CBCT FOR THE DIAGNOSIS AND TREATMENT PLANNING OF A 15 YEAR OLD PATIENT TREATED WITH GUIDED BONE REGENERATION AND ESTHETIC SEMI-TEMPORARY SPLINT FOLLOWING TOOTH EXTRACTION.

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INTRODUCTION

Cone Beam Computed Tomography (CBCT) is a three dimensional radiographic imaging technique which attracts a lot of attention nowadays. Recently evidence based guidelines for the use of CBCT have been made by the SEDENTEXCT Guideline Development Panel (1), but currently there is no evidence for significant patient outcome efficacy in paediatric dentistry. CBCT gives a lower radiation dose compared to multiple slice computed tomography, but a higher one compared to conventional radiography. It is evident that the three basic principles of radiation protection (justification, optimization and protection (ALARA or as low as reasonable achievable)) should always be respected. As children are more susceptible to the risks of ionizing radiation, extra attention should be paid to keep the radiation burden as low as possible, without giving in on diagnostic yield.

CASE REPORT

A healthy 15 year-old female patient presented herself at the department of paediatric dentistry and special care of the Ghent University dental out-patient hospital. Subjective complaints were sensitivity for cold in the posterior zones and sensitivity for pressure in the maxillary incisors. Clinical inspection (fig. 1) with sensibility testing and conventional peri-apical (fig. 2) and dental panoramic (fig. 3) imaging revealed deep composite restorations on teeth 16, 26, 36 and 46, probably responsible for the reported sensitivity to cold stimuli. Interproximal decay was also observed. Tooth 11 showed an extensive external root resorption with possible involvement of tooth 12 which had clinically also shown sensitivity to percussion.

Due to an earlier dento-alveolar trauma, the patient had received endodontic treatment for her right central maxillary incisor. From the peri-apical radiograph, it can be assumed that the trauma or infection subsequently caused severe local inflammation and hence bone resorption. CBCT was used in order to evaluate the three dimensional extent of the lesion in the first place, secondly to check for root fractures of tooth 11, thirdly to check for possible pulp involvement of tooth 12 and finally to verify possible involvement of the nasopalatine canal. The size and extent of the lesion as observed on the peri-apical radiograph, justified the use of CBCT (Planmeca Promax 3D Max®, FOV: 50x55 mm, resolution: 200 µm) in this patient, following the guidelines for indications for CBCT (1) for inflammatory root resorption.

Axial, sagittal and coronal slices showed a pulp stone in tooth 12 which had a flattened apex (fig. 4). The images also showed an extensive, round unilocular moderately well-defined radiolucent zone (fig. 5a-5d), apical, buccal, palatal and lateral of the radix of tooth 11. There was a perforation of the buccal cortex of the maxilla with lifting of the cortex of the nasal floor. In this radiolucent zone radiopaque inclusions can be observed, which most probably were root canal cement or calcium hydroxide-paste. The lesion extended itself in latero-lateral dimension from the intermaxillary suture until the apex of tooth 12. In the cranio-caudal dimension it extended over the entire root length and superior up to the nasal floor, in sagittal direction it extended from the perforated maxillary cortex until 1mm posterior of the apex of tooth 11. A possible root fracture could not be detected because of artefacts caused by the dens and radiopaque root canal filling. The nasopalatine canal was not involved.

Subsequently the right central maxillary incisor was extracted and a bone-substitute material (Bio-oss®) as well as an absorbable gelatin sponge (Spongostan®) was placed in the socket after extensive curettage (fig. 6a-6h).The tooth showed indeed an inflammatory root resorption and a crack in its surface could be visually observed (fig. 7a-7d). Immediately after suturing, a semi-temporary aesthetic provision was constructed out of the original crown of the tooth, composite and a semi-flexible orthodontic wire (fig. 8a-8d). This procedure was performed under rubber dam. One year postoperative radiographs (including a follow-up CBCT) and clinical examinations showed an aesthetic and healthy situation with obvious signs of bone formation (fig. 9-12).

COMMENT

The use of CBCT in this patient was justifiable and necessary for the treatment planning. It was certainly beneficial to the outcome for the patient. The use of CBCT needs, considering the slightly higher radiation dose than a few panoramic images, to be justified in a patient-by-patient manner.

Reference:

SEDENTEXCT Guideline Development Panel. Evidence Based guidelines on cone beam CT for Dental and Maxillofacial Radiology. 2012.

Fig. 1: Initial clinical presentation of the patient

Fig. 2: Conventional peri-apical radiographs on the day of referral

Fig. 3: Dental panoramic tomography on the day of referral

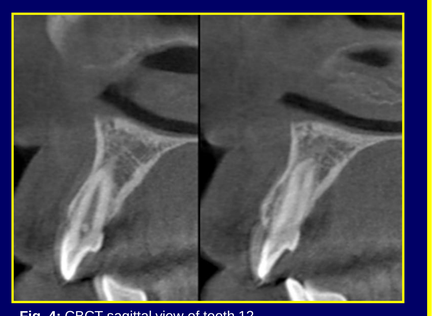

Fig. 4: CBCT sagittal view of tooth 12

Fig. 5a: Three dimensional reconstruction of the CBCT 50 x 55 mm volume

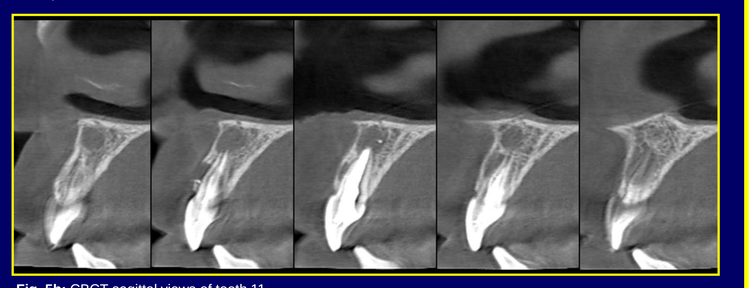

Fig. 5b: CBCT sagittal views of tooth 11

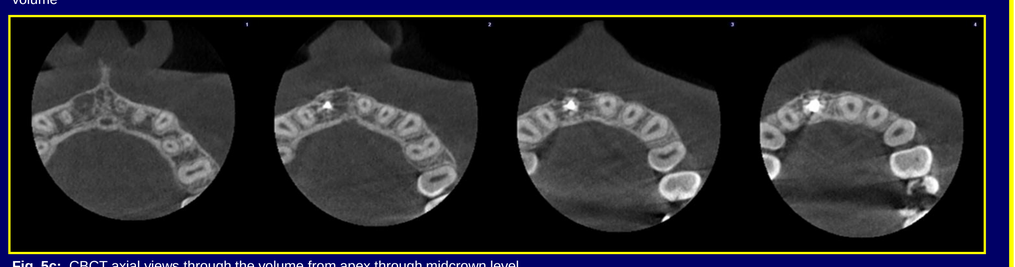

Fig. 5c: CBCT axial views through the volume from apex through midcrown level

Fig. 5d: CBCT coronal views following the axis of tooth 11

Fig. 6a-6h: Extraction of tooth 11, placement of Bio-oss ® and suturing with vicryl 3-0

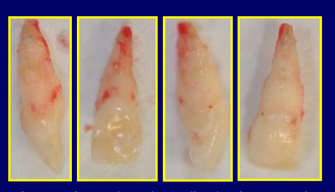

Fig. 7a-7d: Tooth 11, immediately after extraction

Fig. 8a-8d: Construction and placement of the splint under rubberdam

Fig. 9: Clinical and two dimensional radiographic view immediately after initial treatment

Fig. 10: Clinical and two dimensional radiographic view (2 weeks follow-up)

Fig. 11: Clinical and two dimensional radiographic view (1 year follow-up)

Fig. 12: CBCT sagittal views more posterior and caudal orientated, obvious signs of healthy bone formation in the maxillary incisor region, some cement still in situ, decay and deep composite restorations observed, still no treatment by private dentist (1 year follow-up)

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