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Research Article

Complications of Robotic Surgery in Oncological Gynecology: The Experience of the Brazilian National Institute of Cancer

The objective of this study is to assess the complications and outcomes of gynecological cancer cases treated with robotic surgery at the Brazilian National Institute of Cancer (INCA). The safety of the procedures was evaluated by detecting early and late complications of the procedures, thus determining morbidity and mortality.

Introduction

The number of surgeries performed with robotic equipment has increased ever since its release by the Food and Drug Administration (FDA) in 2005 [1].

Robotic surgery is well accepted and seems to be as effective as laparoscopy in the treatment of endometrial and cervix cancers [2,3]. Some of the advantages of using this method over the traditional laparoscopic technique include 3D visualization, tremor filtration, greater dexterity, better ergonomics, lower blood loss and lower post-operative pain index [4].

In spite of some known limitations, such as the limited view of the 4 surgical quadrants when using Da Vinci® series S and Si, robotic surgery is now widely used in the United States [5]. Furthermore, this limitation has been correct by the newest Da Vinci® series XI, increasing the effectiveness of the method. With this updates in technology, the American Society of Gynecologic Oncology (SGO) now recognizes robotic surgery as a changer in gynecologic cancer treatment paradigms [6].

To the present moment, 3200 robotic platform exist in the world (2223 in the USA, 549 in Europe and 494 in the rest of the world). Also, in the United States 95% of the gynecologic oncologists have these platforms in their institutions and have been trained to use them [7].

Methodology

A descriptive cross-sectional, quantitative and retrospective study, with quantitative and non-experimental research design, was conducted from April 2012 to October 2015 at the Oncology Gynecology Service of the Brazilian National Institute of Cancer (INCA)

Patients ineligible for surgical treatment or presenting non-precocious clinical stage (ASA III and IV evaluation) were excluded from the study. After applying the exclusion criteria, 135 women diagnosed with early stage gynecological cancer (uterine cervix, endometrium, and ovary) submitted to assisted robotic surgery performed through the Da Vinci Si® platform (Sunnyvale, CA Intuitive Surgical) were selected.

Variables such as age, time of surgery, mooring time, length of hospital stay, blood loss in the operative period, number of blood transfusions, the rate of surgery for open surgery and number of dissected lymph nodes were observed through the analysis of medical records.

Results

Of the 135 surgeries studied, there was one case of conversion to laparotomy due to an endometrial stage IV cancer and in five cases of cervical cancer, radical hysterectomies were not performed due to the presence of pelvic lymph nodes positive for malignancy.

11 (8.14%) patients with stages IIIa and IIIb by the Clavien-Dindo Classification required a new surgical intervention. A bladder perforation resulting from the use of a uterine manipulator was treated by robotic surgery but no patient had multiple organ failure or death.

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22 procedures had peri-operative complications, 15 were urologic and occurred at the time of bladder detachment, and at the dissection of the ureter and the ureter tunnel during radical hysterectomy. When performing the dissection with bipolar Maryland forceps without triggering the monopolar energy of the scissors in 35W, lesions not noticed in the peri-operative period ceased and no more fistulas occurred.

Furthermore, the use of a 10-fold increase in 3D vision allowed the performance of nerve sparing surgeries (without impairing the bladder branch of the lower hypogastric plexus) and, therefore, avoided complications such as neurogenic bladder and other bladder dysfunctions.

The mean blood loss, length of hospital stay and surgical time were 31.17mL; 1.46 days and 229.66 minutes respectively.

Regarding the types of cancer, most of the surgeries were due to cervical cancer (n=69; 51.11%) followed by endometrial cancer (n=61, 45.18%) and ovarian cancer (n=5, 3.7%). The mean age was 48 years and the BMI 28.84.

The results of the 135 studied cases are shown in table 1. A comparison between this data and other similar studies is displayed in table 2.

Table 1: Intra and Postoperative Complications.

Occurrence		nº (%)
Intraoperative Complications		1 (0,74)
	Accidental bladder perforation by the uterine manipulator	1
Early postoperative complications		5 (3,70)
	Uretero-vaginal fistula	2
	Vesico-vaginal fistula	1
	Ischemia of the distal third of the ureter	1
	Infected lymphocele	1
Late postoperative complications		16 (11,80)
	Ureteral stenosis	4
	Neurogenic Bladder	2
	Incisional hernia	2
	Incisional hernia with intestinal obstruction	1
	Urinary incontinence	1
	Uretero-vaginal fistula	1
	Vesico-vaginal fistula	1
	Bowel obstruction by flanges	2
	Atraso na retirada da SVD > 30 dias	2
Clavien Dindo Classification		-
	I (no medication required)	6
	II (medication required)	5
	III A (requires surgical intervention without general anesthesia)	2
	III B (requires surgical intervention with general anesthesia)	9
	IV (threatens life and requires ICU/dysfunction of one or more organs)	0
	V (death)	0
Total complications		22 (16,29)

Discussion

Robotic surgery and cervix cancer

Radical hysterectomy is the main surgical option for the treatment of early stage carcinoma of the uterine cervix. Because of its complexity, few surgeons perform this surgery by using laparoscopy. Thus, the employment of the robotic technique can result in positive outcomes, as it's safer, less complex and easier to learn than the traditional laparoscopy [8,9].

Besides that, it's known that radical hysterectomies performed by the robotic via carry less risk of postoperative complications, bleeding, and infection, and have faster recovery times [10,11].

Average long-term survival is similar between the laparoscopic and the robotic techniques, reaching 95% in 24 months and 97% in 48 months [12]. The number of dissected lymph nodes is generally bigger in the robotic radical hysterectomy [13].

Robotic surgery and endometrial cancer

In gynecologic oncology, robotic surgery is mainly used in the treatment of endometrial cancer. Systematic comparative data between the use of the robotic and the traditional laparoscopic methods is still not available, as the majority of the comparative studies are retrospective.

The benefits of the usage of the robotic over the laparoscopic technique are evident in a major publication by Paley [14]. In this study, 377 patients submitted to robotic hysterectomy had fewer complications and shorter recovery times when compared to 131 patients who underwent laparoscopic hysterectomies.

Robotic surgery and ovarian cancer

The role of the robotic surgery for the treatment of ovarian cancer is still not clear, as there are no comparative papers currently available. With the introduction of the new Da Vinci® XI, new possibilities should be opened in this field, as this machine can now visualize all the 4 operative quadrants.

A retrospective revision work by Feuer et al., [15], comprising of 63 cases demonstrated that, in comparison to the laparoscopic method, the robotic via has: less blood loss, faster postoperative recovery, but longer surgery durations. Complication rates, mean survival time and recurrence risks were not different between the methods.

Conclusions

The occurrence of complications in robotic surgeries is related to factors such as the procedure's learning curve, the surgeon's previous laparoscopic experiences, and the mastery of the robotic technique. The appropriate training of the Robotic Team is essential to decrease surgical time and complication rates [16,17].

Complications lead to more hospital visits, readmissions, and delays in hospital discharge. Many of the complications of

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Table 2: Complications of Robotic Surgeries: Literature X Present Study.

Author	nº	Type of Surgery	Average surgical time (Min)	Mean blood loss (ml)	Average length of hospital stay (Days)	Complications (n%)	Conversion to laparotomy (n%)
Boggess et al. [18]	103	Endometrial staging	191,20	74,50	1,00	7 (6,8%)	3 (2,8%)
Halloway et al. [19]	100	Endometrial staging	171,00	103,00	1,12	20 (30,8)	4 (4%)
Gehrig et al. [20]	49	Endometrial staging	189,00	50,00	1,00	6 (12,2%)	0
Veljovich et al. [21]	118	Endometrial staging	283,00	66,60	1,70	21 (17,8%)	0
Person et al. [22]	80	Robotic radical hysterectomy in cervical cancer	262,00	150,00	3,00	33 (41%)	0
Elsahwi et al. [23]	155	Endometrial staging	127,00	119,00	1,50	40 (25,8%)	0
Coronado et al. [24]	71	Endometrial staging	189,00	99,40	3,50	15 (21,1%)	3 (2,4%)
Seror et al. [25]	40	Endometrial staging	248,00	N/D	6,90	10 (25%)	N/D
Ga Won Yim et al. [26]	242	Endometrial staging and robotic radical hysterectomy in cervical cancer	268,00	168,00	9,80	39 (16,1%)	0
Present Study	135	Staging of endometrial, ovary and robotic radical hysterectomy in cervical cancer	229,66	31,17	1,46	22 (16,29%)	1 (0,74%)

endometrial cancer operation are due to the clinical condition of the patients, since many of them are obese, hypertensive, or have other comorbidities [18-20].

Robotic tweezers should always be on the surgeon's sight and the electric activation of the bipolar should always be controlled. If one holds noble structures such as nerves or vessels with an activated bipolar, irreversible damage may occur. Furthermore, the traction on the structures need to be controlled with experience and vision, because the surgeon doesn't have the tactile feedback [21,22].

The limitation of our study was the lack of comparison with conventional laparoscopy and laparotomies. Thus, a definitive conclusion based on our data is difficult and new prospective studies will be crucial to clarify and demonstrate implications in clinical practice. In spite of this limitation, our data is important due to the number of cases and to the perception that, with practice and time, we can perform complex minimally invasive procedures with great dexterity and safety by the robotic route.

Prospective controlled and randomized studies should evaluate parameters such as postoperative morbidity, the long-term progression of the diseases, and the precise improvement in quality of life [23-26].

Assisted robotic surgery has revolutionized the standard procedures of gynecological surgery, especially in oncological interventions, by reducing postoperative morbidity rates and preserving the basic principles of oncologic surgery.

Finally, technological advances and the development of new therapeutic alternatives indicate that the future of gynecological cancer treatment is promising. Hence the importance of analyzing per and postoperative data of patients submitted to these new techniques.

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