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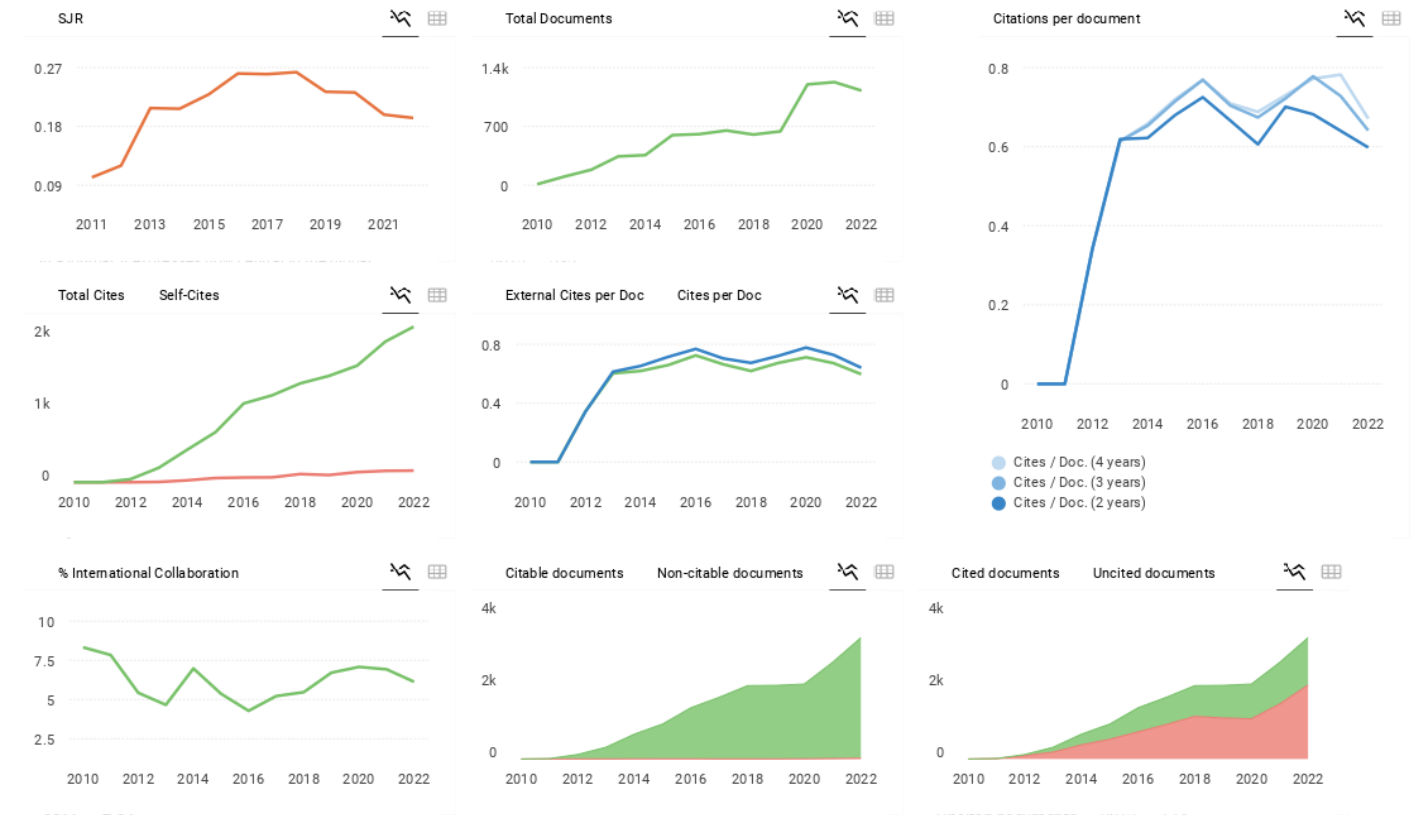
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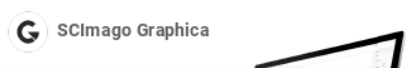
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## Beware of lethal Wernicke's encephalopathy after cytoreductive surgery with HIPEC for peritoneal pseudomyxoma: Case report of morbidity and mortality review

Oumayma Lahnaoui, Nezha EL Bahaoui, Sara El Atiq, Laila Amrani, ... Amine Souadka  
Article 107500

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## Perioperative management of closed fracture subtrochanteric femur sinistra in type 2 diabetes mellitus with multiple comorbid: A case report

Nadya Mutiara Viryani, Soebagijo Adi Soelistijo  
Article 107536

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## Revisiting the clinico-radiological features of an unusual inguino-labial swelling in an adult female

T. Vinoth, Ankit Lalchandani, Swastik Bharadwaj, Bharati Pandya  
Article 107515

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## Non-perforated Stercoral Colitis patients with septic shock have a higher mortality than their perforated counterparts. A case report and review of literature

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## A rare case of delayed splenic rupture following initial negative CT scan imaging: A case report and review of the literature

Margo Carlin, Adel Elkbuli, Piueti Maka, Mark McKenney, Dessy Boneva  
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## Breast Implant-Associated Anaplastic Large Cell Lymphoma (BIA-ALCL) in a young transgender woman: A case report

Marco Materazzo, Gianluca Vanni, Maurizio Rho, Chiara Buonomo, ... Stefano Mori  
Article 107520



## Case report

# Perioperative management of closed fracture subtrochanteric femur sinistra in type 2 diabetes mellitus with multiple comorbid: A case report

Nadya Mutiara Viryani, Soebagijo Adi Soelistijo\*

Department of Internal Medicine, Faculty of Medicine, Universitas Airlangga – Dr. Soetomo General Academic Hospital, Surabaya, Indonesia



## ARTICLE INFO

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## ABSTRACT

**Background:** Perioperative management aims to reduce surgical complications by controlling blood sugar levels and comorbid factors in type 2 diabetes mellitus.

**Case presentation:** An elderly Indonesian female, 60 years old, complained of wounds on the base of both big toes for 3 months, paresthesia, and fever. The patient also had a left femoral close fracture after falling out of bed and feeling pain in the left leg. The patient had a medical history of type 2 diabetes mellitus and hypertension for 15 years. Physical examination revealed hypertension (150/80 mm Hg), pulse rate of 102×/min, fever (38 °C), obesity class III (BMI = 42.6 kg/m<sup>2</sup>, body height = 147 cm, body weight = 92 kg), wound in both *digiti I pedis* (right = 2 × 2 cm, left = 3 × 3 cm), ankle-brachial index (ABI) of 1.03 (right) and 1.07 (left), and lower extremity sensory of gloves shocks paresthesia. Laboratory examination showed an HBA1c of 8.2 %, HBsAg reactive, and a left femoral X-ray showed a subtrochanteric fracture sinistra. Patients delayed surgery for >30 days post-fracture because of increased blood glucose levels and hyponatremia. The patient was successfully verified, and the outcomes were excellent (blood glucose and blood pressure expected).

**Discussion:** Perioperative management of diabetes includes surgical risk assessment, diabetes management pre-intra-post-surgery with blood glucose target levels of 140–180 mg/dL and surgical anticipation.

**Conclusion:** Perioperative management focuses on blood sugar control, insulin dosing accuracy, and managing multiple comorbidities.

## 1. Introduction

Diabetes mellitus is a group of metabolic diseases characterized by chronic hyperglycemia due to abnormalities in insulin secretion and amount, insulin resistance or a combination of both. The prevalence of diabetes mellitus continues to increase worldwide, from 30 million cases in 1985 to 382 million cases in 2013. According to the International Diabetes Federation, it is estimated that 592 million people will have diabetes mellitus by 2035. The mortality rate of diabetes mellitus in 2013 reached 5.1 million deaths, which is 8 % of the total yearly mortality [1,2]. A recent study reported that problems frequently experienced by diabetes mellitus patients with microvascular complications such as retinopathy, neuropathy, and nephropathy [3]. According to other reports, long-term treatment of diabetes mellitus results in a high risk of atypical femoral fracture [4]. However, the practice of perioperative management of femoral fracture patients with diabetes mellitus is challenging, primarily by reducing the risk of post-surgery infection

[5,6]. Based on the description above, we report an Indonesian elderly with type 2 diabetes mellitus and multiple comorbid complicated with femoral fracture. We write based on SCARE 2020 guidelines [7].

## 2. Case presentation

An elderly Indonesian Female, 60 years old, complained of wounds on both big toes for 3 months, paresthesia, and fever. The patient also had a left femoral close fracture after falling out of bed and feeling pain in the left leg. The patient had a medical history of type 2 diabetes mellitus for 15 years and used insulin aspart of 3 × 38 U and insulin detemir of 38 U every night. The patient also had a history of hypertension and consumed amlodipine 10 mg every morning. Physical examination revealed hypertension (150/80 mm Hg), pulse rate of 102×/min, fever (38 °C), obesity class III (BMI = 42.6 kg/m<sup>2</sup>, body height = 147 cm, body weight = 92 kg), wound in both *digiti I pedis* (right = 2 × 2 cm, left = 3 × 3 cm), ankle-brachial index (ABI) of 1.03 (right) and

\* Corresponding author: Soebagijo Adi Soelistijo, Department of Internal Medicine, Faculty of Medicine, Universitas Airlangga – Dr. Soetomo General Academic Hospital, Jl. Mayjend Prof. Dr. Moestopo No. 6-8, Airlangga, Gubeng, Surabaya, East Java, 60286, Indonesia.

E-mail address: [soebagijo1121@gmail.com](mailto:soebagijo1121@gmail.com) (S.A. Soelistijo).

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1.07 (left), and lower extremity sensory of shocking-gloves paresthesia. Laboratory examination showed an HbA1c of 8.2 %, HBsAg reactive, and a left femoral X-ray showed a subtrochanteric fracture sinistra (Fig. 1).

The patient underwent immobilization skin traction with 10 kg weight and planned for ORIF waiting condition stable. The patient received insulin aspart of 18–18–20 U, insulin detemir of 26 U every night, metformin of 500 mg/12 h, acarbose of 50 mg/8 h, pioglitazone of 30 mg/24 h, telmisartan of 80 mg/24 h, and tramadol of 100 mg if needed. On the 9th day, the patient still had hypertension (150/80 mm Hg), blood glucose pre-bed monitoring was 72 mg/dL, and morning fasting blood glucose was 127 mg/dL. The patient then received an adjustment dose for insulin aspart (16–18–14 U), insulin detemir of 28 U every night, no change for oral antidiabetic (OAD), and added anti-hypertension (bisoprolol of 2.5 mg). On the 11th day, the patient has a morning fasting blood glucose of 65 mg/dL and post-prandial blood glucose of 124 mg/dL. The patient received an adjustment dose for insulin again (aspart of 10–18–14 U and detemir of 18 U) and planned for ORIF. On the 17th day, the patient reschedules surgery because of hyponatremia (130 mmol/L) and morning pre-prandial blood glucose of 178 mg/dL. The patient received decreased insulin (aspart decreased 10 U and detemir of 14 U), bisoprolol increased (5 mg), and NaCl 0.9 % of 1000 cc/24 h. On the 22nd day, the patient was stable with a blood pressure of 140/80 mm Hg, morning fasting blood glucose of 82 mg/dL, post prandial blood glucose of 69 mg/dL, and Na of 137 mmol/L. The patient received aspart of 6–6–6 U, detemir 8 U, and OAD dose continuous.

On the 23rd day, the patient's condition was supported for ORIF in the morning with a blood pressure of 147/89 mm Hg, pulse rate of 88×/min, respiratory rate of 20×/min, and an axillary temperature of 36 °C, and fasting blood glucose of 141 mg/dL. The patient was prepared for fasting from midnight, omitting the morning dose of OAD and insulin, and received low-molecular-weight heparin (LMWH) of 40 mg/12 h from the second day of pre-surgical. Successful ORIF procedure in the operating room was obtained [8,9]. On the 4th day post-surgery, the fasting blood glucose patient of 140 mg/dL, and she continue to received insulin aspart of 6–6–6 U, detemir of 8 U, metformin of 500 mg/12 h, acarbose 50 mg/8 h, and pioglitazone 30 mg/24 h, telmisartan 80 mg/

24 h and bisoprolol 5 mg/24 h. The patient is planned to follow up in the internal and surgeon deviation outpatient ward.

### 3. Discussion

The prevalence of abnormal blood sugar levels (hyperglycemia, hypoglycemia, stress-induced hyperglycemia) perioperatively continues to increase, requiring unique management [1,10]. Operational risk assessment is carried out using a standard scoring system, including the ASA, APACHE-II, and POSSUM classification systems. Cardiac (Goldman Cardiac Risk Index) and pulmonary (Pulmonary Complication Risk) scoring systems are also frequently used for specific comorbid factors. The ASA (American Society of Anesthesiologists) classification system evaluates risk factors and underlying diseases that may complicate surgery. This system is widely used because it is easy and is associated with perioperative mortality and morbidity [11,12]. Common surgical complications include hypertension, diabetes mellitus, kidney disease, coronary heart disease, infection, asthma, obesity, and hemodynamic and electrolyte disturbances [12,13].

In diabetes mellitus patients undergoing surgery, uncontrolled glucose levels are a risk factor for diabetic ketoacidosis (DKA), non-ketotic hyperosmolar (HONK), infection, hypoglycemia, seizures, coma and death. Diabetic nephropathy can cause electrolyte disturbances, AKI conditions, and increased insulin sensitivity. However, this is also a risk for perioperative hypotension, arrhythmias, silent angina, gastroparesis, and decubitus ulcers. These conditions lead to higher morbidity and mortality rates in diabetes mellitus patients undergoing surgery. The preoperative and postoperative blood glucose target is 140–180 mg/dL and considers postponing surgery in elective procedures if blood glucose is 300–500 mg/dL, severe dehydration, DKA and HONK [12,13].

Patients with diabetes mellitus are also recommended to evaluate preoperative HbA1C levels to determine whether surgery is better to postpone or proceed. It was stated that HbA1C levels >8.5 % were associated with higher long-term complications and longer duration of treatment because elevated HbA1C values were a sign of poor blood sugar control. Therefore, elective surgery is recommended to be postponed until the HbA1C level is <8.5 % [14,15]. In diabetic patients

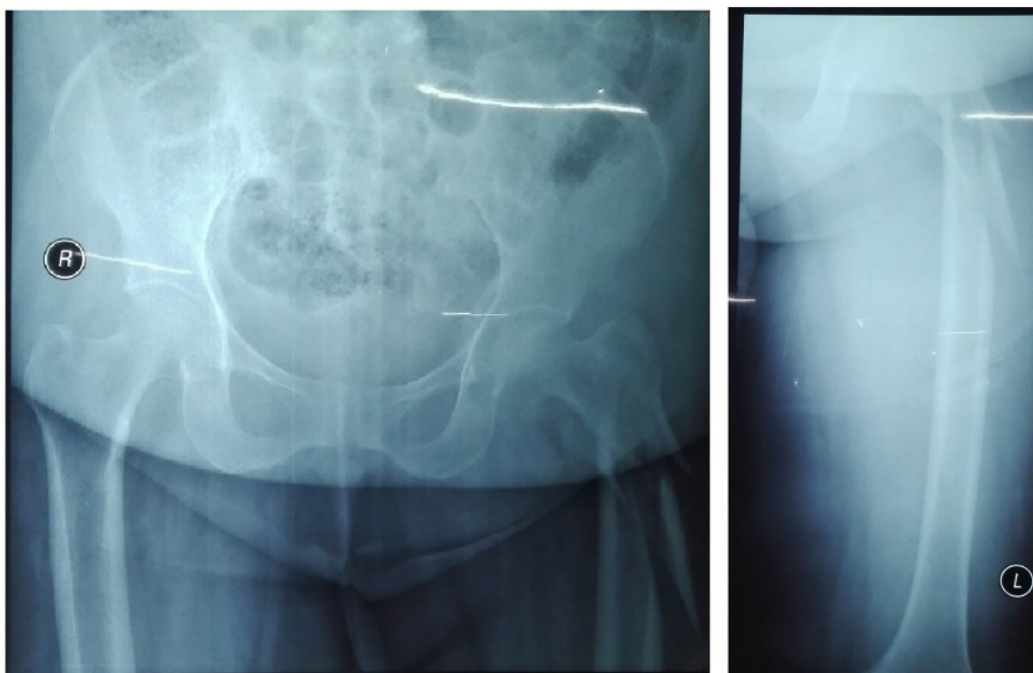


Fig. 1. X-ray showed a comminuted fracture 1/3 proximal OS femur sinistra.

undergoing major surgery and surgery duration >4 h, it is recommended by the ADA and the NHS to have surgery scheduled in the morning. This affects the duration of fasting and the use of insulin infusion. During fasting, adequate glucose infusion aims to prevent hypoglycemia and meet energy needs and severe catabolism. In conditions of extreme stress, more glucose is needed. If additional fluids are required, fluids that do not contain dextrose can be given [16].

The use of diabetic drugs orally is recommended to be carried out on the day before the procedure, and fasting begins at night. Some things that need special attention are the use of biguanides (metformin) and alpha-glucosidase inhibitors (acarbose). In America and Europe, metformin is discontinued before surgery because it can cause complications in kidney function, eventually leading to lactic acidosis. Metformin administration can be continued in procedures that do not use contrast. On the day of surgery, performed in the morning, metformin was still taken according to the hour if it was given once or twice a day, while on metformin three times a day, the afternoon dose was not given. Metformin can be given after the procedure if the eGFR >50 mL/min/1.73<sup>2</sup>. Acarbose is recommended to continue to be consumed, but if it has fasted since the night, then the morning dose is not given. This is because acarbose effectively reduces glucose absorption after meals, so its use is recommended to be continued after the patient has received oral intake [1,16].

The limitation of the case was that we did not consider the use of insulin intravenous in order to make the management of hyperglycemia more effective.

#### 4. Conclusion

Blood glucose control is essential in the operative procedure for diabetes mellitus. Which patient also has hypertension and obesity, which complicate the operation. Perioperative management focuses on blood sugar control, insulin dosing accuracy, and management of multiple comorbidities. Preoperative and postoperative blood glucose levels are within expected.

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All authors contributed toward data analysis, drafting and revising

the paper, gave final approval of the version to be published and agree to be accountable for all aspects of the work.

#### Declaration of competing interest

Nadya Mutiara Viryani and Soebagijo Adi Soelistijo declare that they have no conflict of interest.

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