

Saturnism after accident by large caliber firearm: case report

Saturnismo após acidente por arma de fogo de grande calibre: relato de caso

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ABSTRACT

Saturnism is the poisoning that occurs in activities with high occupational exposure to lead (Pb). Although less common, poisoning can occur after incidents with firearm projectiles (FAP). The present study describes a clinical-surgical case of saturnism by FAP accident in a male patient exposed to multiple fragments and blood lead limiting levels. His main complaint in a maxillofacial consultation was “lead in the body”. After several surgeries and controls between 2007 and 2011, the patient had decreased blood lead levels from 44 mcg/dL to 15.6 mcg/dL and improvement in urinary tract infections, depressions, and mood changes. Saturnism should be included in the diagnostic investigation of patients wounded by gunshots. The proper poisoning diagnosis certainly will assist in the appropriate intervention.

Key words: Wounds, Gunshot; Lead Poisoning, Nervous System, Adult; Lead Poisoning.

RESUMO

Saturnismo é a intoxicação que ocorre em atividades ocupacionais com elevada exposição ao chumbo (Pb). Embora seja menos comum, a intoxicação pode ocorrer após incidentes com projétil de arma de fogo (PAF). O presente trabalho descreve um caso clínico-cirúrgico de saturnismo por acidente por PAF em paciente do sexo masculino com exposição a múltiplos fragmentos e níveis limites de chumbo sanguíneo. Sua queixa principal, em consulta bucomaxilofacial, foi “chumbo pelo corpo”. Após várias cirurgias e controles entre 2007 e 2011 o paciente teve diminuição do chumbo sanguíneo de 44 mcg/dL para 15,6 mcg/dL e melhora de quadros de infecção urinária, depressão e variação de humor. O saturnismo deve ser incluído na investigação diagnóstica de pacientes alvejados por arma de fogo. O adequado diagnóstico de intoxicação certamente auxiliará na apropriada intervenção dos casos.

Palavras-chave: Ferimentos por Arma de Fogo; Intoxicação do Sistema Nervoso por Chumbo em Adultos; Intoxicação por Chumbo.

INTRODUCTION

Saturnism is the poisoning by an important exposure to lead (Pb) occurring more commonly in occupational activities. In Brazil, according to NR-7, the Pb Maximum Allowable Index (MAI) in the blood is 60 mcg/dL and the reference value is 40 mcg/dL.¹

Pb is a metal of easy use and low cost, therefore, it is widely used in the automobile and naval industries, production of paints, and mining. Pb exposure can occur through the ingestion of contaminated food and water and by inhalation of particles

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containing lead.² Although less common, a possible cause of poisoning is the retention of lead fragments in the body due to accidents with firearm projectiles (FAP). In this type of poisoning, the bullet fragmentation and its location directly influence lead blood levels. The higher the number of fragments and the closer they are to large joints, the more lead is absorbed by the synovial fluid with reflection in blood levels.³⁻⁴

The most common clinical manifestations of poisoning are:

- gastrointestinal such as abdominal pain, vomiting, and anorexia;
- hematological such as normochromic and normocytic anemia or hypochromic and microcytic anemia;
- neurological such as a headache, anxiety, depression, and irritability;
- kidney failure.

All symptoms are fairly nonspecific and can start several years after the wound with a bullet, which makes the diagnosis of saturnism late, often not even considered.^{2,5} Specific semiological data; however, not always present, is the Burton line. This is defined as a bluish gum that forms due to the combination of lead with hydrogen sulfide released by bacteria in the oral cavity (Pearce, 2007).⁶

In relation to treatment, the use of parenteral chelators (dimercaprol, penicillamine, and calcium disodium EDTA) has been indicated as a successful therapy. However, surgery may be necessary in certain cases related to the retention of projectiles. The choice between the clinical or surgical treatment must be based on a multidisciplinary and individualized evaluation of each patient.³

The present study describes a clinical-surgical case of saturnism by accident with a firearm in a male patient with multiple fragments and lead blood levels at the limits.

DESCRIPTION OF THE CASE

This is male patient, 29 years old, referenced by an ophthalmologist for oral and maxillofacial evaluation in March 2007. He presented as the main complaint: "lead throughout the body". He reported that in August of 2006, he had been shot with a large caliber and long-distance firearm, and one of the projectiles would have torn his right femoral artery requiring immediate inter-

vention. Other projectiles would have been housed throughout his body, at little depth. At the time, he underwent several procedures for the removal of FAP by plastic surgery and hand surgery professionals. The patient evolved with repeated urinary tract infections, headaches, and mood swings and made use of antidepressant medication. No other alterations or diseases were reported in other organs and systems.

The following were clearly observed in the oral physical examination: foreign bodies in the left zygomatic region, externally, and foreign bodies in the region of lower left molars, and in the right mandibular body, internally. Other firearm projectiles were not apparent.

The tests for determination of blood lead levels showed increased values in January of 2007 (44.8 mcg/dL) and March of 2007 (43.5 mcg/dL). Fragments of FAP were evidenced through imaging exams in the chest computed tomography and face sinus's x-ray (Figures 1 and 2).



Figure 1 - Semi-lateral computed tomography of the thorax.

In April of 2007, the patient underwent an oral and maxillofacial surgery. A total of 5 FAPs were removed from the following facial regions (Figure 3):

- left orbit;
- left mandibular molars region (Figure 4);
- anterior nasal and cervical region.

Due to operating difficulties, three cervical FAPs were not removed. The patient presented postoperative infection in the maxillary region closely linked to the nasal region. This region suffered suture dehiscence and was left to heal by second intention under antibiotic therapy treatment. The area healed with no new complications in 15 days.



Figure 2 - FAP in Water X-ray.



Figure 3 - FAP from the face.



Figure 4 - FAP removed from inside the mouth.

In June of 2007 the patient presented lead test revealing values below the limit of 40.0 mcg/dL (exam values = 31.0 mcg/dL), however, he returned in April of 2009 not having attended the proposed follow-ups (Figure 5).

On his return, the patient reported surgeries in upper limbs and a scheduled procedure with an or-

thopedist to assess FAPs in his lower limbs. He was less anxious about the first attendances and reported having fewer headaches. The lead dosing conducted in May of 2009 was 20.8 mcg/dL (Figure 5). He was followed-up for eight months, not manifesting alterations in his clinical condition. In March of 2010, he received a dental implant in the region previously grafted without complications. In May of 2010, the hematological exams of lead showed a result of 15.6 mcg/dL (Figure 5). The patient was clinically and radiologically followed until August of 2011 without alterations in the oral and maxillofacial framework and without mood swings. An evaluation of blood lead levels was requested in July of 2011, however, the patient no longer returned for follow-ups.

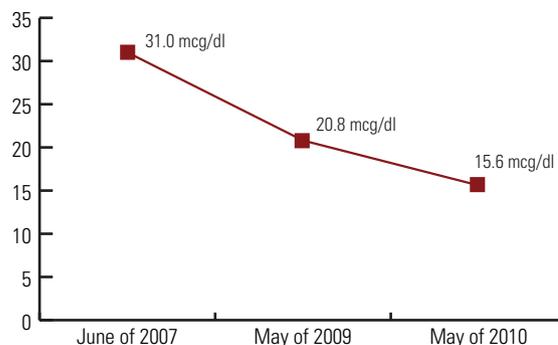


Figure 5 - Pb blood values after surgical procedures to remove FAPs.

DISCUSSION

The firearm injury consists of a source of saturnism, which occurs in an insidious form with late symptoms and the patient may be oligosymptomatic or asymptomatic. A study conducted in 2011, with patients intoxicated by lead through various means of contamination, showed that 64.3% of patients presented a clinical picture of anxiety. Another study conducted in Senegal in 2009 showed about 20.0% of neuropsychiatric symptoms in children and adults intoxicated by lead with the most cited being anxiety, headache, and irritability.^{2,7} These data are consistent with the symptoms observed in the patient described in this clinical case report. No data were found in the literature showing repeated urinary tract infections related to saturnism; this framework might not be related to saturnism. Despite little evident symptoms, the diagnosis of saturnism was considered because the medical history indicated multiple FAPs.

McQuirter et al.⁸, researching 502 victims of accidents by firearms, demonstrated that blood lead concentration increased with time after the lesion, and that patients who had bullet fragments lodged near bones and joints had blood lead levels around 30.0% higher than patients with fragments in other locations. Fragments housed in soft parts have less risk of toxicity due to the formation of pseudo-capsules surrounding the site. Other factors such as age and a greater number of fragments also contribute to increased levels of intoxication. Cavalieri-Costa et al.⁹ reported three cases of accidents by FAP with bullets lodged in the hip joint. In these patients, the blood Pb levels were above 70 mcg/dL. The patient studied in this report was diagnosed with saturnism, showing less exorbitant levels of blood Pb (44.8 mcg/dL) in relation to those reported by Cavalieri-Costa et al.⁹ It is understood that the explanation for the lower dosage of Pb is due to the fact that fragments are in the most superficial and far from large joints sites. Conversely, the patient presented various fragments in the body, which would have allowed more contact with the harmful substance. Thus, the important volume of projectiles culminated into levels close of intoxication. If the patient showed signs of a single and superficial fragment, his tests would have revealed lower levels of Pb.¹⁰ This report explains the good response in postoperative care as for lead control dosages.

Madureira et al.¹¹ described the efficacy of the chelation therapy for the treatment of saturnism in one patient. He remained asymptomatic and with significant levels of lead excretion in the urine after using CaNa₂EDTA. Almeida et al. (2010)¹² also stressed a drop of 26.0% in blood lead levels after the chelation treatment. However, this treatment is a temporary and palliative measure approach to symptoms. The definitive treatment consists of surgery to remove bullets.⁴ The clinical case presented was approached by means of surgical interventions performed by various specialties. Chelation was not considered because the levels of lead in the blood decreased promptly after the removal FAPs.

CONCLUSION

The patient presented a saturnism oligosymptomatic diagnostic that was difficult because of unspecific symptoms. However, the history of an accident with multiple projectiles in the body associated with symptoms allowed suggesting a lead poisoning frame-

work. Hematological examinations and imaging examinations confirmed the diagnostic hypothesis of poisoning. Although with borderline levels of lead, the patient reported intoxication due to numerous fragments in varied topographical locations, which contributed to the increase in Pb levels. Although firearm accidents are not a common cause of saturnism, cases of patients with a history of accidents with FAP should be valued. The early investigation of cases related to firearm accidents is of paramount importance for the correct diagnosis of saturnism and its appropriate clinical-surgical treatment.

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