Case series

Pelvic exenteration by robotically-assisted laparoscopy: A feasibility series of 6 cases

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A A B S T R A C T

After concomitant chemo-radiation therapy, 20 to 30% of advanced cervical cancers recur in irradiated territory. Pelvic exenteration remains a therapeutic option for selected patients. However, this procedure remains complex because of tissue fragility after radiotherapy and their associated co-morbidities. Minimally invasive surgery such as robotically assisted laparoscopy may overcome these surgical challenges. The objective of this study was to evaluate the feasibility of pelvic exenteration with robotically assisted laparoscopy.

Patients who underwent this procedure between 2015 and 2016 were included. Patients characteristics, treatment indication, intraoperative events, immediate and late complications, and histological outcomes were recorded.

The data of 6 patients were analyzed. The primary cancer staging ranged from IB1 to IIB. All cases were loco-regional recurrence and 2 cases presented with vesico-vaginal fistula. All patients had a history of pelvic irradiation. The mean operative time was 6.7 h. No complications occurred during surgery. The average hospital stay was 11.5 days. Immediate complications were mostly represented by urinary tract infections (4/5).

Histological margins were clear in 67% (4/6), and a focal involvement was found in 33% (2/6) of cases. Late complications occurred within 82 days on average and included stenosis of ileal anastomosis, wound infection, acute renal failure, and pulmonary embolism. Revision surgery was necessary in 2 cases. There were 3 local recurrences occurring within an average of 215 days.

In the light of these results, pelvic exenteration by robotically assisted laparoscopy may represent a valuable treatment modality of recurrent cervical cancer with low immediate postoperative morbidity.

1. Introduction

Cervical cancer is the third leading cause of cancer in women worldwide after breast and colon cancer, with an incidence rate of 6.7 per 100,000 women (Globocan 2012) (Fact Sheets by Population [Internet], n.d). In France, the incidence rate ranked at the 9th position. In 2012, 3028 new cases were diagnosed, with almost 1100 deaths per year. The incidence of cervical cancer is almost non-existent before the age of 25 and reaches a peak between 40 and 50 years old amounting to 20 cases per 100,000 women. Cervical cancer screening allows for early diagnosis and management.

Recurrences occur within 18 to 24 months of initial treatment and its frequency is related to initial stage. The risk is 10% for stage IB and 17% for stage IIA. Twenty to 30% of locally advanced cervical cancers recur in previously irradiated area. After concomitant radio-chemotherapy recurrences occur in 23% for stage IIB, 42% for stage III and 74% for stage IV (Sardain et al., 2016).

In case of recurrence, chemotherapy associated with bevacizumab is now available (NCCN Guidelines®), but currently, the only curative treatment is surgery. Pelvic exenteration (anterior, middle, posterior or total) is the corner stone of the surgical approach. However, surgical challenges, increased by previous irradiation, need for urinary reconstruction and a high peri-operative complication rate represent the most common limitations.

The first total laparoscopic pelvic exenteration was performed in 2003 by Pomel et al. (2003), but the use of this technique remains
limited, probably due to the difficulty of laparoscopic urinary reconstruction. Robotic-assisted laparoscopy may help overcome these limitations. This technique allows to combine the advantages of a micro-surgical approach with laparoscopy with accurate gestures of laparotomy. The objective of this study was to assess the feasibility of pelvic exenterations by a robotically-assisted laparoscopic approach in local recurrences of advanced cervical cancers.

1.1. Patient and methods

A retrospective analysis was carried out including all patients who underwent pelvic exenterations between 2015 and 2016 in the gynecological surgery department of “Hôpital Européen Georges Pompidou”. Information was collected from patient’s electronic health record. Data including age, weight, height, medical and surgical history, alcohol and tobacco use, medical treatments such as anti-platelet aggregation or anticoagulant therapy were collected from anesthesia records. Operator’s name, type of intervention, operative time, as well as procedures carried out intraoperatively were recorded along with the histological type, staging and initial treatment.

Details pertaining the postoperative stay including drainage, intensive care unit stay (ICU), transfusion need, prophylaxis of venous thromboembolic diseases, use of level 3 analgesics (morphine-based drugs), duration of hospitalization were captured. Immediate and late complications were reviewed. Early complications were de-aggregation or anticoagulant therapy were collected from anesthesia records. Mean operating time was 402 min (180–480 min). One patient required intraoperative transfusion. No intraoperative complication occurred and no conversion to laparotomy was necessary (Table 2).

2.2. Late complications (> 30 days)

Late complications occurred in 5 patients. Two required surgical management, because of a stenosis of anastomosis after ileostomy closure and obstructive renal failure. The 3 other complications were medically managed: a vaginal scar disunion, postoperative dysuria and a pulmonary embolism. The mean onset time of the first complication symptom was 82.4 days (6–247 days).

During follow-up, 3 recurrences were reported: vaginal fundus and lymph node. These recurrences occurred after an average of 7 months and were all treated with chemotherapy.

Long-term complications were represented by recto-vaginal fistula for 2 patients and ilio-ureteral fistula for one patient. The onset time of these complications was approximately one year.

One patient died after 10 months of hemorrhagic shock due to vaginal bleeding. (Table 3).

3. Discussion

Pelvic exenteration is a complex surgical procedure and remains the only cure for local recurrence of advanced cervical cancers that have been irradiated. Laparotomy remains the standard procedure for recurrences (cervix) and one involving the centro-pelvic and digestive area. These recurrences were managed by anterior pelvic exenteration with Bricker type derivation in 2 cases. One posterior pelvic exenteration with stomy was performed and another one with anastomosis. Finally, a total pelvic exenteration was performed for the last patient. Mean operating time was 402 min (180–480 min). One patient required intraoperative transfusion. No intraoperative complication occurred and no conversion to laparotomy was necessary (Table 2).

Table 1

| Case | Age (year) | BMI (kg/m²) | Histological type | Initial stage | Initial treatment | Recurrence localization | Time to recurrence (year) |
|------|------------|-------------|-------------------|---------------|-------------------|-------------------------|--------------------------|
| 1    | 56         | 19.6        | Squamous cell carcinoma | NM           | RH, RCC and brachytherapy | Vaginal fundus + vesico-vaginal fistula | 15                        |
| 2    | 39         | 18.2        | Squamous cell carcinoma | IIB          | RCC               | Cervix                  | 2                        |
| 3    | 70         | 21.4        | Adénocarcinoma      | IIB          | RH, RCC and brachytherapy | Vaginal fundus + bladder | 2                        |
| 4    | 75         | 26          | Squamous cell carcinoma | IIB          | RCC and brachytherapy | Cervix and proximal parametrium | 1                        |
| 5    | 53         | 34.7        | Squamous cell carcinoma | IB1        | RH and brachytherapy | Centro-pelvic + digestive | 4                        |
| 6    | 58         | 27.1        | Squamous cell carcinoma | NM           | RH, RCC and brachytherapy | Vaginal fundus + vesico-vaginal fistula | 6                        |

RH: total non conservative hysterectomy.
RCC: concomittant radiochemotherapy.
NM: not mentioned.
exenterations, but several teams have demonstrated its feasibility by laparoscopy with good histological results (Pomel et al., 2003; Lavazza and Gkegkes, 2014; Lambaudie et al., 2010).

The advantage of robotically-assisted surgery is to offer 3-dimensional vision, better precision of operative gestures by increasing degrees of freedom of the hand and by reducing tremors (Ngô et al., 2016). The learning curve is also reduced using robotically-assisted surgery. In the literature, few is known about pelvic exenteration by robotic-assisted laparoscopy in cervical cancer recurrence. A series of 7 patients operated for cervical cancer recurrence by robotic-assisted laparoscopy was published by Jau et al., (2011). However, they included only 2 anterior exenterations. The other procedure were anterior colpectomies. Postoperative complications observed in this series were tissue sequelae due to radiotherapy and operating time above 7 h (Ferron and Martel, 2003). In our series, there were 3 early complications, as pulmonary embolism, vaginal scar disunion, and postoperative dysuria requiring self-sounding learning.

Late postoperative complications (> 30 days postoperatively) vary between 36 and 61% in the literature and are represented by enterocutaneous and vaginal fistulas, ureteric obstructions, digestive occlusions and pyelonephritis. Risk factors found were postoperative adhesions, self-sounding and tumor recurrences (Yoo et al., 2012). Our series agree with these findings. There were 3 fistulas (2 recto-vaginal fistulas and 1 urethral fistula) after local recurrences and ureteral stenosis requiring percutaneous nephrostomy and a mono-J-probe. Mortality in relation to post-operative complications is estimated between 0 and 12% according to the series (Yoo et al., 2012; Kaur et al., 2012; Chiantera et al., 2014b; Tanaka et al., 2014; Schmidt et al., 2012). In our series, a patient died at 10 months of pelvic exenteration, after haemorrhagic shock secondary to vaginal bleeding related to local recurrence. This recurrence occurred at 7 months of the operation and was treated with cisplatin and bevacizumab. Our results are therefore comparable to those observed previously in laparotomy series. Assisted robot approach aims to reduce peri-operative morbidity and mortality but do not alter the course of disease.

Based on previously published data, the median recurrence period ranged from 6 to 50 months. Recurrences were local in 35 to 60% of cases and distant metastasis in 20 to 40% of cases (Sardain et al., 2016; Yoo et al., 2012). In our series, median occurrence of recurrence was 3 years (1 to 15 years).

Our histological findings showed a positive resection margins in 33.3% of cases, which is in agreement with the literature reporting 70% of free margins after pelvic exenterations, in all types of interventions and thromboembolic complications. Risk factors described for these complications were tissue sequelae due to radiotherapy and operating time above 7 h (Ferron and Martel, 2003). In our series, there were 3 early complications, as pulmonary embolism, vaginal scar disunion, and postoperative dysuria requiring self-sounding learning.

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Table 4

| Series | Age | Histologic type | Type of operation performed | Procedure duration | Complications | Postoperative stay |
|--------|-----|----------------|----------------------------|-------------------|---------------|-------------------|
| Jaffe et al., 2011 | 67 | Squamous cell carcinoma | Anterior pelvic exenteration, lymphadenectomy | 480 | None | 3 |
| Davis et al., 2010 | 50 | Squamous cell carcinoma | Anterior pelvic exenteration | Mean, 540 | NM | 8 |
| Lambaudie et al., 2010 | 65 | Squamous cell carcinoma | Anterior pelvic exenteration | 480 | Perineal abscess, miami pouch failure | 25 |
| | | | | | Ureteral stenosis | 14 |
| | | | | | Acute obstructive ileus, female failure | 15 |
| | | | | | Acute uratostomy, immediate ileostomy, nine ileostomy | 12 |
| | | | | | Posterior exenteration | 9 |
| Our series | 1 | 56 | Squamous cell carcinoma | Anterior exenteration | Vaginal suturing | 14 |
| | 2 | 39 | Squamous cell carcinoma | Extended colpohysterectomy, posterior exenteration | Anastomosis stenosis after ileostomy closure | 14 |
| | 5 | 53 | Squamous cell carcinoma | Posterior exenteration | Immediate pulmonary embolism | 5 |
| | 6 | 58 | Squamous cell carcinoma | Total pelvic exenteration | Immediate urinary tract infection | 9 |

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Pelvic exenteration by robotically-assisted laparoscopy can be implemented in cervical cancer recurrence. Morbidity and mortality are acceptable and not superior to standard laparoscopy and laparotomy. Robotic-assisted laparoscopic surgery is associated with shorter hospital stay, less postoperative pain, and less intraoperative blood loss. This robotically-assisted approach offers increased ergonomic and technical comfort to the surgeon during difficult and time-consuming surgical procedures. Histological results are positive and encouraging but remain to be confirmed with long-term follow-up. Based on careful patient selection, this minimally invasive surgery can represent an interesting treatment alternative to laparotomy in recurrence of pelvic cancers in irradiated area.

4. Conclusion

Pelvic exenteration by robotically-assisted laparoscopy can be implemented in cervical cancer recurrence. Morbidity and mortality are acceptable and not superior to standard laparoscopy and laparotomy. Robotic-assisted laparoscopic surgery is associated with shorter hospital stay, less postoperative pain, and less intraoperative blood loss. This robotically-assisted approach offers increased ergonomic and technical comfort to the surgeon during difficult and time-consuming surgical procedures. Histological results are positive and encouraging but remain to be confirmed with long-term follow-up. Based on careful patient selection, this minimally invasive surgery can represent an interesting treatment alternative to laparotomy in recurrence of pelvic cancers in irradiated area.