margins with the results of large global centers subjected to meta-analysis, the same results were found in selected stages of the disease and patient groups. In one case some differences could be observed in the numbers for stage T3b (a higher percentage of positive margins in the laparoscopic group, but the Fisher's exact test did not indicate any significant differences within this type of the procedure, $p = 0.1304$). In a worldwide meta-analysis it was found that PSM oncology scores for T3 are higher in RARP than in RRP [17]. Taking into account the parameters compared in both types of surgery, regardless of the method of operation, the most important factor seems to be quick diagnosis and qualification for surgery, which gives the patient a greater chance of a negative surgical margin and longer survival.

CONCLUSIONS

1. There was no statistically significant correlation ($p > 0.05$) between the incidence of a given type of surgical margin and the type of the procedure.
2. There was no statistically significant correlation ($p > 0.05$) between the surgical margins and the type of the procedure and group.
3. There was a statistically significant correlation ($p < 0.05$) between the stage of the tumour and the type of surgical margin. In particular, stages T2c and T3b differed in the number of PSM.

CONFLICTS OF INTEREST

The authors declare no conflicts of interest.

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