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CASE REPORT

Mandibular Osteitis Revealing Calcium-Phosphate Imbalance in a Severely Disabled Child: A Case Report

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ABSTRACT

Calcium-phosphate metabolism disturbances are common yet often under-recognized in children with severe disabilities. These imbalances can lead to serious bone disorders, including rickets, osteomalacia, and osteomyelitis. We report the case of a 10-year-old girl with cerebral palsy and epilepsy who developed infectious mandibular osteitis, revealing an underlying calcium-phosphate imbalance. Clinical and laboratory findings showed hypocalcemia, hypophosphatemia, elevated parathyroid hormone levels, and severe vitamin D deficiency—consistent with secondary rickets. The child had been receiving long-term carbamazepine therapy, a medication known to accelerate vitamin D catabolism. A multidisciplinary evaluation involving pediatric neurology, hematology, anesthesia, and maxillofacial surgery was conducted. Before surgery, metabolic abnormalities were corrected and antibiotic treatment initiated. Anesthetic management was tailored to a high-risk airway scenario, with nasotracheal intubation performed using a Boussignac bougie. The surgical procedure included intraoral curettage and selective tooth extractions, without complications. This case illustrates how chronic antiepileptic therapy, nutritional deficiencies, and physical disability can converge to cause severe metabolic and infectious complications. Successful perioperative management requires early recognition, preoperative stabilization, airway preparedness, and individualized anesthetic strategies. A coordinated multidisciplinary approach was essential for achieving a favorable outcome.

Keywords: calcium-phosphate metabolism, osteitis, polyhandicap, pediatrics, antiepileptic drugs, carbamazepine, rickets, multidisciplinary care.

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1. INTRODUCTION

Disruptions in calcium-phosphate metabolism are common but frequently underdiagnosed complications in children with severe disabilities. These disturbances can lead to significant bone pathology, including rickets, osteomalacia, and infectious complications such as osteomyelitis. The prolonged use of enzyme-inducing antiepileptic medications, particularly carbamazepine, further aggravates these metabolic imbalances by accelerating vitamin D catabolism. (1,2) . As a result, affected children often develop hypocalcemia and secondary hyperparathyroidism, increasing their vulnerability to skeletal complications). Despite the clinical importance, these metabolic abnormalities remain under-recognized, delaying appropriate intervention. Effective management requires a multidisciplinary approach focusing on early detection, correction of metabolic derangements, prevention of infectious risks, and coordinated care (4). We present a complex clinical case that illustrates these challenges and emphasizes the need for heightened awareness and comprehensive management strategies in this vulnerable population.

Objectives

To present a complex clinical case of calcium-phosphate dysregulation revealed by mandibular osteitis in a severely disabled child; to identify the risk factors and underlying pathophysiological mechanisms, and to describe the integrated multidisciplinary medical management approach.

2. CASE REPORT

We report the case of a 10-year-old female patient with a history of cerebral palsy and treated epilepsy, referred to our department for management of infectious mandibular osteitis. Follow-up was initially conducted by the Pediatrics Department of the University Hospital of Sidi Bel Abbès. During the pre-anesthetic consultation performed at the Pediatric Anesthesia and Intensive Care Department of the University Hospital Establishment of Oran on November 1, 1954, on May 6, 2025, the following findings were noted:

On clinical examination, the child presented with cerebral palsy, psychomotor delay, and growth retardation (−3 SD in height and −2 SD in weight). There was significant kyphoscoliosis and limited mouth opening (see Figure 1), poor dental hygiene with multiple dental caries and localized alveolar necrosis (see Figure 2), raising concerns of a difficult airway (Mallampati class III) in the event of surgical intervention.

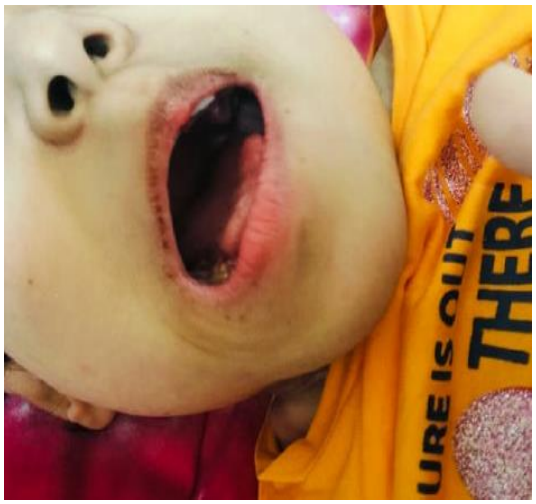

Figure 1. Clinical photograph showing significant kyphoscoliosis and limited mouth opening in a child with cerebral palsy, suggesting a potentially difficult airway.

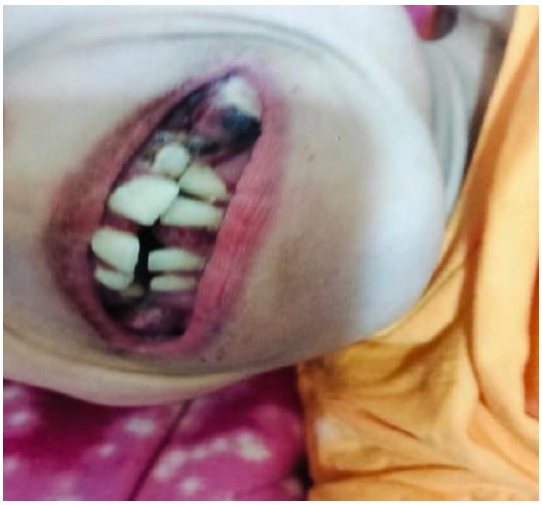

Figure 2. Intraoral view revealing poor dental hygiene, multiple dental caries, and localized alveolar necrosis, consistent with chronic oral infection.

The laboratory evaluation demonstrated hypocalcemia (82 mg/L), hypophosphatemia (21 mg/L), and markedly elevated parathyroid hormone levels (180 ng/L, approximately three times the upper limit of normal). Additionally, microcytic anemia and thrombocytosis (700,000/mm³) were observed. These findings are suggestive of secondary rickets or an underlying chronic metabolic disturbance. Serum vitamin D concentration was significantly reduced at 12 ng/mL. A frontal chest X-ray showed normal lung parenchymal transparency with no active or sequelae-related lesions. A left-convex dorsolumbar scoliosis of 32° (Cobb angle measured between the superior endplate of T8 and the inferior endplate of L5, with apex at L2) was noted (Figure 3).

A sleep electroencephalogram (EEG) demonstrated poorly organized light slow-wave sleep with bifrontal median epileptiform activity without secondary generalization, under treatment with Amitral (7 mg/kg/day) and Carbamazepine (42 mg/kg/day). A dental CT scan of the maxilla and mandible revealed diffuse mandibular osteolysis along the alveolar bone with cortical disruption in places, consistent with infectious osteitis. The patient was receiving a triple antibiotic regimen consisting of ceftriaxone, metronidazole, and gentamicin. An echocardiographic assessment showed situssolitus, good atrioventricular and ventriculoarterial concordance, a left ventricle with preserved systolic function (LVEF 70%), non-dilated left atrium and ascending aorta, a right ventricle with preserved systolic function, a dry pericardium, and a compliant, non-dilated inferior vena cava.

A specialized opinion from the Pediatric Hematology Unit at the EHU of Canastel recommended iron supplementation (Sélfer at 10 mg/kg/day for two months, followed by 5 mg/kg/day for four months), after ferritin level measurement. The introduction of acetylsalicylic acid (Aspégic) was suggested if the platelet count exceeded 1,500,000/mm³ for 7 days . The pediatric neurology team advised continuation of the current antiepileptic therapy.

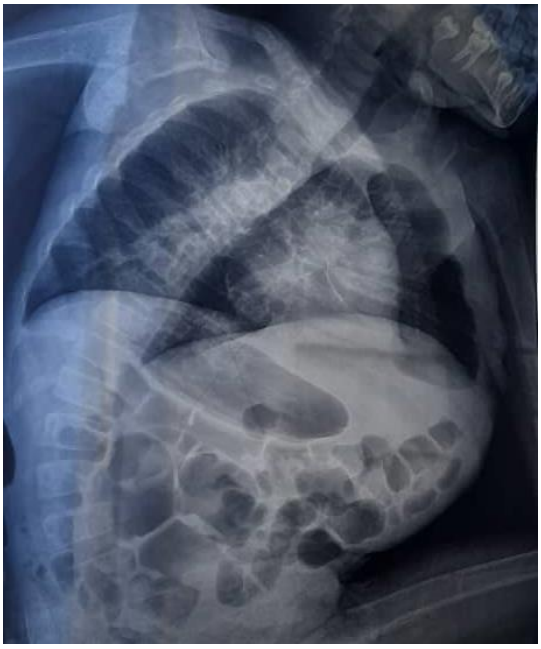

Figure 3. Frontal chest X-ray showing a 32° left-convex dorsolumbar scoliosis (Cobb angle between T8 and L5, apex at L2), without active pulmonary lesions.

Surgical management was temporarily deferred following multidisciplinary consultation with the maxillofacial surgery team. The patient was referred back to the original pediatric department with four specialist consultation reports (neuropediatrics, maxillofacial surgery, hematology, and anesthesia-intensive care) for Continuation of investigations and correction of underlying metabolic disturbances. The intensivist prescribed antibiotics for 15 days:Ceftriaxone 2 g/day**,**Metronidazole 500 mg twice a day**,** as well as**:**Calcium Sandoz supplementation, 500 mg/day orally**,** and Sevelamer 800 mg, three times a day orally**.**

The patient presented for consultation on day 32 following her initial visit. The biological work-up was within normal limits, and the multidisciplinary team meeting decided to proceed with surgery. The following day, after a 6-hour fasting period, the patient was brought to the operating room. Inhalational induction was performed while maintaining spontaneous ventilation, followed by nasotracheal intubation guided by a Boussignac bougie. In anticipation of potential difficult airway managementgiven the lack of pediatric videolaryngoscopeat our disposal and the patient's high risk of difficult intubation (Mallampati class III, limited mouth opening)an ENT specialist was present to perform a tracheostomy if needed.

Once ventilation was secured, intravenous induction was achieved using a bolus of Midazolam (Hypnovel) 0.1 mg/kg, Fentanyl 2 µg/kg, and Propofol 2 mg/kg. These doses were selected to ensure a smooth induction, minimize cardiovascular risks, and avoid excessive respiratory depression. Anesthesia maintenance was provided with Sevoflurane, with continuous monitoring (SpO2, EtCO2 ECG, non-invasive blood pressure, and temperature). Intraoperative monitoring was meticulous, with electrolyte correction administered as needed.

The surgical procedure consisted of curettage of the mandibular osteolytic area, with removal of necrotic bone tissue and infected debris. Extensive surgical irrigation with normal saline was performed. Targeted dental extraction was necessary for two non-vital teeth identified as potential sources of infection. The approach was intraoral to minimize scarring and preserve facial integrity. No organized abscesses were observed. Bone and dental specimens were collected for histopathological examination and microbiological cultures. A passive drain was placed and maintained for 48 hours. The surgery proceeded uneventfully, and no signs of immediate complications were noted. Perioperative antibiotic therapy included intravenous Ceftriaxone (100 mg/kg/day) and Metronidazole (15

mg/kg, three times daily), administered via continuous infusion. This regimen was continued for two days, followed by oral administration for seven days according to the initial protocol. The patient remains on replacement therapy and continues to be followed through a multidisciplinary care approach.

3. DISCUSSION

The anesthetic management of a child with cerebral palsy (CP), presenting with mandibular osteitis revealing underlying calcium-phosphate dysregulation, highlights a complex interplay between chronic medication use, nutritional deficiencies, immobilization, and infection-related complications. Children with CP and severe disability are highly susceptible to vitamin D and calcium deficiencies. This is exacerbated by long-term treatment with enzyme-inducing antiepileptic drugs (AEDs) such as carbamazepine, phenytoin, and phenobarbital, which induce cytochrome P450 enzymes, accelerating hepatic degradation of 25(OH) vitamin D (1).

Rickets, characterized by bone demineralization due to deficiencies in vitamin D, calcium, or phosphate, weakens skeletal structures, including the mandible. Vitamin D deficiency reduces intestinal calcium absorption, promoting osteomalacia and increasing susceptibility to bone infections such as osteitis. Chronic use of carbamazepine, an enzyme-inducing antiepileptic drug, may be contribute to this condition by enhancing hepatic catabolism of vitamin D, thereby worsening the deficiency and increasing the risk of mandibular osteitis in predisposed individuals (5).

Chronic use of carbamazepine, by inducing cytochrome P450 enzymes, accelerates the catabolism of vitamin D, leading to lower serum 25-hydroxyvitamin D levels (6). This reduction impairs intestinal calcium absorption, resulting in chronic hypocalcemia, secondary hyperparathyroidism, and increased bone turnover. The consequent osteomalacia weakens bone architecture, including the mandible, making it more susceptible to infection. Clinical and radiographic evidence correlates chronic AED use, particularly carbamazepine, with decreased bone mineral density and increased fracture and osteomyelitis risk (7). The resulting hypovitaminosis D leads to hypocalcemia, hypophosphatemia, and secondary hyperparathyroidism, increasing the risk of osteomalacia and infectious complications like osteomyelitis (3,8,9).

These children also face reduced sunlight exposure, swallowing disorders, inadequate enteral nutrition, and often lack systematic supplementation (10,11) . Severe kyphoscoliosis, common in CP, impairs ventilation mechanics and poses additional anesthetic challenges. Reactive thrombocytosis in this case was most likely secondary to bone infection. However, persistent or disproportionate thrombocytosis warrants hematologic evaluation to exclude a myeloproliferative disorder (12).

Delaying surgery until metabolic stabilization was a justified decision to ensure anesthetic safety. Airway management in pediatric anesthesia presents a significant challenge, particularly in patients with limited mouth opening, facial asymmetry, or cervical rigidity due to kyphoscoliosis. A thorough airway strategy is crucial and should include access to a videolaryngoscope, a fiberoptic bronchoscope, and surgical airway equipment. Inhalational induction while maintaining spontaneous respiration is generally recommended to preserve respiratory safety. In this case, nasotracheal intubation was successfully performed using laryngoscopy, guided by a Boussignac bougie, without requiring tracheostomy, although a full surgical setup had been prepared in advance. Neuromuscular blocking agents were avoided due to the increased risk of exaggerated responses in the setting of hypocalcemia.

General anesthesia in the context of calcium-phosphate imbalance presents specific hazards: hypocalcemia may cause cardiac conduction abnormalities, reduced myocardial contractility, hemodynamic instability, and altered sensitivity to neuromuscular blocking drugs. Therefore, preoperative correction of metabolic disturbances is essential to reduce intraoperative risks (13). Additionally, antiepileptic drugs (AEDs) significantly affect anesthetic drug metabolism. Enzyme inducers such as carbamazepine reduce the efficacy of benzodiazepines and volatile agents, necessitating dosage adjustments and vigilant monitoring. Conversely, enzyme inhibitors like valproate may potentiate anesthetic effects and increase the risk of intraoperative bleeding.

The anesthetic protocol was selected to ensure smooth induction, minimize cardiovascular risk, and avoid excessive respiratory depression. Midazolam provided effective anxiolytic sedation; fentanyl offered rapid analgesia without prolonged effect; and propofol enabled a stable induction with precise control of anesthetic depth while respecting the neurological fragility of the patient.

4. CONCLUSION

This clinical case highlights the multifaceted interplay between calcium-phosphate imbalance, chronic antiepileptic therapy, bone infectious complications, and anesthetic challenges in a severely disabled child. It reinforces the need for early detection of mineral disturbances in high-risk patients and demonstrates the critical value of a structured multidisciplinary approach, particularly in the anesthetic planning of surgery involving malnutrition and difficult airway management

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Conflict of interest: The authors declare no conflict of interest

Institutional review board statement: The study was carried out at the University Hospital Establishment of Oran—1 November 1954. The infant's anonymity is respected; parents sign consent for all treatment and care on the hospitalization form.

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