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# Salvage Robotic Prostatectomy after Brachytherapy

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## Abstract

**Introduction:** Salvage radical prostatectomy, although still underused, is becoming a feasible treatment for young, healthy patients with biochemical progression after initial treatment with radiotherapy. We introduce the first Spanish serie of salvage prostatectomies after low-dose rate brachytherapy and it constitutes the first comparative serie between open and robotic surgery at a single institution.

**Materials and Methods:** Descriptive and comparative study of fifteen patients who underwent salvage radical prostatectomy between December 2009 and May 2014. 8 patients underwent open surgery and 7 underwent robotics.

We analyzed and compared clinical and oncologic parameters at diagnosis and at relapse (PSA, Gleason, clinical stage, time to progression), peri-operative complications, functional data and oncologic outcomes.

**Results:** Median follow-up: 29.75 months in open prostatectomy and 11.29 in robotic one. The complication rate was higher in the open surgery group (50 vs. 28.5%).

Four patients (26.7%) had postoperative persistent disease, three of them in the robotic group.

In multivariable analysis we found no association between positive surgical margins (PSMs) and persistence of disease.

None PSA recurrence has been detected. There has been no exitus until date.

The percentage of incontinence is higher in the open surgery group (62.5 vs. 42.9%), while sexual function is more affected in the robotic one.

**Conclusions:** We observed a higher percentage of locally advanced disease in robotic surgery patients, associated with an increase in positive surgical margins in this group (p=0.01). PSMs were not related to PSA persistence.

A trend to a greater rate of complications was seen in open surgery.

**Keywords: Salvage radical prostatectomy; Salvage robotic-assisted laparoscopic prostatectomy; Prostate neoplasm; Brachytherapy; Biochemical progression**

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## Abbreviations

EBRT: External Beam Radiotherapy; SRP: Salvage Radical Prostatectomy; HIFU: High Intensity Focused Ultrasound; SORP: Salvage Open Radical Prostatectomy; sRALP: Salvage Robotic-Assisted Laparoscopic Prostatectomy; PSA: Prostate-Specific Antigen; CT: Computerized Tomography; PET/CT: Positron Emission Tomography/Computerized Tomography; BMI: Body Mass Index; PSM: Positive Surgical Margin; PDE5Is: Phosphodiesterase Type 5 Inhibitors

## Introduction

We report the first Spanish series of salvage radical prostatectomy following low-dose rate brachytherapy. This is also the first publication analysing a homogeneous series of patients receiving exclusively low-dose rate brachytherapy as primary radical treatment. Moreover, this is the first study comparing the outcomes of open salvage radical prostatectomy and those of robotic-assisted radical prostatectomy in a single institution.

According to the literature, 27% to 35% of patients with organ-confined prostate cancer undergoing radical prostatectomy, External Beam Radiotherapy (EBRT) or brachytherapy with curative intent, will experience biochemical progression within 10 years of receiving initial treatment.

16% to 35% of these patients will require second-line therapy during the first 5 years [1].

These second-line or salvage therapies have been progressively developed and improved during recent years and nowadays there is a variety of options at our disposal: Salvage Radical Prostatectomy (SRP), salvage radiotherapy, brachytherapy (in patients treated with EBRT), salvage cryotherapy, surveillance and high intensity focused ultrasound (HIFU) [1].

Androgen deprivation therapy is another treatment to be considered. However, it is increasingly indicated for ageing patients or for patients whose high comorbidity does not allow the use of salvage treatments [2,3].

As regards patients undergoing low-dose rate iodine-125 brachytherapy as initial treatment for low risk localized prostate cancer, according to D'Amico risk-classification system 1998 [4], the latest revisions of the literature show disease-free survival rates of 91-92% at 5 yrs and of 81% at 10 yrs [5,6].

Salvage radical prostatectomy, although still underused, is becoming a feasible treatment for young, healthy patients who present with biochemical progression after initial treatment with radiotherapy, and there is ever more evidence in the literature supporting its indication [3,7-10]. One of the latest issues of the European Association of Urology Guidelines (EAU, March 2016) rates salvage radical prostatectomy with a B recommendation grade in selected patients. Likewise, due to the complexity and morbidity associated with this technique, SRP is recommended to be performed in experienced institutions (A recommendation grade) [1].

Open surgery has been traditionally the standard approach, but robotic-assisted laparoscopic prostatectomy is gaining increasing support given the lower perioperative morbidity and the shorter hospital stay. Early oncological outcomes are promising, with disease-free survival rates similar to those obtained by means of open surgery. Yet, it is necessary to carry out further prospective studies with longer follow-up periods than those of the series so far published [7,8,10-13].

The aim of our study is to revise our series of salvage radical prostatectomies following low-dose rate iodine-125 brachytherapy with curative intent in patients with low-risk localized prostate cancer.

We also compare Salvage Open Radical Prostatectomy (SORP) with salvage robotic-assisted laparoscopic prostatectomy (sRALP) in terms of functional and oncological outcomes and surgical complications.

## Materials and Methods

Descriptive and comparative observational study of 15 patients undergoing salvage radical prostatectomy due to local recurrence after early curative treatment with low-dose rate iodine-125 brachytherapy, carried out from December 2009 to May 2014. Disease recurrence was confirmed by means of transrectal ultrasound-guided prostate biopsy due to the presence of biochemical progression.

Biochemical progression is defined according to the criteria established by the American Society for Therapeutic Radiology and Oncology (ASTRO) in the Phoenix Consensus Conference of 2005: a rise of 2ng/mL or more above the PSA nadir in two consecutive measurements obtained at least one month apart [14].

Prior to surgery, distant metastasis was discarded by means of bone scintigraphy and contrast enhanced thoracoabdominal and pelvic CT scan. Recently, a new tool has been incorporated into our diagnostic repertoire, the choline PET/CT. To the end of our study this tool had been used in 6 patients, 4 included in the SORP group, with negative results, and 2 other patients who were excluded from the study due to the presence of metastasis and who consequently could not be eligible for salvage surgery.

Patients were selected following the criteria established by the EAU [1]: patients with low comorbidity, at least 10 yrs of life expectancy, organ-confined disease p ≤T2b, Gleason ≤7 and PSA <10ng/mL at recurrence.

Eight patients underwent retro pubic radical prostatectomy and 7 patients Da Vinci assisted laparoscopic radical prostatectomy. The selection of the robotic arm is based upon the contraindications established by the internal protocol of our service for robotic-assisted surgery: BMI >35 kg/m$^2$, previous intra-abdominal surgery, anesthetic complications that contraindicate laparoscopy. All the interventions have been performed by the two same urologists.

Robotic-assisted surgery does not differ from radical prostatectomy as primary treatment, using the standard six-port transperitoneal technique. However, being oncological control our main aim, no intended nerve-sparing procedures have been performed.

The preoperative preparation of patients for salvage prostatectomy and primary radical prostatectomy does not differ, with the exception of bowel preparation.

All the patients treated with robotic-assisted prostatectomy underwent cystography prior to withdrawal of the urethral catheter 12 ± 3 days after the intervention. Whenever urinary leak was observed, patients underwent a new cystography seven days later. Postoperative follow-up has been carried out according to our protocol: first revision one month after surgery including PSA test, flowmetry, IPSS, urinary incontinence questionnaires (ICIQ) and erectile function questionnaires (IIEF).

All biopsies and surgical specimens were analysed by the same anatomopathologist specialized in uropathology.

The following clinical and oncological parameters have been analysed and compared, both at diagnosis and at recurrence: PSA, Gleason score and tumour stage at diagnosis and at recurrence, time to biochemical progression, presence of bounce phenomenon.

We have analysed surgical complications, using Clavien-Dindo classification [15], length of hospital stay and other perioperative parameters that will be explained in more detail below.

We have also analysed the anatomopathological characteristics and oncological outcomes: disease persistence and recurrence after surgery, Gleason score, surgical specimen staging and time free of biochemical progression in both groups.

PSA persistence is defined as a first postoperative PSA ≥0.1 ng/mL; PSA recurrence as a post-treatment PSA ≥0.2 ng/mL, confirmed by another consecutive PSA >0.2 ng/mL.

The following functional parameters have also been compared: erectile function (erections sufficient for intercourse) and postoperative urinary incontinence (mild, moderate or severe incontinence depending on the daily use of pads).

**Table 1:** Clinical and oncological parameters at diagnosis and at recurrence.

| | Age at surgery: yrs | PSA at diagnosis (ng/m) p=0.021 | Clinical stage at diagnosis | Gleason at diagnosis | PSA (ng/m) at recurrence | Clinical stage at recurrence | Gleason at recurrence (preoperative biopsy) | Time to biochemical progression: months p=0.028 | Bounce phenomenon |
|---|---|---|---|---|---|---|---|---|---|
| SORP n=8 | 62.88 (59-68) | 6.58 (4.70-9.56) | 7 T1c 1 T2a | 6 3+3 2 3+4 | 4.34 (2.88-5.97) | 8 T1c | 4: 3+3 1: 4+4 3: undetermined | 22.88 (16-29) | No |
| sRALP n=7 | 61.14 (55-70) | 8.97 (7.08-9.97) | 4 T1c 3 T2a | 2 3+2 5 3+3 | 4.82 (3.10-7.26) | 7 T1c | 3: 3+3 1: 3+4 1: 4+3 2: undetermined | 31.57 (24-47) | No |

**Table 2:** Perioperative factors.

| | Lymphadenectomy | Hospital stay (days) | ClavienI-II | ClavienIII | Anastomotic leak | Anastomotic stenosis |
|---|---|---|---|---|---|---|
| SORP (n=8) | 2(25%) | 6.6 | 3(37.5%) | 1(12.5%) | 3(37.5%) | 1(12.5%) |
| sRALP(n=7) | 4(57.1%) | 4.6 | 2(28.5%) | 0 | 2(28.5%) | 0 |

**Table 3:** Oncological outcomes.

| | Disease persistence: PSA≥0.1 ng/mL | PSA recurrence:PSA≥0.2 ng/mL | Pathological staging (p=0.04) | Gleason | Lymph nodes | PSM (p<0.01) | Seminal vesical invasion | Extracapsular Extension (p=0.04) |
|---|---|---|---|---|---|---|---|---|
| SORP(n=8) | 1(12.5%) | 0 | 7T2c 1T3a | 5(3+3) 2(3+4) 1(4+5) | N+: 1 N-: 1 Nx: 6 | 1(12.5%) | 0 | 1(12.5%) |
| sRALP(n=7) | 3(42.9%) | 0 | 2T2c 3T3a 2T3b | 1(3+3) 2 (3+4) 3 (4+3) 1(4+4) | N+: 0 N-: 4 Nx: 3 | 6(85.7%) | 2(28.5%) | 5(71.4%) |

PSM: Positive Surgical Margin

**Table 4:** Functional outcomes.

| | Mild UI: 0-1 ppd | Moderate UI: 2-3 ppd | Severe UI: >3ppd | Secondary surgery | ED responding to PDE5Is | ED not responding to PDE5Is | ED responding to PGs |
|---|---|---|---|---|---|---|---|
| SORP(n=8) | 2 (25%) | 1 (12.5%) | 5 (62.5%) | 1AUS(12.5%) 1Argus(12.5%) | 4 (50%) | 2 (25%) | 2 (100%) |
| sRALP(n=7) | 3 (42.9%) | 0 | 3 (42.9%) | 0 | 1 (14.3%) | 4 (57.1%) | 2 (100%) |

UI: Urinary Incontinence, ppd: Pads Per Day; AUS: Artificial Urinary Sphincter; ED: Erectile Dysfunction; PDE5Is: Phosphodiesterase Type 5 Inhibitors; PGs: Prostaglandins.
Percentages may not add up to 100% due to missing data.

SPSS Statistics v22 has been used to perform the statistical analysis of data. A value of $p < 0.05$ was considered as statistically significant.

## Results

A total of 256 brachytherapies have been carried out in our institution from January 2007 to May 2014. 9.8% of the patients (25 patients) present with biochemical progression histologically confirmed. 15 salvage prostatectomies have been performed to the end of the present study.

Median follow-up period in the salvage open radical prostatectomy group (SORP) was 29.75 months (11.5-54) vs. 11.29 months (2-19.5) in the salvage robotic-assisted prostatectomy group (sRALP). The difference is explained by the fact that the robotic-assisted laparoscopic prostatectomy programme was implemented in our institution in October 2012. As a result, the follow-up period in this group is shorter.

### Clinical and oncological parameters at diagnosis and at recurrence

Table 1 shows the clinical and oncological characteristics at diagnosis and at recurrence. These variables are compared in both groups. Median age at surgery was 62.88 yrs (59-68) in the first group and 61.14 yrs (55-70) in the second group.

Most patients presented with T1c stage at diagnosis (73.3%) and at recurrence (100%). Gleason score in the majority of cases was 3+3 (73.3% at diagnosis, 46.67% at recurrence, as observed in the preoperative biopsy). In 5 patients (33.3%) Gleason score could not be obtained at recurrence due to the effects of radiation. Median PSA in both groups at diagnosis was 7.7 ng/mL (4.7-9.97). Median PSA at recurrence was 4.56 ng/ mL (2.88-7.26). The table shows the variables distributed per groups, observing statistically significant differences as regards PSA level at initial diagnosis of the tumour.

Median time to recurrence was 26.93 months (16-47), being longer in the sRALP group, 31.57 months vs. 22.88 months in the SORP group (p= 0.028). PSA bounce phenomenon was not observed in any of the 15 patients.

### Perioperative factors

Table 2 provides the perioperative factors under analysis. 25% of the patients in the SRP group underwent bilateral limited pelvic lymph node dissection vs. 57.1% of the patients in the sRALP group. Nowadays, this technique is performed in all salvage prostatectomies. The average number of ganglia obtained was 7.6 (4-13), being positive in 2.6% (a single ganglion).

Mean hospital stay was slightly shorter in the robotic-assisted surgery group (4.6 vs. 6.6 days), without statistical significance.

The complications observed using Clavien-Dindo classification were more common in the open surgery group, showing a tendency towards significance. Yet, larger series of patients would be necessary to confirm such tendency.

Patients in the SORP group presented with three minor complications: two surgical wound seromas (Clavien I) and one surgical site abscess (Clavien II), which resolved with antibiotics. We also observed a major complication: rectal injury during surgery which required temporary ileostomy diversion (Clavien IIIb).

Patients in the sRALP group presented with two minor complications: one acute epididymitis (Clavien II) and one urinary infection with acute bladder retention (Clavien II). No major complications occurred.

The incidence of ureterovesical anastomosis leak is similar in both groups, 37.5% in the first vs. 33.3% in the second group. In both groups the leak was treated with prolonged catheterization. A single anastomotic stenosis occurred in the open surgery group requiring endoscopic internal urethrotomy.

### Anatomopathological characteristics and oncological outcomes

Table 3 reports the oncological outcomes following salvage surgery. Both Gleason score and disease staging (T) have progressed in comparison to initial biopsy. All the tumours found in the surgical specimen are bilateral and Gleason score 3+3, the most common score both at diagnosis and recurrence, has been reduced to 40%.

In the first group, the percentage of low risk Gleason (3+3) reaches 62.5% vs. 14.3% in the sRALP group, without statistical significance.

A higher percentage of advanced disease (T3a+T3b) is observed in the robotic-assisted surgery group: 71.4% in the sRALP group vs. 12.5% in the SORP group, with a statistically significant p=0.04.

As a result, a higher incidence of extra capsular extension is observed in the robotic-assisted surgery group (71.4% vs. 12.5%, p=0.04) and greater seminal vesical invasion. Consequently, we find a greater incidence of positive surgical margins in this group (85.7% vs. 12.5%, p <0.01).

Four of the total number of patients (26.7%) present with postoperative persistence disease, three of them in the sRALP group, without statistical significance. These patients are treated with adjuvant hormonal therapy, free of progression disease at present. The multivariate analysis does not reveal correlation between PSMs and PSA persistence. To date, no recurrences or exitus have occurred in our series.

### Functional outcomes

In Table 4 we can see the functional outcomes.

No significant differences are observed between the two groups as regards urinary incontinence. 33.3% of the patients present with adequate urinary continence (0-1 pads/day) and 53.3% present with severe incontinence (>3 pads/day). Three of the patients with severe incontinence are in the robotic-assisted surgery group, which has a shorter follow-up period, thus the results are expected to improve. One of the 5 patients in the SORP group required implantation of an artificial urinary sphincter and another patient required placement of Argus sub urethral sling.

In relation to erectile function, we must bear in mind that the incidence of erectile dysfunction prior to surgery was 50% in the SORP group and 57.14% in the sRALP group. We lack data about previous erectile function in two patients of the first group and in one patient of the second group. In two patients of the second group, the follow-up period is too short to obtain significant outcomes.

50% of the patients in the SORP group attain erections sufficient for penetration with the help of phosphodiesterase Type 5 inhibitors (PDE5Is) vs. 14.3% of patients in the sRALP group. However, all patients who do not respond to oral treatment have shown positive response to intra-cavernous injections of prostaglandin.

## Discussion

The first report of a salvage radical prostatectomy (SRP) dates from 1980 and was performed by Carson et cols [16].

Traditionally underused, this technique presents a challenge to the urologist because of its greater complexity in comparison to primary radical prostatectomy and the higher comorbidity associated to it, which in part explains its scarce use [8,11,17]. The series published in the last decade show better outcomes associated with the earlier diagnosis of recurrence, the surgeon's experience [9] and the improvement in radiotherapy techniques [18].

We must mention that to date, all the series published report the outcomes in patients treated with different techniques with curative intent (radiotherapy, brachytherapy, radiotherapy and brachytherapy, cryotherapy, etc). As a result, these patients will belong to different risk groups, according to D'Amico, and will have different prognosis and probability of recurrence. We have not found any series in the literature focusing exclusively on low-risk patients initially treated with low-dose rate brachytherapy, as is the case of our series. Likewise, we have not found any series of a single institution comparing the outcomes obtained by means of open surgery with those of robotic-assisted laparoscopy. Our series is the first Spanish series with these characteristics.

It is difficult to make generalizations as regards the oncological outcomes of the different series due to the variety of definitions given to the terms recurrence and biochemical progression; to the variation in follow-up periods, normally too short; to the limited number of patients included in the series and to the heterogeneity of the series which include different risk groups.

Recently, the review of the literature on salvage radical prostatectomy (SRP), including all the surgical techniques, published by Chade [9] has shown 5-year survival rates free of biochemical progression ranging from 47% to 82% and 10-year rates which range from 28% to 53%. Cancer-specific survival at 10 yrs reaches 70% to 83% and global survival at 10 yrs, 54% to 89%. The first series of 7 patients undergoing radical laparoscopic prostatectomy (RLP) was published in 2003 [19] and more recently, in the series of 15 patients published by Ahallal [20], this technique is presented as a feasible, fairly safe treatment with oncological outcomes similar to those of open surgery. Nevertheless, at present, salvage open prostatectomy remains the gold standard.

In 2008, the first salvage robotic-assisted radical prostatectomy was carried out [21]. In a review of 2013, Wheterell et al. [10] studied the present role of this technique and reach the conclusion that it is a feasible option which reduces perioperative morbidity and yields functional and oncological outcomes similar to those of open surgery. The same conclusions are expounded by Williams et al. [13].

The advantages of robotic-assisted surgery are, first of all the 3D vision [3,7,8,10,22-25] which allows for a better identification of the planes of dissection, especially the posterior plane usually more

adhered in patients receiving previous radiotherapy. This reduces the chances of injuring the rectum.

In our early experience we have also noted the especial difficulty entailed by the dissection of this plane in comparison to primary radical prostatectomy.

Secondly, the pneumoperitoneum reduces intraoperative blood loss, being the estimated median blood loss 75-280 mL in comparison to SORP, with a median blood loss of 690 mL. [10,22- 24].

Moreover, the robotic approach reduces considerably the length of hospital stay, being of 1 to 2.7 days in the series published [3,10], shorter than in our series (mean hospital stay of 4.6 days).

As regards oncological outcomes, some authors claim that they are similar to those of open surgery. However, we must take into account that the follow-up periods in these series are shorter than in open surgery, the same as the number of patients included in the series. As a result, this affirmation should be considered carefully [11,17].

The largest series of patients undergoing robotic-assisted surgery with the longest follow-up period published so far, is the one reported by Yuh et al. [3]. They studied 51 patients with a median follow-up period of 36 months, fairly superior to the others series in the literature (around 16 months). In this series, 3-year survival rate free of recurrence or biochemical progression, with independence of prognostic risk, reached 57%. 25% of low risk patients, according to D'Amico classification, presented with disease recurrence or biochemical progression. Globally, 50% of the patients showed T3 stage tumours and 6% presented with ganglia involvement. The incidence of positive surgical margins (PSMs) was 31%.

In the review by Wheterell et al. [10], global PSMs incidence was 24.7% and the incidence of biochemical progression was 24.7%.

In our series, we observe a high incidence of PSMs in the sRALP group, 85.7%. This can be explained by the high incidence of extra capsular extension in our series (71.4%). And in our opinion it is also associated with the surgeon's learning curve. More positive outcomes are found in the group of patients undergoing open surgery: PSMs incidence of 12.5% in a group of patients with 12.5% of extra capsular extension.

Despite the high percentage of PSMs in the sRALP group, PSA persistence only reaches 42.9%, without recurrences to this date. Therefore, the presence of PSMs does not necessarily indicate PSA persistence. In fact, no statistical correlation has been found in our series, which agrees with the reports of other authors.

For instance, in the Chauhan series of 15 patients, 4 (28.6%) presented with biochemical progression and none of them showed PSMs or ganglia involvement [26]. Kaffenberger, in a multivariate analysis, did not find any correlation between PSMs and biochemical progression either. However, he found correlation between apical margin involvement and biochemical progression [8]. In the multivariate analysis by Yuh et al. [3] no correlation was observed between PSMs and disease recurrence.

The impact of PSMs on survival has not been reported by any study.

A common finding in the published series is the high incidence of locally advanced disease revealed by the pathological analysis of the surgical specimen.

Kaffenberger reports up to 47% of tumours ≥pT3. The same is observed in the series analysed by Yuh, with an incidence of 50%.

In our series, we observe a 40% global rate of locally advanced disease, which agrees with previous publications.

We must point out that when we analyse separately the two groups included in our series, patients undergoing sRALP show 71.43% of p ≥T3 tumours whereas such percentage reaches only 12.5% in the SORP group (p=0.04). Although inclusion criteria are the same in both groups, we could explain the difference by the fact that the lower perioperative morbidity of robotic-assisted surgery makes it a valid option for patients who in the past would not have been operated with this technique.

In our series we observe progression both in Gleason score and in tumour staging when compared with initial biopsy. All the tumours found in the surgical specimen are bilateral and the percentage of Gleason 3+3, the most common at diagnosis and found in 73.3% of the patients, decreases to 40% when we analyse the surgical specimen. This seems to be associated with the well-known under staging of radical prostatectomy specimens, ranging from 25% to 30% [27] as well as with the growth of radio-resistant tumours in some patients [28].

The systematic use of 3D magnetic resonance imaging would allow a more accurate locoregional staging [3].

Due to the difficulty to differentiate between local and distant recurrence, new imaging techniques are being implemented such as choline PET/CT scan. The utility of this method to assess biochemical progression with curative intent is supported by European, American and NCCN guidelines, which indicate its use for this purpose [1, 29,30].

In our institution, the systematic use of choline PET/CT has been implemented recently for patients with histologically confirmed recurrence and negative thoracoabdominal CT scan and bone scintigraphy.

Regarding the most common perioperative complications, in the series of patients undergoing open surgery reported before the year 2000, the rectum injury rate ranges from 0% to 28%. In the series reported after the year 2000, such complication ranges from 2% to 10%, which agrees with the incidence observed in our series (6.6%). Anastomotic stenosis reaches 7-27.5% in the series published before 2000 and 11-41% in subsequent series [9,12,31]. Such incidence is lower in our series (6.6%).

In the series of patients undergoing robotic-assisted surgery so far reported, the incidence of rectum injury ranges from 0% to 9%. 9% to 33% of patients present with anastomotic stenosis and the same percentage of patients show anastomotic leak [9,22-25]. No serious complications (Clavien ≥4) are described, with the exception of the series studied by Yuh, where we find two cases of urological sepsis (Clavien 4) [3,10,12]. Non-urological complications are very scarce [8,26] and all of them are classified as Clavien 2.

In our robotic-assisted surgery group, the incidence of complications is inferior to that reported in the literature, as we mentioned earlier. No serious complications (Clavien ≥4), injury of the rectum or anastomotic stenosis have been detected.

As regards functional outcomes, we must take into account that our series present with a high percentage of erectile dysfunction and/or urinary incontinence before surgery as a side-effect of primary treatment. There are reported from 9% to 50% of patients who were potent before surgery, depending on the series. Following surgery, this percentage drops to 0-20% and up to 80% of the patients will require treatment to maintain erectile function [10].

Variable urinary continence rates are described in the different groups, ranging from 0% to 90% [3,9,10]. No differences are observed between the series of patients undergoing open and robotic-assisted surgery [8], but we find some series of patients undergoing robotic-assisted surgery with a lower incidence of urinary continence, probably due to the shorter follow-up period in this group, as some authors have already proposed [3,8].

Our results agree with the literature, but we must bear in mind that the incidence of urinary continence in our series is slightly low, mainly due to the short follow-up period in some patients.

So, although perioperative morbidity has been reduced in recent years as a result of the most adequate selection of patients at high-volume institutions, functional outcomes are still poor.

To summarize, in this paper we provide our experience in open and robotic salvage prostatectomy, showing results consistent with literature. Just emphasize that we have observed a higher incidence of extra capsular disease in the robotic group related to a greater incidence of positive surgical margins, with no impact on survival or disease recurrence. Moreover, our rate of complications is lower than the literature, being higher at the open surgery group.

We can conclude that oncological outcomes of salvage robotic-assisted prostatectomy are promising and similar to open surgery. The perioperative morbidity is lower, leading to a greater number of patients eligible for salvage surgery. This allows offering our patients a potentially curative treatment.

The main limitation of our study is the small sample size. Another disadvantage is the short follow-up period in patients undergoing robotic-assisted surgery, which reduces the reliability of functional and oncological outcomes.

A further limitation is the loss of data concerning the functional outcomes of some patients.

## Conclusions

We have detected a greater incidence of advanced disease in the group of patients undergoing robotic-assisted surgery, which is associated with an increase in positive surgical margins in this group (p=0.01). PSMs are not related to PSA persistence in our study.

Open surgery shows a higher incidence of complications, but series size should be larger to obtain significant results.

Early outcomes are promising but larger series of patients and more long-term outcomes are required to confirm these results.

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