

# Sepsis after Administering an Intramuscular Iron Injection in the Arm of an Elder Patient with Multiple Comorbidities: A Case Report

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## Abstract

**Background:** Skin reactions and musculoskeletal injuries caused by intramuscular injection are an increased risk for skin and soft tissue infections and may culminate in sepsis. **Objective:** To describe the history of an elderly patient who developed a lesion in her right arm after home administration of intramuscular iron injection in this arm and its outcome. **Methods:** This is a case report of a patient who participated in a study in an intensive care unit. **Results:** This study describes a 65-year-old patient with multiple comorbidities who was admitted to the hospital complaining of pain for two months and difficulty in moving her right shoulder associated with skin and soft tissue infections in her right arm after intramuscular iron administration by a relative for the treatment of multifactorial anemia and refractory melena. The patient worsened her general condition and was transferred to the intensive care unit. Despite the therapy instituted, the patient developed sepsis of cutaneous origin, multiple organ dysfunction, and death. **Conclusions:** The administration of intramuscular medication requires the participation of qualified professionals, such as nurses, mainly within the scope of the Brazilian public health system which commonly comprises patients in a context of vulnerability.

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## Keywords

Critical Care, Education, Continuing, Injectables, Septicemia, Soft Tissue Infections, Suppuration

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## 1. Introduction

Intramuscular (IM) injection is a practical and efficient method of administering pharmacological therapies. However, due to its invasive feature, it can lead to risks and restricted clinical complications—including erythema, edema, cellulitis, infectious abscess, tissue necrosis, nerve palsy and loss of range of motion [1] [2] [3] [4] [5]—besides systemic syndromes, such as bacteremia, sepsis and septic shock syndrome (toxic) [4] [5] [6]. Sepsis is a clinical syndrome characterized by an unregulated inflammatory response to infections, that can advance from an infection and bacteremia to septic shock, multiple organ dysfunction syndrome (MODS) and death [7].

Skin reactions and musculoskeletal injuries due to IM injection [1] represent an increased risk for skin and soft tissue infections (SSTIs) [1] [8]. Hence, the IM administration of medications must be performed by a specialized and trained professional, as a nurse, since it requires specific knowledge for an accurate execution and evaluation of the best site for its application [3]. This study aims to report the case of an elder patient who developed a right arm injury after domiciliar administration of an IM iron injection in the site and its outcome.

## 2. Case Report

The present study is a case report of a patient assisted in an intensive care unit (ICU). The informed consent form was signed by a family member who agreed to take part in the research with the CAEE number: 91988318.6.0000.5336.

A 65-year-old woman, caucasian, was admitted in a brazilian hospital with the complaint of pain and difficulty in moving her right shoulder for two months, concomitant with the progressive evolution of skin injury after domiciliary administration of an IM iron injection at the site for the treatment of anemia. During the examination, the patient presented in reduced right shoulder range of motion, intense pain, edema, warmth and eminent hyperemia in the site, plus discret fluctuation point in the right deltoid region, prompting the hypothesis of infection with foci in the skin lesion. Presented dyspnea on light exertion, associated with weakness and edema of lower limbs and abdomen. Also reported retrosternal chest pain that spreads to the nape of the neck and cervical region, recurrent lower gastrointestinal bleeding (LGIB) and oliguria, which was not associated with dysuria. Physical examination revealed: pulse rate was 79 beats/minute, blood pressure (BP) was 131/55 mmHg, respiratory rate 20 breaths/minute, oxygen saturation was 94%, temperature was 36.5°C and blood glucose value of 381 mg/dL. She had a clinical history of hypothyroidism, type 2 diabetes mellitus

(DM), bilateral diabetic retinopathy, stage IV (receiving renal-replacement therapy) chronic kidney disease, peripheral artery disease, coronary artery disease, heart failure (NYHA Classes II-III), systemic arterial hypertension (SAH) and 12 hospital admissions in the last 2 years due to multifactorial anemia, weakness, LGIB and melena. Having used IM iron injection due to treatment-refractory anemia and melena.

During hospitalization, patient evolved with clinical criteria suggestive of sepsis, such as: reduced level of consciousness (Glasgow score equal to 13), hypotension (BP: 100/60 mmHg), fever and leukocytosis (15.870/ $\mu$ L), associated with a potential infection in consequence of the right arm injury. The wound in the right deltoid region showed necrosis sites and liquefaction, edema, erythema, warmth in the site and purulent secretion, which had negative bacteriological SWAB and GRAM-positive cocci.

After 26 days of hospitalization, she was transferred to an ICU, as a result of low cardiac output during dialysis therapy. Magnetic resonance imaging identified bulky collection in the right arm, with irregular edge, heterogeneous and with presence of gas close to the subcutaneous tissue, measuring 12  $\times$  9.6  $\times$  7cm, she also had edema in the trapezius, subscapularis and deltoid muscles and irregularities in the humeral head. The abscess of the right deltoid site was drained at the bedside with expulsion of 300 ml of dark purulent content, requiring a reintervention in the surgical block after 3 days for new drainage and placement of a penrose drain in the site.

Three days after the procedure, septic shock with foci in the infected right arm injury and extensive right-sided pleural effusion were reported. Hemodialysis was started, due to the presentation of anuria, however, the patient evolved with hypotension. The vasoactive drug was started with a delayed hemodynamic response. In addition to all these complications, the patient developed a pressure injury (PI) stage 2 in the sacral region on the fourth day after the admission in the ICU.

Considering the continuous purulent drainage by the surgical wound, the medical staff wondered about the extent and depth of the injury, whether there was bone involvement and/or necrosis sites spreading systemic inflammatory response syndrome. The suture points were opened to enlarge the drainage. And, despite the use of a wide antibiotic therapy regimen, the patient developed signs of unregulated response to infection. She was presenting metabolic and respiratory alkalosis, with severe and refractory shock, in ceiling effect and high probability of death.

Forty-six days after hospital admission, the patient presented with multiple severe chronic pathologies superimposed on an uncontrolled infectious disease with a resistant focus. She also had recurrent anemia due to digestive bleeding, dependent on high dose vasopressors, congestion and anasarca. She developed MODS and had a low prospect of recovery, with progressive clinical worsening and, considering the severe hemodynamic instability, intolerance to dialysis. The patient was sedated, receiving a high dose of vasopressor and being assisted by

invasive mechanical ventilation. She was pale, with a fever of 38°C, cyanotic and cold extremities, hypoglycemia and anasarca, dying on that day.

### 3. Discussion

The present study focuses on the administration, by a family member, of an IM iron injection in the right arm, which has evolved into a severe case of SSTIs. Withal, it can be mentioned as a confounding factor the difficult management of pre-existing diseases, as: anemia, LGIB, melena, diabetes mellitus, chronic kidney disease and pleural effusion associated with the sepsis. There is consensus in the literature that the presence of multicomorbidities is most prevalent in older people, increases the risk of death and disability, worse the general function and quality of life and increases use of health services, as well as adverse drug events. It's believed that the existence of innumerable uncontrolled comorbidities and the severe infection due to right arm injury contributed to the patient's death outcome [9] [10].

Intramuscular injection administering of pharmacological therapies involves much more than just injecting a certain solution into the muscle mass. It requires the evaluation of the best site and muscle to be selected. Such technique must be performed by a qualified professional, who has knowledge about the fundamental aspects of its execution, as, for example, nursing professionals, in order to avoid undesirable reactions. Furthermore, reports of complications related to IM administration are rare when depth muscles, such as gluteus medius and minimus, are selected [3] [11]. Besides, the indication for application of IM iron injection is obligatorily in the gluteus site, deep, through the "Z" technique. Beyond the injection technique, it should be taken care to aspirate the contents of the ampoule by means of a second needle, reserving the one that comes with the product exclusively for the application, considering that this needle is the appropriate size for reaching the deep IM medication. In clinical practice, the importance of the correct technique of aspiration and application of the medication according to the manufacturer's guidance is observed to avoid unwanted events due to the reflux of the injected liquid and its deposition under the skin and subcutaneous tissue [12].

However, the patient received an IM iron injection in the right arm at home, applied by a family member that was not qualified to do it. Therefore, it is not known whether principles of hygiene and asepsis were used for the preparation and application of the medication, and whether the injection was applied in an appropriate site and depth. Thus, it's notable a vulnerability context, since the patient presented bilateral diabetic retinopathy and difficulty in locomotion, depending on family members for activities of daily living, attending to medical appointments and treatments. According to the family, they were instructed on how to apply IM iron medication and administered the injections at home. The family member reported that there were no professionals from the Public Health System (Sistema Único de Saúde—SUS) available to apply the medication at

home and that the family did not have the financial means to pay a professional to make it. Social, political, structural determinants are important factors that contribute more to health inequities than biological or personal choices. All people deserve access not only to health care, but also to the underlying determinants of good health [13].

The patient was admitted due to the right arm injury, however her entrance at the ICU was 26 days after, as a result of low cardiac output during dialysis therapy. In this context, at the ICU her treatment was directed for the injury, with purulent content drainage, cleaning of the site, dressings and adequacy of antibiotic therapy; nevertheless, despite the care, evolved to an infectious condition on the right arm and sepsis.

Advanced age, immunosuppression, diabetes mellitus, several previous hospitalizations, ICU admission and the right arm injury are important risk factors for the development of sepsis. In this report, it's notable that the patient presented severe hypotension, probably related to the infection, justifying the use of high doses of vasopressors for several days until reaching the therapeutic ceiling. In addition to all these complications, the patient developed a pressure injury (PI) stage 2 in the sacral region on the fourth day after the admission in the ICU. Pressure ulcers are difficult-to-heal wounds that arise as a result of compression generated by a bony prominence or a hard surface on soft tissue for a prolonged period of time. Despite its preventable character, the occurrence of such injuries remains high in hospitalized patients, accounting for a high morbidity rate [14] [15].

The medical literature presents few case reports of severe infection after the administration of IM medication. One of the examples reports a case of a 63-year-old man, in which the computerized tomography showed densification of the gluteal muscles and multiple air bubbles in the psoas muscles associated with an IM injection applied one week earlier for back pain. Despite targeted intravenous antibiotic therapy, he evolved badly, with lumbar dorsal spondylodiscitis, multifocal septic arthritis and abscesses. Even though the patient did not present any identified predisposing factor, he developed severe sepsis, which only reinforces the fact that IM injections, sometimes seen as a trivial procedure, should not be seen as harmless [4].

In other case report, a 47-year-old woman, with history of SAH, went to the emergency service due to nausea, vomiting, dysteric sensation, intense pain and swelling in the left buttock and thigh 24 hours after receiving an IM injection of methylprednisolone to treat pharyngotonsillitis. She had erythema ( $3.5 \times 3$  cm) in the left gluteal site, without edema and fluctuation, nor signs of systemic re-percussion. After twelve hours, fluid therapy and ertapenem was started, improving the hemodynamic condition. Six hours later, the patient presented again hypotension, tachycardia, hyperlactacidemia and hypoglycemia, along with progressive cutaneous involvement on the thigh, so the treatment was changed to meropenem and daptomycin. She was subjected to fasciotomy and necrosecto-

my, and was admitted in the ICU, where the patient presented signs of disseminated intravascular coagulation, kidney failure in need of continuous venous hemofiltration and volume-refractory shock, requiring high doses of norepinephrine. Even with the systemic condition improvement and withdrawal of vasoactive drugs, she had symmetrical peripheral gangrene of hands and feet, requiring distal amputation of the four extremities. Six months later, after complete wound closure and rehabilitation treatment, she was discharged [6]. An 88-years-old man, with history of chronic neck pain of unknown etiology, has been to the emergency service with a chief complaint of pain in the right deltoid muscle injection site, where the patient had received an IM injection of pentazocine 23 hours before in another hospital. On physical examination he has presented hyperventilation, systemic livedo reticularis and epigastric tenderness. The laboratory test results have revealed a high inflammatory state, muscular damage, renal failure, disseminated intravascular coagulopathy (DIC) and respiratory alkalosis. The systemic contrast-enhanced computed tomography (CT) scan showed a duodenal perforation which could be the cause of the patient's symptoms. The systemic livedo reticularis and subcutaneous hemorrhage have worsened. Furthermore, the patient's condition and consciousness have had a rapid deteriorated. Seven hours after arriving at the emergency and 30 hours following the IM injection, the patient went into respiratory arrest and ultimately died [16]. Although the cited reports do not include iron administration, they approach negative outcomes related to the IM injections, such as severe SSTIs, necrosis and sepsis, corroborating with findings presented in this case report.

As an implication for clinical practice, the case reinforces the importance of an effective communication between health professionals and patients. It's essential to properly guide and forward the application of deep IM injection, as the iron medication, that must be performed by a skilled professional, mainly in a context of vulnerability, aiming at patient safety.

The study limitations are related to the methodology, since it is a unique case report and, therefore, have a low level of scientific evidence. Still, case reports can present unusual events on the daily life of the professional and, thus, contribute with fundamental information and knowledge for clinical practice. Furthermore, it can serve as an example for future research, to answer new questions.

#### **4. Conclusion**

This study was presented to provide additional information to clinicians about a case of SSTIs after the application of an IM iron injection by a family member, without technical knowledge, that developed signs of uncontrolled infection. The medical staff added antimicrobials to the ICU treatment, however, the multiple comorbidities along with lack of response to the treatment and sepsis of cutaneous foci lead to treatment ceiling, culminating in MODS and death. The IM administration of medications must be performed by a specialized and

trained professional, as a nurse, since it requires specific knowledge for an accurate execution and evaluation of the best site for its application. Mainly in the SUS service, since several of its users live in a vulnerability context, meaning that they have few financial resources, housing, education, opportunities and a qualified health service.

### Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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