Combined novel approaches to the microscopic study of the dental implant site

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MATERIAL
We studied trephine core samples taken from 252 sites where implants were to be placed in a series of 95 patients from KPW’s practice: all material was obtained with patient consent and local ethical committee approval. The sites were both 'jaws cores' where implants were placed at the first operation and 'grinded sites', where a sinus graft procedure had been performed approximately six months before the second operation to place the implant. The initial studies were performed in 1996-1997 while both KPW and ABG were at UCL [1].


METHODS (1)
Samples were fixed in 70% ethanol, dehydrated in ethanol and embedded in PMMA. Sections of 20µm were cut from these cores and stained with toluidine blue, ethidium bromide, and studied using transmitted light and the background fluorescence of the sample to delineate the stained surface layer.

For further correlative light microscopy (LM) for call and uncalcified matrix histology, cores were lightly repolished to remove the carbon coat, surface stained with toluidine blue and ethidium bromide, and studied using transmitted light and/or the background fluorescence of the sample to delineate the stained surface layer.

For further correlative light microscopy (LM) for cell and uncalcified matrix histology, cores were lightly repolished to remove the carbon coat, surface stained with toluidine blue and ethidium bromide, and studied using transmitted light and/or the background fluorescence of the sample to delineate the stained surface layer.

Summary and conclusions

- Valuable information can be retrieved from the study of the bone cores removed to make the space for the dental implant.
- The bone cores can be studied unstained or stained for bone matrix, up to 70% ethanol.
- Derived data could be used for research in medicine or forensic science.
- Do not give the cores to the ‘histology lab’, since they will hardly be able to constrain them from deimating the sample, which half the evidence goes down the sink.
- pmCT can be done on the trephined cores with an additional core.
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METHODS (2)
Later (in 2000 and 2001), several cores were studied by x-ray microtomography (XMT)/µCT using the QUJAX µCT scanner. This enabled us to study the connectivity and volumetric density of native bone, and the mineral/matrix/mineral distribution of the core bone.

The qBSE SEM images of the drilled out core contained it in a PMMA block trimmed and polished, front parallel back and coated with carbon. Recognition of osteoid is simple in iodine contrasted SEM.

Bone mineralisation density from BSE SEM – iodine and triiodide staining permits the study of soft tissue elements including cells and matrix.

Bone mineral content and osteomalacia: more research needed.

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