Robotic-assisted laparoscopic prostatectomy: the ideal application for antegrade nerve-sparing prostatectomy

Expert Rev. Anticancer Ther. 11(7), 969–971 (2011)

Andrea Minervini
Author for correspondence:
Department of Urology, University of Florence, Careggi Hospital, Villa Monna Tessa, Viale Pieraccini 18, 50139 Florence, Italy
Tel.: +39 055 417 645
Fax: +39 055 437 7755
andreamine@libero.it

Marco Carini
Department of Urology, University of Florence, Careggi Hospital, Villa Monna Tessa, Viale Pieraccini 18, 50139 Florence, Italy

"The advent of the da Vinci operating system has changed the current urological practice for prostate cancer..."

A total of 217,730 cases of prostate cancer are diagnosed annually in the USA [1]. Most patients are diagnosed with the tumor localized within the prostate gland and are potentially curable by surgery. In these cases radical prostatectomy (RP) is considered the treatment of choice, involving complete prostate gland removal, with high recurrence-free and cancer-specific survival rates [2,3].

For RP, the usual approach was the retrograde technique described by Walsh and Donker in the early 1980s [4]. Reported advantages of this approach were the possibility to achieving optimal exposure of the prostate and periprostatic tissues, including the neurovascular bundles. Possible disadvantages included the dissection of the dorsal vein complex in the initial phase of the operation, and the isolation of the apex and of the membranous urethra when the prostate is still attached to the periprostatic tissues, making it impossible to put sufficient traction on the prostate to adequately to lengthen the spared functional urethra.

Nevertheless, retrograde RP has been the most popular and most used technique in the past 30 years. The antegrade approach was originally described by Campbell in 1959 [5] and was then presented again 20 years later by Mittemeyer and Cox [6]. In contrast to the Walsh retrograde technique, the antegrade approach begins with the incision of the bladder neck. Then the prostatic base and seminal vesicles are isolated and the bundles are approached from the base of the prostate, where they are thicker and further from the prostatic surface to the prostatic apex where they are thinner. The dorsal vein complex and the apex are dissected and the urethra is incised as the last steps of the procedure, with the prostate otherwise completely mobilized. This leads to a lower risk of intraoperative bleeding and to an optimal definition of the anatomical boundaries of the apex, consequently decreasing the possibility of positive surgical margins at this site. Preliminary data have already demonstrated that this technique could provide better visualization and less blood loss than the retrograde approach [6]. Nevertheless, very few centers adopted the antegrade approach, challenging the widely accepted retrograde technique for the supposed difficulty of incising the bladder neck at the right level, and for the 'unconventional' approach to the neurovascular bundles in case of nerve-sparing procedures [7]. We have systematically used the open antegrade retropubic approach since the mid-1980s, with over 1500 procedures performed in this period. Our recent publications confirmed the historical results reported, showing that the antegrade RP provides optimal cancer control and a low incidence of positive surgical margins even in the presence of limited extracapsular tumor spread [8,9]. Moreover, with the

Keywords: antegrade • da Vinci • laparoscopy • outcome • prostate cancer • prostatectomy • robotic

Expert Reviews

increasing interest in quality of life, we evaluated the functional results in terms of recovery of continence and potency, showing, after a minimum follow-up of 12 months, a 94% rate of complete continence and 70% potency rate after bilateral nerve-sparing RP [8]. In recent years, the antegrade approach was revisited by surgeons involved in minimally invasive surgery owing to the advent of laparoscopic RP (LRP). The laparoscopic approach perfectly complemented the antegrade approach for the technical needs of laparoscopy in general to work in an antegrade direction. Several reports demonstrated that LRP was associated with advantages such as reducing intraoperative blood loss and transfusion requirements, and also involves safe and easy catheter removal with a faster return to normal life. Complication rates and functional results were similar to those reported after open RP [10,11]. Nevertheless, the acceptance and diffusion of traditional LRP was limited worldwide primarily owing to the technical difficulties inherent in the procedure and to the consequent steep learning curve.

"…approximately 5000 robotic procedures have been performed in Italy in 2010, with most consisting of robot-assisted laparoscopic radical prostatectomy, with a documented 30–40% yearly increase in the number of robotic procedures in the last few years."

The advent of the da Vinci operating system (Intuitive Surgical, Inc., CA, USA) has changed current urological practice for prostate cancer in many countries owing to 3D imaging during the procedure. 3D imaging creates the possibility of having complete control of the three operating arms plus the camera by one surgeon from the console, and the possibility to filter and translate the surgeon's hand movements into more precise micromovements of the instruments with seven degrees of freedom. Indeed, robot-assisted LRP (RALP) had a rapid and wide diffusion across the world, and as for LRP, the antegrade technique has also become the standard for RALP. Currently, in the USA, more than 75% of RPs are performed using the da Vinci platform [12]. At present in Italy (data reviewed in January 2011), there are 52 Da Vinci Surgical Systems, and of those, six, nine and 15 were installed in 2008, 2009 and from January 2010 to January 2011, respectively. Approximately 5000 robotic procedures have been performed in Italy in 2010, with most consisting of RALPs, with a documented 30–40% yearly increase in the number of robotic procedures in the last few years [Minervini A; Unpublished Data]. The initial speed of this change was attributed to 'marketing interests of the robot company' and this cannot be neglected; however, this cannot be sufficient to justify the success of RALP in displacing open retrograde RP and LRP as the standard surgical approaches for clinically localized prostate cancer, both for surgeons who have the facilities of the robotic unit in their centers, and for most patients.

However, every proposed minimally invasive therapy should be compared and confirmed to be at least equal in their oncological and functional efficacy and safety to that of open retrograde RP, and only after this step can it be considered a viable alternative and eventually become the standard method. Unfortunately, there is a lack of standardized assessment and outcome reporting in RALP, and this also applies and was probably more evident when analysing older open retrograde RP studies that did not use validated questionnaires for continence and erectile dysfunction. Therefore, in reports of prostate cancer, when evaluating surgical, functional and oncological results of open retrograde RP and RALP, there is the real risk of not comparing 'apples with apples'. There is a clear need for randomized controlled trials to be organized that confirm the superiority of one approach over another; however, at present, it seems extremely difficult to perform such a study owing to the difficulties of most skilled robotic surgeons to randomized patients with clinically localized prostate cancer in the open prostatectomy arm of the treatment, as well as the reluctance of most patients that decided to go for a robotic procedure to be operated by an open approach.

Available studies demonstrated that in experienced hands, patients undergoing RALP fare very well, with a shorter hospital stay, less blood loss, and faster recovery of potency and continence [13,14].

The oncological outcomes of RALP are still presented using surrogate end points such as the positive surgical margin (PSM) rate. Using these oncological end points, RALP has been shown to be equivalent to open retropubic prostatectomy with a trend toward lower PSM rates in the RALP group [15,16]. Smith *et al.* evaluated the incidence and location of PSM between 200 open retrograde RPs and 200 RALPs, and concluded that the use of the robot reduces PSM rates as compared with open RP, especially in low- and intermediate-risk patients, and in those treated with the nerve-sparing technique [17].

"The present impressive increase in robotic surgical volume … initially attributed to 'marketing interests of the robot company' is truly and mainly owing to the use of an effective approach, the antegrade prostatectomy, coupled with the technical advantages of robotic surgery…"

Significant data supporting the oncological effectiveness of RALP have also been obtained by two recent studies with a long follow-up that considered the more reliable biochemical disease-free survival (bDFS) rate as the oncological end point [18,19]. Indeed, Menon *et al.* evaluated a series of 1384 consecutive patients who had RALP, and with a median follow-up of 5 years. The authors reported 189 biochemical recurrences, with a reported actuarial bDFS rate at 3, 5 and 7 years of 90.6, 86.6 and 81.0%, respectively. In a multivariate analysis, the strongest predictors of bDFS were pathological Gleason grade 8–10 (hazard ratio: 5.37; $p < 0.0001$) and pathological stage T3b/T4 (hazard ratio: 2.71; $p < 0.0001$) [18].

Similar results were also reported by Mottrie *et al.* in a recent review, where they provided data from a subgroup of 184 patients with a minimum follow-up of 60 months [19]. Specifically, the 3-, 5- and 7-year bDFS rates were 91, 84 and 81%, respectively. Such long-term oncological data can be considered as confirmation of the oncological safety predicted by previous reports that evaluated the PSM rate.

In conclusion, the present impressive increase in robotic surgical volume in many countries, initially attributed to 'marketing interests of the robot company' is truly and mainly owing to the use of an effective approach, the antegrade prostatectomy, coupled with the technical advantages of robotic surgery, and to the consequent documented optimal surgical, oncological and functional results obtained. The era of robotic surgery for the treatment of prostate cancer has come and is here to stay, and a decrease in the price of robotic surgery, making this device more affordable and more accessible, would surely contribute to widen the indications for RALP and to convincing those sceptical of RALP, improve the worldwide diffusion of robotic surgery.

Financial & competing interests disclosure

The authors have no relevant affiliations or financial involvement with any organization or entity with a financial interest in or financial conflict with the subject matter or materials discussed in the manuscript. This includes employment, consultancies, honoraria, stock ownership or options, expert testimony, grants or patents received or pending, or royalties.

No writing assistance was utilized in the production of this manuscript.

References

1 Jemal A, Siegel R, Xu J *et al.* Cancer statistics, 2010. *CA Cancer J. Clin.* 60, 277–300 (2010).

2 Hull GW, Rabbani F, Abbas F *et al.* Cancer control with radical prostatectomy alone in 1,000 consecutive patients. *J. Urol.* 167, 528–534 (2002).

3 Han M, Partin AW, Zahurak M, Piantadosi S, Epstein JI, Walsh PC. Biochemical (prostate specific antigen) recurrence probability following radical prostatectomy for clinically localized prostate cancer. *J. Urol.* 169, 517–523 (2003).

4 Walsh PC, Donker PJ. Impotence following radical prostatectomy: insight into etiology and prevention. *J. Urol.* 128, 492–497 (1982).

5 Campbell EW. Total prostatectomy with preliminary ligation of the vascular pedicles. *J. Urol.* 81, 464–467 (1959).

6 Mittemeyer BT, Cox HD. Modified radical retropubic prostatectomy. *Urology* 12, 313 (1978).

7 Costantini A, Selli C, Carini M *et al.* Nerve sparing retropubic prostatectomy: technical modifications. *J. Urol.* 143(4), (1990).

8 Carini M, Masieri L, Minervini A, Lapini A, Serni S. Oncological and functional results of antegrade radical retropubic prostatectomy for the treatment of clinically localised prostate cancer. *Eur. Urol.* 53(3), 554–561 (2008).

9 Serni S, Masieri L, Minervini A, Lapini A, Nesi G, Carini M. Cancer progression after anterograde radical prostatectomy for pathologic Gleason score 8 to 10 and influence of concomitant variables. *Urology* 67(2), 373–378 (2006).

10 Guillonneau B, Rozet F, Cathelineau X *et al.* Perioperative complications of laparoscopic radical prostatectomy: the Montsouris 3-year experience. *J. Urol.* 167, 51–56 (2002).

11 Curto F, Benijts J, Pansadoro A, Barmosche S, Hoepffner JL, Mugnier C. Nerve sparing laparoscopic radical prostatectomy: our technique. *Eur. Urol.* 49, 344–352 (2006).

12 Mottrie A, Ficarra V. Can robot-assisted radical prostatectomy still be considered a new technology pushed by marketers? The IDEAL evaluation. *Eur. Urol.* 58, 525–527 (2010).

13 Patel VR, Palmer KJ, Coughlin G, Samavedi S. Robot-assisted laparoscopic radical prostatectomy, perioperative outcomes of 1500 cases. *J. Endourol.* 22, 2299–2305 (2008).

14 Badani KK, Kaul S, Menon M. Evolution of robotic radical prostatectomy: assessment after 2766 procedures. *Cancer* 110, 1951–1958 (2007).

15 Ficarra V, Novara G, Artibani W *et al.* Retropubic, laparoscopic, and robot-assisted radical prostatectomy: a systematic review and cumulative analysis ofcomparative studies. *Eur. Urol.* 55, 1037–1063 (2009).

16 White MA, De Haan AP, Stephens DD, Maatman TK, Maatman TJ. Comparative analysis of surgical margins between radical retropubic prostatectomy and RALP: are patients sacrificed during initiation of robotics program? *Urology* 73, 567–571 (2009).

17 Smith JA Jr, Chan RC, chang SS *et al.* A comparison of the incidence and location of positive surgical margins in robotic ssisted laparoscopic radical prostatectomy and open retropubic radical prostatectomy. *J. Urol.* 178(6), 2385–2389 (2007).

18 Menon M, Bhandari M, Gupta N *et al.* Biochemical recurrence following robot-assisted radical prostatectomy: analysis of 1384 patients with a median 5-year follow-up. *Eur. Urol.* 58(6), 838–846 (2010).

19 Mottrie A, De Naeyer G, Novara G, Ficarra V. Robotic radical prostatectomy: a critical analysis of the impact on cancer control. *Curr. Opin. Urol.* 21(3), 179–184 (2011).