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The use of a specifically developed CBCT quality control phantom for examining the correlation between CBCT pixel intensity values and medical CT numbers

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Introduction

The relation between CBCT pixel intensity values and medical CT numbers using specially designed phantoms has been under investigation since the appearance of this new technique.

Objectives

To examine the use of a specially designed prototype CBCT Quality Control phantom in investigating the correlation between pixel intensity values as recorded by the NewTom3G CBCT unit and medical CT numbers for given materials.

Materials and methods

A prototype Quality Control phantom with test inserts of different materials, developed under the ongoing SedentexCT project, is used. The phantom includes inserts with areas of pmma, hydroxyapatite in different concentrations, aluminium and air. CT numbers of the different materials were recorded with a medical CT unit and consequent scans with a NewTom3G unit were performed. The consistency of the NewTom 3G pixel intensity values for each material and the correlation with the respective CT numbers were investigated.

Results

A correlation between the NewTom 3G CBCT pixel intensity values and medical CT numbers is found, although a non-linear relation is more apparent. Non-uniformity issues have been observed, mostly between the circumference and the central parts of the field of view.

Conclusions and discussion

The use of specifically designed phantoms for QC tests on CBCT units may prove helpful for determining the degree of uniformity of the CBCT scans and investigating the relation between CBCT pixel intensity values of different materials and the respective CT numbers.