

Pseudomonas aeruginosa septicemia causes death following liposuction with allogenic fat transfer and gluteal augmentation

Kornkiat Vongpaisarnsin · Nat Tansrisawad ·
Udomsak Hoonwijit · Teerachote Jongsakul

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Abstract Cosmetic surgery to improve aesthetic and body conditions is becoming increasingly popular worldwide. In 2013, the American Society of Plastic Surgeons (ASPS) reported that one of the top five cosmetic procedures in the US is liposuction with over 200,000 procedures per year. This type of surgery is regarded as a minimal risk operation. Since surgical complications are not often reported, liposuction is usually performed in outpatient clinics. Fatality after cosmetic liposuction surgery is also relatively rare. This case report presents a death following cosmetic liposuction with allogenic fat transfer and gluteal augmentation. The medico-legal autopsy, pathology, and postmortem microbiology examinations reveal that septicemia by *Pseudomonas aeruginosa* was the definite cause of death. Surgical risk assessment and pathogenesis of the organism was reviewed.

Keywords Liposuction · Allogenic fat transfer · Gluteal augmentation · Fatality · Cosmetic surgery · *Pseudomonas aeruginosa* · Sepsis

Introduction

Pseudomonas aeruginosa is a gram-negative bacilli pathogen and is considered a hospital-acquired pathogen that commonly affects immunocompromised patients [1]. It can potentially be involved with other multiple organ systems including respiratory, dermal, bone, and joint systems. This case report

reviews serious complications of undergoing multiple cosmetic surgical procedures in one visit and prolonged surgery time in an outpatient clinic. Septicemia by *P. aeruginosa* was responsible for rapid clinical alteration to death within a few days following surgery.

Case history

A healthy, 32 year-old patient with history of previous cosmetic surgery, male to female sex transformation, visited a private outpatient clinic for additional cosmetic procedures including liposuction, allogenic fat transfer, and bilateral gluteal augmentation with silicone implantation under general anesthesia. Preoperative laboratory tests of complete blood count, blood chemistry, urinalysis, liver function test, prothrombin and thrombin time, electrocardiogram, and chest x-ray were performed and were all within normal range. The patient had no underlying diseases and no allergenic condition was present in past personal and family history. The surgery included three different procedures beginning with liposuction, then allogenic fat transfer and bilateral gluteal augmentation with silicone implantation under general anesthesia. For the first operation, liposuction, a very small cannula was inserted into subcutaneous fat by infused normal saline, and suctioning into a storage bottle was done at chest, back, hip, and thighs with minimal blood loss. The total amount of suctioned fat was 630 ml. Allogenic fat was subcutaneously infused to 363 ml to shape and contour the buttock outline. Subsequently, the bilateral gluteal augmentation with artificial silicone implantation was approached through a paragluteal incision. Total operation time was 9 h and 30 min with approximately 400 ml of total blood loss. The patient was observed at the clinic for 2 days with no fever (36.5–37.2 °C body temperature), and a slight drop in blood pressure (100/60 mmHg) was occasionally detected. All surgical wounds

K. Vongpaisarnsin (✉) · N. Tansrisawad · U. Hoonwijit ·
T. Jongsakul
Kornkiat Vongpaisarnsin, Chulalongkorn University, Bangkok,
Thailand
e-mail: v_kornkiat@yahoo.com

were dressed and well cared for without any signs of infection or inflammation. First generation cephalosporin was given orally every 6 h to treat prophylactically. After 2 days of observation, the patient was discharged with the prescribed oral medication. The patient soon developed a generalized erythematous skin rash on face, back, and both upper extremities. On the third day following the procedure, the patient complained of breathing discomfort and syncope, and was subsequently found dead.

The body underwent a complete forensic autopsy at the Department of Forensic Medicine, Faculty of Medicine, Chulalongkorn University, Bangkok, Thailand. Male gender was recorded as stated on his identity card, while his sexual appearance was female. Upon examination of the body, fixed blood lividity presented at the back, and muscle rigidity was fully developed. An external examination showed skin lesions that manifested on face, neck, chest, abdomen, back, and both upper extremities (Fig. 1). Multiple wounds caused by the liposuction cannula surrounded by contusion were present at the hip, thighs, and buttocks. A 10 cm surgical incisional wound between both buttocks was recorded. The internal examination demonstrated a mild congestion of the brain, heart, spleen, liver, and kidneys. The upper and lower airways were clear without signs of obstruction or anaphylaxis. Lungs showed marked edema and congestion with no thromboembolism in the major trunks of the bilateral pulmonary arteries. Multiple micro abscess-like lesions (0.3–0.5 cm in diameter) were remarked at both the pleural surface of the lungs and at the kidneys. To confirm sex as male, neither uterus nor ovary were identified in the pelvic cavity. An exploration of the paragluteal incisional wound was carefully inspected

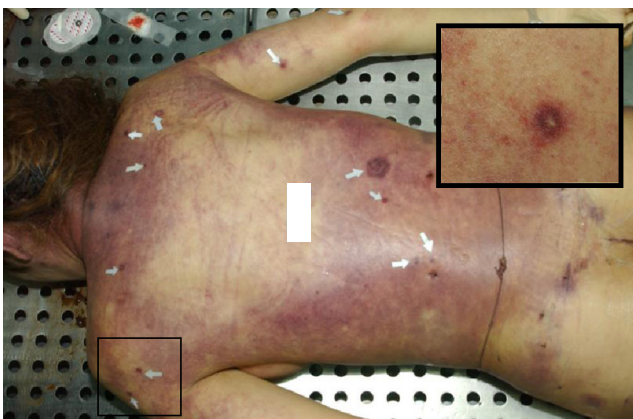


Fig. 1 Multiple discrete papules with central abscess like lesions 0.4–1.5 cm in diameter (white arrows) distributed through face, neck, chest, abdomen, back, and both upper extremities were present 1 day before patient death

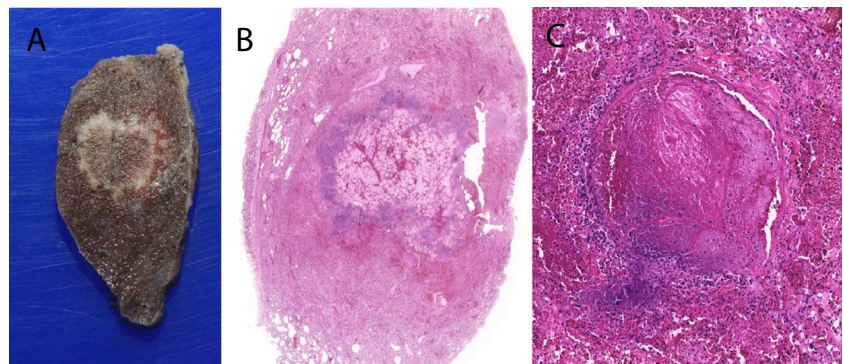
and observed for blood loss or sign of infection. Minimal hemorrhage of the right gluteus maximus muscle was detected with two well-contoured silicone implants (15 cm in diameter), well-positioned in the intramuscular plain of the gluteus. Both calves were explored, and no deep vein thrombosis was detected. Further examination of the remaining internal organs revealed no significant findings of natural disease or injury. Conventional heart blood specimens were collected during the autopsy for further toxicology investigation. Tissue samplings of the spleen, lungs, and peripheral blood were collected for additional tissue and blood cultures. Cut-surfaced lung tissue presented a tan rim lesion 1.5 cm in size (Fig. 2a). The pathological examination of the lungs revealed an abscess formation and perivascular cuffing surrounded with massive fibrous exudates in alveoli (Fig. 2b, 2c). To determine fat embolism, Oil Red O staining was done for brain, lung, and kidney tissues, but showed none. Blood alcohol concentration (BAC) toxicology results were negative. Blood and lung culture examinations revealed heavy growth of *Pseudomonas*.

Discussion

Despite the fact that liposuction surgery claims to be safe with little to no complication, retrospective surveys indicate strong risk factors related to high morbidity and mortality rates. These factors include longer surgery duration, more surgical sites, volume of removed fat, immunosuppressive status, history of smoking, and type of anesthetic used during the procedure [2–5]. To state the risk in this case, the long duration of the entire surgery of 9.5 h, multiple liposuction sites with a large volume of fat removal (630 ml) presents strong indications for postoperative complications. Fat embolism mortality after liposuction is 10–15 % [6, 7]. The report of fat embolism following large volumes of fat removal in combination with operation times of more than 4 h increased the risk of an embolism by nearly 8 % [2]. The tumescent technique with lidocaine is commonly used in liposuction. The maximum recommended lidocaine dose is 35 mg/kg. Anything exceeding this dose can cause anaphylaxis and intoxication [8]. Reviewed literatures have reported major complications and fatality related to this type of cosmetic procedure (Table 1).

The most frequent complication from liposuction is bacterial infection. A report on *P. aeruginosa* infection following liposuction and abdominoplasty with severe complications had been successfully resolved with extensive wound care [9]. The risk of infection is significantly increased in compromised patients. Septicemia with *Pseudomonas spp.* is also reported to be the same in patients with cystic fibrosis. A

Fig. 2 (a) Gross pathology of lung tissue reveals a halo with a tan rim and erythematous patch, all characteristics of acute pneumonia caused by *P. aeruginosa*. (b, c) A histologic view of H&E stains shows abscess formation and perivascular cuffing in lung tissue



previous study reported fatality with different forms of sepsis in five out of 13 patients who developed infections following liposuction [2]. A history of heavy smoking (smoking more than 10 cigarettes/day) has an effect on dermal microvasculature and impairs the wound healing process. There is a heightened risk of nearly 24 % for postoperative infection [18]. The procedure immediately following liposuction, allogenic fat transfer, was carried out with the harvest technique and a centrifuged graft-column in a closed, clean circuit for minimal mechanical damage and viability of adipocytes. This approach was intended to reduce the risk of graft-induced infection; however, the fatality in this case was reported due to breast abscess-induced sepsis after allogenic fat injection from a previous breast augmentation surgery [19].

Table 1 Summary of complication and fatality following liposuction procedure

Complication type and fatality	Descriptions	References
Infection	- Causative pathogens; <i>Aeromonas caviae</i> <i>Bacteroides rheumatic</i> <i>Candida albicans</i> <i>Clostridium perfringens</i> <i>Enterococcus</i> <i>Escherichia coli</i> <i>Mycobacterium chelonae</i> <i>Pseudomonas aeruginosa</i> <i>Staphylococcus aureus</i> <i>Streptococcus pyogenes</i>	[2, 3, 9–15]
Thromboembolism	- Deep vein thrombosis - Arterial embolism with forefoot gangrene - Fat embolism	[2, 8] [2] [6, 7, 16, 17]
Toxicity or drug interactions	- Liposuction with tumescent technique using Lidocaine	[8]
Visceral organ perforation	- Small intestine perforation	[2]

P. aeruginosa is usually found in natural water and rare in treated or drinking water. Its occurrence in drinking water colonizes biofilm in plumbing fixtures [20]. The exact source of infection was unidentified; however, an outbreak of *M. chelonae* infection following liposuction indicated that a contaminated water system could have been a possible source of pathogen transmission [3].

P. aeruginosa causes a wide range of infections, particularly in patients who have been hospitalized for longer than 1 week. The organism induces host cell response by promoting circulating proinflammatory mediators with TNF-alpha, IL-1beta, and IL6. The ability to invade tissues depends upon the production of extracellular enzymes and toxins that break down physical barriers and damage host cells. One of the infected mechanism models is type III secretion system (T3SS) which consists of complex protein molecules forming a needle-like apparatus that manipulates host cell membranes and injects effector proteins; ExoS, ExoT, ExoU, and ExoY. These toxin activities cause a disruption of actin cytoskeleton and apoptosis-like cell death [21].

In conclusion, minor complications from infection after surgery are considered common and usually last for a couple weeks. However, this case presents an abrupt infection resulting in fatality less than 1 week after surgery. There is a heightened risk for infection from virulent organisms; therefore, the host status must be a major area of concern when high-risk patients undergo any type of cosmetic surgery procedure. In patients with a higher risk for *Pseudomonas* infections, a *Pseudomonas*-active perioperative prophylaxis should be given. Although further investigation to prove an actual source of pathogen was not needed, this case offers merit for further examination of the death scenario and investigation of the surgical instruments used to identify unequivocally the true source of the organism related to death for future review and instruction. An audit of hygienic standards and guidelines for handling surgical instruments should be conducted in addition to rigorous surgical staff training to help reduce the risk of infection in future procedures.

Conflict of interest The authors declare that they have no conflict of interest.

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