Original Article

Alternative Approach to Prevent Inferior Alveolar Nerve Injury in Lower Third Molar Surgery: A Pilot Study on Coronectomy

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ABSTRACT

Context: Injury to inferior alveolar nerve (IAN) in lower third molar (L3M) surgery may lead to unpleasant sensation or anesthesia of lower lip. Considering the quality of life of the patient and the litigations faced by the dentist, alternative treatment approaches to odontectomy have been studied by various researchers. Coronectomy is one such option to prevent the nerve injury. Aims: The aim of this study was to assess the efficacy of coronectomy to reduce nerve injury during L3M surgery in high-risk cases as per radiological signs. Settings and Design: A pilot study was conducted in the oral surgery department of Rajah Muthiah Dental College, Annamalai Nagar, Chidambaram, India to evaluate coronectomy and its usefulness. Materials and Methods: Sixty-five patients who satisfied the inclusion and exclusion criteria for coronectomy were included in the study. The patients were followed up to 1-year period. Statistical Analysis Used: Descriptive statistics was used. Results: None of the patients in the study group had IAN impairment. Conclusions: Coronectomy is a safe alternative for complete odontectomy in high-risk L3M surgery cases. Root migration, infection, and need for second surgery are potential complications. Further studies with more samples and variables need to be performed.

KEYWORDS: Coronectomy, impaction complication, inferior alveolar nerve injury, lip anesthesia, lower third molar surgery

INTRODUCTION

Surgical removal of impacted tooth is a common procedure. Many years, odontectomy was considered as a gold standard procedure. Inferior alveolar nerve (IAN) injury has been reported by various studies as 0.35%,[1] 6.6%,[2] and 19%[3] following odontectomy. Radiographic signs such as loss of radiopaque line, diversion of the canal and darkening of the roots in orthopantamogram (OPG)[4,5] periapical or paradontal (juxta apical area) radiolucency,[3] and roots intersected by mandibular canal in cone beam computed tomography scan[6] warn the surgeon regarding the chances of nerve injury but do not prevent it.[7] Coronectomy is an alternative technique to avoid nerve injury.[8,9] Many times the fractured root fragments are left inside the jaw bone heals uneventfully[10] This led the surgeons to remove crown portion of the impacted tooth and leave the roots behind, thereby preventing nerve injury. Ecuyer and Debien[11] developed partial odontectomy in 1984.

The aim of this pilot study was to assess the usefulness of coronectomy to prevent neurosensory deficit in...
Materials and Methods

Patients who reported to Raja Muthiah Dental College during the period 2017–2019 for surgical removal of impacted L3M were screened for nerve–root relationship with OPG. Those who had close relationship between the root apex and IAN canal were included for the study. The patients were explained about the surgical procedure and related complications such as nerve injury, root migration and need for second surgery, dry socket, and wound infection. Patients who satisfied the inclusion and exclusion criteria set by Leung and Chen in their randomized control trial were included in the study.

Inclusion criteria

(1) Tooth is intimate with IAN based on plain radiograph
   (a) Interruption of white line of mandibular canal
   (b) Deviation of mandibular canal
   (c) Darkening of the roots
   (d) Abrupt narrowing of the roots
   (e) Abrupt narrowing of the mandibular canal white line
(2) Impacted tooth with pericoronitis and dental caries
(3) Impacted tooth predisposing to periodontal pathology in adjacent second molar

Exclusion criteria

(1) Impacted tooth not in close contact with mandibular canal as per x-ray panorama
(2) Impacted tooth associated with periapical pathology, cyst, and tumor
(3) Tooth in the line of fracture or those removed for orthodontic/orthognathic surgery
(4) Fibrous dysplasia or radiotherapy to mandible
(5) Craniofacial syndromes with preexisting IAN defects
(6) Smokers and those who are on oral contraceptives

The study was approved by the institutional review board for human experimentation at Annamalai University, Tamil Nadu. All the participants were given detailed information and written consent was obtained.

A total of 65 patients (40 female and 25 male patients in the age group of 25–45 years) were included in the study and were reviewed for 8-month to 1-year period. The patients were reviewed for presence of neurological deficit, dry socket, postoperative infection, and root migration. Neurosensory deficit was diagnosed if both subjective and objective measurements (light touch test, pain threshold test, and 2-point discrimination test) were different from those on the non-affected side or preoperative baseline. Pre- and postoperative assessment was performed by two different surgeons blinded from each other. Pain if develops after 24h (not the immediate postsurgical pain) of surgery was recorded on a visual analog scale (VAS) ranging from 0 to 10cm, with 0 signifying no pain and 10 signifying the most severe pain that the patient could imagine. Pain was considered as a positive complication if the patient reported 4 or more in the VAS scale based on the study conducted by Giuseppe Monaco et al. Infection was defined as the presence of pus, fever, and pain. Dry socket was defined as the increase in pain intensity 48–72h after surgery, loss of the blood clot in the socket, and wound breakdown with or without foul smell. Patients were reviewed 3 days, 1 week, 3 months, and 1 year after surgery for assessment of neurosensory disturbances in IAN and lingual nerve, dry socket, pain, and root migration. Root migration was evaluated by comparing the position of the roots in relation to the cement-enamel junction of the adjacent second molar immediately after surgery and 1 year after surgery with intraoral periapical x-ray.

Surgical method and care

All the patients were given chlorhexidine mouth wash before starting the surgery. Coronectomy was performed using surgical handpiece and straight fissure bur. The crown was sectioned using 702 fissure bur in the buccolingual direction. Care was taken not to perforate the lingual cortex and the mandibular canal. The sectioning of the crown was performed up to two-thirds of the buccolingual width, and the crown was split using a 7mm osteotome and mallet. The root portion was kept 3–4mm sub-crestal and primary closure achieved with 4-0 silk sutures.

Standard postsurgical instructions such as pressure dressing, ice fomentation immediately after surgery, liquid cold diet for 24h, and soft diet for 5 days were given to the patient. Three days’ broad-spectrum antibiotics were prescribed to patients (amoxicillin 500mg q8h or clindamycin 300mg q8h if allergic to penicillin).

The sample size for this study was calculated based on the prevalence of IAN injury as 19% based on the study conducted by Renton et al. with 10% chances for error. Patients were categorized based on the nerve–root relationship, Pederson’s difficulty index, and root form as conical and not conical [Table 1].
RESULTS

Of 65 patients, 60 had successful coronectomy. Five patients underwent total extraction as the roots were mobilized during the procedure. Two patients developed dry socket and pain. Three patients had root migration less than 2 mm in 1-year period.

DISCUSSION

IAN injury is expected if the roots of the impacted tooth are in close approximation with the nerve. Previously researchers have used x-ray panorama to evaluate the risk of IAN injury. In our study, the risk of nerve injury was assessed with OPG. Interruption of the white line, darkening of the roots, and deviation of the mandibular canal are major risk predictors for IAN injury in OPG. All our patients had the aforementioned radiographic risk factors.

The primary objective in delivering care to patients is to improve the quality of life and not to harm (primum non nocere). Staged surgical removal of impacted third molar, orthodontic-aided extrusion, and pericoronal ostectomy are some of the procedures recommended to prevent IAN injury in high-risk cases, but results are unpredictable and necessitate second surgery. Coronectomy is a predictable and simple procedure. Some studies have reported 0% nerve injury with coronectomy. In our study, none of the patients had IAN injury.

Mobilization of the root fragment (failed coronectomy) occurs if the cut between the root and the crown is incomplete and excess force is given to fracture the crown portion and in case of conical roots. In our study all the five failed coronectomy had conical roots. Meta-analysis of studies comparing coronectomy and complete odontectomy revealed the reduced risk of dry socket in coronectomy. There is no significant statistical evidence to prove that coronectomy reduces pain and infection rate in comparison to odontectomy. Only 3% of coronectomy group had dry socket. Coronectomy and root retention works better if the roots are left 3–4 mm below alveolar crest, allowing consistent bone formation and reduced root migration. Root migration was minimal and there was no infection and need for second intervention.

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Conflicts of interest
There are no conflicts of interest.

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Table 1: Categorization of patients

| Categorization                  | Number (n) | Frequency (%) |
|--------------------------------|------------|---------------|
| Pederson’s difficulty index    |            |               |
| Easy                           | 0          | 0             |
| Moderate                       | 43         | 66            |
| Difficult                      | 22         | 34            |
| Root form                      |            |               |
| Conical                        | 7          | 11            |
| Not conical                    | 58         | 89            |
| Nerve–root relationship        |            |               |
| Interruption of white line     | 29         | 45            |
| Darkening of roots             | 5          | 7             |
| Deviation of mandibular canal  | 5          | 7             |
| Combination of above three     | 26         | 40            |
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