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Case Report

The Importance of Early Diagnosis and Treatment of Incidental Tension Pneumothorax During Robotic Assisted Video laparoscopy for Treatment of Diaphragmatic Endometriosis: Report of Two Cases

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Abstract

We describe two cases of robotic assisted video laparoscopy for the treatment of diaphragmatic endometriosis, in which incidental Tension pneumothorax occurred during the initial Inspection and inventory of diaphragmatic lesions.

We Demonstrate the importance of early diagnosis of this complication and report successful resolution using the thoracic drainage technique.

Key words: diaphragmatic endometriosis; diagnosis; respiratory parameters; hemodynamic stabilization; surgery

Introduction

Endometriosis is a disease characterized by a chronic estrogen-dependent inflammatory process that mainly affects the pelvic tissues. Multiple theories have been postulated about etiology, the main ones describe how the detached endometrial tissue travels retrograde to the lower abdominal cavity (Balun SE, et al. 2019). In the vast majority of cases, the disease is found in the pelvis (Andres MP, et al. 2020). Extrapelvic disease that occurs in the upper abdomen, including the diaphragm, is rare and represents a diagnostic challenge. In these cases, robotic assisted laparoscopic surgery associated with video assisted thoracoscopy (VATS) is the best way of treatment (Wolthuis AM et al 2003). We present two cases of robotic assisted laparoscopic surgery for the treatment of diaphragmatic endometriosis that evolved with incidental tension pneumothorax during the visualization of the lesions in laparoscopic time. Both were quickly treated by chest drainage with successful continuation of the surgery.

Design

Case report: Two patients with a previous surgical diagnosis of diaphragmatic endometriosis underwent robotic video-assisted surgery for treatment.

In case 1, after the pneumoperitoneum was installed, during the cavity inventory and inspection, small endometriosis lesions were observed in the tendon portion of the diaphragmatic surface. We observed a sudden increase in maximum airway pressures and a reduction in tidal volume, associated with arterial hypotension and hemodynamic instability, also bulging of the diaphragm, which led to the diagnosis of Tension pneumothorax.

In case 2, diaphragmatic endometriotic lesions were also observed after hepatic mobilization after visualization of endometriotic lesions, an abrupt decrease in the capnography values were observed, consistent with hypertensive pneumothorax. In both cases, even after deflation of the abdominal cavity, hemodynamic instability was still maintained. We decided treatment with thoracic drainage, which gave immediate normalization of the

respiratory parameters and hemodynamic stabilization, which allowed the surgery to continue.

Description of cases

Case 1:

A 38-year-old patient, 52 kg, BMI = 20 kg/m2, ASA I classification, nulligravid, diagnosed with infiltrating pelvic endometriosis ASMR: IV ENZIAN A2 B2 C3 FI FO FU. With a medical history of chronic pelvic pain, infertility, and right subscapular pain, worsened in the menstrual period. She was submitted to a previous laparoscopy for rectosigmoidectomy, bilateral ureterolysis, left oophoroplasty, left nerve decompression, and bladder nodule shaving, performed in another service 1 year Before. As a complication of the procedure, she developed a septic condition and a right pleural effusion which was drained. She remained hospitalized for 23 days, released with symptoms very similar to those that led her to seek medical attention. She underwent another surgery for the treatment of infiltrative pelvic endometriosis 6 months later with a shaving of a nodule in the rectum, left oophoroplasty, implant vaporization, flap lysis and colpectomy. Lesions of endometriosis were found on the diaphragmatic surface, but were not treated due to the potential infectious risk due to intestinal manipulation and prolonged surgical time. After 6 months of clinical treatment with suspension of menstruation with GnRh analog (gosserelin 3.6 mg per month subcutaneously, associated with "Add on therapy" with transdermal estradiol 25 mg twice weekly for six months), we performed a new Magnetic resonance of the upper abdomen in an attempt to document the lesions, but the presence of endometriotic lesions in the diaphragm was not identified, in addition to the normal preoperative chest radiograph. She was admitted in October 2016 for pelvic revision surgery (second look). The pre-anesthetic procedure consisted of a quick, sedative eight-hour medication immediately before being referred to the operating room.

In the operating room, monitoring was performed with an EKG, pulse oximetry, bispectral index (BIS), and capnography, which was only instituted after orotracheal intubation. For the monitoring of neuromuscular activity, a sequence of four stimuli with an intensity of 40 mA (acceleromyography - TOF-GUARD Organon Teknika, NY) was used, coupling a device to stimulate the orbicularis muscle. Venoclysis was performed with an 18G catheter, balanced hydro electrolyte solution infusion, administration of omeprazole (40 mg), ondansetron (4 mg) and dexamethasone 10 mg, intravenously. Sedation was then performed with midazolam (5 mg) and fentanyl (50 mcg) for thoracic epidural puncture between T7-T8, with an epidural catheter and 0.75% epidural infusion of ropivacaine 10 ml associated with 2 mg of morphine and 100 µcg of fentanyl.

Subsequently, anesthetic induction for general anesthesia was performed balanced with 5 µcg / kg fentanyl, 100 mg propofol and 1.2 mg / kg rocuronium (with continuous infusion that maintains 0.6 mg / kg / h) and maintenance with sevoflurane and remifentanil, as necessary to maintain the BIS index between 40-50. Selective tracheal intubation was performed with a 35 F double-lumen tube on the right, with no evidence of complications in the respiratory tract. The correct positioning of the double light tube was confirmed by pulmonary auscultation, showing effective selective ventilation. Volume-controlled mechanical ventilation was instituted, maintaining a tidal volume of 7 ml / kg, a respiratory rate of 12 rpm and a positive pressure at the end of expiration of 7 mmHg, with an IE: 1-1.5 ratio and maintaining maximum pressure below 35 mmHg. An orogastric tube, eye protection with gel and film, in addition to the oropharyngeal plug was passed. Esophageal thermometer and thermal blanket installed at 38 ° C. After proper positioning (standard position for pelvic and thoracic access) thus allowing access to videolaparoscopy pneumoperitoneum was started with an initial intracavitary pressure of 20 mmHg, with a reduction at 15 mmHg after trocar separation. The patient remained stable, maintaining adequate hemodynamic parameters. The cavity inventory was performed with the patient in the prone position, and after a slight hepatic mobilization, endometriotic implants were visualized on the right diaphragmatic surface (Figure 1), compromising part of the central tendon in various forms of presentation. After repositioning Trendelemburg at 21 degrees, an inventory of the cavity was made in the pelvic region, where we identify fibrotic / endometriotic tissue developed by previous surgery in the retrocervical region and the bottom of the vaginal sac. During the study of the pelvic cavity, approximately 18 minutes after the start of surgery, an increase in maximum airway pressure was observed, reaching 35 mmHg, with a reduction in tidal volume and arterial hypotension (> 20% of basal pressure) maintaining adequate oxygen saturation. After the alert from the anesthesiologist, the surgical team perceives the bulging of the diaphragm (Fig.1) and visualizes small communication holes in endometriotic lesions in the right diaphragm, which after correct mobilization of the liver for visualization, they served as a mechanism for the formation of hypertensive pneumothorax, since the defects were large enough. In view of the clinical evidence, the CO2 insufflator was switched off and a chest drain was placed in the fourth right intercostal space, mid-axillary line. After drainage, there was an immediate normalization of the maximum airway pressures and hemodynamic stabilization (Fig. 1). With effective drainage, the abdominal cavity was insufflated with 15 mmhg and surgical treatment of the respective lesions was continued, assisted by robotic laparoscopy. To treat diaphragmatic lesions, monopulmonary ventilation was installed and video-assisted thoracoscopy was performed to aid in resection of the lesions, delimitation of the surgical margin, and identification of important anatomical structures (vena cava, suprahepatic, hiatus, and nerves) for proper management and reconstruction of the diaphragmatic defect. Using a laparoscopic approach, the right falciform and triangular ligaments were dissected, with resection of a multi-fenestrated endometriotic lesion in the central tendon of the right diaphragm measuring approximately 8 cm, followed by reconstruction using robotic assisted laparoscopic suture. At the end of the procedure, the neuromuscular blockade was reversed with sugammadex at a dose of 4 mg / kg. The awakening was smooth and uneventful, the patient was referred to the post-anesthetic recovery room, being discharged to the room after 90 minutes, without incident. The surgery time was 200 minutes.

Case 2:

A 45-year-old patient, weight = 68, BMI = 25,6, ASA II (hypertension and hypothyroidism), nulligravid, with diagnosis of deep endometriosis ASMR IV ENZIAN: A3 B2 C3 FO FU FI, undergone second surgical time for treatment of pelvic endometriose (revision) and definitive treatment for diaphragmatic endometriose. The first intervention occurred 6 months before, followed by blocking with the GnRh analog (gosserelin 3.6 mg subcutaneously once a year for 6 months), associated with "add back therapy" with 25mcg of transdermal estradiol, twice a week. Programmed robotic laparoscopic resection of diaphragmatic lesion assisted also by video-thoracoscopy. Anesthesia technique carried out followed the same steps and procedures of the case I. While pelvic inspection was being performed, approximately 10 minutes after the start of surgery, an abrupt change in capnography (CO2) was noted (Expired - EtCO2 - 34mmHg for 24mmHg), concomitantly with arterial hypotension (reduction of 25% two base values), maintaining adequate saturation of oxygen. With direct laparoscopic vision, multiple holes were found in the diaphragm in endometriotic lesions, which acted as communicating lesions during hepatic mobilization. As in the previous case immediate desufflation of the abdominal cavity and treatment of the tension pneumothorax were performed, by puncture in the second intercostal space with a 14F venous catheter to decompress the lung, (Figure 4). After drainage, capnography normalized immediately, with hemodynamic stabilization. The surgery was uneventful, with an approach similar to case I, with robotic assisted laparoscopy and Videoasisted thoracoscopy to Treat the diaphragmatic disease. The patient was extubated in the operating room, without respiratory

difficulties, and thoracic drainage was placed and maintained until the second postoperative day.

Discussion:

The appearance of diaphragmatic endometriosis is rare and difficult to diagnose (Andres MP, et al. 2020). In most cases, it represents an accidental finding, with lesions observed by laparoscopy generally behind the right lobe of the liver (Ceccaroni M, et al. 2012). Compatible with the literature, in both reported cases, the MRI examinations did not show the lesions.

Diaphragmatic fenestrations in endometriotic tissue are described in the literature as a mechanism of pneumothorax formation, being responsible for (7.3-36%) of cases of spontaneous catamenial pneumothorax (Gil Y, et al. 2020). Although it occurs on the right side in approximately 90% of cases, it can be on the left or bilateral (Narula N, et al. 2018). Pelvic endometriosis is associated in 30-51% of the cases (Visouli AN, et al. 2012; Segawa M, et al. 2011). Spontaneous pneumothorax formation in these patients is due to the transdiaphragmatic passage of air through the peritoneal cavity and its air, from the cervix during the menstrual period (Frost A, et al. 2012). However, the opening of diaphragmatic fenestrations in endometriotic tissue during pneumoperitoneum has not yet been described in the investigated literature (Ceccaroni M, et al. 2012). Video-Laparoscopic treatment can lead to incidental opening of small holes in diaphragmatic endometrial tissue during surgical manipulation, even without direct tissue trauma, causing incidental pneumothorax. Intraoperative hypertensive pneumothorax is a serious event. It requires immediate diagnosis and treatment with hemodynamic and respiratory repercussions. The progressive increase in intrathoracic pressure, as a result of air trapping between the pleura, causes the collapse of the affected lung and the deviation of the mediastinum to the contralateral side, which interferes with venous return and ventilation (Zugliani AH, et al .2008).

In both cases presented, the simple movement of the liver to visualize the lesions, associated with the maintenance pressure of the pneumoperitoneum, was enough to open communication channels in the endometrial tissue and the formation of tension pneumothorax, even without surgical manipulation of the endometriosis lesions. Diaphragmatic endometriotic tissue remains a possible route of communication with the chest, and with increasing pressures in the abdominal cavity, suspected pneumothorax should be considered versus increases in maximum airway pressure after stabilization of the pneumoperitoneum. Capnography indirectly reflects the state of pulmonary circulation and CO^2 supply to the right heart chambers. Low cardiac output (shock) reduces perfusion of the alveolar segments, which therefore do not participate in gas exchange. Furthermore, collapse of the lung areas due to pneumothorax can lead to an abrupt decrease in EtC02 values on capnography, which is a warning sign found in diaphragmatic endometriotic resections. In the second reported case, no significant increase in airway pressure was detected, but the reduction in EtC02 values served as a parameter for diagnostic suspicion. In a case report of pneumothorax during anesthesia for puncture of an ultrasound-guided breast tumor, reduction of EtCO2 was also one of the first indicative signs of pneumothorax (Oliveira RF, et al. 2004). Such conditions should be considered, since prompt diagnosis and treatment are necessary to avoid serious repercussions and even death. In both cases, thoracic drainage was chosen, which caused immediate normalization of respiratory parameters and hemodynamic stabilization, allowing surgery to continue.

Conclusion:

Intraoperative pneumothorax is a complication that can also occur in patients with pelvic endometriosis to be treated with conventional laparoscopy and who may have diaphragmatic endometriosis not previously diagnosed by imaging tests. The anesthesiologist and the surgeon should be aware that such a complication is a possibility for these patients and should be prepared to diagnose and treat this complication immediately. During robotic assisted videolaparoscopy procedure for the treatment of diaphragmatic endometriosis, the visualization of the endometriosis lesions (behaves as communication holes) in the tendon portion of the diaphragmatic surface and the changes in ventilatory patterns should alert the medical team to the development of incidental tension pneumothorax.

The early identification of this complication in both cases allowed rapid intervention for chest drainage and allowed the surgical procedure to continue.

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