Laparoscopy & robotics: a historical parallel

Laparoscopia & robótica: um paralelo histórico

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ABSTRACT

The evolution of robotic platforms has brought up ethical, economic, educational, and clinical applicability issues that refer to the early 1990s, when laparoscopy began its dissemination as a technology that would revolutionize surgery. Introduced in Brazil since 1990, laparoscopy has received a lot of resistance from different sectors, including the medical academy itself. The technique was considered expensive, complex, poorly available and with limited clinical applications. However, in a short time, it was established as the gold standard for the treatment of most diseases in different organ systems and surgical specialties. At this time, similarly to laparoscopy, robotic surgery is expressed as a disruptive technology, determining an important breakdown of paradigms, and moving the wheel of history forward. The author draws a parallel in relation to the use of both technologies in the surgeon's armamentarium. The fear of the "new technology”, seen when laparoscopy appeared, is repeated with the advent of robotic surgery. Laparoscopy and robotic surgery, at the same time, imposed new knowledge challenges for surgeons, anesthetists, nurses, engineers - the need to learn again, to develop new skills. The previous experience of implementing laparoscopy should always be remembered and considered, optimizing the current scenario of the robotic platform, in its introduction and dissemination with the surgical community. The advent of the “robotic era” and its evolutionary potential will continue to assist surgeons in their mission to serve their patients with quality and safety.

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currently acts as a disruptive technology, determining an important breakdown of paradigms and moving the wheel of history forward\textsuperscript{3,5}. When analyzing the particularities of the introduction of both technologies in the surgeon's armamentarium, we note many similarities. Robotic surgery and laparoscopy act as an interface between surgeon and patient, and complement each other, since it is in the laparoscopy realm (closed cavity, video camera, indirect image, artificial lighting, and pneumoperitoneum) that robotic surgery thrives\textsuperscript{3,5}. The equipment involved in laparoscopy, as well as robotic surgery (in much greater quantity and variety), makes the environment inside the operating room more complex and threatening due to the filling of the physical space and the diversity of hardware to be controlled\textsuperscript{1}. In this context, a larger and very well-trained surgical team is highly necessary. Communication between members of the surgical team becomes more complicated and relevant, significantly influencing the procedure's success. It is evident that robotic surgery is more demanding in this regard. Both technologies (robotics much more so!) imposed new knowledge challenges for surgeons, anesthesiologists, nurses, and engineers – the need to learn again, to develop new skills\textsuperscript{4,5}.

The advent of laparoscopy and robotic surgery increased the direct costs related to surgical procedures\textsuperscript{3,5}. In a few years, laparoscopy was able to prove cost-effectiveness based on the significant decrease in the value of equipment and instruments associated with the decrease in hospital stay and the patients’ swift return to professional activities\textsuperscript{3}. It is likely that robotic surgery will follow this same path, even if the cost is much higher than that of laparoscopy.

New technologies establish the need for new teaching methodologies\textsuperscript{4}. In laparoscopy, the main model was real simulation in simple simulators (“black boxes”) and experimental surgery in a live animal model. In robotics, virtual reality simulation seems to be the most accessible and sustainable model\textsuperscript{6,7}. Thus, the use of experimental surgery in live animals tends to decrease in robotics. In this sense, the use of parts of human corpses appears as an interesting option, although still expensive\textsuperscript{6}.

Surgical tutoring, initially little used in laparoscopy, is now established as an important method for the development of advanced procedures, such as bariatric and colorectal video-surgery\textsuperscript{6}. In robotic surgery, tutoring is a fundamental condition for training and certification\textsuperscript{6}. The deficiency in the number and quality of courses hindered the evolution of laparoscopy and is repeated in robotic surgery, causing inadequate training, with excessive influence from the industry\textsuperscript{6,7}.

Certification has also been the subject of intense debate since the introduction of laparoscopy in Brazil. Only in the mid-2000s, when the Brazilian Medical Association (AMB) considered laparoscopy as a domain area of general and digestive surgery, and defined criteria for the granting and registration of degrees, that certification became a reality\textsuperscript{4}. The certification in robotic surgery has been directed by the industry\textsuperscript{6}. Thus, action by the Brazilian College of Surgeons (CBC) in partnership with other specialty societies proposes national regulations for the process of training and certification in robotic surgery in the country\textsuperscript{6}.

The similarities that we observed in the process of introduction and development of both technologies did not show great differences. Laparoscopy was an evolution of the old laparoscopy, described at the beginning of the 20\textsuperscript{th} century, through the incorporation over time of technological advances, such as fiber optics, electrosurgery, CO\textsubscript{2} insufflators, video cameras, etc\textsuperscript{4}. In fact, when comparing equipment and instruments, laparoscopy seems an outdated technology in relation to robotic surgery. The robotic platform has extraordinary potential for incorporating other technologies, especially in information\textsuperscript{5}. In addition, robotic surgery approaches open surgery in terms of movements and vision, with greater freedom of action of the articulated forceps and the possibility of third-dimensional imaging, even though the Da Vinci platform does not provide haptic feedback\textsuperscript{5}.

Recent improvements in telemedicine, with the use of high-speed wi-fi connections, provide for an increasing use of distance training and tutoring of surgeons and, soon, telesurgery assisted by robotic tools\textsuperscript{5}. Between analogies and parallels, we can conclude that the fear of “new technology”, seen during the appearance of laparoscopy, is repeated with the advent of robotic surgery, expressed by overly conservative surgeons and by uninformed patients. Questions from 30 years ago are repeated without embarrassment. The
previous experience of implementing laparoscopy should be remembered and considered, optimizing the current scenario of the robotic platform in the introduction and dissemination to the surgical community and the provision of benefits to patients. The advent of the “robotic era” and the evolutionary potential will continue to assist surgeons in their mission to serve their patients with quality and safety.

**REFERENCES**


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