

Three-dimensional radiographic evaluation of root migration patterns 4–8.5 years after lower third molar coronectomy: a cone beam computed tomography study

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Abstract. This prospective study in patients with a follow-up of 4–8.5 years aimed to describe the long-term, three-dimensional changes of coronectomized lower third molar roots. Pre- and postoperative cone beam computed tomography (CBCT) scans were compared. The distance of root migration, the direction of root translation and rotation, and the amount of bone regeneration at the adjacent second molar and superficially to the third molar root were recorded. Age, gender, time elapsed following surgery, the status of the retained root including impaction pattern and depth of impaction were tested to check if they were influencing factors for the above outcomes. A total of 57 coronectomized third molars from 44 patients were included. The distance of the mean root migration was 2.82 mm, and they predominantly translated mesially (76.8%). Age negatively correlated with the distance of migration. Root remnants with a soft tissue coverage had less bone regenerated at the adjacent second molar (1.27 mm vs. 2.95 mm) in comparison to their impacted counterparts. Based on the present radiographic results and the absence of any pathological findings, coronectomy can be recommended for selected cases of third molar removal as a safe procedure with favourable long-term outcomes.

Key words: third molar; coronectomy; root migration; cone beam CT.

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Coronectomy was first described by Knutsson et al. (1989) as a viable treatment method for lower third molars,

which had a high risk of inferior alveolar nerve (IAN) injury.^{1–4} It involves removing only the crown of a lower third molar

and leaving the remaining root within the dentoalveolar bone. This treatment option has been proven in randomized clinical

trials to be effective in preventing IAN injury, and is also safe in the long-term with only minimal postoperative morbidity.^{3,5-10} It has been found in several studies using plain radiography that the embedded roots tend to migrate anteriorly with time.⁵⁻⁷ It has also been reported that a small portion of the coronectomized roots migrate to an extent that results in root exposure, which requires a second surgery to remove the root.⁷ Most roots show a tendency to stop migrating towards the end of follow-up studies of 2-3 years following the surgical intervention.^{5,6,11} However, to date there has been no long-term follow-up study, and no study has investigated the movement of the third molar roots after coronectomy and the status of the roots, including the surrounding bone, in all three dimensions radiographically. Furthermore, it is unknown how much bone regeneration occurs superficially to the retained third molar root and at the distal aspect of the adjacent second molar.

Cone beam computed tomography (CBCT) is a three-dimensional medical imaging technique that is commonly used in dentistry and maxillofacial surgery.¹² It carries a lower radiation dosage when compared to the conventional spiral computed tomography. Thus, the aims of this study were to describe the long-term changes of the retained roots after lower third molar coronectomy, and to investigate bone regeneration at the adjacent second molars and superficially to the third molar roots using CBCT scans.

Materials and methods

The present study is part of an ongoing prospective evaluation of long-term changes after lower third molar coronectomy.⁵⁻⁷ Ethical approval for this specific radiographic analysis was granted by the local institutional review board (HKU/HA HKW IRB UW 17-074).

Eligible patients

Patients who had received unilateral or bilateral lower third molar coronectomy in the Discipline of Oral and Maxillofacial Surgery, Faculty of Dentistry, The University of Hong Kong were recruited for the study. The clinical decision to use coronectomy and not a total removal approach was based on a close proximity of the third molar root(s) to the inferior alveolar canal following a radiographic evaluation. The inclusion criteria for the present study were: (1) the patient had received coronectomy 2 years or more ago, (2)

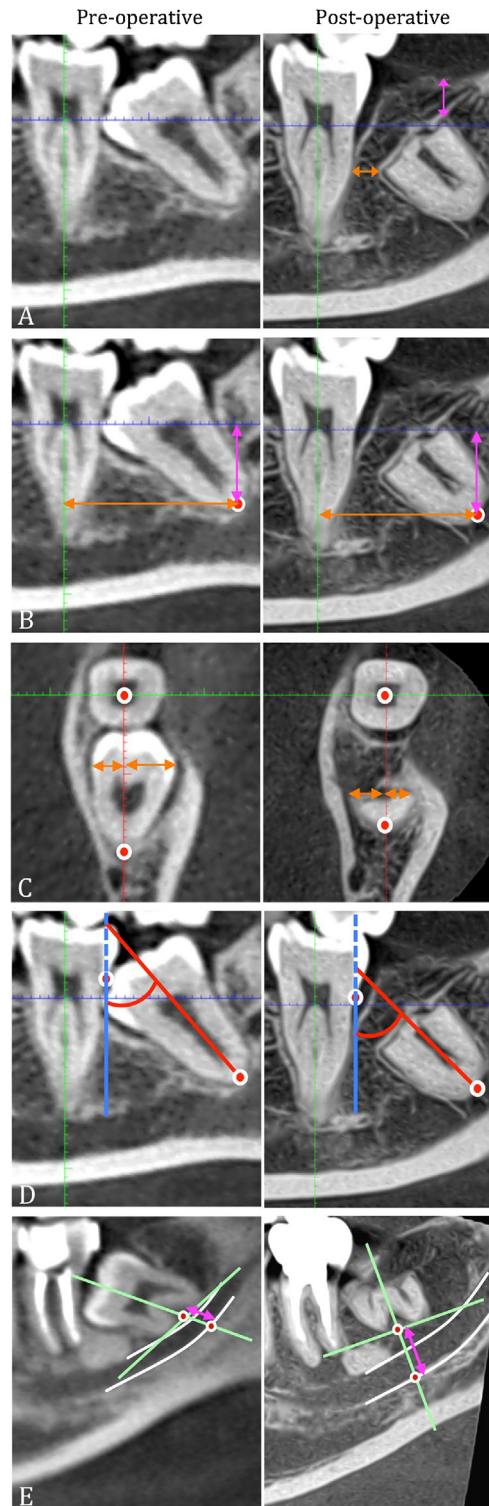


Fig. 1. Assessment of root remnants following coronectomy using cone beam computed tomography (CBCT) imaging. (a) The amount of bone superficially to the third molar root was measured as the shortest distance between the coronectomized root surface and the superficial bone crest (purple line). The amount of bone regenerated at the distal aspect of the adjacent second molar was measured as the shortest distance between the third molar root and second molar (orange line). (b) Vertical and horizontal translations were assessed in a sagittal CBCT view. A vertical translation (purple line) was evaluated from the apex of the third molar root to a perpendicular line according to the long axis of the second molar passing through the pulp by comparing pre- and post-operative scans. A horizontal translation (orange line) was evaluated from the apex of the third molar root to the long axis of the second molar. (c) A

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