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Orthopaedic Manifestations of Scurvy in a 22-month-old Child: A Case Report

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Case Report

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Abstract

Background -

Scurvy is an uncommon but important nutritional deficiency in children, resulting from inadequate vitamin C intake. Mucocutaneous and connective tissue complications are typical. Musculoskeletal manifestations predominate among its presentation. For a resource-limited setting, this highlights the utility of clinicoradiologic findings in diagnosing scurvy.

Case presentation -

We report the case of a 22-month-old female child who presented with a 3-month history of progressive swelling of the right leg, a 1-month history of bleeding gums, and a 3-day history of fast breathing and a sudden inability to bear weight on the right. Complementary feeding had been markedly delayed, and her subsequent diet consisted mainly of maize porridge with minimal fruit and vegetables. Examination revealed pallor, gingival hypertrophy, petechiae, ecchymoses, tenderness and swelling involving the right leg and both wrists. Haemoglobin was 6.8 g/dL, white-cell count 17.4 × 10^9/L, platelet count 670 × 10^9/L and C-reactive protein 9.6 mg/L. Osteomyelitis was initially considered. However, radiographs demonstrated generalised osteopenia, characteristic metaphyseal abnormalities, Pelkan spurs, subperiosteal haemorrhage and associated forearm fractures. Serum ascorbate measurement was unavailable. Clinical scurvy was diagnosed from the markedly restricted diet, mucocutaneous bleeding, anaemia and characteristic radiographic findings. However, she responded to daily administration of vitamin C 300mg for 3 months.

Conclusions -

Scurvy should be considered in young children with restricted diets, mucocutaneous bleeding, anaemia and unexplained musculoskeletal symptoms. Where ascorbate assays are unavailable, a compatible dietary history, characteristic radiographs and response to vitamin C supplementation can provide strong diagnostic support.

Background

Vitamin C deficiency, or scurvy, is a clinical manifestation of prolonged vitamin C (ascorbic acid) deficiency. While often thought of as a historic disease, pediatric scurvy has re-emerged as a modern-day problem, with its incidence more than tripling over 5 years from 8.2 per 100,000 in 2016 to 26.7 per 100,000 in 2020 (1, 2). Patients with scurvy were more likely to be younger, male, in the lowest income quartile, and obese (2).

As a cofactor for prolyl and lysyl hydroxylases, vitamin C stabilizes collagen's triple helix and enables osteoid matrix formation. Deficiency causes mucocutaneous bleeding, epiphyseal fractures, increased bone resorption, and defective osteoblast function (3, 4). Pediatric scurvy is associated with dietary deficiencies in ascorbic acid, malabsorption, and neurodevelopmental conditions that impact dietary selection (5, 6). Due to its role in collagen and connective tissue synthesis, vitamin C deficiency results in defective collagen formation, compromising the structural integrity of blood vessels, bone, cartilage, skin, gingiva, and other connective tissues (3, 7). In the developing skeleton, impaired collagen production interferes with osteoid formation and normal endochondral ossification. Vitamin C deficiency is also associated with increased bone resorption and reduced bone formation, resulting in decreased bone strength and increased susceptibility to microfractures and hemorrhage (8). These mechanisms explain the prominent musculoskeletal manifestations observed in children with scurvy.

Musculoskeletal complications affect about 80% of scurvy cases, starting with nonspecific pain like arthralgias, myalgias, fatigue, and malaise. In children, lower limb pain, refusal to bear weight, limping, pseudoparalysis, and gait disturbances predominate, often mimicking inflammatory arthritis or infection (9, 10). Adults may have muscle hematomas, hemarthrosis, swelling, and weakness, especially in the lower extremities (10). These effects arise from impaired procollagen formation, leading to fragile connective tissues, bones, and muscles (11). These symptoms usually emerge after 3 months of deprivation when body stores have dropped below 300 mg (8).

Radiologically, it may present with characteristic radiographic features such as the Frankel line, Trümmerfeld zone, Wimberger ring sign, Pelkan spurs, pathologic fractures, and subperiosteal hemorrhage. However, these signs may either be missed or overlooked for other conditions such as osteomyelitis, metabolic bone diseases, bone neoplasms, or non-accidental injuries, leading to delayed or missed diagnoses (12). Serum ascorbate assay confirms the diagnosis. However, in its absence, a compelling clinical history coupled with clinicoradiologic findings and improvement with vitamin C supplementation provides strong evidence for diagnosis.

We present a 22-month-old female child with severely restricted dietary vitamin C intake who presented with mucocutaneous bleeding, severe anemia, and typical musculoskeletal findings. It highlights the utility of thorough dietary assessment and recognition of typical clinicoradiographic features in the diagnosis of pediatric scurvy in resource-constrained settings, considering the unavailability of serum ascorbate assays.

Case Presentation

A 22-month-old female child presented to the Pediatric Emergency Unit of Komfo Anokye Teaching Hospital by her mother. She had been experiencing a 3-month history of progressive painless swelling of the right leg but no restriction in ambulation. Mother noticed the swelling during her daily care. A month prior to presentation, mother noticed that the child had been having recurrent episodes of bleeding gums. The mother reported that the child had been seen at a peripheral site where X-rays of the lower

limbs were done and was told by the attending physician that they were normal. She was managed on an outpatient basis with analgesics; however, symptoms recurred after a few hours of relief. Additional significant history includes exclusively breastfeeding for the first year of life without vitamin supplementation. Her main meals over the past 10 months have consisted of maize-based and vitamin C-deficient diets due to family financial constraints.

She presented with a 3-day history of fast breathing and a sudden inability to bear weight. Mother booked at 2months of gestation, attended scheduled antenatal visits regularly, and delivered at term via caesarean section on account of fetal distress. Child's birth weight was 2.7kg. Significantly, the child was noticed to be jaundiced after day 2 of life and resolved after about 3days with increased breastfeeding. At presentation, she was up to date with immunizations and had no issues with developmental milestones, except for her refusal to walk after taking her first steps. She lived with both parents; her mother, a teacher, and her father was unemployed. On examination, she was irritable, pale, and tachypneic, with a respiratory rate of 40 cycles per minute and saturating at 95% on room air. Her heart rate was 140 beats per minute, temperature 37.2°C, and weight 11 kg (weight-for-age 0 - +2). She had multiple petechiae and ecchymoses on the lower limbs, perifollicular hemorrhages on the legs and arms, and swollen, bleeding gums with gingival hypertrophy. She refused to ambulate due to a tender diffuse circumferential swelling in middle third of the right leg. The right leg was held immobile with the knee flexed and leg externally rotated. She also had bilateral tender wrists with diffuse swelling. No hepatosplenomegaly or lymphadenopathy was noted. Neurological exam was unremarkable.

Initial impression was an acute hematogenous osteomyelitis of the right tibia, while entertaining leukemia and non-accidental injury as differentials. However, initial laboratory investigations revealed hemoglobin of 6.8 g/dL, HB electrophoresis – AF, white blood cell count of 17.4 × 10^9/L, platelet count of 670 × 10^9/L, normal renal function test, and serum C-reactive protein at 9.6 mg/L(Normal: 0–10), not suggestive of infection. An x-ray of the right tibia done showed a characteristic white line of Frankel with a radiolucent band beneath it (Trümmerfeld zone), midshaft tibial periosteal elevation (subperiosteal haemorrhage), and Pelkan spurs at the metaphyses, consistent with scurvy (Fig. 1). Also noted in the upper extremity radiographs were bilateral distal ulna transverse fractures (Fig. 2). A clinical diagnosis of vitamin C deficiency (scurvy) was made, and the child was admitted for intravenous fluids, blood transfusion, analgesia and oral vitamin C supplementation at 100mg tds x 3 months. Serum vitamin C assay could not be done due to unavailability of laboratories capable of running it.

She was noticed to have progressive improvement in the right leg swelling while on the vitamin C supplementation. She was discharged home after 2 weeks to continue complementary meal plan desgined by the nutritionists. She reported for review 3 weeks post-discharge, at which point she could ambulate without pain. She had complete resolution of the leg swelling.

Discussion and Conclusions

The present case illustrates the characteristic musculoskeletal presentation of pediatric scurvy in a 22-month-old child with a markedly restricted diet. The clinical combination of anemia, gingival bleeding, cutaneous hemorrhagic manifestations on the background of a compatible dietary history, and pathognomonic radiographic abnormalities supported the clinical diagnosis even without biochemical confirmation with serum ascorbate levels.

The musculoskeletal manifestations of scurvy are particularly important in children because they may constitute the initial or dominant presentation. Reported manifestations include limb pain, arthralgia, myalgia, tenderness, swelling, subperiosteal hemorrhage, hemarthrosis, pathological or insufficiency fractures, epiphyseal separation, limp, and refusal to walk or bear weight (8, 9). In a retrospective review of 28 children with scurvy, 96% presented with limping or inability to walk and 86% had tenderness of the lower limbs (13). Similarly, a review of pediatric orthopaedic cases identified refusal to bear weight as the most common orthopaedic presentation, as was seen in our patient (10). The refusal to bear weight in the present child is therefore highly consistent with the recognized musculoskeletal phenotype of pediatric scurvy (8, 14). The absence of joint effusions in our patient, despite marked limb tenderness and inability to bear weight, further supports a periosteal or osseous rather than primary inflammatory joint process. The bilateral tender wrist swelling may similarly reflect pathological fractures, hemorrhagic and connective-tissue manifestations of vitamin C deficiency rather than septic or inflammatory arthritis.

The principal predisposing factor in this child was inadequate dietary diversity. Complementary feeding was substantially delayed, and the subsequent diet consisted predominantly of maize-based porridge with minimal fruit and vegetable intake, reportedly influenced by financial constraints. This represents a prolonged period of inadequate dietary vitamin C intake at an age correpsonding to rapid skeletal growth. Pediatric scurvy has repeatedly been associated with restrictive diets and inadequate fruit and vegetable intake (5, 13). This case also demonstrates why dietary assessment should extend beyond estimates of caloric intake or body weight. Nutritional risk may be overlooked when evaluating children with musculoskeletal symptoms, particularly when the child does not have obvious signs of malnutrition or underlying neurological and or developmental disorders, as was evident in our patient.

A recent narrative review of pediatric scurvy found that the most frequently reported radiographic abnormalities were the Frankel line, Wimberger ring sign, osteopenia, Pelkan spurs, and the Trümmerfeld zone (5). These abnormalities reflect the underlying disturbances in bone formation and mineralization caused by vitamin C deficiency. These were all present in both knee radiographs of our patient. On the radius ulnar radiogrpah there were transverse distal ulna fractures. The radiographic abnormalities may be particularly valuable in young children because they can provide an important diagnostic clue when the clinical presentation is nonspecific. In the present case, the identification of the above features substantially strengthened the clinical suspicion of scurvy. Nevertheless, no single radiographic sign should be described as pathognomonic. These abnormalities may be subtle, initially absent or overlooked, particularly when the images are interpreted without knowledge of the dietary and mucocutaneous findings (12, 15). This may explain why the radiographs obtained during the child's earlier peripheral evaluation were reportedly normal.

Although radiographs are usually sufficient to identify characteristic skeletal changes, advanced imaging may be necessary when the presentation mimics infection, inflammatory bone disease, or malignancy. MRI can demonstrate subperiosteal hematomas, bone marrow abnormalities, periosteal reaction, and soft-tissue edema (16). These findings can overlap with osteomyelitis, chronic recurrent multifocal osteomyelitis, leukemia, and other infiltrative or inflammatory conditions. Consequently, recognizing the characteristic radiographic changes and correlating them with dietary and clinical findings can help prevent unnecessary invasive investigations (5, 16). In our patient, an MRI was not requested due to the financial implications. Also, the clinical suspicion of scurvy was significantly high from the clinical presentation and key radiologic findings.

The hematological findings in this case also deserve consideration. The child had severe anemia with a hemoglobin concentration of 6.8 g/dL. Anemia is frequently reported in pediatric scurvy and may result from several interacting mechanisms, including dietary deficiency, chronic blood loss, and impaired iron absorption. Vitamin C facilitates intestinal absorption of non-heme iron, and its deficiency may therefore contribute to iron deficiency and anemia (8). In addition, bleeding from fragile capillaries and tissues may contribute to blood loss. The severe anemia in this child may therefore have compounded her generalized weakness and reduced mobility.

Measurement of plasma or serum ascorbic acid is considered the laboratory standard for confirmation when available, although clinical and radiological findings may be sufficiently characteristic to strongly support the diagnosis (5). A response to vitamin C supplementation provides additional therapeutic confirmation. In this case, the diagnosis was followed by treatment with oral vitamin C at 300 mg/day, together with nutritional support and dietary counseling. High-dose vitamin C (e.g.,150 mg twice daily initially) resolves pain, swelling, and gait issues within weeks, with radiographic healing of fractures and osteopenia. Supplementation boosts collagen synthesis and muscle recovery, preventing osteoporosis risk. Early diagnosis via dietary history avoids misdiagnosis as rheumatologic or neoplastic conditions (17). Similar pediatric case reports have described rapid improvement in pain, mobility, gingival abnormalities, and general clinical condition following vitamin C replacement (13, 14, 18–21). The apparent increase in reported pediatric scurvy in recent years further emphasizes the continuing relevance of this condition (2). Although these figures represent hospitalized children and should not be interpreted as population-wide incidence, they suggest that scurvy remains clinically relevant in contemporary pediatric practice. The reasons for increased recognition are likely multifactorial and include restrictive dietary patterns, food insecurity, selective eating, and greater clinical awareness (2, 5).

This report has several limitations. Serum ascorbate measurement was unavailable, preventing biochemical confirmation. The investigation of the severe anaemia and possible coexisting micronutrient deficiencies was incomplete. Nevertheless, the concordant dietary history, mucocutaneous haemorrhagic findings, characteristic radiographic abnormalities and improvement after vitamin C supplementation strongly supported the diagnosis. This case underscores the importance of careful dietary assessment and early recognition of scurvy in young children with otherwise unexplained musculoskeletal symptoms, particularly where access to specialised biochemical

testing is limited. It also highlights the need to consider scurvy in the differential diagnosis of a child with unexplained limb pain, tenderness, limp, or refusal to bear weight, particularly when gingival bleeding, bruising, petechiae, anemia, or poor nutritional intake accompany these symptoms. Careful review of plain radiographs for characteristic metaphyseal and epiphyseal abnormalities may provide a relatively rapid and non-invasive route to diagnosis. Finally, early recognition is important because scurvy is readily treatable and clinical improvement can occur rapidly after vitamin C replacement.

Declarations

Ethics approval and consent to participate

Informed consent was obtained from the mother who was the guardian of the patient. Ethical approval was not required for publication due to local institutional protocol.

Consent for publication declaration

Written informed consent for publication of this case report was obtained from the patient's mother/guardian. A copy of the consent form is available to the editor of this journal on request.

Availability of data and materials

All data generated or analysed during this study are included in this published article.

Competing interests

The authors declare that they have no competing interests.

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Authors' contributions

IMK Ahorklo – conceptualisation, manuscript writing, editing. NAM Nimoh-Brema – manuscript writing, photography. SG Brenu – manuscript writing, proofreading. All authors read and approved the final manuscript.

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Figures

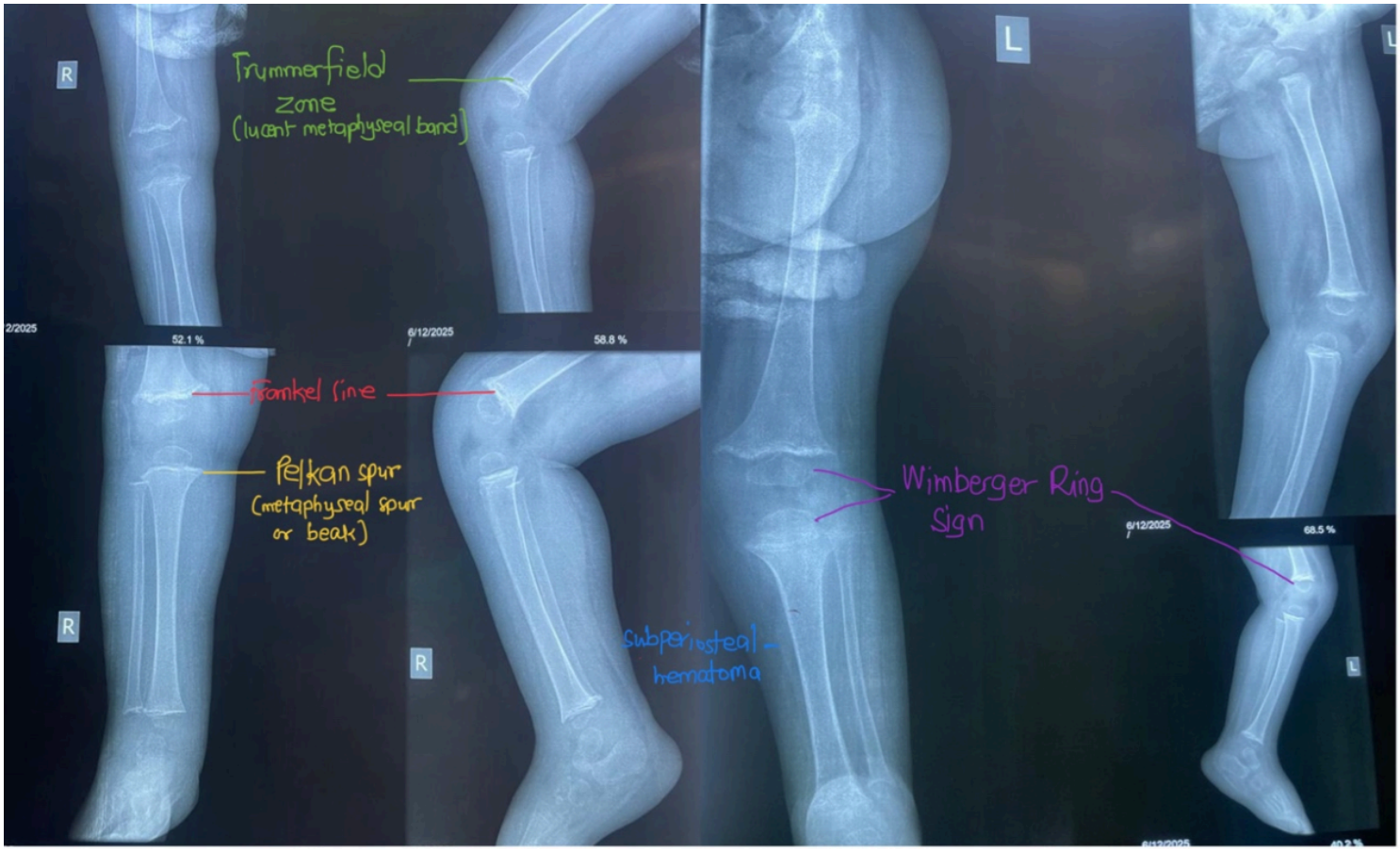


Figure 1

Radiographs showing the TRUMMERFELD ZONE (lucent metaphyseal band) adjacent to the FRANKEL LINE (an area of scelrosis and dense metaphyseal lines), and the PELKAN SPUR (a metaphyseal bony spur). The epiphyses show the WIMBERGER'S RING SIGN (a ring of calcification surrounding an osteopenic epiphysis). An area of SUBPERIOSTEAL HEMORRHAGE is seen along the right tibia shaft.



Figure 2

Radiograph of both radius and ulna showing minimally displaced bilateral distal ulna shaft fractures.

Supplementary Files

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