Internal Medicine
The Japanese Society of Internal Medicine
doi: 10.2169/internalmedicine.9277-17
Intern Med 57: 1479-1481, 2018
http://internmed.jp

【 CASE REPORT 】

A Fatal Case of Super-super Obesity (BMI >80) in a Patient with a Necrotic Soft Tissue Infection

Toshihiko Yoshizawa, Kouhei Ishikawa, Hiroki Nagasawa, Ikuto Takeuchi, Kei Jitsuiki, Kazuhiko Omori, Hiromichi Ohsaka and Youichi Yanagawa

Abstract:
A 35-year-old man (height, 169 cm; body weight, 240 kg; BMI, 84) visited the Department of Dermatology due to left leg pain and swelling. Focused enhanced computed tomography (CT) of the left leg ruled out complications of deep venous thrombosis. Surgical exploration of the left leg resulted in a diagnosis of necrotic soft tissue infection, but amputation was ruled out due to his weight. The patient ultimately died of multiple organ failure on the fourth day of hospitalization. A culture of the surgical material revealed *Streptococcus dysgalactiae*. The present case suggests that super-obese patients should be aggressively treated before lethal complications occur.

Key words: super-super obesity, cellulitis, *Streptococcus dysgalactiae*

(Intern Med 57: 1479-1481, 2018)
(DOI: 10.2169/internalmedicine.9277-17)

Introduction

The World Health Organization Consultation on obesity defines the following body mass index (BMI) categories: underweight (BMI <18.5), normal weight (BMI 18.5-<25), overweight (BMI 25-<30), and obese (BMI ≥30). Obesity is subcategorized into the following grades: grade 1 (BMI 30 to <35), grade 2 (BMI 35 to <40), and grade 3 (BMI ≥40) (http://apps.who.int/bmi/index.jsp?introPage=intro_3.html). Flegal et al. performed a meta-analysis to calculate the hazard ratios (HRs) of all-cause mortality for overweight and obese individuals relative to individuals of normal weight in the general population (1). As a result, obesity (all grades) and grade 2 and 3 obesity were associated with significantly higher all-cause mortality in comparison to normal weight. In addition, being overweight was associated with significantly lower all-cause mortality. Pepper et al. reported the results of a meta-analysis on the correlation between BMI and mortality due to sepsis or septic shock (2), and concluded that being overweight or obese reduced the adjusted mortality rate in adults admitted to intensive-care units with sepsis, severe sepsis, or septic shock. In these two reports, patients with a BMI of ≥40 was classified into a single group. However, categories of malignant obesity, specifically super obesity (BMI ≥50) and super-super obesity (BMI ≥60), have been established (http://medical-dictionary.thefreedictionary.com/Super+Super+Obesity). Of note, super-super obesity tends to be associated with elevated mortality in patients undergoing the duodenal switch procedures (3).

Necrotizing soft tissue infection is a life-threatening condition. Early operative debridement is necessary to restore the appearance of the tissue or to confirm the diagnosis and to reduce mortality among patients (4, 5). We herein report a fatal case of super-super obesity (BMI >80) complicated by a necrotic soft tissue infection.

Case Report

A 35-year-old man (height, 169 cm; weight, 240 kg; BMI, 84) visited the Department of Dermatology due to left leg pain, redness and swelling. Focused enhanced computed tomography (CT) of the left leg ruled out complications of deep venous thrombosis. He was diagnosed with cellulitis

Department of Acute Critical Care Medicine, Shizuoka Hospital, Juntendo University, Japan
Received: April 2, 2017; Accepted: September 19, 2017; Advance Publication by J-STAGE: January 11, 2018
Correspondence to Dr. Youichi Yanagawa, yyanaga@juntendo.ac.jp

Figure. The patient's left leg on arrival. His left leg showed redness, swelling, and tenderness.

and was sent home with a prescription for Cefdinir. The next day, the symptoms of his left leg deteriorated, and he re-visited the Department of Dermatology. A biochemistry analysis of his blood revealed multiple organ dysfunction, so our department was consulted. The patient had a history of recurrent cellulitis, and he had been obese since he was a child. He was employed in home demolition. On a physical examination, he could not stand by himself due to pain. As a stretcher could not accommodate him, a bed was retrieved from a ward; nine people lifted him onto the bed. The side bars on the bed had to be removed in order to accommodate the patient.

On admission, the patient's Glasgow Coma Scale score was 15. A physical examination revealed the following: blood pressure, 174/65 mmHg; heart rate, 108 beats per minute; respiratory rate, 30 breaths per minute; SpO_2, 98% (with 3 L/minute of oxygen using a nasal cannula); and body temperature, 36.7℃. His left leg had redness, swelling, and tenderness (Figure). A venous gas analysis revealed the following: pH, 7.352; PCO_2, 28.8 mmHg; PO_2, 61.7 mmHg; HCO_3^-, 15.5 mmol/L; and lactate, 6.2 mmol/L. An electrocardiogram showed sinus tachycardia. A chest roentgenogram revealed cardiac enlargement. CT could not be performed to detect the focus of the sepsis because the CT equipment could not accommodate the patient.

A biochemical analysis of the blood revealed the following: white blood cell count, 6,800/μL (neutrophil 96%, lymphocyte 2%, monocyte 2%); hemoglobin, 14.0 g/dL; platelet count, 9.0×10^4/μL; C-reactive protein, 12.8 mg/dL; aspartate aminotransferase, 315 IU/L; alanine aminotransferase, 93 IU/L; glucose, 78 mg/dL; blood urea nitrogen, 26.0 mg/dL; creatinine level, 1.34 mg/dL; creatinine phosphokinase, 9,670 IU/L; activated partial thromboplastin time, 38.7 (27.5) s; international normalized ratio of prothrombin time, 1.83; fibrinogen, 261 mg/dL; and fibrinogen degradation product, 21.4 mg/dL. He received a tentative diagnosis of sepsis with multiple organ failure due to a left leg infection.

He was treated with a massive infusion of Ringer's lactate and linezolid and meropenem after tracheal intubation. Surgical exploration of his left leg was performed on the bed because the operating Table could not support the weight of the patient. A diagnosis of necrotic soft tissue infection was made. Left leg amputation was not performed due to the patient's weight. The nurses were unable to reposition the patient. His laboratory findings transiently improved on the second hospital day, but oligouria continued after admission. It was impossible to secure a cannula for renal replacement therapy due to the patient's obesity. The patient ultimately died of multiple organ failure on the fourth hospital day. A culture of the surgical material revealed *Streptococcus dysgalactiae*. Blood culturing was not performed due to the patient's super-obesity.

Discussion

There are many problems associated with the management of patients with a BMI of >80. The present patient could not be easily moved by a few people, and changing his position was very difficult, thus a special lift machine was required for even the most basic of maneuvers. Furthermore, CT could not be performed as the gantry could not accommodate such a large patient. Securing a venous route was very difficult, and some materials did not reach the vascular bed due to the thickness of the patient's subcutaneous fat. The appropriate volume of infusions and drug dosages were also difficult to determine. The administration of 30 mL/kg crystalloid for hypotension or lactate ≥4 mmol/L is recommended for sepsis patients, based on the 2016 Surviving Sepsis Guidelines (6) (30 mL/kg×240 kg=7,200 mL). However, the administration of >5 L of fluid to sepsis patients during the first intensive care unit (ICU) day is associated with a significantly increased risk of death and markedly increased hospital costs (7). The drug dosage determined on a per-kilogram basis easily exceeds the maximum dosage covered by medical insurance. Accordingly, it is very difficult for general hospitals to treat patients with a BMI of >80.

Obesity is prevalent in the United States of America, and bariatric surgery is often performed to improve weight control. Hospitals in which bariatric surgery is performed are equipped with special beds, lifts, and medical equipment designed to accommodate obese patients (8, 9). The 2015 guidelines for the perioperative management of obese surgical patients in England also emphasizes the preparation of special equipment for such patients (10). Accordingly, a special hospital with appropriate equipment and specially trained staff members might be required to treat super-obese patients in Japan. However, even US-based hospitals face a number of challenges when super-obese patients are admitted to the intensive-care unit. One report suggested that, among patients undergoing laparoscopic gastric operations, the rates of postoperative mortality and morbidity in patients with BMI values of >60 are not higher than those of patients with lower BMI values (11). However, there have been no reports concerning the mortality and morbidity rates of patients with BMI values of >80 (super-super-super

obese); this degree of obesity might lead to severe disturbance of the microcirculation disturbance in the fatty tissue, which may be complicated by infection (12, 13). Accordingly, even in hospitals outfitted with special equipment to accommodate super-super obese patients, a fatal outcome might be expected when a patient with a BMI of >80 develops infection. Tatusov et al. reported the case of a patient with a BMI of 115 and obesity hypoventilation syndrome whose hospital course was remarkable (14).

Super obesity is often accompanied by multi-system organ dysfunction, a condition associated with rates of high morbidity and mortality and few treatment options. In addition, standard imaging techniques and procedures are difficult or impossible to apply and often require expert intervention, similar to the present case. Surgical options have been used to treat super-obesity. These result in rapid weight loss, an improvement in the respiratory function, an improved metabolism and decreased inflammation (15). Accordingly, aggressive treatments, including early surgical intervention for super-obese patients, should be recommended before lethal complications occur.

The authors state that they have no Conflict of Interest (COI).

Financial Support

This manuscript received financial support from the Ministry of Education, Culture, Sports, Science and Technology (MEXT)-Supported Program for the Strategic Research Foundation at Private Universities, 2015-2019, concerning [The constitution of a total research system for comprehensive disaster and medical management, corresponding to a wide-scale disaster].

References

1. Flegal KM, Kit BK, Orpana H, Graubard BI. Association of all-cause mortality with overweight and obesity using standard body mass index categories: a systematic review and meta-analysis. JAMA **309**: 71-82, 2013.
2. Pepper DJ, Sun J, Welsh J, et al. Increased body mass index and adjusted mortality in ICU patients with sepsis or septic shock: a systematic review and meta-analysis. Crit Care **20**: 181, 2016.
3. Fazylov RM, Savel RH, Horovitz JH, et al. Association of super-super-obesity and male gender with elevated mortality in patients undergoing the duodenal switch procedure. Obes Surg **15**: 618-623, 2005.
4. Wong CH, Chang HC, Pasupathy S, et al. Necrotizing fasciitis: clinical presentation, microbiology, and determinants of mortality. J Bone Joint Surg Am **85**: 1454-1460, 2003.
5. Rogers AD, Shahrokhi S. Surgical management of necrotizing soft tissue infection. Up To Date. [Internet]. 2017 Feb. 21 [cited 2017 Apr. 1]. Available from: http://www.uptodate.com/contents/surgical-management-of-necrotizing-soft-tissue-infections
6. Dellinger RP, Schorr CA, Levy MM. A users' guide to the 2016 Surviving Sepsis Guidelines. Intensive Care Med **43**: 299-303, 2017.
7. Marik PE, Linde-Zwirble WT, Bittner EA, Sahatjian J, Hansell D. Fluid administration in severe sepsis and septic shock, patterns and outcomes: an analysis of a large national database. Intensive Care Med 2017.
8. Members of the Working Party:, Nightingale CE, Margarson MP, Shearer E, et al; Association of Anaesthetists of Great Britain; Ireland Society for Obesity and Bariatric Anaesthesia. Peri-operative management of the obese surgical patient 2015: Association of Anaesthetists of Great Britain and Ireland Society for Obesity and Bariatric Anaesthesia. Anaesthesia **70**: 859-876, 2015.
9. RudavskyS. Hospitals super-sizing equipment for obese patients. USA today [Internet]. 2013 Jan 21 [cited 2017 Apr. 1]. Available from: http://www.usatoday.com/story/news/nation/2013/01/21/hospitals-doctors-obesity-equipment/1851299/
10. Peterson K, Anderson J, Boundy E, Ferguson L, Erickson K. Rapid evidence review of bariatric surgery in super obesity (BMI $\geq$ 50 kg/m^2). J Gen Intern Med 2017.
11. Kushnir L, Dunnican WJ, Benedetto B, et al. Is BMI greater than 60 kg/m^2 a predictor of higher morbidity after laparoscopic Roux-en-Y gastric bypass? Surg Endosc **24**: 94-97, 2010.
12. Landini L, Honka MJ, Ferrannini E, Nuutila P. Adipose tissue oxygenation in obesity: a matter of cardiovascular risk? Curr Pharm Des **22**: 68-76, 2016.
13. Sorop O, Olver TD, van de Wouw J, et al. The microcirculation: a key player in obesity-associated cardiovascular disease. Cardiovasc Res **113**: 1035-1045, 2017.
14. Tatusov M, Joseph JJ, Cuneo BM. A case report of malignant obesity hypoventilation syndrome: a weighty problem in our ICUs. Respir Med Case Rep **20**: 38-41, 2016.
15. Nightingale CE, Margarson MP, Shearer E, et al.; Members of the Working Party. Peri-operative management of the obese surgical patient 2015: Association of Anaesthetists of Great Britain and Ireland Society for Obesity and Bariatric Anaesthesia. Anaesthesia **70**: 859-876, 2015.