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The Introduction of Robot-Assisted Surgery in Urologic Practice: Why Is It So Difficult?

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1. Introduction

During past decades, the treatment of prostate cancer (PCa) has been the subject of intense debate. As with all diseases, there is a continuous search for less invasive but equally or more effective treatments. Brachytherapy, cryotherapy, high-intensity focused ultrasound, Cyberknife, and radiation therapy with an external linear accelerator were proposed as alternatives to surgical treatment. Contemporary radical prostatectomy (RP) moved from "anatomic" open surgery to a "magnified" laparoscopic approach to "millimetric" robot-assisted laparoscopic RP (RALP). Finally, in the era of the opportunistic prostate-specific antigen screening, the relevant risk of overdiagnosis and overtreatment increased attention to watchful waiting. Despite the various available options to treat clinically localised PCa, little high-level evidence supports the decision-making process [1].

In this scenario, the introduction of a new treatment could be complex and difficult. Frequently, the introduction of an innovative surgical technique is characterised by a nonvirtuosic process, starting with a promising report and finishing with a standard procedure [2].

Although RALP presents some limitations, highlighted by Murphy et al in this issue of *European Urology* [3], the available data in the literature demonstrate that the evolution of the RALP was more virtuosic and, above all, seems to be particularly interesting for the future.

In recent years, those supporting the novel technique have defended its advantages but often faced the problem of increased costs, time, and learning curves. Others defended the "old fashioned" but standardised technique based on results from many years of experience. The risk is that in such a debate, economic and protective issues play an important role: Those in favour of the novel technique try to increase its importance—and their patients—and the establishment desperately defends its territory and has different reasons for not incorporating the novel technique. At the same time, criticism generally comes from colleagues who have no experience at all with the new treatment option, having never used it or even seen a procedure. A novel technique can also be economically pushed by the selling company doing aggressive publicity and using the Internet to promote its tool to the public.

The introduction of robot-assisted surgery in urologic practice, and specifically in the treatment of PCa, has sparked debate and controversy. Besides the typical perioperative advantages for patients who undergo laparoscopic surgery, there are long-term oncologic outcomes that are not yet available. The oncologic safety of the laparoscopic technique was based on surrogate end points such as positive surgical margin (PSM) rates that can be very pathologist dependent.

Objective evaluation of functional outcomes (early continence and erectile function) is also hindered by the lack of standardisation of outcome reporting after RALP, laparoscopic RP, or open RP. Honest reporting of the results is an important issue because these data become available to everyone via the Internet and could cause bad publicity. Surgeons often support their technique not with their own but with the best available results in the literature. Unfortunately, many centres do not measure or track their own results. To make discussion even more difficult, surgery—and urologic procedures—have outcomes for which one of the most important variables is the surgeon. Success in surgery is very dependent on the competence and experience of the surgeon, whether the surgery is open, laparoscopic, or robot assisted. The same surgeon is typically more skilled in one technique than another.

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2. The introduction of robotics for the operative treatment of prostate cancer

Laparoscopic urology started in the early 1990s with the first nephrectomy that was successfully performed laparoscopically by Ralph Clayman and coworkers. This success generated enthusiasm in the urologic world, which was already familiar with endourology through transurethral surgery. Several centres soon realised that laparoscopy was not an easy technique due to the loss of freedom of motion; the counterintuitive, unnatural movements of the instruments intra-abdominally; and the lack of depth perception on the screens. Even as laparoscopic RP became widespread, especially outside the United States, it continued to be criticised for having only short-term, minor benefits for patients and results that were questionable and unconvincing. At minimum, the learning curve has proven to be exceptionally long [4].

At that time, we all dreamed of being able to perform laparoscopy with magnified, high-definition, three-dimensional vision and instruments that were movable at their tips, offering us up to 7 degrees of freedom (compared to 4 degrees of freedom for laparoscopy and 6 degrees of freedom for traditional surgery) that copy the movements of the surgeon in miniature. These advantages are now available through a new tool (wrongly called "robot"): the da Vinci Surgical System (Intuitive Surgical, Sunnyvale, CA, USA). Even without hard data available yet, it is logical that these inherent advantages allow us to do things laparoscopically that are more precise and secure than ever before. It is amazing how much opposition there still is to this novel and promising technique.

3. Results and downsides of robot-assisted laparoscopic prostatectomy

Murphy et al have nicely summarised the downsides of RALP [3]. Let us discuss some of the issues mentioned by the authors.

The goals of treating PCa are Cancer Control, Continence, and Coitus (the *trifecta*) as well as acceptable Comorbidity. Robotic, laparoscopic and open RP have the same goal and outcome measure: complete removal of all prostatic tissue with minimal morbidity or deterioration of quality of life. Because surgical cure rates for localised PCa have improved considerably, the functional sequelae of treatment (urinary continence and potency) have moved to the forefront in urologic oncology.

To date, reasonable evidence in the literature from nonrandomised case reviews and comparative studies shows that RALP is a well-tolerated, safe, and efficacious intervention for the management of localised PCa. But even though the first robotic prostatectomy was performed in May 2000, long-term results are still lacking. With regard to oncology, Ficarra et al have shown a statistically significant advantage for RALP when comparing PSMs with open and laparoscopic prostatectomy [5]. Different high-volume, experienced centres have shown promising results related to early continence and recovery of erectile function [6,7]. Oncologic and functional results must always be correlated because PSM rates will rise as one dissects closer to the prostate; this statement holds for RALP as well as for open and laparoscopic prostatectomy [8]. Perhaps because of the better vision, precise dissection can be done with more ease using RALP.

Another difficulty of handling results is the effect of a learning curve. Each new technique needs to be taught, and this cannot be considered a downside unless the learning curve is very long. *Learning curve* is also very difficult to define because it never really ends. There is always progression as experience increases. Attempts have been made to measure the length of a learning curve [9] according to results on PSM rates, functional outcomes, operative times, and complications. Unfortunately, the critical point is that we have not shared quality indicators to define initial and advanced learning curves for RP.

It is clear that the results of a new robotic programme will not be as good as those from an experienced centre, but how long this difference lasts depends on multiple factors. The ability of the surgeon to adapt to robotic surgery is probably the most important variable. Another important issue related to the learning curve is the need to standardise

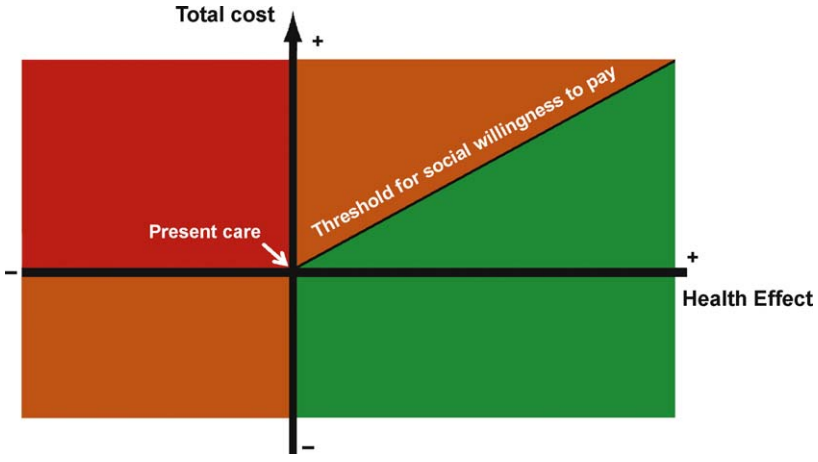

Fig. 1 – Cost effectiveness of novel treatment.

effectiveness tutoring programs to shorten the learning curve period for the second generation of robotic surgeons and to optimise the costs for dissemination of the robotic technology.

Costs appear to be the most relevant obstacle to the further dissemination of robotic surgery in urology. The introduction of a novel treatment must include a cost–benefit analysis (Fig. 1) [10]. When a treatment is more expensive and worse in health effect (red area on the left upper quadrant of Fig. 1), it is clear that the treatment will not be retained. Alternatively, if the new treatment is beneficial for the health effect and is cheaper, it is more easily accepted. When the novel therapy is more expensive but better, then acceptance depends on the willingness of the health system to incur the extra cost for the benefit (steepness of the diagonal line in the right upper quadrant of Fig. 1). As for robotics, it will be up to society to determine whether the extra costs are worth the benefits offered.

Compared to traditional open surgery and even traditional laparoscopy, robot-assisted surgery is significantly more expensive. But is this the right comparison? Modern medical practice has become significantly more expensive in other specialties as well. In oncology, modern chemotherapy has become exponentially more expensive, and in radiotherapy, a linear accelerator with incorporated intensity-modulated radiation therapy or Cyberknife are significantly more costly than the old-fashioned cobalt therapy. Why can't we give our patients modern surgery as well? It is important for the urologic community to speak with one voice to our governments about the patient benefits of RALP in order to get proper reimbursement.

One major drawback is the monopoly of Intuitive Surgical in robotic surgery. Intuitive Surgical put tremendous effort into making robotic surgery available and has only made a profit since 2004. The lack of a competitor is economically a bad thing and has contributed to costs remaining prohibitively high. I fully agree with Murphy et al that use of robotic instruments, or at least some of them, should not be limited to a specific number of sessions (usually 10).

The cost of a robotic programme (installation, entertainment, disposable material) prevents equitable availability of this technology across diverse health care systems. This is not an issue for the selling company but rather for our professional association and health care systems. Must all expensive treatments be available in all centres or can networking provide possible solution?

One must not forget that more and more indications are successfully treated with robotics, not only in urology but also in other disciplines.

4. Conclusions

Robotic surgery is an evolution of traditional laparoscopy with a special tool offering the surgeon more mobile instruments and better vision. With increased experience, more and more indications will be performed robotically, with significant benefit for our patients. The present principal drawback remains the cost. Because of the advantages, robotics are here and are here to stay.

Conflicts of interest: The author has a proctoring agreement with Intuitive Surgical.

References

[1] Heidenreich A, Aus G, Bolla M, et al. EAU guidelines on prostate cancer. Eur Urol 2008;53:68–80.
[2] McKinlay JB. From "promising report" to "standard procedure": seven stages in the career of a medical innovation. Health and Society 1981;59:374–411.
[3] Murphy DG, Bjartell A, Ficarra V, et al. Downsides of robot-assisted laparoscopic radical prostatectomy: limitations and complications. Eur Urol 2010;57:735–46.
[4] Vickers AJ, Savage CJ, Hruza M, et al. The surgical learning curve for laparoscopic radical prostatectomy: a retrospective cohort study. Lancet Oncol 2009;10:475–80.
[5] Ficarra V, Novara G, Artibani W, et al. Retropubic, laparoscopic, and robot-assisted radical prostatectomy: a systematic review and cumulative analysis of comparative studies. Eur Urol 2009;55:1037–63.
[6] Ficarra V, Cavalleri S, Novara G, Aragona M, Artibani W. Evidence from robot-assisted laparoscopic radical prostatectomy: a systematic review. Eur Urol 2007;51:45–56.
[7] Mottrie A, Van Migem P, De Naeyer G, Schatteman P, Carpentier P, Fonteyne E. Robot-assisted laparoscopic radical prostatectomy: oncologic and functional results of 184 cases. Eur Urol 2007;52:746–51.
[8] Zorn KC, Gofrit ON, Orvieto MA, Mikhail AA, Zagaja GP, Shalhav AL. Robotic-assisted laparoscopic prostatectomy: functional and pathologic outcomes with interfascial nerve preservation. Eur Urol 2007;51:755–63.
[9] Vickers AJ, Bianco FJ, Serio AM, et al. The surgical learning curve for prostate cancer control after radical prostatectomy. J Natl Cancer Inst 2007;99:1171–7.
[10] Mauskopf JA, Sullivan SD, Annemans L, et al. Principles of good practice for budget impact analysis: report of the ISPOR Task Force on good research practices—budget impact analysis. Value Health 2007;10:336–47.