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Research Article

Open radical prostatectomy and laparoscopic radical prostatectomy: perioperative comparison of the procedures

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Abstract: Radical prostatectomy is seen as one of the main methods for the treatment of prostate cancer and has been performed for more than 150 years, being considered the gold standard for the treatment of localized disease. In recent years, laparoscopic and robot-assisted access has received notoriety, with oncological results similar to the open technique associated with the benefits of the minimally invasive approach. Aim: To compare complications and perioperative complications in patients undergoing radical open prostatectomy with the laparoscopic approach. Method: This is a retrospective data analysis performed by reviewing the electronic medical records of patients diagnosed with localized prostate cancer at the Regional Hospital of Vale do Paraíba, SP, Brazil (HRVP). Data were collected regarding the procedures performed from January 2014 to December 2018, totaling 35 patients undergoing Laparoscopic Radical Prostatectomy and 35 patients undergoing Open Radical Prostatectomy. Intra and perioperative data were analyzed, specifically the surgical time, blood transfusion rate, type and time of drainage of the surgical site, and length of hospital stay. The data were subsequently analyzed, and the results of both techniques were compared. Results: When comparing the averages of operative times, we obtained a variation rate of 26.2%. The calculated p-value was 0.00002, demonstrating that the operative time in the open group was significantly shorter. When comparing the mean time taken to remove the drain, we observed a variation rate of 37.8%. The calculated p-value was 0.00004, this time being statistically shorter in the laparoscopy group. The other variables evaluated did not show statistical significance between the groups. Conclusion: The main advantage of an open group is that the procedure can be performed in less time. The main advantage of the laparoscopic group was the possibility of removing the drain before patients were operated on by PRA.

Keywords: surgery; prostatectomy; open surgery, robotic prostatectomy, prostatitis

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1. Introduction

In Brazil, prostate cancer is the second most common cancer among men, less frequent only than non-melanoma skin cancer (1). It is considered a cancer of the elderly, with 75% of cases occurring in patients over the age of 65. An increase in the incidence rate of prostate cancer has been observed in Brazil, possibly due to greater access to imaging tests, greater access of the population to the health system, and increased life expectancy. There are an estimated 65,840 new cases, with 15,576 deaths in 2020 alone (2).

Radical prostatectomy is seen as one of the main methods for treating prostate cancer and has been performed for more than 150 years, being considered the gold standard for the treatment of localized disease (1). In the late 1970s and early 1980s, anatomical studies provided important information on periprostatic anatomy, contributing to better oncological, perioperative, and postoperative outcomes. The technique was standardized by Eggleston and Walsh (3), which presented excellent perioperative, oncological, and postoperative functional results (1,4,5).

Despite greater anatomical knowledge, retropubic radical prostatectomy is still associated with significant morbidity, including bleeding, postoperative pain, thromboembolism, urinary incontinence, erectile dysfunction, and ureterovesical anastomotic stenosis (6).

In recent years, laparoscopic and robotic-assisted access has received notoriety, with oncological results similar to the open technique associated with the benefits of the minimally invasive approach. Laparoscopic access was introduced in order to reduce perioperative morbidity, but it is known that the learning curve is high (1). To illustrate the above, Secin et al.(7) analyzed 8544 consecutive surgeries performed by 51 surgeons and demonstrated that the rate of positive margins reached a plateau with only 250 procedures. Carvas et al.(8) demonstrated that surgeons with high surgical volume had lower rates of blood transfusion, postoperative incontinence, erectile dysfunction, length of hospital stay, and urethrovesical anastomotic stenosis (4). In another study, it was evidenced that the rate of cancer recurrence was substantially reduced with increasing surgeon experience with laparoscopy. The same study also reported that experience in open prostatectomies did not reduce the learning curve in laparoscopic prostatecuses (9). However, it should be noted that what weighs against the laparoscopic approach is the long learning curve, minimized by robotic surgery(1,4,10). Robotic surgery has been growing in recent years, especially in developed countries and large medical centers. Prostatectomy is one of the most commonly performed surgeries with robotic access. In the United States, more than 70% of prostatectomies are performed in this way. However, there is no clear evidence of better oncological and functional results of this technique. The main advantages of robotic access are related to the improvement of ergonomics during surgery. As a negative point of robotic-assisted surgery, the considerable financial increase that the technique requires is highlighted(6,10–12).

Based on the above, the relevance of the present study is observed, especially nowadays, in which better surgical results in prostate cancer are sought, and the role of laparoscopic access in times when robotic surgery has been gaining notoriety.

2. Materials and Methods

The study is a retrospective analysis of data, carried out through a review of the electronic medical records of patients diagnosed with localized prostate cancer, at the Regional Hospital of Vale do Paraíba (HRVP). The surgical procedures were performed by physicians from the urology team of the HRVP. The project of this study was submitted and authorized by the ethics committee of the Institute of Education and Research of the HRVP.

Data were collected regarding procedures performed from January 1, 2014 to December 31, 2018, totaling 35 patients who underwent Laparoscopic Radical Prostatectomy (LRP) and 35 patients who underwent Open Radical Prostatectomy (ARP). Patients undergoing PRA were selected in pairs with patients undergoing PRL (surgeries performed on close dates), because in the period there was a considerably higher number of RPAs. The surgical procedures were indicated by urologists attending the HRVP after review of clinical data and clearance by the anesthesia team. Patients considered clinically unfit in the surgical risk assessment were referred for treatment with alternative therapies. The open technique was based on the classic description standardized by Walsh (13). The laparoscopic technique was performed with extraperitoneal access. In all PRAs, the drain used in the postoperative period was the vacuum suction drain (Portovac). The Penrose drain was used in all PRLs.

Intraoperative and perioperative data were analyzed, specifically surgical time, blood transfusion rate, type and time of surgical site drainage, and length of hospital stay. The data were later analyzed, comparing the results of both techniques. Numerical variables were presented by a measure of central tendency (mean or median), followed by their respective measure of dispersion (minimum and maximum values, and standard deviation). Categorical variables were presented as absolute and relative frequency.

3. Results

Group 1 – Patients undergoing PRA

In the analysis of the data of the 35 patients submitted to PRA, we found a range in age from 49 to 71 years, with a median of 63 years and a mean of 62.3 ± 6.2 years.

Prostate volume ranged from 19 to 70 cm³, with a median of 40 and a mean of 39.1 ± 13.1 cm³.

Regarding the operative time, a variation from 135 to 275 minutes was observed, with median of 190 minutes and mean of 195 ± 29.4 minutes.

A blood transfusion rate of 3% (n = 1) was observed. A variation of 3 to 7 days in the length of hospital stay was observed, with a median of 4 days and a mean of 4 ± 1 day. The drain removal time ranged from 3 to 11 days, with a median of 4 and a mean of 4.5 ± 2 days (Table 1).

Table 1: Group 1 - Patients undergoing PRA

	Time of surgery (minutes)	Age (years)	Prostate volume (cm³)	Days of Hospitalisation	Probe Removal Time (days)
Minimum	135	49	19	3	3
Maximum	275	71	70	7	11
Median	190	63	40	4	4
Average ± DP	195 ± 29,4	62,3 ± 6,2	39,1 ± 13,1	4 ± 1	4,5 ± 2

Source: data collected by the author.

Group 2 - Patients undergoing PRVL

In the analysis of the data of the 35 patients submitted to PRL, an age range from 48 to 76 years was found, with a median of 61 and a mean of 61.4 ± 7.8 years.

Prostate volume ranged from 12 to 81 cm³, with a median of 40 and a mean of 38.5 ± 12.5 cm³.

Regarding the operative time, a variation from 135 to 460 minutes was observed, with a median of 250 and a mean of 264.1 ± 78.5 minutes.

A blood transfusion rate of 3% (n = 1), conversion to PRA of 6% (n = 2), and rectal injury of 3% (n = 1) were identified. A variation of 3 to 8 days was observed at the time of hospitalization, with a median of 4 and a mean of 4 ± 1.1 days. On the other hand, the drain removal time ranged from 2 to 7 days, with a median of 3 and a mean of 2.8 ± 1.1 days (Tables 2).

Table 2: Group 2 - Patients undergoing PRVL

	Time of surgery (minutes)	Age (years)	Prostate volume (cm^3)	Days of Hospitalisation	Probe Removal Time (days)
Minimum	135	48	12	3	2
Maximum	460	76	81	8	7
Median	250	61	40	4	3
Average ± DP	264,1 ± 78,5	61,4 ± 7,8	38,5 ± 12,5	4 ± 1,1	2,8 ± 1,1

Source: data collected by the author.

Comparison between PRA and PRL patients

The test used to compare the variables was the *unpaired t-test, considering the parametric distribution of the data (verified by the* Kolmogorov Smirnov test performed in Microsoft Excel®). A significance level of 95% was defined, and comparisons with *a p-value* lower than 0.05 were considered statistically different.

In the comparison of the mean ages, there was a variation of 1.4%. The *calculated p-value* was 0.625. Since the p-value was > 0.05, the difference between the means was not significant.

Comparing the mean volumes of the prostates, a variance rate of 1.5% was obtained. The *calculated p-value* was 0.828, also without statistical significance.

When comparing the mean operative times, a variation rate of 26.2% was obtained. The *calculated p-value* was 0.00002, demonstrating that the operative time in PRA was significantly shorter.

In the comparison of blood transfusion rates, a rate of 3% (n=1) was identified in both methods, with no statistically significant difference ($p = 1$).

When comparing the mean length of hospital stay, no rate of variation was found, as both procedures had an approximate mean length of stay of 4 days. The p-value calculated for the mean length of hospital stay was 0.482, with no statistical significance.

Finally, in the comparison of the meantime for drain removal, the variation rate was 37.8%. The *calculated p-value* was 0.00004, which was statistically shorter in the PRL group.

The comparisons between the groups can be seen in Table 3, which shows the rates of variation between the means of each of the parameters evaluated, in addition to the p-values observed after the application of the *unpaired* Student's t-test.

Table 3: Rates of Variation between Means and P-values of Parameters Evaluated

	Rate of Change between Averages (PRA x PRVL)	p-value
Age	1,4%	0,625 (ns)
Prostate volume	1,5%	0,828 (ns)
Surgery time	26,2%	0,00002
Length of Hospital Stay	0%	0,482 (ns)
Drain Removal Time	37,8%	0,00004
Haemotransfusion	0 %	1 (ns)

ns = not significant.

Source: data collected by the author.

4. Discussion

Radical Prostatectomy (RP) is considered the gold standard method for the treatment of localized prostate cancer (14). The PR was introduced by Young (15), and revised by Millin

(16). However, Walsh et al.(13) described new technical aspects of the surgery, establishing standardization for the procedure in question.

The learning curve is essential to minimize perioperative and postoperative complications, as well as to reduce surgical time(14,17). Salomon et al. (18) reported a mean surgical time of 197 minutes through the suprapubic approach. Saito et al.(14) showed a mean surgical time of 140 minutes, considering surgeries performed by residents in training. In our study, an average of 195 minutes of surgical time was observed, which is consistent with what has been found in the literature.

Regarding the rate of blood transfusion in Open Radical Prostatectomy, we showed a blood transfusion rate of 3%. In other studies, Coelho (4) reported a rate of 5.7%, with an estimated mean bleeding of 600 ml. Saito et al.(14), on the other hand, showed a blood transfusion rate of 7.2%, with a mean bleeding of 488 ml. Amorin et al.(17), in their study, observed a blood transfusion rate of 11.1%.

Laparoscopic Radical Prostatcomia was first described by Schuessler et al.(19), who concluded that the procedure was not a good alternative due to the long surgical time and inferior results to the open technique. From then on, there was a great improvement in perioperative morbidity related to the laparoscopic technique (20).

In our analysis, the mean time found in PRL (all by extra pectoral access) was 264 minutes. In his presentation, Siqueira Júnior (20) demonstrated a mean surgical time of 175 minutes in transperitoneal laparoscopic radical prostatectomy and 267.6 minutes in extraperitoneal access. He also reported a conversion rate and rectal injury rate of 2.5% in both techniques. Regarding the rate of blood transfusion, it was found to be 5% in the transperitoneal access and 12.5% in the extraperitoneal access. The mean length of hospital stay reported by the author was 3 days in both techniques.

Mariano et al.(21) published a series of 730 patients submitted to PRL, in which they showed a mean surgical time of 124.97 minutes, a mean length of hospital stay of 4.3 days, and a blood transfusion rate of 5.4%. Comparing our data, we observed a lower blood transfusion rate than what is reported in the literature, both in the Mariano et al (21) and Siqueira Junior (20) reports. Rassweiler et al.(6) published a comparison between 219 patients who underwent open radical prostatectomy and 521 patients who underwent laparoscopic radical prostatectomy. The authors showed a significantly shorter surgical time in the open technique, although the rate of blood transfusion was lower in the laparoscopic approach. Results are similar to those of our study, in which we observed a shorter surgical time in the PRA group, with statistical significance.

Venkatesh et al.(22) demonstrated a series of 361 patients who underwent extraperitoneal surgery performed by an experienced surgeon, with a mean surgical time of 190 minutes and a mean hospital stay of 1.28 days. Bollens et al.(23) showed a mean surgical time of 317 minutes in extraperitoneal surgeries, with a blood transfusion rate of 13%.

Vickers et al.(9), in a multicenter and retrospective study, reported that surgeons with more than 100 laparoscopic prostatectomies performed had better postoperative oncological results, showing that this technique presents a large learning curve to achieve satisfactory perioperative and oncological results.

Bollens et al.(23) compared open radical prostatectomy with laparoscopic and robotic prostatectomy. The authors' blood transfusion rate was 21% in open cases, 4.6% in laparoscopic cases, and 1.8% in robotic cases.

In our exposure, there was no great variation in prostatic volume, which hindered a specific analysis of this item. Chang et al.(24) showed in their publication that the volume of the prostate did not modify the length of hospital stay or the rate of blood transfusion. The mean surgical time was 14 minutes longer, but not statistically significant.

Rassweiler et al.(25) reported that the main benefits of robotic access over laparoscopic access are the surgeon's ergonomics and the lower learning curve. In addition, the learning curve of laparoscopic access has been shown to be long, in which the surgeon needs around 250 procedures to present better perioperative and oncological results (26). This fact is important in our study because the surgeons responsible for the laparoscopic procedures experienced a learning curve during the period, which may have contributed to a discrepancy in the results compared to the open one, especially during surgical time.

With greater access to the use of robots to perform prostatectomies, especially in large centers, there is a clear trend towards a decrease in laparoscopic prostatectomies, although this is still a more affordable method with perioperative and oncological results similar to robotics. It is worth noting, however, that the open approach is still important in the therapeutic arsenal of prostate cancer, especially in less developed and economically unfavorable centers.

5. Conclusions

In our study, we observed that the main advantage of PRA is that the procedure is performed in a shorter time. Regarding PRL, the main statistical evidence was the earlier removal of the drain in the postoperative period. Despite the small number of patients included in this study, the results call attention to the advantages of each of the methods evaluated, and as discussed, we present results similar to those found in the literature. It is suggested that further studies be conducted, with a larger sample and better control of preoperative, intraoperative and postoperative parameters, in order to verify whether the results observed here can be repeated when evaluated on a larger scale.

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