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Intraoperative Cardiac Arrest During Liposuction: A Case Report

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Background: With the popularity of liposuction surgery, more awareness should be obtained regarding complications. Liposuction has been thought of as a safe procedure with a very low incidence of major complications. However, life-threatening risks of liposuction have rarely been reported.
Methods: We present a case of a 36-year-old woman who developed cardiac arrest during a liposuction procedure, and we present a literature review.
Results: She was previously healthy and had no risk factors for pulmonary embolism. The diagnosis was made based on clinical presentation and the presence of an electrolyte disorder and a positive sign on computed tomography pulmonary angiogram (CTPA). Mild hypothermia treatment, symptomatic treatment, and supportive therapy were applied. As the respiratory and circulation were smooth, she was discharged to a rehabilitation hospital. Seven months after discharge, the patient was still in a coma with eye opening.
Conclusions: Spinal anesthesia, pulmonary embolism, and hyperkalemia are the most probable contributors to the cardiac arrest observed during the liposuction procedure in this specific case. There is a heightened imperative to vigilantly monitor for critical incidents during these operations and to meticulously identify associated risk factors during liposuction. *(Plast Reconstr Surg Glob Open 2024; 12:e5619; doi: 10.1097/GOX.0000000000005619; Published online 8 March 2024.)*

INTRODUCTION

Liposuction is one of the most popular aesthetic procedures of this decade worldwide.[1] With the rapid growth in the use of liposuction, its safety and complications are in the spotlight.[2] It has been reported that the overall complication rate is 2.4%, including short-term complications and long-term complications.[3,4] The most common short-term complications were wound infection, hematoma, seroma, edema, ecchymosis, paresthesia, fat embolism, pulmonary embolism (PE), and skin necrosis. Contour deformity, hyperpigmentation, hypertrophic scarring, and lymphedema are common long-term complications.[3] Life-threatening risks of liposuction have rarely been reported. Thirteen publications were found containing the terms "liposuction" and "cardiac arrest." This report describes a severe event during the liposuction procedure.

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CASE REPORT

A 36-year-old woman was hospitalized in a private plastic surgery clinic for abdominal liposuction and breast prosthesis implantation. Her body mass index was 21.09. The patient's clinical history was negative for hypertension, cardiac and vascular disease, cancer, oral contraceptives, and family history of deep vein thrombosis. She had a history of rhinoplasty and no history of drug allergy. The activity level of the patient before surgery was normal. Preoperative examinations, including routine blood tests, hepatic and renal function, blood clotting, and electrocardiogram (ECG), were in the physiological range. Combined spinal-epidural anesthesia was chosen for the operation. Anesthesia was begun at 13:50 PM, and the operation was begun at 14:25 PM. The flank area was treated in the prone position. The suctioning area was accessed through the single midline paraspinous region. 10 mL of 2% lidocaine, 1 mL of 0.1% epinephrine, and 1000 mL of 0.9% sodium chloride were mixed and used as the tumescent fluid. The total volume of tumescent fluid was unclear. One hour and 28 minutes after surgery and just as 600 mL of fat was aspirated, the patient developed a sudden arrhythmia (the type was not recorded),

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hypoxemia, and hypotension. Immediately, the patient was placed in the supine position, and an orotracheal tube was placed after 4 minutes. Then, cardiopulmonary resuscitation (CPR), epinephrine, and defibrillation were given to the patient until successful recovery (ECG: sinus rhythm, BP: 93/61 mm Hg, SpO2: 96%). After basic life support (BLS), the patient was transferred to the emergency department of a teaching hospital. Consciousness could not be recognized because of the use of sedative drugs with unknown dosing. Pupils were narrow, 1 mm in diameter, with slow pupil reaction to light. There was ecchymosis on both sides of the lateral waist (Fig. 1). Cardiac and pulmonary physical examinations were negative. An arterial blood sample while the patient had been receiving low-flow nasal cannula therapy showed the following: pH = 7.39, PCO_2 = 29 mm Hg, PO_2 = 81 mm Hg, BE = −6.4 mmol/L, HCO_3 = 17.6 μmol/L, lactate = 1.8 mmol/L, sodium = 125 mmol/L, and potassium = 5.4 mmol/L. D-Dimer was 0.65 ng/mL [<0.55 μg/mL]; TnT was 96.2 pg/mL [pg/mL]; the venous potassium level was 5.65 mmol/L; and CK, CK-MB, and hepatic and renal function were unremarkable. The reason for the cardiac arrest was still unclear, and the patient was referred to the intensive care unit for supportive treatment. Nine hours after transfer to emergency department, lung computerized tomography (CT) showed embolization of the right upper lobe artery and the right lower lobe artery and right lower lobe infarction (Fig. 2). The brain and abdomen CT were negative (Fig. 3). When hospitalized in the ICU, the patient was still under sedation with invasive ventilator-assisted breathing (FiO_2 = 50%), and circulation was stable without vasoactive drugs. The patient's pupil sizes were 2.5 mm, with slow pupil reaction to light. Her immediate laboratory investigations revealed elevated total leukocyte count, c-reactive protein (CRP), interleukin 6 (IL-6), serum lactate, and D-dimer levels. Her ECG was normal. Transthoracic echocardiography revealed a normal size of the cardiac atrium and ventricle, without an elevated pulmonary artery pressure. Mild hypothermia treatment, dehydration therapy, antiinfection therapy, and anticoagulation were applied within 12 hours after being hospitalized. There was no secondary hypoxemic happening during the ICU admission. The sedative drug was withdrawn after 72 h. One week after CPR, reexamination of the brain CT showed encephaloedema. The Glasgow Coma Scale showed G1VTM2. The muscle tone was markedly increased in both lower limbs, no voluntary movement was observed in any of the four limbs, and both Babinski signs were positive. The neurologist diagnosed the patient with hypoxic-ischemic encephalopathy and suggested continuous dehydration therapy. On the 10th day after CPR, the patient was still comatose (G2VTM4) but had spontaneous breathing. Tracheotomy and cannula oxygen inhalation were applied. Hyperbaric oxygen therapy was applied on the 11th day after CPR. A reexamined brain CT showed that the edema had improved on the 14th day after CPR. Coma with eye-opening and a sleep-wake cycle occurred in the patient. An electroencephalogram (EEG) showed highly abnormal EEG and EEG topography. Several days later, the patient was discharged from the ICU and was transferred to a rehabilitation hospital. At the seven-month follow-up after discharge, the patient was still unconscious, but had a sleep-wake cycle.

Takeaways

Question: Liposuction has been thought of as a safe procedure with a very low incidence of major complications. However, life-threatening risks of liposuction have rarely been reported.

Findings: We present a case of a 36-year-old woman who developed cardiac arrest during a liposuction procedure. The diagnosis has been tentatively determined as pulmonary embolism accompanied by hyperkalemia in the current cases.

Meaning: Given the increasing prevalence of liposuction procedures, there is a heightened imperative to vigilantly monitor for critical incidents during these operations and to meticulously identify associated risk factors.

Fig. 1. A photograph of ecchymosis on the lateral waist.

DISCUSSION

In this case, the patient had sudden cardiac arrest while undergoing liposuction. BLS successfully rescued her life, and the patient was transferred to a comprehensive hospital for advanced life support. Hyperkaliemia, PE/infarction were the main positive clinical findings. There was no evidence of stroke or cardiogenic shock. After mild hypothermia treatment, dehydration therapy, antiinfection therapy, and anticoagulation treatment, coma with eye opening occurred.

Several risk factors for cardiac arrest during a liposuction procedure have been reported before. The causes of death reported after liposuction are lidocaine toxicity, cardiac arrest due to fluid overload, and so on.[5] In the current case, the amount of lidocaine and fluid used was unlikely to cause cardiac arrest. As the author is neither a plastic surgeon nor an anesthesiologist, we refrain from making any recommendations regarding methods of anesthesia

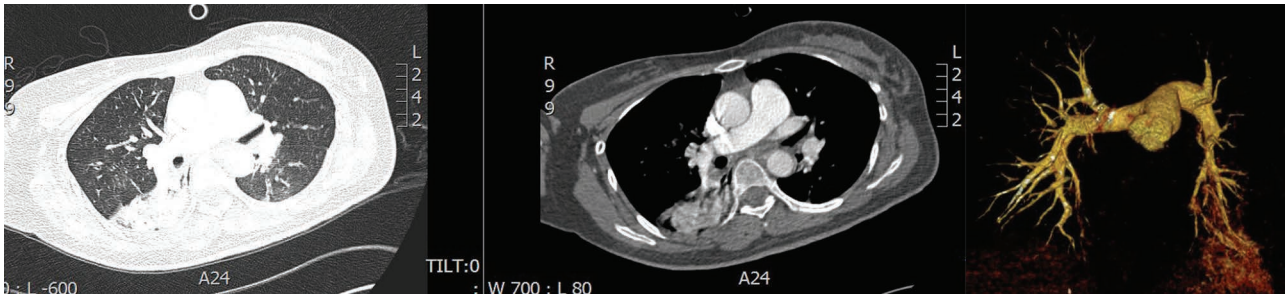

Fig. 2. Graphs that show a CT scan of the chest. The enhanced CT showed embolization of the right lower lobe artery and right lower lobe infection.

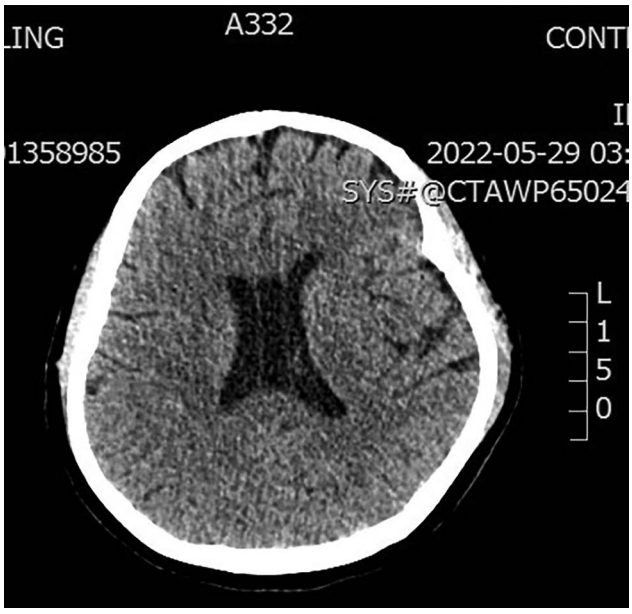

Fig. 3. The brain CT displayed showed no sign of stroke.

during liposuction. The most common severe side effects of spinal anesthesia are hypotension, total spinal anesthesia, neurological injury, spinal hematoma, arachnoiditis, and transient neurological syndrome.[6] In the current case, spinal anesthesia and lack of artificial airway might reduce the success rate of BLS after a cardiac event and contribute to irreversible brain damage.

The major factors contributing to cardiac arrest are 5Hs and 5Ts, including hypovolaemia, hypoxia, hydrogen ion (acidosis), hyper-/hypokalaemia, hypothermia, toxins, cardiac tamponade, tension pneumothorax, coronary thrombosis, and pulmonary thrombosis.[7] There was evidence of several reasons, such as hyperkalemia and PE in this case.[8] Because the content of potassium in fat cells is adequate,[9] potassium is very likely to increase during the liposuction procedure. No publications were found containing the terms "liposuction" and "hyperkalemia" in PubMed or in Chinese medical database. This is the first time that hyperkalemia after liposuction was reported. It is advisable to use arterial blood gas analysis for the monitoring of serum potassium levels during liposuction, if such facilities are available.

The other abnormal clinical event in this patient was PE. The first chest CT of the patient in the emergency department showed embolization of the right upper lobe artery and right lower lobe artery and right lower lobe infarction. The wide opening of veins during liposuction procedure could be responsible for the PE in this case.[10] The patient had no history of deep vein thrombosis, oral contraceptives, or cancer. She was at low risk for thromboembolism preoperatively.[11] Pulmonary fat embolism is a common complication of liposuction and fat grafting.[10] With the increase in the number of patients undergoing aesthetic surgery, liposuction-related fat embolism has gained more attention.[12] Among PE patients whose symptoms onset within 24 hours after liposuction or intraoperatively, 86% required mechanical ventilation, 56% had cardiac arrest events, and 54% died.[10] The volume of aspired fat was not necessarily associated with the incidence of fat embolism.[13] Two different phenotypes are described: microscopic fat embolism (MIFE) and macroscopic fat embolism (MAFE).[14,15] MIFE is a systemic inflammatory procedure caused by fat droplets and fatty acids.[16,17] The significant symptoms are described in the Gurd criteria, including four major criteria and seven minor criteria (Table 1).[13] Going through the reported cases, fever, dyspnea, and consciousness within 3 days were the typical signs of MIFE, and patients with these conditions should be admitted to a hospital immediately.[13] The most common radiology findings were ground-glass opacities and pleural effusions in seven MIFE cases and one MAFE case.[15,17–20] However, there were no significant pleural effusions in this patient during hospitalization. According to research by Durán et al, if severe symptoms begin intraoperatively, MAFE should be considered.[13] MAFE usually does not occur after 24 hours. Taking all medical history into consideration, this patient's diagnosis was most likely MAFE. Highly aggressive hemodynamic support and intensive care unit support using mechanical ventilation were recommended.[13] For those patients who develop sudden cardiac arrest intraoperatively, liposuction should be discontinued, and high-quality BLS should be applied immediately. The patient should be transferred to an appropriate medical center for advanced life support.

For management of PE/PFE, the mainstay of treatment for patients with PE/PFE is supportive management, especially respiratory and hemodynamic support.[10] Infection compromise may follow, including pneumonia

Table 1. Gurd Criteria

Major	Minor
Axillary or subconjunctival petechiae	Tachycardia >110 beats/min
Hypoxemia PaO_2 < 60 mm Hg (FiO_2 = 0.4)	Fever >38.5°C
Central nervous system depression disproportionate to Hypoxemia	Emboli present in the retina on funduscopy
Pulmonary edema	Fat present in urine
	A sudden inexplicable drop in hematocrit, hemoglobin, or platelet values
	Increasing ESR
	Fat globules present in the sputum

ERS, erythrocyte sedimentation rate.

and surgical wound infection. The timing and selection of antibiotics are crucial to these patients. Magnetic resonance or CT imaging of the brain and the torso assist in clinical treatment and evaluate the prognosis, especially in those patients with consciousness impairments. Anticoagulation treatment is suggested to be applied after evaluation in patients with PE/PFE.[21]

Meanwhile, there are other possible factors resulting in cardiac arrest during liposuction. Pinheiro and colleagues reported a cardiac arrest case after epidural anesthesia during liposuction.[22] Twenty minutes after the neuraxial blockade, cardiac arrest occurred. Unlike embolism and hyperkalemia, neuraxial blockade occurs in a short time. The reasons for epidural anesthesia-related cardiac arrest are accidental subarachnoid administration, extensive sympathetic nerve block, myocardial ischemia, and respiratory depression.[23] The diagnosis has been tentatively determined as PE accompanied by hyperkalemia in the current case. The mean limitation of this case is the recall bias of the physicians in private plastic clinics.

CONCLUSIONS

Along with the literature review, awareness of the sudden complications related to liposuction surgery should be reevaluated. Spinal anesthesia, PE/infarction, and hyperkalemia are the most probable contributors to the cardiac arrest observed during the liposuction procedure in this specific case. Given the increasing prevalence of liposuction procedures, there is a heightened imperative to vigilantly monitor for critical incidents during these operations and to meticulously identify associated risk factors.

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DISCLOSURE

The authors have no financial interest to declare in relation to the content of this article.

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ETHICS STATEMENT

This study involving a human participant was reviewed and approved by the Clinical Research Ethics Committee of the Second Xiangya Hospital of Central South University (approval number: 2023-K003). This retrospective case report was exempt from informed consent by the board.

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