Bone Quality: From Bench to Bedside

Editorial Comment

The Clinical Challenge of Altered Bone Quality

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The clinical definition of altered bone quality is the expression of the mechanical and physiologic integrity of the bone that may be compromised by disease states, altered homeostasis, nutritional, environmental, or pharmacologic agents.

As evidenced in this symposium, there have been major advances in understanding of the mechanical and biochemical properties, measurement modalities, and diagnostic characteristics and methods of altered bone quality. These advances along with the development of multiple pharmacologic agents and surgical devices have supplemented the clinician's armamentarium to address the problems of bone quality and its sequelae. These advancements coupled with increased patient awareness and pressure for treatment and the laudable desire of some healthcare providers to participate in the diagnosis and treatment of compromised bone quality may have precipitated problems.

The availability, safety, and relatively low costs of noninvasive diagnostic methods have provided a plethora of screening but not necessarily diagnostic data. Appropriate utilization of the data requires a thorough understanding of the tool, its limitations, and the pathophysiology of the various disease states. Demonstration of increased or decreased bone mineral density by the commonly utilized clinical methods does not necessarily establish the diagnosis. It is imperative that an accurate diagnosis be substantiated to initiate appropriate treatment. Further, documentation of increased bone mineral density, utilizing present common clinical means, does not equate with improved bone mineral quality.

Fig. 1 J. Gregory Kinnett, MD, is shown.

Based on the increased understanding of the fundamental alterations of bone quality, several agents and devices have entered into the treatment arena. These additions have provided us with important weapons to address compromised bone but may have contributed new problems as well. These potential problems include, but are not limited to, mandibular osteoma, transverse subtrochanteric fracture, and osteogenic sarcoma. Even the well-accepted modalities of supplemental calcium and vitamin D may be associated with negative outcomes including increased risk for cancer.

Great strides have been made in establishing sources for information for patients and clinicians. This has served to heighten awareness among both patients and healthcare providers. The goal remains to ensure valid information is reaching the appropriate people.

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The economic and social impact and the human suffering associated with compromised bone quality are well documented. To alleviate these consequences, we must continue to pursue fundamental knowledge through basic research in the pathophysiology of bone quality. Information must be sought and disseminated with care to avoid misinformation. New and improved diagnostic modalities should be pursued, but the clinician must ensure the diagnosis is accurate and complete. Treatment should be directed toward the exact conditions responsible for the altered bone quality or the sequelae of the compromised bone. As new treatments become available, vigilance is

necessary to ensure all ramifications are considered and understood.

In 1974, at the Metabolic Bone Clinic at The Hospital for Special Surgery, New York, NY, approximately 50% of the patients referred with the diagnosis of osteoporosis either had a different or additional concurrent metabolic bone abnormality. In general orthopaedic practice, the number today may be similar. The process is in place and progress has been made, but the coalition and the cooperation from bench to bedside must continue and be strengthened to meet the challenge of bone quality.