Pentafecta outcomes after robot-assisted laparoscopic radical prostatectomy: First 100 cases in Latinoamerican Hospital

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Abstract
Objective: Radical prostatectomy (RP) is the standard treatment for cancer control in the long term. The rise of minimally invasive surgery and new technologies have yielded better results and enabled us to pursue more ambitious objectives. The main works still use the trifecta as classic presentation, but this does not cover all aspects of surgery. Pentafecta is a new and more comprehensive methodology to report outcomes after RP, including complications and surgical margin status with the three major outcomes classically reported. The purpose of this study is to report our experience with robot-assisted laparoscopic radical prostatectomy (RALRP) by applying the concept of pentafecta.

Material and Method: Describe the experience in this institution from March 2009 to December 2012 of RALRP by pentafecta.

Results: We performed 101 interventions and obtained the following results: Average age 60.89 ± 7.32 years (40–77), total PSA 8.5 ± 5.57 ng/dl (0.2–29); D’Amico classification: Low 29 (28.71%), Medium 65 (64.36%), High 7 (6.93%); Operative time 253.44 ± 51.51 min (90–540), Complications 12.9% (Clavien I-II 10.89% and Clavien IIIa 1.98%); Positive surgical margins 20.83%; Biochemistry recurrence 12.5% follow-up (6–44 months); and Continence 87.5% per year and Potency 59.52%.

Conclusions: RALRP is a safe and reproducible procedure with excellent results in terms of pentafecta, inclusive during the initial experience at a low volume center for prostate cancer. A longer follow-up study and experience with higher volume of patients are required to obtain better results and data to be compared with excellence centers.

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PALABRAS CLAVE
Prostatectomía radical laparoscópica asistida por robot; Pentafecta; Cáncer de próstata

Resultado de pentafecta en prostatectomía radical robótica: primeros 100 casos en un hospital público latinoamericano

Resumen
Objetivo: La prostatectomía radical (PR) es el tratamiento de elección para el control del cáncer de próstata a largo plazo. El auge de la cirugía mínimamente invasiva y las nuevas tecnologías ha permitido obtener mejores resultados y aspirar a objetivos más ambiciosos. Los principales trabajos aún emplean la trífecta como forma clásica de presentación, pero esta no abarca todos los aspectos relacionados con la cirugía. La pentafecta es una nueva y amplia metodología; en ella se incluyen las complicaciones y el estado de los márgenes quirúrgicos junto con los 3 parámetros reportados clásicamente. El propósito de este estudio es reportar nuestra experiencia en prostatectomía radical laparoscópica asistida por robot (PRLAR) aplicando el concepto de pentafecta.

Material y método: Describir la experiencia de esta institución entre Marzo 2009 - Diciembre 2012 de PRLAR en función de pentafecta.

Resultados: Se realizaron 101 intervenciones, edad promedio: 60,89 ± 7,32 años (40-77), PSA total 8,5 ± 5,57 ng/dl (0,2-29), clasificación Dúrmico: bajo 29 (28,71%), intermedio 65 (64,36%), alto 7 (6,93%), tiempo operatorio 253,44 ± 51,51 min (90-540), complicaciones 12,9% (Clavien I-II 10,89% y Clavien IIIa 1,98%). Márgenes quirúrgicos positivos 20,83%, recurrencia bioquímica 12,5% en seguimiento (6-44 meses), continencia y potencia 87,5% y 59,52% respectivamente al año.

Conclusiones: La PRLAR es un procedimiento seguro, reproducible, con buenos resultados en función de pentafecta, inclusive durante la experiencia inicial en centros con limitada afluencia de pacientes con cáncer de próstata. Se requiere más tiempo de seguimiento y experiencia con mayor número de casos para mejorar los resultados y hacerlos comparables con los centros de excelencia.
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Introduction
Prostate cancer is the leading cause of cancer death among males in Venezuela, so its management represents a public health problem. Despite multiple options, RP remains the treatment of choice for long-term control of this disease. The emergence of minimally invasive surgery and new technologies, such as the Da Vinci® robotic surgical system, has yielded excellent outcomes and enabled us to aspire to more ambitious objectives. In spite of this, the main research centers still use trífecta as the traditional form of presentation, but it does not properly cover all the aspects related to surgery. It is within this context that pentafecta emerged as a new and broad methodology to report those results subsequent to the performance of RP, including complications and the state of surgical margins along with the 3 traditional parameters. The aim of this study was to report our initial experience with RALRP, by applying the concept of pentafecta.

Methodology
Patients who underwent RALRP performed at our institution from March 2009 to December 2012 through a six-port transperitoneal approach in forced Trendelenburg position and conducted by 6 different surgeons with previous experience in conventional laparoscopic radical prostatectomy (LRP). In the first 15 cases, we were advised by an internationally certified supervisor. We used the Da Vinci® robotic surgical system, model S, manufactured by Intuitive Surgical, Sunnyvale, CA and the corresponding set of instruments consisting of 0 and 30° scopes, monopolar curved scissors, Maryland graspers, Prograsp forceps and long needle-holders (×2).

Surgical technique
W-shaped trocars were placed as shown in Fig. 1, with the aim of performing an anterograde dissection of the prostate. Bladder descent was achieved through Retzius’ space; then we cleaned the anterior side of the prostate and proceeded to the opening of the endopelvic fascia, ligation, section and the suspension of the dorsal venous complex to the pubic area with PDS® 0. Then, the vesicoprostatic junction was opened, the posterior side of the prostate was exposed and vas deferens and seminal vesicles were dissected out. Denonvilliers’ fascia was then dissected, the prostatic pedicles were clipped with Hem-o-lok® ligating clips, and the neurovascular bands were released and non-thermally preserved using the intrafascial technique in selected cases. We continued with the cutting of the urethra, the introduction of the piece in the collection bag, the reconstruction of the bladder neck if necessary, the addition of the Rocco stitch using Vicryl® 3.0 in the inferior edge of the bladder and the urethra, ureterovesical anastomosis with Monocryl® 3.0 or self-anchoring barbed suture (v-Loc® 90 Absorbable...
Figure 1  Distribution of the trocars.

Wound Closure Device-Covidien), drainage and finally the extraction of the piece. Extended lymphadenectomy was only performed in high-risk patients (nomograms).

Positive surgical margin

It is defined as the presence of neoplastic glands in direct contact with the ink on the surface of the piece, with no interposed connective tissue. The anatomopathological classification was done according to the 2002 TNM system.

Definition of complications, biochemical failure, continence and potency

The follow-up of patients was performed as an examination at the medical consultation on a quarterly basis in the first year, and then on a semi-annual basis in the following controls. Complications were categorized according to the modified Clavien classification system. Biochemical failure, in turn, was established by PSA level based on the EAU guidelines. Continence was defined as patients who remain dry and who do not “require” any kind of protection (towel, sanitary napkin, diaper, etc.) in their everyday activities. Sexual potency was defined as the ability to get and keep an erection for long enough to have satisfying sexual relations with or without the use of type-5 phosphodiesterase inhibitors (PDE-5) and a Sexual Health Inventory for Men (SHIM) score greater or equal to 21.

Statistical analysis

A prospective, descriptive study was conducted, where continuous parametric variables were expressed as average, standard deviation (SD), range, mean, percentage and interquartile range (IQR). The variables introduced in the study included age, body mass index (BMI), prostate antigen (PSA), clinical stage, Gleason classification, risk groups, surgical time, operative bleeding and conversions, besides the parameters that constitute the pentapecta (PSA, potency, continence, complications and surgical margin). Data were stored in Excel® sheets (Microsoft Inc, Redmond, WA) and analyzed using MedCalc® version 12.6.1.0 (MedCalc Software, Ostend-Belgium).

Results

101 RALRPs were performed at our institution from March 2009 to December 2012. Patients’ characteristics and preoperative parameters are summarized in Table 1. The average surgical time was 253.44 ± 51.51 min (90–540); 4 out of 7 high-risk patients underwent extended lymphadenectomy and none was positive for cancer. In total, there were 13 complications (12.9%); out of these, 11 had a Clavien grade II complication (10.89%) and 2 a Clavien grade IIIa complication (1.98%) due to stenosis of the anastomosis which required endoscopic resolution. No deaths associated with the procedure were reported. 5 conversions to open surgery (4.95%) were necessary. In 3 cases (2.97%) due to uncontrolled bleeding (of the pubis area, upper bladder and the accessory pudendal area) and in 2 (1.98%) due to robotic instrument failure (irreversible blockage of the entire system). Intraoperative bleeding was of 309.8 ± 296.89 cc (25–1500) and a total of 8 patients (7.92%) required transfusion. Hospitalization time was 3.53 ± 0.73 days (1–11) with bladder tube placement for 8.04 ± 3.19 days (7–21). Both neurovascular bands (NVB) were preserved in 45 patients (46.88%) and unilateral preservation was done in 12 (12.5%). Positive surgical margins were observed in 20 pieces (20.83%), most of them located at the level of the apex in 5 cases (25%), multifocal in 10 (50%) and larger than 1 mm in 10 (50%). Biochemical recurrence occurred in 12 patients (12.5%) with a follow-up from 6 to 44 months, as shown in Fig. 2. Self-anchoring barbed suture (v-Loc® 90 Absorbable Wound Closure Device-Covidien) was used in 23% of the anastomoses. After 12 months, 84 patients (87.5%) were continent and continence recovery is detailed in Fig. 3. Of the total number of cases, only 42 (41.58%) had a SHIM score greater or equal to 21 before surgery, with a mean IQR of 23 (22–24). Within this group, 59.52% of the patients were potent 1 year after the procedure with or without the use of PDE-5 inhibitors, using 5 mg of PDE-5 orally once a day as protocol, starting a week before the operation and during the first 6 months after it. The definitive biopsy reported a Gleason score of 7 (3+4) in 64.58% of the patients and the most common pathological stage was pT2c in 66.67% of the cases. The relationship between biochemical relapse and surgical margins and the D’Amico classification is shown in Figs. 4 and 5. Most patients started oral tolerance to liquids within the first 8 postoperative hours. The mean time of drain permanence was 3.4 ± 0.73 days (1–7).
Table 1  Perioperative characteristics (n = 101).

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean age ± SD (years)</td>
<td>60.89 ± 7.32 (40–77)</td>
</tr>
<tr>
<td>(range)</td>
<td></td>
</tr>
<tr>
<td>Mean BMI ± SD (kg/m²)</td>
<td>25.95 ± 2.92 (18.2–35.9)</td>
</tr>
<tr>
<td>(range)</td>
<td></td>
</tr>
<tr>
<td>Preoperative SHIM ≥ 21 points</td>
<td>42 (41.58%)</td>
</tr>
<tr>
<td>Clinical stage</td>
<td></td>
</tr>
<tr>
<td>T1</td>
<td>61 (60%)</td>
</tr>
<tr>
<td>T2</td>
<td>40 (40%)</td>
</tr>
<tr>
<td>T3</td>
<td>0</td>
</tr>
<tr>
<td>Mean PSA (ng/ml) (range)</td>
<td>8.5 (0.2–29)</td>
</tr>
<tr>
<td>D’Amico risk category</td>
<td></td>
</tr>
<tr>
<td>Low</td>
<td>29 (28.71%)</td>
</tr>
<tr>
<td>Intermediate</td>
<td>65 (64.36%)</td>
</tr>
<tr>
<td>High</td>
<td>7 (6.93%)</td>
</tr>
<tr>
<td>Mean operative time ± SD (min) (range)</td>
<td>253.44 ± 51.51 (90–540)</td>
</tr>
<tr>
<td>Number of blood transfusions</td>
<td>8 (7.92%)</td>
</tr>
<tr>
<td>Conversions to open surgery</td>
<td>5 (4.95%)</td>
</tr>
<tr>
<td>Complication rate</td>
<td>13 (12.9%)</td>
</tr>
<tr>
<td>Clavien I=II</td>
<td>11 (10.89%)</td>
</tr>
<tr>
<td>Clavien III</td>
<td>2 (1.98%)</td>
</tr>
<tr>
<td>Clavien IV</td>
<td>0</td>
</tr>
<tr>
<td>Clavien V</td>
<td>0</td>
</tr>
<tr>
<td>Final pathologic stage (%)</td>
<td></td>
</tr>
<tr>
<td>pT2a/b/c</td>
<td>88 (91.67%)</td>
</tr>
<tr>
<td>pT3a</td>
<td>3 (3.13%)</td>
</tr>
<tr>
<td>pT3b</td>
<td>4 (4.16%)</td>
</tr>
<tr>
<td>Vanished carcinoma</td>
<td>1 (1.04%)</td>
</tr>
<tr>
<td>Positive surgical margins (%)</td>
<td>20 (20.83%)</td>
</tr>
<tr>
<td>T2</td>
<td>16 (18.62%)</td>
</tr>
<tr>
<td>T3</td>
<td>4 (57.14%)</td>
</tr>
<tr>
<td>Mean prostate weight ± SD (g) (range)</td>
<td>47.27 ± 27.75 (10–186)</td>
</tr>
<tr>
<td>Number of lymphadenectomies (positive for cancer)</td>
<td>4 (0)</td>
</tr>
<tr>
<td>Mean hospital stay ± SD (d) (range)</td>
<td>3.53 ± 0.73 (1–11)</td>
</tr>
<tr>
<td>Mean permanence of the catheter ± SD (d) (range)</td>
<td>8.04 ± 3.19 (7–21)</td>
</tr>
</tbody>
</table>

SD: standard deviation; BMI: body mass index; PSA: prostate specific antigen.

Discussion

Since the emergence of robotic surgery, few surgical specialties have been more influenced than urology. RALRP is currently a firmly established technique in medical practice at numerous health centers, reaching the point where it has replaced traditional open and laparoscopic techniques as the gold standard treatment for prostate cancer. The most important factors that have encouraged this development include the following: the enthusiasm displayed by surgeons for learning this new technique, the interest of patients and aggressive marketing. Despite the absence of clear evidence of superiority of one technique over the other, it is widely accepted that among the advantages shown by RALRP we can find a decrease in operative bleeding, a lower complication rate according to the Clavien classification system and a quicker return to daily activities. The assessment and comparison of perioperative and follow-up parameters enable us to establish effective working methodologies aimed at improving outcomes. Patel et al. published excellent results in the largest RALRP series performed by a single surgeon. These authors reported a mean surgical time of 105 min (55–300), intraoperative bleeding of 111 cc (50–500), a mean complication rate of 4.3%, a hospital stay of 24 h in most patients and there were no reported deaths. In our study, the mean operative time was 253.44 ± 51.51 min (90–540), bleeding was 309.8 cc (25–1500), complications

Figure 2  Risk of biochemical relapse depending on time.

Figure 3  Recovery of post-RALP urinary continence.
12.9% and the mean hospitalization time was 3.53 days (1–11). When comparing our results with the centers of excellence in robotic surgery, we observed significant differences; however, when contrasting our series with reports from similar centers, or with reports of initial experiences in RALRP, the results were much more comparable, with a surgical time ranging from 186 to 241 min, a bleeding rate from 274 to 400 cc, a complication rate from 6.4 to 15.75% and a mean hospitalization time from 1.8 to 7 days.\textsuperscript{2,14–19}

The state of surgical margins after RP is an important independent factor that allows us to predict local recurrence of the disease, besides being an effective parameter to measure treatment effectiveness. The mean rate of positive surgical margins in most RALRP series is around 11 and 20%, it being statistically lower in the groups with stage T2 and a Gleason score \textless 6.\textsuperscript{17–19} In a multi-institutional series of 8095 patients, the rate of positive surgical margins was 15.7%, and 9.45 and 37.2% for stages pT2 and pT3 respectively.\textsuperscript{20}

Biochemical recurrence was of 4.9, 9.4, 13.4 and 19% at years 1, 3, 5 and 7 respectively in the study conducted by Menon et al.\textsuperscript{19} In our series, we observed a rate of biochemical recurrence of 12.5% with a maximum follow-up time of 44 months; however, different publications support the fact that the surgeon’s experience causes positive margins to be lower as more procedures are performed.\textsuperscript{22}

Initial series establish continence recovery rates between 84 and 97% 12 months after the operation, this time being possibly reduced with certain modifications in the traditional surgical technique. Despite this, results are still influenced mainly by the patients’ perioperative characteristics, the surgeon’s experience, the surgical technique and the methodology used for information collection and presentation.\textsuperscript{17,23–25} In our series, the rate of urinary continence was 87.5%, a result which is within the parameters considered as suitable for this variable.

Age, the state of preoperative sexual potency, the comorbidity index, the preservation of NVBs, the non-thermal dissection of structures and low-energy cauterization of bleeding spots are the most important factors to regain sexual potency.\textsuperscript{14} In the present study, we obtained a potency rate of 59.52%, far below the data described by Coelho et al., whose mean rate of sexual potency at months 3, 6, 12 and over 18 months was 38.4, 61.1, 71.2 and 94%, respectively,\textsuperscript{21} largely due to the fact that the study group had a preoperative SHIM score greater than 21 in only 41.58% of the cases, despite being a relatively young group, possibly motivated by the large number of patients, 77 (76.24%), with associated systemic comorbidities (arterial hypertension, diabetes, etc.) and that preservation of both NVBs was only performed in 50% of these previously potent patients. Despite this, there are other centers that show sexual potency results in early stages similar to ours.\textsuperscript{28}

Conclusions

RALRP is a safe, reproducible procedure with good penta-pecta outcomes, even during the initial experience in centers with a limited influx of patients with prostate cancer. Nonetheless, this technique represents a surgical challenge requiring its learning curve in order to optimize its implementation. Greater follow-up time and acquiring experience with a larger number of cases are definitely required to improve outcomes and to make them compatible with the centers of excellence in robotic surgery.

Conflict of interest

The authors declare that they have no conflict of interest.

References

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