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CONTENTS OF THE SIMPLE BONE CYST CAVITY

To the Editor:—We read with interest the report by Drs Kuhmichel and Bouloux, "Multifocal Traumatic Bone Cysts: Case Report and Current Thoughts on Etiology," published in the January 2010 issue of the *Journal*.[1] In the article a case of mandibular traumatic bone cyst (TBC) was presented, and the etiology of TBC was discussed. The authors expounded their theory under the concept that there are empty TBC cavities and denied the etiologic hypothesis of other authors. However, we believe that TBCs of the jaws are always filled with fluid, just like the TBCs of the extracranial bones,[2] because there was no cavity with gas density area on computed tomography (CT) scans in our 52 TBC cases[3] or on CT/magnetic resonance imaging scans presented in previous reports and textbooks.[4,5] We believe that the air enters the cavity in place of the fluid that is aspirated or that leaks through the cortical bone split during the operation.[3,6] Gas (air) easily enters the cavity, which often lacks a soft tissue lining and is surrounded solely by the bony wall. Even in the presented case, the authors confirmed the empty cavity at the time of surgery despite the CT image that showed fluid density of the cavity. We recommend that the authors re-evaluate the contents and the etiology of TBC of the jaws.

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In reply:—The comments offered in response to our previously published article are greatly appreciated. It is interesting that the authors are convinced of the presence of fluid within these curious lesions in all patients. This is largely based on their case series of 52 patients who were evaluated with computed tomography. The authors found that the preoperative cavity density as measured in Hounsfield units was consistent with fluid despite surgical reports of air being encountered at the time of surgery in almost half the cases. In addition, the authors report that similar lesions in the appendicular skeleton are also always fluid filled. Although the apparent presence of fluid on preoperative computed tomography scans certainly is compelling, 3 issues should be considered. First, the presence of fluid within appendicular lesions in the pediatric population may be the result of pathologic fracture, which is the reason for radiographically identifying these lesions in this population. Furthermore, these lesions may not be the same entity as the maxillofacial traumatic bone cyst. Second, traumatic bone cysts are dynamic lesions that develop insidiously and enlarge. The apparent presence of cystic fluid on computed tomography scans may simply represent a stage in the lesion's development, with the lesion ultimately becoming gas filled. Lastly, the surgical documentation of air and the purported mechanism by which the authors believe air enters the cystic cavity at that time seems to lack evidence. It seems less than plausible that surgically entered cyst cavities lose the fluid from aspiration given that similarly sized epithelium-lined odontogenic cyst cavities nearly always have fluid present despite the surgical procedure required to expose the cavity. If the lack of a lining within traumatic bone cysts provides an additional mechanism by which the fluid could be rapidly absorbed within the medullary bone, this would require a significant and unlikely pressure gradient, which has not previously been identified. The presence of fluid or gas within the traumatic bone cyst will continue to be controversial, as will the etiology of these lesions.

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ZIRCONIA IMPLANTS AND MEMORY LANE

To the Editor:—The article "Feasibility Study of a Partially Hollow Configuration for Zirconia Dental Implants" by Zhu et al,[1] took me down memory lane to the "Core-Vent" Implants, which introduced me to implantology many years ago. Those also featured a hollow, perforated, lower portion, inserted into the bone prepared with a trephine-type drill that left a central core of bone. The midportion of the implant provided threads to "grip into" the bone, and the upper half was (also) hollowed to accept a superstructure for prosthetic restoration.

This truly was a wonderful design, and the rate of integration was high. It would even integrate successfully when the central bony core inadvertently fractured off during preparation, leaving a complete "hole"—exactly mimicking the preparation described in the report by Zhu et al.[1]

The Core-Vent design fell into disuse after reports of many implant fractures at the height of the alveolus, where the hollow upper and the hollow lower met, because of stresses similar to those discovered in this recent investigation. I would not be surprised if additional testing of this newly designed implant—as suggested by the authors—results in fracture at that same level.

Plus ça change, plus c'est la même chose (the more things change, the more they stay the same).

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Reference

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In reply:—We thank Dr Zola for sharing his thoughts and concerns about implant fractures. The proposed zirconia implant in our report has a hollow lower part; it is open at the bottom with holes through the lower cylindrical walls. The initial mechanical testing results of the bending strength, hardness, and fracture toughness indicated that zirconia implants with the proposed configuration can be fabricated to have structural properties comparable to, or exceeding, the usual requirements for implants. Perhaps this explains why mechanical failures of the implants were not observed during animal testing for a relatively limited duration. The long-term reliability of the implants, subject to cyclic stresses, was not addressed in our report. Thus, the concern of Dr Zola about fracture of a partially hollow configuration is fair and readily understandable.

We wish to mention that "dry" tests were performed to study the long-term reliability of the proposed implant configuration. These tests were not mentioned in our report. Using a laboratory set-up for cyclic tests, the implants were subject to cyclic stresses of various amplitudes and frequencies. The cyclic forces were applied in the bending and torsional (twisting) modes, causing the implants to degrade and, in some instances, to fracture and fail. It has been found that the rate of failure is comparable to that of the solid implants in popular use. When failure occurred, the rupture was not sudden. An optical image of a typical crack pattern under a stress rate of 1 MPa/s (Fig 1A) had a half-coin shape. When the stress rate was increased to 100 MPa/s, a breakthrough crack developed in the half-coin region (Fig 1B). The hollow lower part of the implant is not a thin-walled shell; thus, failure by sudden and unstable crack growth under a moderate stress (a characteristic of biting) is not likely. Although these dry tests cannot replace in vivo studies, their results do provide an indication of long-term reliability.

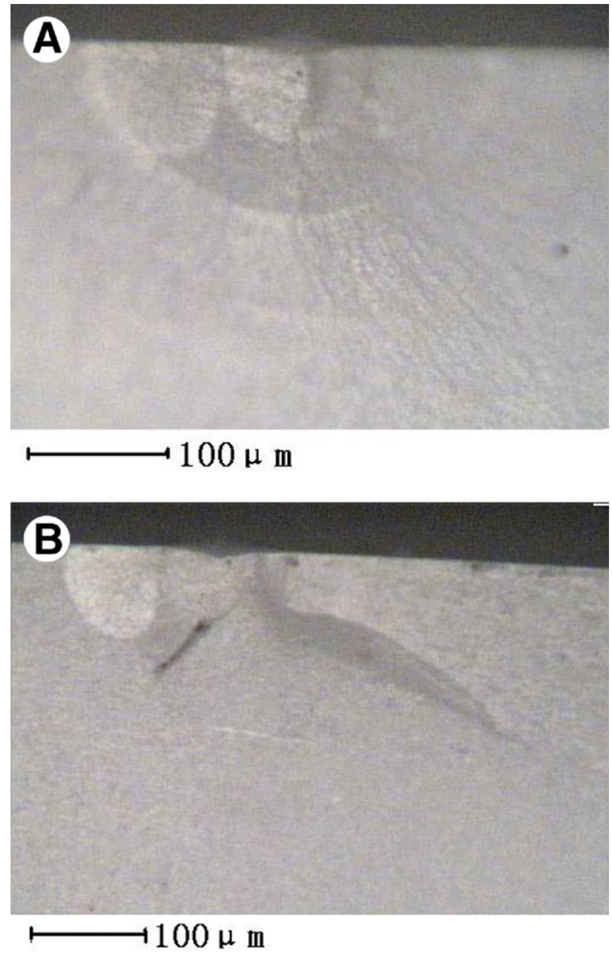

FIGURE 1. Crack patterns under stress rate of *A,* 1 MPa/s and *B,* 100 MPa/s.

As mentioned by Dr Zola, old ideas keep reappearing. In the design of a partially hollow implant, perhaps the old problem of fracture can somehow be controlled. One reason could be the availability of higher grade implant materials. Another reason is the better understanding of the effect of each design parameter on performance (not discussed in our report). Each parameter in the proposed design can be optimized in a certain manner. For example, an appreciable increase in the size of the radial tunnels (holes through the lower cylindrical walls) would increase the rotational rigidity owing to bone growth but would diminish the structural integrity of the implant. It is our hope to be able to release long-term reliability data in the future. In our continuing tests, we have found complications that have required re-evaluation of some design parameters; however, fracture has not been one of the complications to date.

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