F13 The Trabecular Bone in Identification — Part 2

Robert B.J. Dorion, DDS, Laboratoire S.J.M.L., Edifice Wilfrid-Derome, 1701 Parthenais, 12ieme, Montreal, QC H2K 3S7, CANADA; and Sylvain Desranleau, DMD, 273 Boul Laurier, Mont St-Hilaire, QC J3H 3N8, CANADA*

After attending this presentation, attendees will acquire new information regarding the use of trabecular patterns in the mandible for the establishment of positive identification.

This presentation will impact the forensic science community by providing new scientific evidence regarding the positive identification by trabecular patterns taking into consideration their variations in morphology and a method of calculating its significance.

According to Berkeley's Orthopaedic Biomechanics Laboratory, the trabecular bone can be classified as a porous cellular solid, consisting of an irregular three-dimensional array of bony rods and plates, called trabeculae, which are composed of a calcified matrix. Bone marrow fills the spaces of the pores. In addition, because all free bone surfaces are covered with bone cells, bone is a living tissue that is self-healing and has the ability to adjust its morphology in response to changes in its mechanical environment, the so-called but poorly understood phenomenon of bone remodeling. As such, the mechanical complexity of this two-phase biological tissue surpasses any engineering material making it a fascinating subject of study regardless of clinical applications.

Dental identification compares postmortem to antemortem records. It involves the analysis of different factors such as: the presence and the absence of teeth; crown and root morphology and their interrelationships; the evaluation of the periodontal status; the type and extent of restorative and endodontic materials; fixed, removable, and implanted prosthetics; tori and sinus configuration; anomalies and pathologies of teeth; and, bone as well as trabecular pattern morphology.

Few studies have been completed on the statistical reliability of trabecular bone patterns for identification purpose. Mann's research indicated that radiolucencies and radiodensities in the distal femur and proximal tibia are valid individualizing features for establishing a positive personal identification in human remains;[1] Hiss and Kahana used the densitometric analysis of the trabecular bone pattern as a sole means of identification that was confirmed later with two other methods;[2] Kahana, Hiss, and Smith's research concluded that the trabecular architecture is unique to each individual and stable enough to be used as a forensic marker for positive identification of human remains;[3] and, Couture, Whiting, Hildebolt, and Dixon studied the alveolar trabecular bone in radiographs.[4] On the other hand, other related studies discussing the radiographic recognition of dental implants,[5] the morphometric analysis of intra-oral radiographs of unrestored teeth,[6] the computer-aided dental identification,[7] the sensitivity, specificity and reliability of radiographic periapical diagnosis of posterior teeth,[8] the root morphology and anatomical patterns in forensic dental identification,[9] and the dentists' qualifications affecting the accuracy of radiographic identification have also been carried out.[10]

As a continuation of the preceding research, "*The Trabecular Bone in Identification*," the current research focuses on trabecular bone pattern morphometric analysis and comparison as a viable and empirical method of positive identification. It involves the collection and analysis of panoramic, apical, and bitewing radiographs from the same patient over a number of years as well as from different patients. Locating, identifying, marking, and measuring common sets of trabecular patterns for each patient's radiographs, and determining whether trabecular patterns are unique to that patient, and if and how they are affected by the turnover rate in bone remodeling.

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 ** Presenting Author*