# Successful management of type B lactic acidosis in metastatic cervical neuroendocrine carcinoma: A case report

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**Abstract.** Type B lactic acidosis associated with malignancies is a rare but life-threatening complication, particularly in hematological cancers but less commonly in solid tumors. The current study presents a rare case of type B lactic acidosis in a 59-year-old woman with metastatic cervical neuroendocrine carcinoma (NEC), a highly malignant and uncommon tumor. The patient exhibited severe symptoms, including significant ascites, tachycardia and hyperlactatemia, with lactate levels peaking at 11.2 mM. Despite initial symptomatic treatments such as fluid replacement and sodium bicarbonate therapy, the patient's condition continued to deteriorate. Based on the literature, chemotherapy is considered potentially the only effective treatment for malignancy-associated lactic acidosis. Given the critical status and poor general condition of the patient, a reduced dose of intravenous etoposide (100 mg; days 1, 3 and 4) was administered. After the first dose, the patient developed tumor lysis syndrome (TLS), which was promptly managed with appropriate interventions. Following stabilization, etoposide treatment was continued on the third and fourth days. Subsequently, a delayed intraperitoneal infusion of carboplatin (300 mg; day 6) was administered. Post-chemotherapy, lactate levels significantly decreased to 2.2 mM, and the patient's overall condition improved, leading to discharge. This case underscores the potential efficacy of using reduced doses of etoposide (100 mg on days 1, 3 and 4) and intraperitoneal carboplatin (300 mg on day 6) in managing malignancy-associated lactic acidosis. It also highlights the importance of proactive management of TLS and other chemotherapy-related complications, contributing valuable insights to the limited literature on this subject.

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## Introduction

Hyperlactatemia is a serious clinical manifestation typically categorized into type A, type B and type D (1). Type A hyperlactatemia is characterized by hyperlactatemia due to inadequate tissue oxygenation, typically seen in conditions such as shock, sepsis and severe hypoxemia. In Type A hyperlactatemia, the primary cause is tissue hypoxia leading to anaerobic metabolism and lactate production. Malignancy-induced lactic acidosis (Type B lactic acidosis) occurs in the absence of systemic oxygenation impairment, characterized by a pH below 7.35 and serum lactate concentration exceeding 5-6 mM (2). Lactate is produced anaerobically from pyruvate, primarily metabolized in the liver through gluconeogenesis, with a secondary role in renal lactate metabolism (3). Under normal circumstances, the production and clearance rates of lactate remain in equilibrium to maintain physiological acid-base balance. However, in cases of high tumor burden, anaerobic glycolysis leads to excessive lactate production, resulting in hyperlactatemia. Type D hyperlactatemia is related to drug-induced causes, where medications or substances interfere with lactate metabolism and clearance, leading to elevated lactate levels in the blood (2,4). Among these, type B lactic acidosis associated with malignancies is a rare but life-threatening oncological emergency, most commonly observed in hematological malignancies and less frequently in solid tumors. Documented cases (5,6) of solid tumor-associated Type B lactic acidosis are associated with various types of cancer such as lung cancer (especially small-cell lung cancer), breast cancer, sarcoma, cholangiocarcinoma, and colorectal cancer (7). The prognosis for patients with solid tumor-induced hyperlactatemia is typically poor, with ~80% of patients succumbing within 10 weeks and 55% within the first week of onset (5). Cervical neuroendocrine carcinoma (NEC) is a rare and highly malignant tumor, accounting for only 1.6% of all cervical cancer cases. To date, there have been no reported cases of hyperlactatemia caused by metastatic cervical NEC. Current treatment guidelines for metastatic NEC recommend use of etoposide and cisplatin chemotherapy (8). The current study presents a rare case of type B lactic acidosis in a patient with metastatic cervical NEC. Notably, the patient's condition significantly improved after the administration of a reduced dose of intravenous etoposide and a delayed intraperitoneal

infusion of carboplatin. This case underscores the potential efficacy of this therapeutic approach in managing this critical condition and contributes to the limited body of literature on the subject.

## Case report

A 59-year-old female patient with a history of good health, no surgical history and no chronic diseases experienced intermittent vaginal bleeding in January 2023, which was left untreated. In August 2023, the patient developed abdominal distension and sought medical attention at West China Hospital (Chengdu, China), where the initial diagnosis by cervical biopsy, was high-grade NEC, a cervical malignant tumor. CT scan indicated extensive abdominal metastases. Chemotherapy was recommended, but the patient refused and opted for palliative care at home. In September 2023, the patient presented to the Emergency Department at the People's Liberation Army General Hospital of Western Theater Command (Chengdu, China) due to a significant worsening of abdominal distension accompanied by dyspnea. A physical examination revealed a performance status (PS) score (9) of 3 and a heart rate of 110 bpm. The patient was wheelchair-bound. Emergency computed tomography showed an extremely distended abdomen with an elevated right lung base. A large amount of ascites was present around the liver, with no pleural effusion detected (Fig. 1A). A roughly round, heterogeneous density mass was observed within the cervix, measuring ~6.1x5.6 cm, with unclear boundaries (Fig. 1B). Patchy and nodular shadows were seen adjacent to the right side of the uterine body and in the lower left abdominal cavity, with the largest measuring ~4.5x4.1 cm (Fig. 1C).

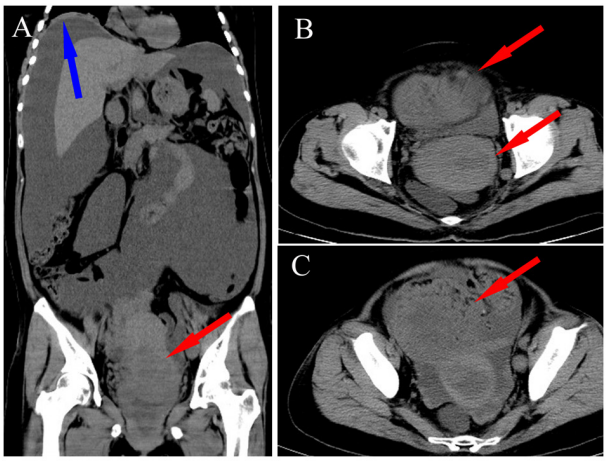


Figure 1. CT findings upon hospital admission. (A) CT coronal image showing marked abdominal distension in the patient, with a significant amount of ascites causing elevation of the diaphragm (blue arrow) and a massive cervical tumor (red arrow). (B) A roughly round, heterogeneously dense mass measuring ~6.1x5.6 cm is observed within the cervix (arrow), with unclear boundaries. (C) Patchy and nodular shadows are seen adjacent to the right side of the uterine body and in the lower abdominal cavity, with the larger shadow measuring ~4.5x4.1 cm. The greater omentum (arrow) is thickened and folded into a pancake shape. CT, computed tomography.

Upon admission, the patient had significant ascites, and a paracentesis was performed, draining ~2,000 ml daily. The patient's white blood cell count (16.5x$10^9$/l; normal reference range, 3.50-5.30x$10^9$/l) and C-reactive protein level (119.00 mg/l; normal reference range, 0-3.0 mg/l) were significantly elevated. The patient presented with a PS score of 3-4 accompanied by severe hyperlactatemia, caused by both tumor- and non-tumor-related factors. Tumor-related factors include pelvic and abdominal mass caused by the tumor, extensive ascites, and excessive lactate production, while non-tumor-related factors include infection, hypoalbuminemia. The patient presented with infections, hypoalbuminemia and electrolyte imbalances that all need to be corrected. Therefore, supportive treatment was initiated. Cefoperazone-sulbactam (4 g twice a day for 8 days) was administered for anti-infective therapy and tramadol hydrochloride extended-release tablets (200 mg twice a day for 2 days) were used for pain management. Enteral nutrition powder (400 mg daily for 6 days) was provided for nutritional support. Rivaroxaban (10 mg every day for 13 days) was used for thrombosis prevention. The patient's neuron-specific enolase (NSE) level was >370.00 ng/ml (normal reference range, 0-17.00 ng/ml). After anti-infection and fluid therapy, the infection markers improved.On the 7th day post-admission, a pathological report on the ascitic fluid revealed a small amount of nuclear heterogeneous cell clusters (Fig. 2), with immunohistochemical markers suggesting NEC cells (10,11). The immunohistochemical (IHC) marker results for this patient were: Carcinoembryonic antigen (CEA) (+), cytokeratin (CK)5/6(-), CK8/18(+), chromogranin A (CgA) (+), estrogen receptor (ER)(-), Ki-67(+, 80%), NSE(+), p16(+), p63(+), synaptophysin (Syn)(+), thyroid transcription factor-1 (TFT-1)(+), vimentin (Vim)(-) and Wilms' tumor-1 (WT-1)(-; data not shown). The IHC and pathological staining protocols were as follows: A total of 500 ml ascitic fluid was collected in a sterile glass bottle and allowed to settle for 1 h. The bottom liquid was drawn and transferred to a plastic centrifuge tube. Next, 5 ml of 10% formalin solution was added, and the tube was centrifuged at 500 g at 4˚C for 5 min. The supernatant was discarded, and another 5 ml of 10% formalin solution was added. The tube was centrifuged again, this process was repeated once more, and then the tube was left to stand. The cells obtained following centrifugation of asciteswere fixed in 10% neutral-buffered formalin at room temperature for 24 h. The samples were dehydrated through graded alcohols (70, 80, 95 and 100%) and then cleared in xylene. The samples were embedded in paraffin and sectioned to 4- to 5-$\mu$m thick. The sections were deparaffinized in xylene and rehydrated through graded alcohols to water. Antigen retrieval was performed using citrate buffer (pH 6.0) in a microwave or pressure cooker. Endogenous peroxidase activity was blocked with 3% hydrogen peroxide for 10 min. Non-specific binding was blocked with 5% normal goat serum at room temperature for 30 min. The sections were then incubated with primary antibodies at room temperature for 60 min . The primary antibodies used were Syn antibody, with a dilution concentration of 1:200 (cat. no. MAB0742), CEA antibody at a dilution of 1:200 (cat. no. MAB0852), CK5/6 antibody at a dilution of 1:200 (cat. no. MAB0744), CK8/18 antibody at a dilution of 1:200 (cat. no. MAB1002), CgA antibody at a dilution of 1:200 (cat. no. MAB0548), ER antibody ready-to-use (cat. no. Kit 0012), Ki-67 antibody at a dilution of 1:200 (cat. no. MAB0542), NSE antibody at a dilution of 1:100 (cat. no. MAB0791), p16 at a dilution of 1:200 (cat. no. MAB0673), p63 antibody at a

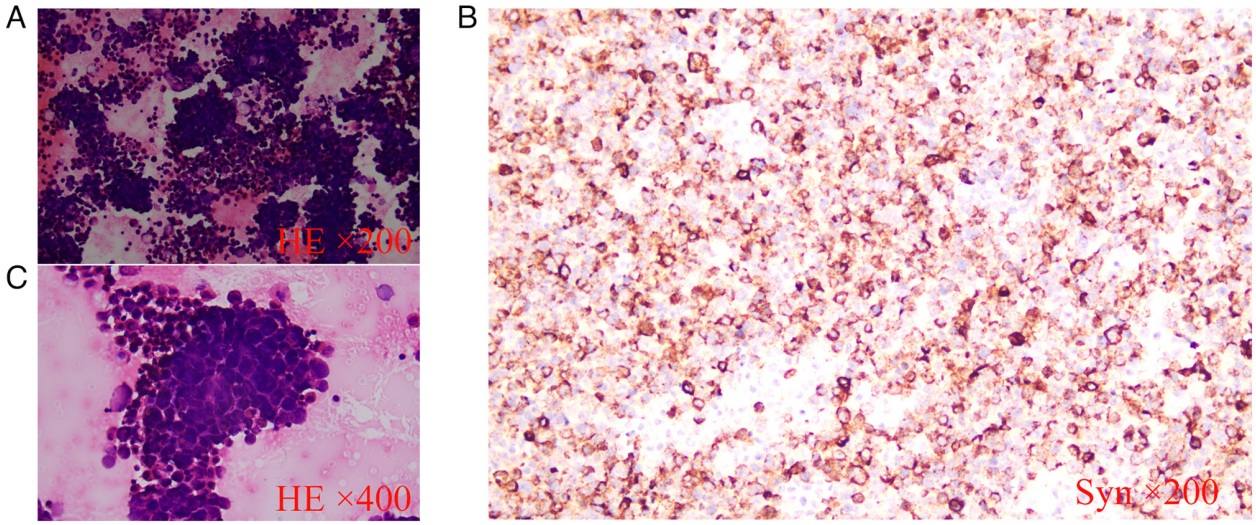


Figure 2. Cytological examination of ascitic fluid. (A) HE and (B) Syn immunohistochemistry staining at x200 magnification. (C) HE staining at x400 magnification. Pathological examination of ascitic fluid reveals clusters of cells with nuclear heterogeneity. Malignant cells are present with a high nuclear-cytoplasmic ratio. Immunohistochemical staining results indicate neuroendocrine carcinoma cells. The cancer cells are Syn(+). Syn, synaptophysin.

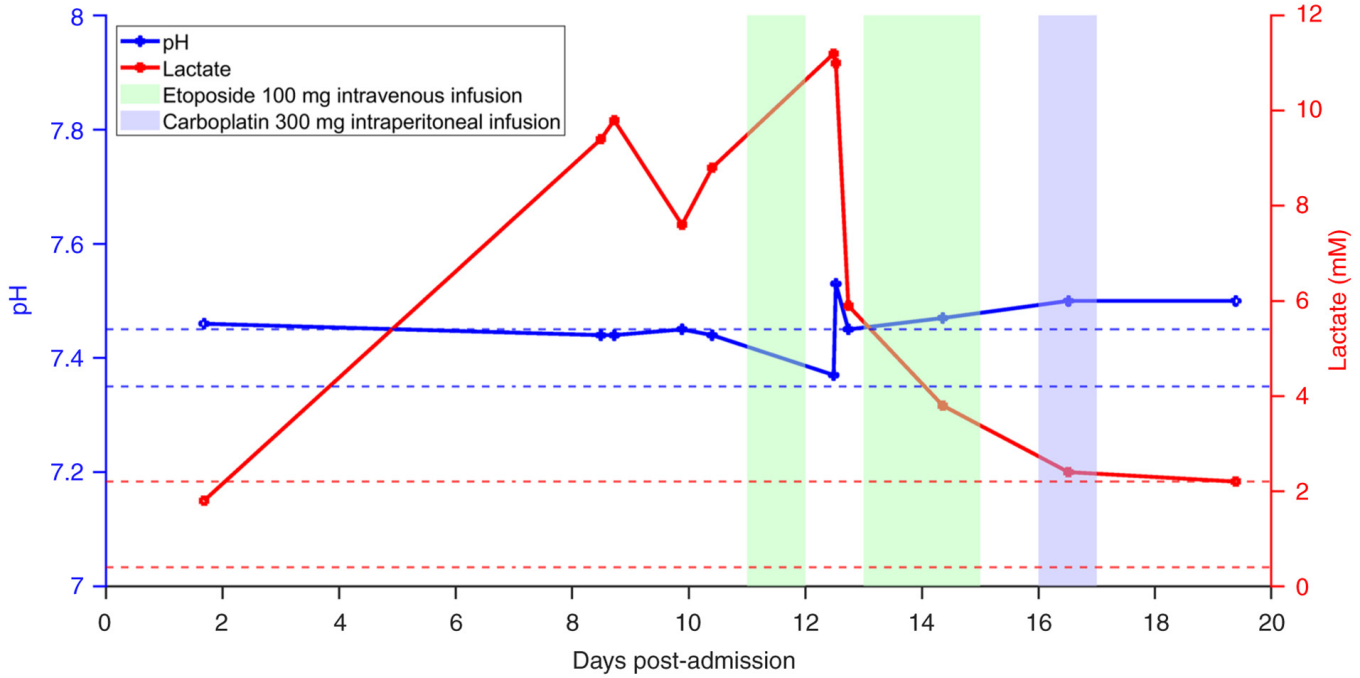


Figure 3. Changes in blood lactate and pH during treatment. On day 1 post-admission, the patient's lactate level was 1.8 mM. Lactate peaked at 9.8 mM on the 8th day post-admission and remained high at 8.8 mM on the 10th day post-admission. After 100 mg of etoposide on the 11th day post-admission, the lactate level rose to 11.2 mM on the 12th day post-admission. Subsequent treatment reduced the lactate level to 5.9 mM. Etoposide treatments on the 13th day and the 14th day post-admission further decreased the level to 2.4 mM on the 16th day post-admission. After administration of 300 mg carboplatin, the lactate level dropped to 2.2 mM on the 19th day post-admission. The pH levels stayed above 7.35 throughout. The lactate normal reference range is 0.4-2.2 mM and the pH normal reference range is 7.35-7.45. Dashed lines indicate normal reference range.

dilution of 1:200 (cat. no. MAB0694), TFT-1 antibody at a dilution of 1:100 (cat. no. MAB0266), Vim antibody at a dilution of 1:200 (cat. no. Kit 0019), and WT-1 antibody at a dilution of 1:200 (cat. no. MAB0678; all antibodies from Fuzhou Maixin Biotechnology Development Co., Ltd. The sections were next incubated with biotinylated secondary antibody for 30 min at room temperature. The sections were incubated with DAB Detection Kit (Amplifier Polymer) cat. no. TT0803, Fuzhou Maixin Biotechnology Development Co., Ltd)for 30 min and then developed with DAB substrate for 3-5 min. The sections were finally counterstained with hematoxylin at room temperature for 1-2 minutes, dehydrated, cleared and mounted.

On the 8th day post-admission, blood gas analysis showed a pH level of 7.44 (normal reference range, 7.35-7.45) and lactate level of 9.8 mM (normal reference range, 0.4-2.2 mM). Daily fluid intake was 3,000 ml and a daily injection of 125 ml sodium bicarbonate was administered. Fluid replacement and sodium bicarbonate therapy did not

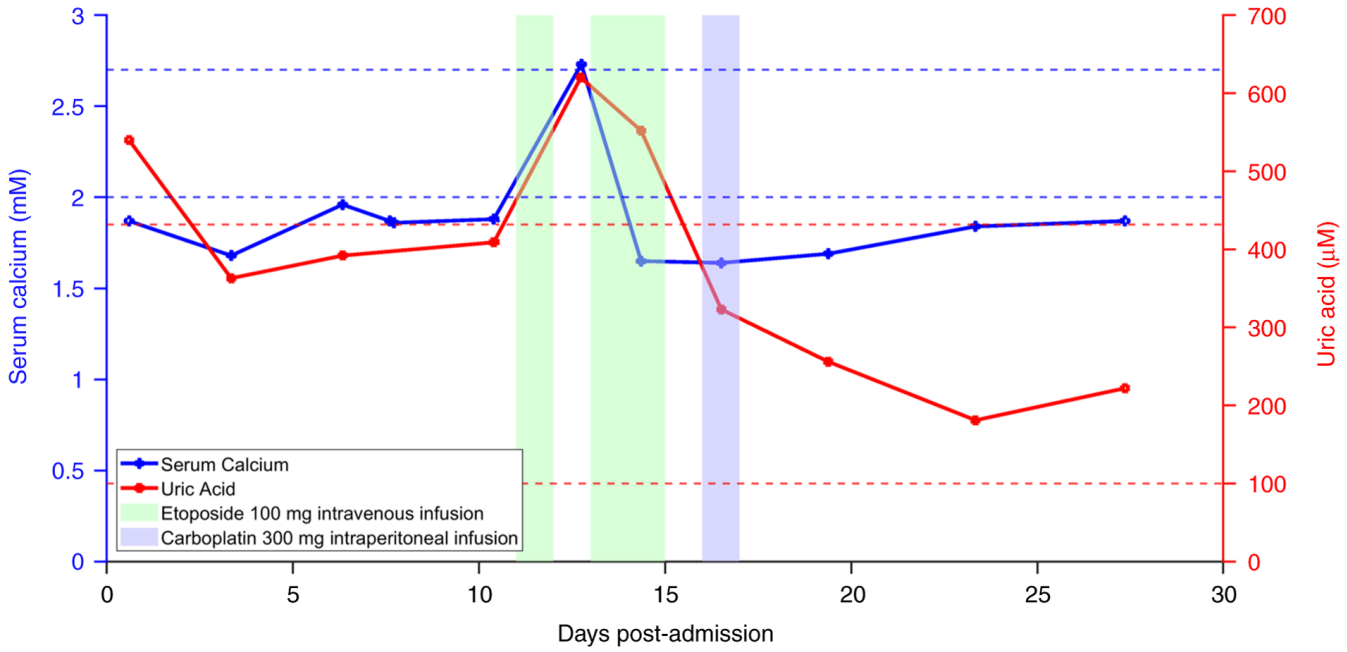


Figure 4. Changes in serum calcium and uric acid. On the 11th day post-admission, chemotherapy with 100 mg etoposide was administered. On the 12th day post-admission, the serum calcium level suddenly increased to 2.73 mM and the uric acid level increased to 620 $\mu$M. Both levels gradually returned to normal on the 14th day post-admission. The serum calcium normal reference range is 2.00-2.70 mM and the uric acid normal reference range is 100-432 $\mu$M. The normal reference range has been marked on the graph as horizontal dashed lines in the same color as the test item line.

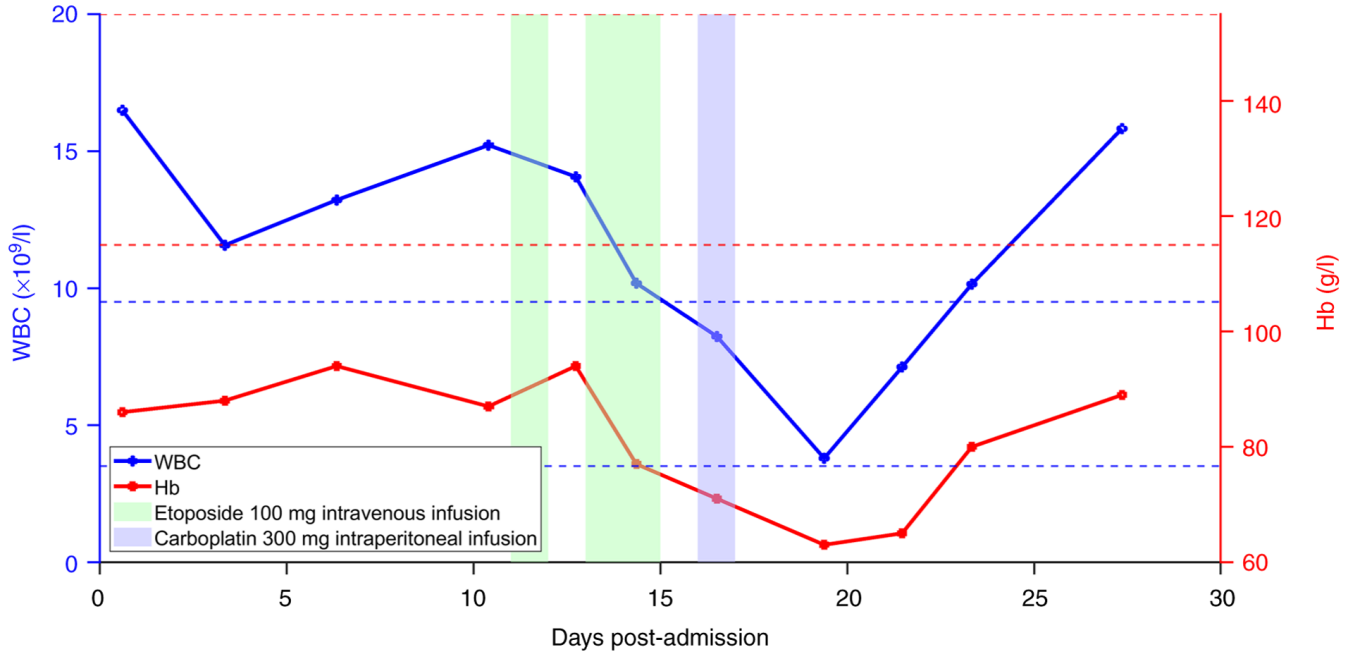


Figure 5. WBC count and Hb level during treatment. The patient's WBC count significantly increased upon admission due to infection and did not decrease significantly after anti-infection treatment. On the 8th day of receiving etoposide chemotherapy, the WBC decreased significantly and rose again after receiving granulocyte colony-stimulating factor (300 mg daily). The patient's hemoglobin significantly decreased on the 8th day after chemotherapy, and rose again after receiving a transfusion of 1.5 units of packed red blood cells. The normal reference range for WBCs is 3.50-9.50x$10^9$/l and the normal reference range for Hb is 115-150 g/l. WBC, white blood cell; Hb, hemoglobin. The normal reference range has been marked on the graph as horizontal dashed lines in the same color as the test item line.

significantly reduce the lactate levels (Fig. 3). The patient's PS score was 4, and despite anti-infection and electrolyte correction therapy, the lactate levels continued to rise, with worsening tachycardia. Given the normal pH, significantly elevated lactate levels and severe metabolic disturbances, type B lactic acidosis secondary to the tumor was considered. According to the literature (1,2), chemotherapy is the only effective treatment for this condition. Solid tumors with type B lactic acidosis are rare and critical conditions. Due to the lack of treatment literature for cervical NECs with

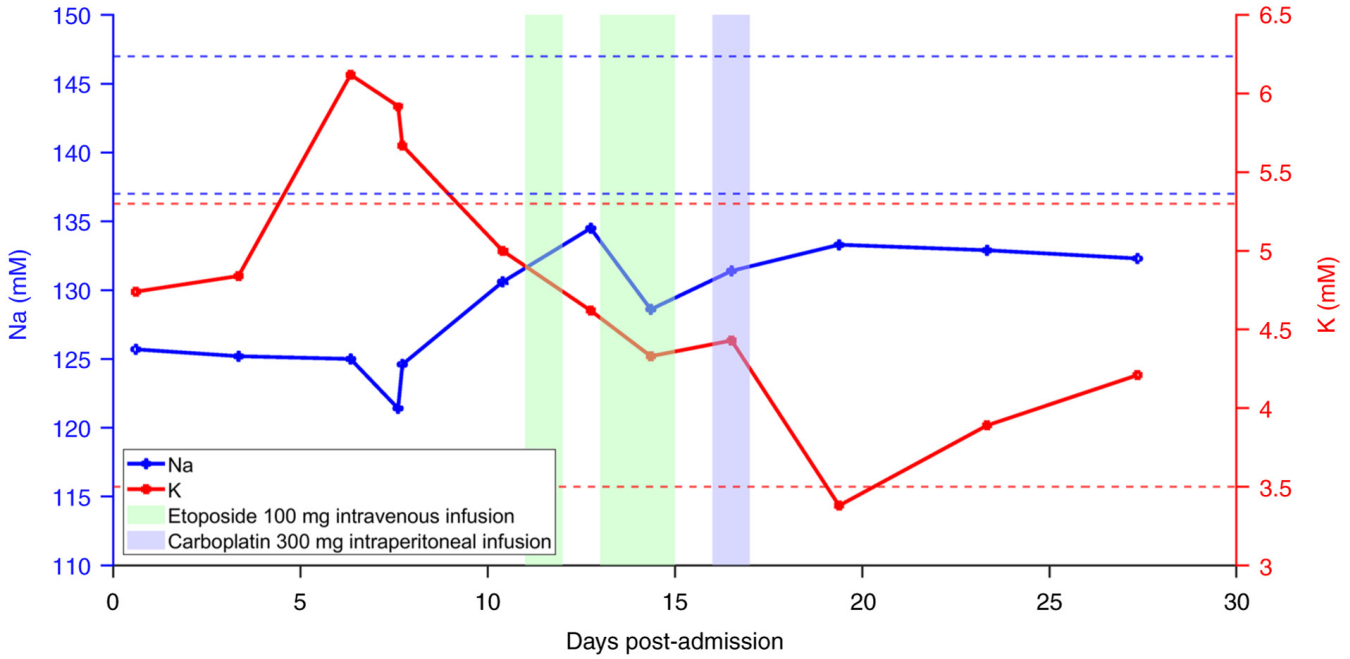


Figure 6. Serum sodium and potassium levels during treatment. The patient presented with hyponatremia upon admission and did not show a significant increase after receiving sodium supplementation therapy. The sodium level returned to normal after chemotherapy. The patient's blood potassium levels were significantly elevated upon admission and showed a slight decrease after fluid replacement and diuretic therapy. After chemotherapy, the levels decreased significantly and rose again after intravenous potassium supplementation. The normal reference range for serum sodium is 137.0-147.0 mM and the normal reference range for serum potassium is 3.50-5.30 mM. Na, sodium; K, potassium. The normal reference range has been marked on the graph as horizontal dashed lines in the same color as the test item line.

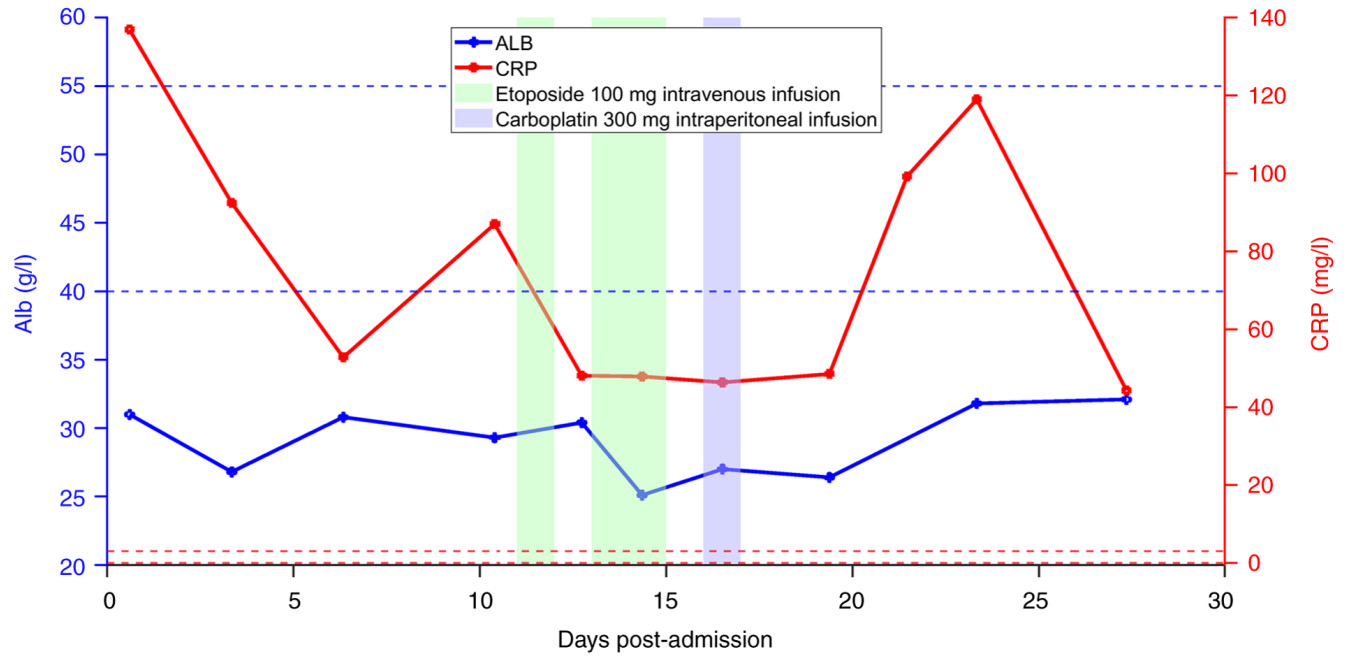


Figure 7. C-reactive protein and albumin levels during treatment. The C-reactive protein level was markedly elevated upon admission, and decreased after anti-infection treatment. the level increased again on the 21th day post-admission, and decreased after receiving cefoperazone-sulbactam sodium treatment. The albumin level did not show a significant increase after receiving 20% human albumin solution for injection by infusion, but showed a noticeable improvement after chemotherapy. The normal reference range for C-reactive protein is 0-3.0 mg/l and the normal reference range for albumin is 40.0-55.0 g/l. CRP, C-reactive protein; Alb, albumin. The normal reference range has been marked on the graph as horizontal dashed lines in the same color as the test item line.

type B lactic acidosis, the chemotherapy treatment method used for lymphoma with type B lactic acidosis was adopted. The specific chemotherapy regimen was referenced from the NCCN Guidelines for Cervical NEC (12) and the Chinese Society of Clinical Oncology (CSCO) Guidelines for Small Cell Lung Cancer (2023) (13).

According to the Guidelines of the CSCO for Small Cell Lung Cancer, for patients with non-tumor-related PS scores

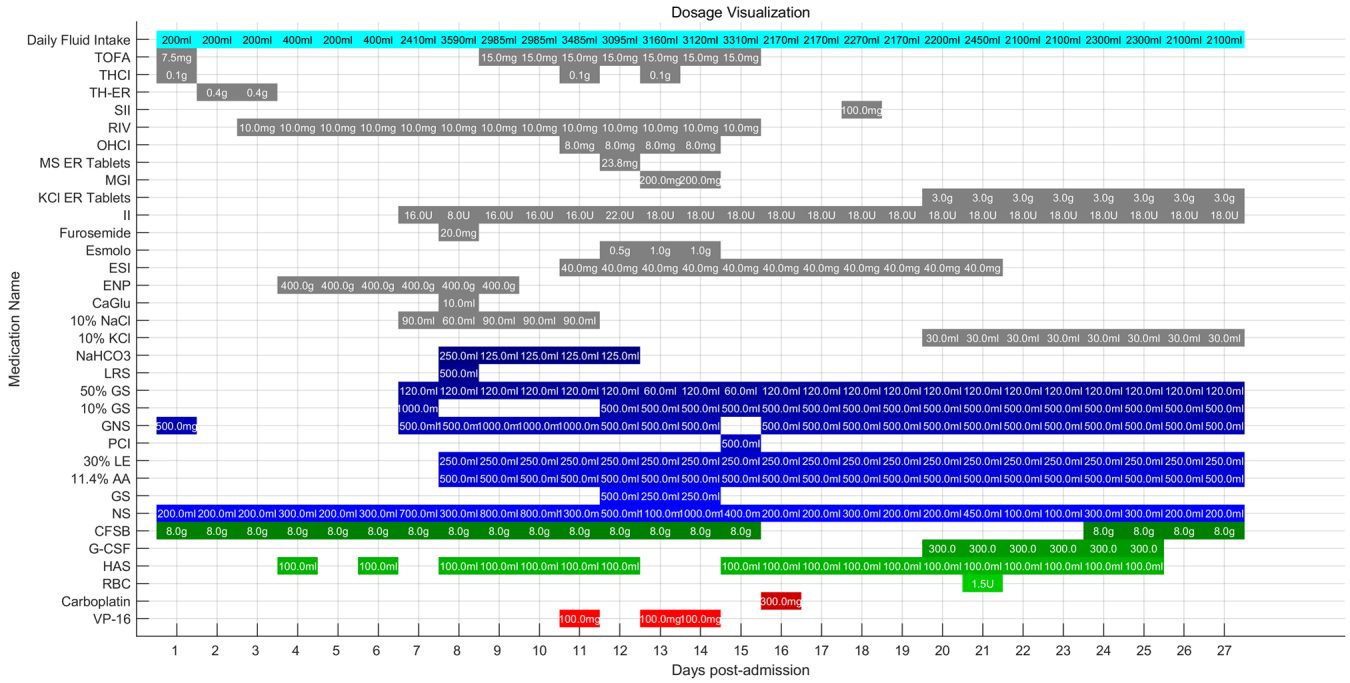


Figure 8. Detailed medication information. CFSB was administered twice a day, TH-ER was administered twice a day, NS and GS were administered multiple times, 10% KCl and 10% NaCl were slowly infused into NS or GS, and the remaining medications were administered once daily. All pharmacological agents and solutions are commonly used in medical treatment and therapy. VP-16, etoposide; RBC, red blood cell suspension; HAS, 20% human albumin solution for injection; G-CSF, granulocyte colony-stimulating factor; CFSB, cefoperazone-sulbactam; NS, 0.9% NaCl injection; GS, 5% glucose injection; 11.4% AA, 11.4% amino acid injection; 30% LE, 30% lipid emulsion injection; PCI, polypeptide collagen injection; GNS, glucose sodium chloride injection; GS, glucose solution for injection; LRS, lactated Ringer's injection; NaHCO3, sodium bicarbonate injection; 10% KCl, 10% potassium chloride injection; 10% NaCl, 10% concentrated sodium chloride solution for injection; Esmolo, esmolo hydrochloride injection; CaGlu, 10% calcium gluconate; ENP, enteral nutrition powder; ESI, esomeprazole sodium for injection; II, insulin injection; KCl ER tablets, potassium chloride extended-release tablets; MGI, magnesium isoglycyrrhizinate injection; MS ER tablets, metoprolol succinate extended-release tablets; OHCI, ondansetron hydrochloride injection; RIV, rivaroxaban; SII, sucrose iron injection; TH-ER, tramadol hydrochloride extended-release tablets; THCI, tramadol hydrochloride injection; TOFA, tofacitinib tablet.

of 3-4, after improvement with symptomatic supportive treatment, if the physical condition improves and the PS score reaches ≥2, treatment can be conducted following the strategy for patients with PS 0-2. Therefore, supportive therapy, including anti-infection, fluid replacement, nutritional support, and correction of electrolyte disturbances, was initially administered. However, following this treatment, the patient's PS score not only failed to improve but deteriorated further. However, considering the rapid tumor progression and risk of further deterioration without chemotherapy, the patient and their family were repeatedly informed about the current condition and the risks associated with chemotherapy. After thorough consideration, they agreed to proceed with salvage chemotherapy. Considering the patient's condition, a reduced-dose chemotherapy regimen was administered. This modified regimen involved one cycle of 100 mg etoposide on days 1, 3 and 4, and 300 mg carboplatin on day 6. On the 11th day post-admission, the patient received chemotherapy. By the next day, the patient's condition had deteriorated, with an ECG showing junctional tachycardia and a heart rate of 167 bpm. On the 12th day post-admission esmolol was administered to control the heart rate,a daily 1 g esmolol hydrochloride injection was infused slowly for controlling the ventricular rate to keep it below 140 bpm for 70 h. An ultrasound also revealed a large right pleural effusion, which was drained. Blood tests showed a lactate level of 11.2 mM, a uric acid level of 620 $\mu$M (normal reference range, 100-432 $\mu$M) and a sudden increased in serum calcium to 2.73 mM (normal reference range, 2.00-2.70 mM) (Fig. 4), suggestive of tumor lysis syndrome (TLS). Fluid replacement and glucose-insulin therapy were administered over a 20-h period, consisting of 3,095 ml of liquid, which included 22 IU of insulin and 160 g of glucose, 125 ml of 5% NaHCO3), 120 ml of 50% glucose solution (GS), 500 ml of 10% GS, 500 ml of glucose sodium chloride, 250 ml 30% lipid emulsion injection (LE), 500 ml of 11.4% amino acid, 500 ml of GS, 500 ml 0.9% sodium chloride injection (NS), and 100 ml of 20% human albumin solution (HAS). Blood potassium levels were monitored during this period. On the 11 and 12th days post-admission, the total fluid intake was 6,850 ml, excluding oral fluid intake.

Intravenous etoposide (0.1 g) administration was continued on the 13th day and the 14th day post-admission. Post-chemotherapy, the lactate levels significantly decreased, the heart rate improved and the general condition of the patient also improved. On the 16th day post-admission, the lactate levels were 2.4 mM and the patient had a PS score of 3. The patient's daily drainage of ascites ranged from 1,600 to 2,600 ml. To further reduce the ascites, 300 mg carboplatin was administered intraperitoneally on day 6. During the course of the disease, the patient developed bilateral lower extremity edema and recurrent hypoalbuminemia, requiring albumin supplementation (intravenous infusion of 100 ml of 20% human albumin daily for a total of 18 days. On the 20th day post-admission, the patient's hemoglobin

(Hb) concentration dropped from a pre-chemotherapy level of 89 g/l to 63 g/l (normal reference range, 115-150 g/l). A total of 1.5 units of red blood cells were administered, which increased the Hb level to 80 g/l, and it later stabilized at 90 g/l (Fig. 5). Leukopenia occurred on the 8th day after the start of chemotherapy. The patient's white blood cell (WBC) count was $3.89x10^9$/l (normal reference range, $3.50\text{-}5.30x10^9$/l), necessitating the administration of 300 mg granulocyte colony-stimulating factor daily for 6 days. The patient's high blood serum potassium level of 5.92 mM (normal reference range, 3.50-5.30 mM) before chemotherapy shifted to a low blood potassium level of 3.38 mM, and potassium supplementation began on the 8th day after chemotherapy (Fig. 6). Due to elevated C-reactive protein levels (Fig. 7), 4 g cefoperazone-sulbactam was administered twice a day for 15 days for anti-infection treatment, which subsequently alleviated the infection. Additionally, the patient experienced poor appetite post-chemotherapy and was provided with intravenous nutritional support; specifically, an 11.4% amino acid injection (250 ml twice a day) and a 30% lipid emulsion injection (250 ml every day). Esomeprazole sodium injection (40 mg) was used for treating chemotherapy-induced nausea and vomiting. As the albumin level was 30.8 g/l (normal reference range, 40.0-55.0 g/l), 20% human albumin solution was injected at 100 ml daily for correcting hypoalbuminemia. On the 19th day post-admission, the lactate levels were 2.2 mmol/l and the amount of ascites was reduced compared with previously. Symptoms such as bilateral lower extremity edema, recurrent hypoalbuminemia, infection and electrolyte imbalances were attributed to the cancer. Adverse effects caused by the therapy included decreased Hb and WBC counts, as well as the poor appetite experienced by the patient. Detailed medication information can be found in Fig. 8.

As the patient condition had improved, they were discharged from hospital on the 28th day post-admission, with a PS score of 2. The daily drainage of ascites had decreased from 2,000-3,000 ml before chemotherapy to 800-1,000 ml at discharge. The patient was discharged home for palliative care treatment, and declined re-hospitalization for chemotherapy. Recurrent abdominal distension was noted 20 days after discharge, and the patient passed away 47 days post-discharge. However, the patient did not receive hospital treatment after the onset of abdominal distension until the time of death, which spanned 27 days, and the specific management measures are unclear. Through communication with the family, it was understood that the patient did not undergo chemotherapy or other treatment but only received symptomatic supportive treatment at home, including pain relief.

## Discussion

Malignancy-associated type B lactic acidosis (MA-LA) is a rare but life-threatening oncological emergency. The exact pathophysiology of MA-LA remains unclear. One prominent hypothesis, known as the Warburg effect, describes a phenomenon in which tumor cells switch their metabolic machinery towards a glycolytic state even in the presence of normal oxygen concentrations, leading to excess lactate production (6,14). The condition of the present patient deteriorated rapidly, with lactate levels rising precipitously. On the 8th day post-admission, 2023, the lactate levels had reached 9.8 mmol/l. Despite symptomatic treatments such as sodium bicarbonate infusion and rehydration, the lactate levels did not decrease, remaining at 8.8 mmol/l 2 days later. This aligns with literature reports that MA-LA is difficult to alleviate with symptomatic treatment alone (4). Effective chemotherapy appears to be the only hope for survival (1). Traditional chemotherapy can be overly aggressive for patients with compromised metabolic states, and the reported success rates for such interventions are generally low (15,16). Cervical NEC is a rare malignancy, accounting for only 0.9-1.5% of all cervical malignancies. Cervical NEC represents a significant challenge in treatment, given the small number of patients and limited clinical experience. Current therapeutic modalities are mainly based on experience in treating small cell NEC of the lung, given the great histological similarities between these two diseases (17). According to the Guidelines of the CSCO for Small Cell Lung Cancer (2023) (13), treatment for patients with PS scores of 3-4 due to the tumor, various factors should be fully considered when selecting a treatment plan, such as chemotherapy (single-agent regimen or reduced combination regimen). For patients with non-tumor-related PS scores of 3-4, after improvement with symptomatic supportive treatment, if physical condition improves and the PS score reaches ≥2, treatment can be conducted following the strategy for patients with PS 0-2. The standard regimen includes carboplatin with an area under the curve (AUC) of 5-6 on day 1, and etoposide at 100 mg/m$^2$ on days 1, 2 and 3. The present patient had a creatinine level of 37 $\mu$M due to malnutrition (normal reference range, 44-133 $\mu$M), a height of 156 cm, a weight of 65 kg and a body surface area of 1.58 m$^2$. Therefore, the standard regimen would require etoposide to be administered at 158 mg on days 1, 2 and 3, and carboplatin to be administered at 594 mg with an AUC of 5 on day 1. The modified regimen actually used involved administering etoposide at 100 mg on days 1, 3 and 4, and carboplatin at 300 mg on day 6, and was thus considered a 'reduced-dose' regimen as per the CSCO guidelines for Small Cell Lung Cancer. Dose-reduced chemotherapy aims to decrease tumor burden and lactate production while minimizing the risk of severe side effects. Although the literature on this approach is limited, there are precedents in oncological practice where dosages are adjusted based on patient tolerance. For instance, certain chemotherapeutic regimens are modified for patients with reduced organ function or those who have experienced significant toxicities from standard doses. Lowering lactate levels and alleviating symptoms can significantly enhance the quality of life and potentially extend survival for patients in acute distress. The immediate stabilization achieved through dose-reduced chemotherapy provides an opportunity for further therapeutic interventions, whether they involve more aggressive chemotherapeutic regimens or supportive care measures. However, considering the present patient's PS score of 4, the risks were significant. After comprehensive evaluation, 100 mg etoposide was administered intravenously on the 11th day post-admission. The patient subsequently developed tachycardia and dyspnea. Blood tests revealed a lactate level of 11.2 mmol/l and a uric acid level of 620 mM, and that the serum calcium level had suddenly increased to 2.73 mM, with

a potassium level of 4.2 mM. TLS is an oncological emergency characterized by severe electrolyte imbalances, typically occurring when patients with hematological malignancies begin systemic chemotherapy (18). Given the patient's high tumor burden and rapid proliferation rate, TLS was considered as the diagnosis. Etoposide treatment was paused, and symptomatic treatments, including hydration, diuresis and potassium restriction were administered, leading to symptom relief (19,20).

On the 12th day post-admission, the lactate levels had dropped to 5.9 mmol/l. Etoposide treatment was resumed over the next 2 days, with lactate levels decreasing to 2.4 mmol/l by the third day. Additionally, carboplatin is typically administered intravenously as part of the standard regimen. However, due to the patient's significant ascites volume, the choice was made to administer an intraperitoneal carboplatin perfusion to enhance the local drug concentration within the ascites and minimize any systemic toxic effects. Following intraperitoneal infusion of 300 mg carboplatin, the lactate levels had further decreased to 2.2 mmol/l on the 19th day post-admission. Throughout the course of treatment, the patient's pH levels remained above 7.35, which differs from literature reports of low pH in similar cases, suggesting that the specific mechanisms warrant further investigation (6,21,22). During the disease course, the patient experienced severe infections, hypoproteinemia, anemia and chemotherapy-induced myelosuppression. Benefiting from previous literature reports (23,24) and our clinical experience, these complications were anticipated, and appropriate treatments were administered promptly. The symptoms of bilateral lower extremity edema, recurrent hypoalbuminemia, infection and electrolyte imbalances were attributed to the cancer. Adverse effects caused by the therapy included decreased Hb and WBC counts, as well as the poor appetite experienced by the patient. This proactive approach allowed the patient to overcome the most critical periods and achieve clinical remission, leading to discharge. The utilization of reduced-dose intravenous etoposide in combination with intraperitoneal carboplatin deviates from standard protocols, providing a novel approach for addressing critical oncological emergencies in patients with a poor PS.

In conclusion, type B lactic acidosis is a rare but fatal complication of malignancy. The condition is typically associated with hematological malignancies and has also been reported in NEC, but to the best of our knowledge, there are no previous reports of its occurrence in cervical NEC. When a patient with advanced cancer presents with severe hyperlactatemia and normal pH levels, malignancy-induced lactic acidosis should be strongly considered. Chemotherapy may be the only effective treatment. The present case demonstrates the administration of a reduced dose of intravenous etoposide and a delayed intraperitoneal infusion of carboplatin, along with proactive management of TLS and other complications, leading to patient remission and discharge. This case highlights the potential efficacy of reduced-dose chemotherapy in critically ill patients with MA-LA, and provides a reference for managing similar oncological emergencies in clinical practice.

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**Availability of data and materials**

The data generated in the present study may be requested from the corresponding author.

**Authors' contributions**

BT, PM, JX and YW were responsible for the research design and data interpretation, the data acquisition, selection and analysis, as well as the clinical interpretation of the data. XS and BT designated the clinical treatment plan for the patient. BT and XS read, revised and approved the final draft. BT and XS confirm the authenticity of all the raw data. All authors have read and approved the final version of the manuscript.

**Ethics approval and consent to participate**

Not applicable.

**Patient consent for publication**

The patient's authorized relative (the patient's son) provided written informed consent allowing for the publication of the patient's data and related images.

**Competing interests**

The authors declare that they have no competing interests.

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