

Radical Prostatectomy by Laparotomy: Retrospective Study Comparing Separate and Continuous Stitches in the Performance of Vesicourethral Anastomosis at a Single Center in the Public Health Network

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Abstract

Background: Prostate cancer ranks as the second most prevalent malignancy in men, with treatment strategies ranging from observation to various interventions. Radical prostatectomy is a common approach, aiming for a cure, and the technique for vesico-urethral anastomosis varies, employing separate or continuous stitches. However, a consensus on the optimal technique is lacking. This study aims to compare vesico-urethral anastomosis techniques (separate vs. continuous stitches) in laparotomy-based radical prostatectomies, evaluating peri and postoperative outcomes. **Materials and Method:** A retrospective analysis of 140 patients' medical records yielded 86 eligible cases, divided into two groups based on anastomosis technique. Both groups underwent surgery at the same urology center between 2016 and 2019, with a follow-up period exceeding 12 months. Pre-operative characteristics were statistically similar between groups. **Results:** Perioperative complication rates did not significantly differ between the two techniques ($p > 0.99$). However, the continuous stitch group experienced a 20-minute longer procedure time ($p < 0.01$). Postoperative outcomes favored separate stitches, evidenced by shorter hospital stays, lower sentinel drain usage, and reduced stenosis rates ($p < 0.01$). Although urinary incontinence rates at 02, 06, and 12 months

showed no statistical difference ($p > 0.05$), patients with continuous stitches had 2.5 times higher diaper usage at twelve months ($p < 0.01$). **Conclusion:** This research suggests that vesico-urethral anastomosis with separate stitches yields superior results in laparotomy-based radical prostatectomies compared to continuous stitches, demonstrating benefits in surgical time, hospital stay, sentinel drain duration, stenosis rates, and long-term urinary incontinence outcomes.

Keywords

Prostate Cancer, Urinary Incontinence, Urethrovesical Anastomosis

1. Introduction

Prostate cancer is the second most common malignant neoplasm in men, following skin cancers, currently accounting for 27% of male neoplasms [1]. It is the sixth leading cause of male mortality worldwide, with an estimated 899,000 cases and 258,000 deaths annually [2]. In Brazil, the estimate by the National Cancer Institute (INCA) (2019) for the 2020-2022 triennium indicated 625,000 new cancer cases, with prostate cancer representing 29.2% of cancers in men, making it the second most frequent tumor in the male population after non-melanoma skin cancer. The estimate predicts 65,840 new cases of prostate cancer each year during the triennium, corresponding to an estimated risk of 62.95 new cases per 100,000 men [3].

It is estimated that by 2030, the number of men affected by prostate cancer worldwide will increase to 1.7 million, with annual deaths reaching 499,000 due to population growth and increased life expectancy [4]. Among living men, approximately 1 in 7 (15.3%) are expected to be diagnosed with prostate cancer, and 1 in 38 (2.6%) is projected to die from this disease [5].

Currently, potential treatments for non-metastatic prostate cancer, according to the European Association of Urology guidelines (2019) [6], include active surveillance, watchful waiting, radiotherapy, hormonal blockade, and radical prostatectomy, involving the total removal of the prostate and seminal vesicles.

A crucial step in radical prostatectomy, regardless of the technique, is vesicourethral anastomosis, which tends to be linked to postoperative urinary continence. The technique for this anastomosis varies based on the surgeon's experience and the chosen access route. For laparotomy, a standard approach involves separate-stitch anastomosis, while minimally invasive routes often utilize continuous suture for this anastomosis.

Furthermore, current literature highlights the patient's age at the time of surgery as a significant factor associated with postoperative continence return. Approximately 95% of men under 65 years old can achieve urinary continence after the procedure [6] [7].

In conclusion, despite the advancement of minimally invasive techniques, the retro pubic laparotomy approach continues to be an important and relevant method for prostate cancer treatment. This study aims to compare vesico-urethral anastomosis techniques (separate vs. continuous stitches) in laparotomy-based radical prostatectomies, evaluating peri and postoperative outcomes.

2. Materials and Methods

This is a study conducted based on data collected from the medical records of 140 patients who underwent radical prostatectomy in oncology, at a single urology service in a hospital center of the Unified Health System (SUS), from 2016 to 2019, by the same surgical team. Out of these patients, 86 were included in the study, while the remaining 54 were excluded due to lack of data in the medical records or lack of informed consent. Additionally, the first 50 patients operated on in 2016 were not included in the analysis, aiming to remove the bias of surgical team learning.

As this is a retrospective study, there was no intervention or change in patient management during data collection, and the research was approved by the Ethics Committee of the Federal University of Minas Gerais, as stated in the Certificate of Presentation for Ethical Appreciation (CAAE): 47092121.8.00005149.

The data collected from the 86 patients included: surgical technique (type of vesico-ureteral anastomosis); postoperative hospital stay; age; associated diseases; preoperative continence; tumor staging and preoperative digital rectal examination; Gleason score from preoperative biopsy; surgical specimen staging; duration of sentinel pelvic drain use; postoperative urinary fistula frequency (defined as drainage greater than 100 mL in 24 hours); incontinence rate (measured by diaper count at 2, 6, and 12 months); number of diapers used in 24 hours; anastomotic stenosis requiring surgical reoperation or use of urethral dilators. The mean age of the 86 patients included in the casuistry was 60 years, and the most prevalent comorbidities were Systemic Arterial Hypertension, Diabetes Mellitus, and Dyslipidemia.

The casuistry was divided into two groups of patients, based on the type of vesico-ureteral anastomosis performed during the surgical procedure. The selection of patients for each group was done directly, without prior selection of each case, based on the team's experience on the day of the procedure, standardizing the technique that the team had the most experience in. All patients underwent retropubic radical prostatectomy, followed by vesico-ureteral anastomosis, using absorbable monofilament thread No. 3.0, with group 1 undergoing interrupted stitch anastomosis and group 2 undergoing continuous stitch anastomosis. The comparison between the two patient groups based on the preoperative data collected and using the Fisher's exact test and Shapiro-Wilk test showed that there was no difference between them, thus, the groups were considered homogeneous ($p > 0.05$) (**Table 1**).

Table 1. Preoperative characteristics of patients.

Characteristic Analyzed	Patients Total (n)	Anastomosis with	Anastomosis with	p-value
		Separate Stitches Group 01 n = 56 (n %)	Continuous Stitches Group 02 n = 30 (n %)	
Age (years)	86	63 ± 7.6	62.8 ± 8.7	0.90
Systemic Arterial Hypertension	52	32 (57.1)	20 (66.7)	0.49
Diabetes Mellitus	9	4 (7.1)	5 (16.7)	0.27
Dyslipidemia	4	3 (5.4)	1 (3.3)	>0.99
Hypothyroidism	3	2 (3.6)	1 (3.3)	>0.99
Smoking	16	11 (19.6)	5 (16.7)	0.78
Alcoholism	16	11 (19.6)	5 (16.7)	0.78
Family History	2	1 (1.8)	1 (3.3)	>0.99
PSA (ng/ml)	86	8.6 ± 8.9	8.2 ± 6.7	0.37
Gleason Score	86	56	30	0.54
3 + 3	54	35 (62.5)	19 (63.3)	>0.05
3 + 4	17	13 (23.2)	4 (13.3)	>0.05
4 + 3	9	5 (8.9)	4 (13.3)	>0.05
4 + 4	5	3 (5.4)	2 (6.7)	>0.05
4 + 5	1	0 (0.0)	1 (3.3)	>0.05
Digital Rectal Exam	86	56	30	0.09
T1C	44	32 (57.1)	12 (40.0)	>0.05
T2A	23	16 (28.6)	7 (23.3)	>0.05
T2B	11	5 (8.9)	6 (20.0)	>0.05
T2C	5	1 (1.8)	4 (13.3)	>0.05
T3A	3	2 (3.6)	1 (3.3)	>0.05
Tumor Staging	86	56	30	0.07
Low Risk	35	21 (37.5)	14 (46.7)	>0.05
Intermediate Risk	36	28 (50.0)	8 (26.7)	>0.05
High Risk	15	7 (12.5)	8 (26.7)	>0.05

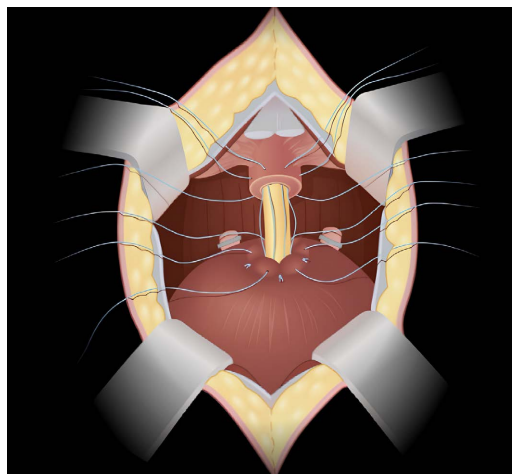
Source: Research Data.

Data analysis was performed using regression techniques, specifically generalized linear models. Fisher's exact test was employed for categorical variables and the t-test for continuous variables when comparing patient groups regarding the technique used for vesico-ureteral anastomosis. Before conducting the t-test, the Shapiro-Wilk normality test was performed for all continuous variables. For the variables 'number of diapers used', gamma generalized linear models were adjusted, with the type of anastomosis construction as the explanatory variable. To compare if there was a difference in urinary incontinence between patient groups undergoing continuous and interrupted stitch anastomosis, a multivariate generalized linear mixed model was adjusted with binary response variables

representing postoperative urinary incontinence after 2, 6 and 12 months, and the explanatory variable being the technique of anastomosis construction used, in addition to Fisher's exact test.

2.1. Technique for Performing Vesicourethral Anastomosis with Separate Stitches

- Creation of six separate stitches at the positions of 12, 2, 5, 6, 7, and 10 o'clock;
- Bladder catheterization intermittently between the stitches and placement of the catheter inside the bladder;
- Creation of stitches in the vesical neck at their corresponding positions;
- After assembling the anastomosis, the stitches are tied sequentially from posterior to anterior, aiming for the proper approximation of the edges (**Figure 1**).

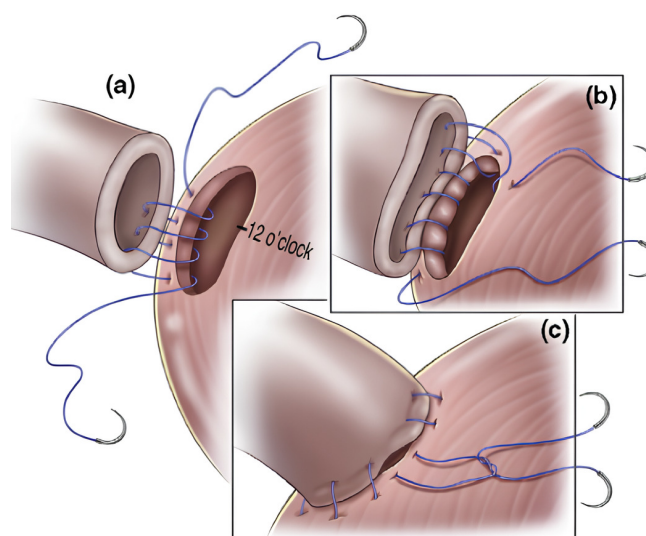


Source: Wein *et al.* (2019) [8].

Figure 1. Vesicourethral anastomosis with separate stitches.

2.2. Technique for Performing Vesicourethral Anastomosis with Continuous Stitches

- Creation of two initial stitches with the passage of the urethrovesical anastomosis assembly;
- Continuation of the anastomosis with simple over-and-over stitches, with one stitch in a clockwise direction and the other thread in a counterclockwise direction until completing the circumference of the structures and achieving proper edge approximation;
- Bladder catheterization intermittently and placement of the catheter inside the bladder;
- After assembling the anastomosis and passing the indwelling bladder catheter, the stitches are pulled to achieve proper edge approximation, and knots are tied between the stitch ends to finalize the anastomosis (**Figure 2**).



Source: Wein *et al.* (2019) [8].

Figure 2. Vesicourethral anastomosis with continuous stitches.

3. Results

The comparative analysis between the two groups of patients regarding the rate of per-operative surgical complications did not reveal significant differences ($p > 0.99$). However, statistically significant differences were observed in variables such as surgery time, length of hospital stay, duration of sentinel drain usage, and vesico-urethral anastomosis stenosis rate among patients undergoing separate stitch anastomosis compared to those with continuous stitches ($p < 0.01$) (Table 2).

Table 2. Intraoperative characteristics and complications of patients.

Analyzed Characteristic	Patients Total n	Anastomosis with Separate Stitches Group 01 n = 56 (n %)	Anastomosis with Continuous Stitches Group 02 n = 30 (n %)	p-value
Surgery Time (minutes)	86	107.07 ± 22.1	126.2 ± 17.5	<0.01
Hospitalization Time (days)				
2 days	8	2 (3.6)	6 (10.0)	<0.01
3 days	50	39 (69.9)	11 (36.7)	<0.01
4 days	19	11 (19.06)	8 (26.6)	<0.01
5 or more days	9	4 (7.2)	5 (16.7)	<0.01
Drainage Time (days)				
None	9	3 (5.4)	6 (20.0)	<0.01
2 days	52	41 (73.2)	11 (36.7)	<0.01
3 days	18	8 (14.3)	10 (33.3)	<0.01
4 or more days	7	4 (7.1)	3 (10.0)	<0.01

Continued

Vesico-urethral Anastomosis Stenosis	5	0 (0.0)	5 (17.2)	<0.01
Surgical Complication	7	5 (8.9)	2 (6.7)	>0.99

Source: Research Data.

The evaluation of the staging of the surgical specimen sent for pathological anatomy, free surgical margins, and urinary incontinence rate at the follow-up times of 2, 6, and 12 months postoperatively did not show significant differences between the groups ($p > 0.05$) (**Table 3**).

Table 3. Postoperative characteristics and pathological anatomy findings of the surgical specimen.

Analyzed Characteristic	Patients Total n	Anastomosis with Separate Stitches Group 01 n = 56 (n %)	Anastomosis with Continuous Stitches Group 02 n = 30 (n %)	p-value
Surgical Specimen Staging	86	56	30	0.65
Positive Surgical Margin	55	36 (64.3)	19 (63.3)	>0.99
Urinary Incontinence (after 2 months)	41	18 (52.8)	13 (48.1)	0.81
Urinary Incontinence (after 6 months)	33	20 (37.7)	13 (48.1)	0.47
Urinary Incontinence (after 12 months)	25	14 (26.4)	11 (40.7)	0.21

Source: Research Data.

Finally, a comparison of diaper usage between groups was conducted using a Generalized Linear Model with Poisson distribution. After two months, the average number of diapers used was 0.28 for one group and 0.23 for the other ($p = 0.23$). At the six-month mark, the difference persisted with 0.42 diapers used in one group compared to 0.23 in the other ($p = 0.23$). However, after 12 months, patients undergoing vesico-urethral anastomosis with separate stitches required a lower number of daily diapers, with a statistically significant difference ($p < 0.01$).

These results indicate that, although no significant differences were observed in some variables between the groups, the technique of separate stitch anastomosis appears to provide significant benefits in terms of surgery time, length of hospital stay, duration of drain usage, and incidence of vesico-urethral anastomosis stenosis compared to continuous stitch technique.

4. Discussion

This is a retrospective study involving data collection from the medical records

of 86 patients operated on by the same surgical team at a reference center for surgical oncology within the SUS network in the state of Minas Gerais. The total number of patients, as well as the number in each group analyzed, was obtained through a convenience sample, which was deemed adequate for this study's analysis. Another important aspect was to identify if the two patient groups were homogeneous, which was verified through a preoperative evaluation that showed no statistical difference between them in various aspects ($p > 0.05$). Based on these findings, we consider the results of this study to be reliable.

In terms of preoperative tumor staging, there was a predominance of patients with low and intermediate tumor risk at the time of treatment. The average PSA was 8.5 ± 8.2 , a Gleason Score of $3 + 3$ was present in 62.8% of patients, and a T1C or T2A digital rectal exam was observed in 77.9% of patients. These findings are consistent with national and international population and epidemiological studies [2] [4].

Regarding the procedure time, it was statistically longer with the continuous suturing technique, averaging 20 minutes longer compared to separate sutures ($p < 0.01$). This finding might be biased considering that the anastomosis time was not analyzed separately, but given the significant sample size, we can infer that the anastomosis may have contributed to the increased surgical time. No studies were found to compare this finding, but one hypothesis is the greater technical difficulty in performing continuous suturing. During the continuous anastomosis, the surgical exposure in the laparotomic approach is reduced, making the passage of sutures more difficult and slower.

The variable related to drain time was analyzed considering the common practice of the surgical team and most oncology services, which is the placement of a sentinel drain after radical prostatectomy by laparotomy. According to the literature, the purpose of the drain is to prevent the accumulation of lymph and possible urine leakage through the vesicourethral anastomosis, and it is usually kept until the output is less than 100 ml in 24 hours [8]. In patients who underwent radical prostatectomy with continuous suturing, 43.3% had the drain for three days or more, while in the separate suturing group, this value was 21.4%, a statistically significant difference ($p < 0.01$). A possible explanation for this finding is the greater technical difficulty in performing continuous suturing in the laparotomic approach, either due to reduced exposure or less experience with this technique, possibly leading to less effective anastomosis edge approximation and increased local secretion drainage. Considering that the sentinel drain was kept until drainage was less than 100 ml in 24 hours, this increased drainage may have justified the need for longer drain maintenance in patients undergoing continuous suturing.

The variable 'hospital stay time' in days varied between groups, with 43.3% of patients in the continuous suturing group having a hospital stay of 4 days or more, compared to 26.8% in the separate suturing group ($p < 0.01$). Studies indicate that hospital stay time for patients undergoing laparotomic radical prostatectomy varies by center, but in experienced oncology centers, the average

hospital stay was 3 - 5 days [8]-[11]. Considering that one of the discharge criteria at the research center in this study was a sentinel drain output of less than 100 ml in 24 hours, the hospital stay time variable may have been influenced by the longer need for drain maintenance in patients undergoing continuous suturing. Thus, both variables showed similar results, with longer drain use and hospital stay for the continuous suturing group.

In this study, the rate of vesicourethral anastomosis stenosis was statistically significant when comparing the two patient groups during the evaluation period. The group with continuous suturing had a 17.2% stenosis rate, while the separate suturing group had no stenosis ($p < 0.01$). This significant difference suggests possible explanations, such as the continuous traction of the sutures in the vesicourethral anastomosis with continuous suturing, which might narrow the urethral canal and promote stenosis over time, or it could again reflect the greater difficulty in exposure during the anastomosis.

Given that the groups were formed randomly based on a convenience sample without prior patient selection and were homogeneous based on preoperative data, we can identify that this study's findings reinforce that separate suturing resulted in more positive outcomes compared to continuous suturing. The longer surgical time suggests greater difficulty in performing continuous sutures, which increases hospital costs without providing better postoperative results. On the contrary, patients with continuous suturing had longer hospital stays, longer drain use, and higher stenosis rates in the postoperative follow-up.

Three generalized Poisson linear models were adjusted, with the response variables being the number of diapers used after 2, 6, and 12 months post-surgery. There was no significant difference in the urinary incontinence rate between the anastomosis techniques at 2, 6, and 12 months when divided into those who used diapers and those who did not. The variable 'type of anastomosis technique' was not statistically significant in explaining the number of diapers used at 2 and 6 months post-surgery. However, for the model of the number of diapers used 12 months after radical prostatectomy, the variable 'type of anastomosis technique' was significant ($p < 0.01$), with patients undergoing continuous suturing using, on average, 2.5 times more diapers than those with separate suturing. Considering that all patients analyzed came from the SUS public health system, from the same hospital service, and had similar socioeconomic levels, we can assume that financial bias did not interfere with this analysis.

Based on these findings, we can conclude that urinary incontinence does not vary between the techniques if defined as the use or non-use of diapers. However, when subdividing the group with urinary incontinence, patients with continuous suturing used significantly more diapers daily at 12 months compared to those with separate suturing. A hypothesis to explain this finding after 12 months might be that the continuous suturing group had a higher stenosis rate requiring surgical reintervention.

Studies on the quality of life in patients with urinary incontinence indicate that the number of daily diapers and the patient's perception of incontinence

negatively impact their quality of life [12]-[17]. Therefore, the fact that the continuous suturing group used 2.5 times more diapers than the separate suturing group suggests a deterioration in quality of life and perception of incontinence in these patients (continuous suturing group).

5. Limitations

This study has some limitations that need to be considered. Firstly, it is a retrospective study based on medical records of 86 patients operated on by a single surgical team, which may introduce selection bias and limit the generalizability of the results. Additionally, the exclusion of 54 patients due to lack of data or informed consent reduces the sample size, which can affect the statistical power of the analyses.

Another significant limitation is that we did not specifically evaluate the anastomosis time, only the total surgery time, which may obscure the direct influence of the anastomosis technique on the observed outcomes. The homogeneity of the groups was confirmed by statistical tests, but the sample was obtained by convenience, which can introduce bias.

Lastly, the absence of a prospective evaluation of patients' quality of life, especially related to urinary incontinence, prevents a comprehensive analysis of the impact of anastomosis techniques on patients' recovery and well-being. Future studies, ideally prospective and randomized, are needed to confirm our findings and explore in greater detail the variations in surgical techniques and their effects on postoperative outcomes.

6. Conclusion

Based on the results of this research, some points have been identified that lead us to believe that vesico-urethral anastomosis with separate stitches tends to yield better results compared to continuous stitches in patients undergoing radical prostatectomy via laparotomy, as evidenced by shorter surgical time, shorter hospital stay, shorter drain usage, lower postoperative stenosis rates, and fewer daily diapers used by urinary incontinence patients after 12 months of surgery. In order to contribute and provide better results for patients undergoing radical prostatectomy via laparotomy, new prospective and randomized studies should be conducted to address biases in this research.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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