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Peripheral Nerve Block Combined with Epidural Anesthesia for Incarcerated Inguinal Hernia Repair in a Patient with Severe Chronic Obstructive Pulmonary Disease: A Case Report

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Abstract

Background: Invasive mechanical ventilation worsens prognosis in patients with severe chronic obstructive pulmonary disease (COPD). To avoid complications in these patients, anesthesia should be carefully considered. **Case presentation:** A 78-year-old man with COPD presented with dyspnea and pain from the epigastric to the umbilical regions. He was diagnosed with left incarcerated inguinal hernia and underwent radical inguinal hernia repair and surgical ileus treatment. To avoid general anesthesia with tracheal intubation, epidural anesthesia was combined with peripheral nerve blocks. An epidural catheter was inserted from T12/L1, and ilioinguinal-iliohypogastric and genitofemoral nerve blocks were performed under ultrasound guidance. No post-surgery complications or pain symptoms were noted. **Conclusions:** General anesthesia would likely have been challenging due to the patient's COPD; however, management of peritoneal traction pain is difficult using peripheral nerve block alone. By combining epidural anesthesia with peripheral nerve blocks, we safely performed a procedure in a patient with severe COPD while avoiding invasive positive pressure ventilation.

Keywords

COPD, Hernia Repair, Peripheral Nerve Block, Epidural Anesthesia

1. Introduction

Invasive mechanical ventilation worsens prognosis in patients with severe chronic obstructive pulmonary disease (COPD) [1]. This paper presents the case of a 78-year-old man with incarcerated inguinal hernia and a history of severe

COPD who was scheduled for inguinal hernia repair, surgical ileus treatment, and small bowel resection, if needed. To avoid general anesthesia with tracheal intubation, peripheral nerve blocks were combined with epidural anesthesia.

2. Case Presentation

Herein, we report the case of a 78-year-old man (height: 160 cm, weight: 38 kg) who, up to the age of 50 years, had smoked 50 cigarettes a day for approximately 30 years. COPD was noted at that time, and he stopped smoking but did not receive any treatment. At the age of 66 years, the patient sought medical care for shortness of breath on exertion. A respiratory function test showed a forced expiratory volume in 1 second (FEV1.0) of 37.75% (1.48 L) and a forced expiratory volume % in 1 second (%FEV1.0) of 56.2%, consistent with Stage II moderate obstructive pulmonary disease. However, even at this stage, treatment was not initiated, at the request of the patient. At the age of 70 years, the patient started taking long-acting $\beta 2$ agonists and long-acting anticholinergic drugs for worsening shortness of breath; however, his compliance was poor. At the age of 75 years, home oxygen therapy (HOT) was initiated. Despite treatment, the patient was admitted to the hospital several times for infection-induced COPD exacerbation. At the age of 76 years, his most recent respiratory function test showed COPD at GOLD Stage IV with an FEV1.0 of 0.66 L, %FEV1.0 of 24.6%, and vital capacity of 86.1%. He was admitted to our emergency department with epigastric-to-umbilical-region pain and breathing difficulty.

At the time of admission, the patient's SpO_2 was approximately 80% (oxygen via nasal cannula at 1 - 2 L/min), and he had an American Society of Anesthesiologists physical status of Class 4 and respiratory status of Hugh-Jones classification V. Preoperative chest radiography showed hyperinflated lungs with flattening of the diaphragm (**Figure 1**), and chest computed tomography (CT) showed prominent emphysematous changes in all lung fields, with almost no lung parenchyma (**Figure 2**). The patient's past medical history included percutaneous coronary interventions performed at 69 and 70 years for angina, with placement of a drug-eluting stent (in #7 and 13). No wall-motion abnormalities were found on echocardiography at the time of admission. An abdominal CT showed an incarcerated left inguinal hernia and associated ileus; therefore, the patient was admitted to the hospital (**Figure 3**).

On day 2 of admission, intravenous administration of 10 mg/day morphine hydrochloride was initiated for dyspnea. After manual reduction, the patient was monitored since he refused surgery. However, since prolapse of the small intestine into the hernial sac did not improve, surgery was planned on day 9 of admission.

Regarding the surgical procedure, the time required for radical left inguinal hernia repair and surgical ileus treatment using the anterior approach was estimated to be 1 hour. However, the procedure was expected to exceed 2 hours if ischemic findings requiring small intestine resection were present. Furthermore,

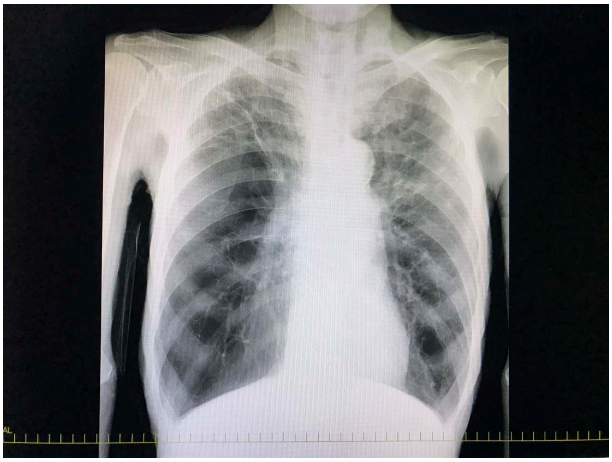

Figure 1. Preoperative chest radiograph. Hyperinflation of the lung and increased lucency of the lung field can be observed.

Figure 2. Preoperative chest computed tomography image. Diffuse low-attenuation areas and bullae can be seen, and normal lung tissue is scarce.

Figure 3. Preoperative abdominal computed tomography image. Left incarcerated inguinal hernia and associated ileus can be observed.

general anesthesia was likely to be difficult due to the patient's deteriorated respiratory status. Hence, we planned to perform epidural anesthesia with ilioinguinal-iliohypogastric and genitofemoral nerve blocks.

When entering the operating room, the patient's SpO_2 was 63% (oxygen via nasal cannula at 2 L/min) and respiratory rate was approximately 25 breaths/min. A line was inserted into the left radial artery under local anesthetic. Blood gas analysis showed a pO_2 of 35.5 mmHg and pCO_2 of 50.9 mmHg, consistent with the patient's complaint of severe respiratory distress. Oxygen via the nasal cannula was increased to 3 L/min. After monitoring the patient a while, a gradual increase in SpO_2 was observed. The patient was then placed in the lateral decubitus position, and epidural anesthesia was administered, as follows: an epidural catheter was inserted from T12/L1, and 6 mL of 0.375% levobupivacaine was administered. The patient was then returned to the supine position for inhaled β-agonist treatment. The level of anesthesia was T6 at this point. Thereafter, under ultrasound guidance, 20 mL of 0.25% levobupivacaine was administered for a left ilioinguinal-iliohypogastric nerve block, and 10 mL of the same drug was administered for a left genitofemoral nerve block. No complications associated with either nerve block were observed.

The patient's procedure began only after confirmation that his temperature and pain sensitivity had diminished to the level of T4. The surgeon made a skin incision, slightly to the cranial side of the outer inguinal ring using a longitudinal incision of about 5 cm along the skin secant. The presence of an internal inguinal hernia was confirmed due to the presence of a transversalis fascia bulge near the pubis after exfoliation. When the hernia sac was incised and confirmed, no prolapse of the intestinal tract was observable and the incarceration was released. Therefore, it was speculated that there was no necrosis of the intestinal tract. The hernia gate was repaired via the mesh plug method and the operation was completed.

During the procedure, oxygen saturation was maintained (80%) with the patient under 2 L/min oxygenation via a nasal cannula. The patient did not complain of dyspnea. The procedure time was 65 min, with an anesthesia time of 143 min. The patient returned to the ICU with no obvious complications or pain symptoms. Continuous intravenous infusion of morphine hydrochloride was continued during the perioperative period, and no additional analgesics or sedatives were administered. However, lower gastrointestinal bleeding was confirmed on the 11^{th} postoperative day. Thereafter, the patient's condition suddenly deteriorated, which resulted in his death on postoperative day 11.

3. Discussion

Perioperative respiratory function, oxygenation, and ventilation capacity should be considered when anesthetizing a patient whose respiratory function is impaired by COPD. The best anesthesia method (general anesthesia alone, general anesthesia with peripheral nerve block, or peripheral nerve block alone) should

be confirmed after assessing COPD severity [1].

While determining an appropriate anesthetic method, we realized that general anesthesia should be avoided because very poor prognoses had been reported in cases where invasive positive pressure ventilation (IPPV) was performed on patients with severe COPD after receiving HOT [2]. A preoperative CT showed severe emphysematous changes, raising concerns of pulmonary barotrauma due to positive pressure ventilation; furthermore, the patient's marked obstructive pulmonary disease was expected to make ventilation adjustments challenging.

Spinal subarachnoid anesthesia has a minor respiratory effect in patients with normal respiratory function. Expiratory, internal intercostal, external/internal oblique, and transversus abdominis muscles are supplied by nerves from the thoracic spine. As such, high spinal subarachnoid anesthesia decreases expiratory reserve volume, maximum expiratory volume, and maximum minute ventilation. Therefore, spinal subarachnoid anesthesia in patients with obstructive lung disease must be performed with caution [1] [3]. In addition, considering that even a slight change in position after hospitalization can reduce oxygen saturation levels as well cause respiratory distress, we believed that it would be better for the patient if he was able to change his body position himself. Therefore, we opted for peripheral nerve block rather than spinal subarachnoid anesthesia.

Ilioinguinal-iliohypogastric nerve blocks were performed to prevent pain at the incision site [4]. A genitofemoral nerve block was performed to prevent pain in the inguinal canal, which is thought to occur after the procedure as a result of surgical mesh insertion [5]. In addition, epidural anesthesia was used to reduce visceral pain, peritoneal traction pain, irritation to the spermatic cord and testis, and to facilitate pain management in case the procedure time was extended to perform small bowel resection. The patient's respiratory status was extremely poor; therefore, the avoidance of general anesthesia with tracheal intubation was essential. Epidural anesthesia was combined with a peripheral nerve block to ensure an adequate analgesic effect, and surgery was performed after obtaining sufficient analgesia.

During the procedure, the patient did not have pain symptoms. After the procedure, he changed his position by himself to some extent without showing signs of dyspnea. Therefore, it is likely that these anesthetics worked effectively. In a previously reported case, inguinal hernia radical surgery was performed with peripheral nerve block alone [6]. However, if there is a possibility of intestinal resection, epidural anesthesia is needed.

Thoracic epidural anesthesia is known to improve postoperative respiratory function and prognosis, and is believed to be beneficial for COPD patients [7]. In addition, to support respiratory function, noninvasive positive pressure ventilation (NPPV) is recommended as a ventilatory adjuvant therapy during COPD exacerbation events. NPPV has a high success rate and has been reported to improve dyspnea and mortality [8] [9] [10]. NPPV is associated with fewer complications, such as ventilator-associated pneumonia, than IPPV [11] [12]. However, NPPV could not be used in the treatment of this patient due to his high risk of as-

piration from ileus, which was associated with his incarcerated inguinal hernia.

The patient had previously received HOT, but in the operating room where his SpO_2 level was as low as 63%. Therefore, the oxygen flow rate was increased with the goal of raising his SpO_2 to 88% - 92%, while considering risk of CO_2 narcosis [13]. In addition, his blood gas level was measured, as appropriate, while paying attention to increases in $PaCO_2$. The use of inhaled short-acting β2 agonists is strongly recommended during COPD exacerbation [12] [14]. We administered short-acting β2 agonists using a metered dose inhaler. Further, short-term systemic steroid administration (prednisolone equivalent of 30 - 40 mg/day) for severe COPD improves hypoxemia and shortens time to recovery [9] [13] [15]. Although it was not used in this patient, systemic steroids have the potential to be beneficial in the perioperative period.

4. Conclusion

By combining epidural anesthesia with peripheral nerve blocks, we safely performed a procedure in a patient with severe COPD while avoiding IPPV.

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Consent for Publication

Written informed consent was obtained from the patient's family for the publication of this case report and accompanying images.

Availability of Data and Materials

A copy of the data presented in this report is available upon request.

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Authors' Contributions

YI and HK treated the patient and wrote the manuscript. SN supervised the patient's treatment. YI and HK drafted the manuscript. YN, RA, and JT critically revised the manuscript. All authors read and approved the final manuscript.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

References

[1] Hausman, M.S., Jewell, E.S. and Engoren, M. (2015) Regional versus General Anesthesia in Surgical Patients with Chronic Obstructive Pulmonary Disease: Does

Avoiding General Anesthesia Reduce the Risk of Postoperative Complications? *Anesthesia and Analgesia*, **120**, 1405-1412. https://doi.org/10.1213/ANE.0000000000000574

[2] Hajizadeh, N., Goldfeld, K. and Crothers, K. (2015) What Happens to Patients with COPD with Long-Term Oxygen Treatment Who Receive Mechanical Ventilation for COPD Exacerbation? A 1-Year Retrospective Follow-Up Study. *Thorax*, **70**, 294-296. https://doi.org/10.1136/thoraxjnl-2014-205248

[3] Steinbrook, R.A., Concepcion, M. and Topulos, G.P. (1988) Ventilatory Responses to Hypercapnia during Bupivacaine Spinal Anesthesia. *Anesthesia and Analgesia*, **67**, 247-252. https://doi.org/10.1213/00000539-198803000-00007

[4] Gucev, G., Yasui, G.M., Chang, T.Y. and Lee, J. (2008) Bilateral Ultrasound-Guided Continuous Ilioinguinal-Iliohypogastric Block for Pain Relief after Cesarean Delivery. *Anesthesia and Analgesia*, **106**, 1220-1222. https://doi.org/10.1213/ane.0b013e3181683821

[5] Sasaoka, N., Kawaguchi, M., Yoshitani, K., Kato, H., Suzuki, A., *et al.* (2005) Evaluation of Genitofemoral Nerve Block, in Addition to Ilioinguinal and Iliohypogastric Nerve Block, during Inguinal Hernia Repair in Children. *British Journal of Anaesthesia*, **94**, 243-246. https://doi.org/10.1093/bja/aei031

[6] Tanaka, M., Azuma, S., Hasegawa, Y., Mori, N., Takahashi, N., *et al.* (2009) Case of Inguinal Hernia Repair with Transversus Abdominis Plane Block and Rectus Sheath Block. *Masui. The Japanese Journal of Anesthesiology*, **58**, 1306-1309.

[7] Miskovic, A. and Lumb, A.B. (2017) Postoperative Pulmonary Complications. *British Journal of Anaesthesia*, **118**, 317-334. https://doi.org/10.1093/bja/aex002

[8] Williams, J.W., Cox, C.E., Hargett, C.W., Gilstrap, D.L., Castillo, C.E., *et al.* (2012) Noninvasive Positive-Pressure Ventilation (NPPV) for Acute Respiratory Failure. Report No. 12-EHC089-EF, Agency for Healthcare Research and Quality (US), Rockville.

[9] Langsetmo, L., Platt, R.W., Ernst, P. and Bourbeau, J. (2008) Underreporting Exacerbation of Chronic Obstructive Pulmonary Disease in a Longitudinal Cohort. *American Journal of Respiratory and Critical Care Medicine*, **177**, 396-401. https://doi.org/10.1164/rccm.200708-1290OC

[10] Xu, W., Collet, J.P., Shapiro, S., Lin, Y., Yang, T., *et al.* (2010) Negative Impacts of Unreported COPD Exacerbations on Health-Related Quality of Life at 1 Year. *The European Respiratory Journal*, **35**, 1022-1030. https://doi.org/10.1183/09031936.00079409

[11] Suzuki, M., Makita, H., Ito, Y.M., Nagai, K., Konno, S., *et al.* (2014) Clinical Features and Determinants of COPD Exacerbation in the Hokkaido COPD Cohort Study. *The European Respiratory Journal*, **43**, 1289-1297. https://doi.org/10.1183/09031936.00110213

[12] Hurst, J.R., Vestbo, J., Anzueto, A., Locantore, N., Müllerova, H., *et al.* (2010) Susceptibility to Exacerbation in Chronic Obstructive Pulmonary Disease. *The New England Journal of Medicine*, **363**, 1128-1138. https://doi.org/10.1056/NEJMoa0909883

[13] Seemungal, T.A., Hurst, J.R. and Wedzicha, J.A. (2009) Exacerbation Rate, Health Status and Mortality in COPD—A Review of Potential Interventions. *International Journal of Chronic Obstructive Pulmonary Disease*, **4**, 203-223. https://doi.org/10.2147/COPD.S3385

[14] Albertson, T.E., Chenoweth, J.A., Pearson, S.J. and Murin, S. (2020) The Pharmacological Management of Asthma-Chronic Obstructive Pulmonary Disease Overlap

Syndrome (ACOS). *Expert Opinion on Pharmacotherapy*, **21**, 213-231. https://doi.org/10.1080/14656566.2019.1701656

[15] GBD 2015 Chronic Respiratory Disease Collaborators (2017) Global, Regional, and National Deaths, Prevalence, Disability-Adjusted Life Years, and Years Lived with Disability for Chronic Obstructive Pulmonary Disease and Asthma, 1990-2015: A Systematic Analysis for the Global Burden of Disease Study 2015. *The Lancet Respiratory Medicine*, **5**, 691-706.