

Beyond Bone Fracture: Expanding Out of the Box Thinking

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Editorial

This article has been written to provide editorial comments about the article, Osteogenesis Imperfecta: A Case Report and Diagnosis Thinking beyond Bone Fracture by Dr. Manuela Stoicescu [1]. Dr. Stoicescu is a consultant doctor of Internal Medicine and an Assistant Professor of Medicine and Pharmacy, in the Medical Disciplines Department at the University of Oradea, Romania. She has several publications demonstrating her interest in identifying important considerations in medical diagnosis.

Dr. Stoicescu provided an excellent example of putting her clinical observation skills and a problem-solving approach together, in order to analyze potential causes of a forearm fracture in a 19 year old woman. This retrospective case study exemplifies the value of critical thinking. The article clearly presented the patient's history, details of the observations, method of confirmation of the diagnosis, and provided a review of the rare genetic ossification disorder. Osteogenesis imperfecta is caused by a metabolic defect in formation of collagen. DNA testing has identified that mutation of COL1 A1 and COL1 A2 genes produces abnormalities in the formation of type 1 procollagen that leads to bone degradation.

The recommendations of the author regarding the case included: 1) Contraindications for surgery due to poor healing, keloid scarring, and structural defects of the long bones such as: malformation, thinning or thickening of bones, fragile bones, weak tendons and low muscle tone; 2) Emphasis on physical therapy intervention to increase muscle tone of the extremities through physical activity; 3) Supplementation with Vitamin D and minerals, especially magnesium (without specified dosage); and 4) Prescription of bisphosphonates-alendronate (Fosamax) to manage the condition, at 10 mg once daily for 6 months.

It is important to consider the biochemistry of the human body, in order to understand disease metabolic process for development of new bone growth called bone remodeling [2]. Under normal circumstances, the human skeletal system undergoes continual degradation and synthesis. The body is dynamic, as demonstrated by mechanical stress induced by strenuous physical activity, which can either accelerate bone density or facilitate the loss of important bone minerals that may cause stress fractures [2].

Many synergistic factors have been shown to effect the bone replacement process, such as age, gender, heredity, smoking, alcohol use, bioavailability of vitamins and minerals, the type and amount of exercise or lack thereof, presence of disease, hormonal levels, the intake of proteins, calcium, magnesium, potassium, sodium, phosphorus, zinc, trace minerals that provide the building blocks for bone strength and density, as well as muscle tone and strength [3].

The majority of dieticians and physicians may think that nutritional deficiencies may be corrected by a well-balanced diet and a daily multi-vitamin and mineral pill. Unfortunately, the concept of a "well-balanced diet" is a blanket term that no longer applies to foods grown in minerally deficient soils [4] and also to vegetables and fruits that are harvested early in an immature state before they are ripe, and then shipped thousands of miles away. Mineral and vitamin content of edible plants rises as plants approach ripeness and these nutrients are characteristically lower in plants that are harvested too early compared to mature vegetables and fruits [5].

Regrettably, most medical schools all over the world have not challenged the basic biochemistry skills of medical students, which provided the strong foundation for many entering medical schools. Nor does faculty at medical schools teach the evidence-based nutritional medicine research that is readily available. Using the familiar adage, "thinking out of the box", medical students, physicians, and faculty may not have all of the necessary tools to view understand the perspectives of nutritional medicine from inside a self-imposed box.

Complementary and Alternative Medicine nutritional research has shown that supplementation is often necessary for the prevention and reversal of many disease symptoms [6]. As research has not progressed quickly enough to identify the benefits of nutritional medicine in all conditions, it will take time to expand medical knowledge about the value of supplementation.

Dr. Stoicescu presented a case of a woman that would not be able to benefit from an all-purpose mineral and vitamin supplement covering minimum daily requirements such as those approved by the pharmaceutical Federal Drug Administration in the United States. A physician should expect that a patient with osteogenesis imperfect would very likely need a laboratory assessment of their levels of essential vitamins and minerals, along with specific replacement of deficient nutrients to target replacement of bone. Because of biochemical individuality and genetic polymorphism, the nutrient requirements of an individual cannot be met by a "one-size-fits-all" all-purpose mineral and vitamin supplement designed to provide the minimum daily requirements of vitamins and minerals. Dr. Roger Williams who wrote the book 'Biochemical Individuality' recognized that genetic expression is influenced and to a great extent controlled by nutrient availability and this concept is even more significant in an individual with a known genetic condition [7]. Research has shown that the drug Fosamax generates only 6%-8% of new bone per year, by stopping the re-absorption process of the remodeling cycle for development of new bone, with documented unpleasant side effects [8]. Fosamax and other later drugs have been shown to treat osteoporosis and reduce fractures. There have been 15 law suits regarding the consequences of serious side effects for Fosamax [9]. Dr.

Stoicescu's recommendation for 6 months of Fosamax in the presence of osteogenesis imperfecta would not provide lasting benefits for the chronic condition [10]. Fosamax may be recommended for 5-10 years duration [11-14]. However, a complete nutritional regimen for development of bone growth has more potential for lasting effects. Much more could be done to take this patient further along in the process of reduction of bone fractures.

Many physicians have long accepted the role of electrotherapy in health care for rejuvenation of bone tissue and non-healing fractures [9]. However, deductive reasoning would indicate that in order to maximize the benefits of electrotherapy, it would also be critical use nutritional supplementation to mobilize the body's own electrical properties through enablement of "Intracellular mineral levels, cell membrane capacitance, cell protein production, normal collagen structure and calcium crystal deposition" [3], in order to facilitate bone mineralization and regeneration.

The bone matrix is comprised of a framework of non-collagenous proteins and collagen that becomes hardened through calcium and other mineral deposition [3]. Haltiwanger explained the bone reproduction process; the initial stage in bone production is the secretion of collagen molecules by bone forming cells called osteoblasts. The collagen strands secreted by the osteoblasts then spontaneously organize themselves into triple helix structures. The stability of collagen requires vitamin C, which is necessary for the amino acid proline to form cross linkages between the three strands of collagen. Vitamin C is therefore an essential nutrient in bone formation. Collagen now binds to molecules called proteoglycans (chondroitin sulfate and hyaluronic acid), which are also made by bone osteoblasts, forming a composite connective tissue matrix called osteoid. The formation of osteoid traps the osteoblasts in the matrix where they now secrete calcium salts on the surface of the collagen these salts eventually crystallize into calcium hydroxyapatite crystals hardening the matrix" [3].

In conclusion, it makes logical sense to continue to explore not only the causes of bone fracture, but the non-drug alternatives for bone remodeling in the case of genetic defects. Clearly, there are so many factors to be considered.

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