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SUBCUTANEOUS EMPHYSEMA AND HYPERCARBIA DURING DIAGNOSTIC GYNECOLOGIC LAPAROSCOPY: A CASE REPORT

DIAGNOSTIK JİNEKOLOJİK LAPAROSKOPİ SIRASINDA OLUŞAN SUBKUTANÖZ AMFİZEM ve HİPERKARBİ: OLGU SUNUMU

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Anahtar Sözcükler: Subkutanöz amfizem, hiperkarbi, laparoskopi

SUMMARY

Diagnostic and therapeutic laparoscopy is a relatively safe invasive procedure, but complications can occur, mainly related to Veress needle and trocar insertion. The rare occurrence of subcutaneous emphysema, as a consequence of pneumoperitoneum, following laparoscopy, is reported. The mechanism for the development of this complication and its management are discussed.

ÖZET

Diagnostik ve operatif laparoskopiler nispeten güvenli girişimler olmakla birlikte başlıca Veress iğnesi ve trokar yerleştirilmesine bağlı olarak komplikasyonlar görülebilir. Laparoskopide, pnömoperitonyum sırasında nadiren oluşan subkutanöz amfizem bildirilmiştir. Olgu sunumunda bu komplikasyonun gelişim mekanizması ve yönetilmesi tartışıldı.

INTRODUCTION

Laparoscopic procedures were first being performed in 1902 by Kelling and started to be used by surgeons after the study of Steptoe related to laparoscopic techniques in gynecology in 1967. Laparoscopy has becomed a widely used technique in France in 1987 and in USA in 1988 (1). Since 1970s laparoscopy is being used in diagnosis and treatment of variety of gynecologic cases. Technological developments provide usage of laparoscopic procedures not only gynecology, but also in thoracic and abdominal surgery (2, 3).

Minimalization of tissue trauma, providing a little incision scar, decreased morbidity and hospitalization period are the factors making laparoscopy more popular. However, laparoscopy is not without potential complications.

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Several case reports exists in literature offerring hypotheses on factors related to the risk of hypercarbia, subcutaneous emphysema, pneumothorax, and pneumomediastinum (4-8). Possible risk factors are related to surgical technique including preperitoneal insufflation (9-11) and improper trocar insertion with CO2 leakage into subcutaneous tissue (4,7).

CASE

A 32-year-old patient admitted to our hospital with primary infertility. She was 70 kg in weight and 167 cm in height. Diagnostic laparoscopy under general anesthesia was planned to this patient. Following induction with 4 mg/kg thiopenthal, 100 µg fentanyl, and 0.5 mg/kg atracurium endotracheal intubation was performed. Anesthesia was followed by 1-3% sevoflourane in 50% oxygen+nitrous oxide. Intraoperative monitorization was done by

electrocardiogram, noninvasive blood pressure, oxygen saturation (SpO2), respiratory rate, inspiratory and expiratory oxygen, end-tidal carbon dioxide (ETCO2) and end-tidal sevoflourane, tidal volume, minute volume, airway pressure. After intubation inspirium/expirium ratio was 1:2, respiratory rate was 12/minute, ETCO2 was 32 mmHg, oxygen saturation was 100%, and blood pressure was 123/79 mmHg, heart rate was 83 beats/minute. The lungs were mechanically ventilated equally.

At supine position Veress needle was inserted to peritoneal cavity and when adequate insufflation has been achieved Veress needle was removed and trocar was inserted. Eleven minutes after CO2 insufflation ETCO2 started to increase even mechanical ventilation parameters were setted. 18 minutes later ETCO2 increased from 32 mmHg to 57 mmHg. At the same time minute ventilation was increased to 8.3 L/min from 5.9 L/min by tidal volume and frequence increase. Partial pressure of carbon dioxide (PaCO2) was 61 mmHg in the arterial blood gas analysis. Even deep anesthesia was present peak inspiratory pressure (PIP) was increased from 16 cmH2O to 26 cmH2O and the heart rate was increased to 125 beats/minute. Blood pressure was 120/81 mmHg. Oxygen saturation continued to be stable as 100-99%.

Both hemithorax were ventilated equally on auscultation, but crepitation was present in upper abdominal region on palpation. Subcutaneous emphysema was thought to be developed and the patient was bringed to the horizontal position from trendelenburg position. Desufflation was performed and the operation was ended in 5 minutes. ETCO2 decreased to 50 mmHg, PaCO2 was 54 mmHg at the same time in arterial blood gas analysis. PIP decreased to 20 cmH2O. Heart rate was 93 beats/min and blood pressure was 118/91 mmHg. After 10 minutes of manual respiration, decurarization was performed and 5 minutes later the patient was extubated. After all these procedures ended there was crepitation between upper abdominal region and the level of iliac crests. The patient was taken to postoperative unit and 4 hours later subcutaneous emphysema was regressed and PaCO2 was 35 mmHg in blood gas analysis. The patient was discharged from the hospital after 24 hours without any problem.

DISCUSSION

Incidance of laparoscopic complications are related to the types of laparoscopic procedures, but the education and the experience of the surgeon performing the procedure affects the rate of the complications. In laparoscopic gynecologic operations minor complication incidance is 1-4%, major complication incidance is 0.3-2.8%. Major complication rate seems to be decreased in spite of increased number of laparoscopic operations (12, 13).

First step in laparoscopic operations is to provide pneumoperitoneum for visualisation of the organs and surgical manipulation. Insufflation and trocar insertion should be performed only after assurance that patient's stomach and the baladder are empty. Surgical experience and meticulous adherence to proper technique are essential to prevent complications. Nevertheless, some complications, such as those associated with blind insertion of trocar, may be unavoidable. Veress needle is placed from a small subumblical incision into peritoneal cavity. Extraperitoneal insufflation occurs when the Veress needle fails to enter the peritoneal cavity.

Carbon dioxide is generally used to provide pneumoperitoneum. The increase in arterial carbon dioxide pressure (PaCO2) during laparoscopy primarily results from diffusion of CO2 from the peritoneal cavity (14). Type of surgery, degree of dissection around diaphragm and in the retroperitoneal space might also be important (9). Patients' risk factors like age and concurrent cardiopulmonary disease also effects the incidance of this complication (15, 16).

The incidance rates for subcutaneous emphysema during laparoscopy vary from 0.43% to 2.34% (17, 18). Wolf et al found 34 of 44 patients (77%) who had laparoscopic surgery to have subcutaneous emphysema on postoperative chest x-ray, nine of them with concommitant pneumomediastinum (9). Wolf et al also reported 34% of subcutaneous emphysema in urologic laparoscopic procedures (11). McAlister et al reported 56% subcutaneous emphysema in 27 patients who had laparoscopic cholecystectomy by performing computed tomographic scans (19).

Murdock et al found that risk factors for the development of subcutaneous emphysema were maximum end-tidal CO2 of 50 mmHg or greater, older age, the use of six or more operative ports, and operative time over 200 minutes (20). Other authors have shown that there is a strong association between high positive end-tidal CO2 and subcutaneous emphysema (9, 11).

Leakage of the insufflated gas into subcutaneous tissue is the most likely etiological factor in development of subcutaneous emphysema (20). There seems to be link between preperitoneal insufflation and extensive retroperitoneal dissection with the development of subcutaneous emphysema and the resultant hypercarbia (6,9-11,21). Subcutaneous emphysema can be diagnosed by development of crepitation on the abdominal wall.

Differences in airway pressures and increased end-tidal CO2 are the early findings of the extravasation of CO2. Increase of CO2 diffusion seen with subcutaneous emphysema causes hypercapnea and respiratory acidosis. In our case end-tidal CO2 increase is firstly recognized and we increase minute ventilation to compansate this. Since there was no regression both hemithorax were auscultated and found to be normal but crepitation at upper abdominal region was recognized and the surgery was ended by the development of subcutaneous emphysema. In most cases there is not any spesific intervention for subcutaneous emphysema. It usually regresses after peritoneal desufflation (22, 23). In our case emphysema regressed after 4 hours but in advanced cases emphysema may progress from the abdominal wall to chest wall, neck and face. In such cases if gas passes through thorax or mediastinum, pneumothorax or pneumomediastinum may be seen respectively. Because of this risk when emphysema occurs in neck and face, chest x-ray must be seen and proper treatment must be applied.

In conclusion, the authors emphasize the importance and the need of continuous monitoring to reduce perioperative morbidity and to avoid major complications in the course of laparoscopy.

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