Radiographic assessment of lower third molar prior to surgery: A report of four cases

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ABSTRACT
Objective: To familiarize the practitioner and specialist with the usual false features noticed in routine radiographs taken prior to surgery so that complicated treatment could be avoided.

Materials and Methods: All the cases reported for lower third molar surgery underwent routine radiographic evaluation such as Intra-oral X-ray and OPG (Orthopantomograph) to assess the severity and the surgical outcome in relation to the anatomy, root morphology and the associated anatomical structures. The surgery was planned with selective surgical procedure giving due consideration to factors such as minimal incision, flap reflection, bone cutting and selective tooth sectioning. We noticed four cases showing different radiographic features in the root architecture and the anatomy of the third molar when compared with the same tooth structure observed during removal. Completing the surgical procedure was a challenge.

Results: To our clinical experience differences noticed between the radiographic appearance and the existing clinical scenario are common. This is because the radiographs routinely used are only two dimensional whereas the unique architecture of the mandible and third molar may lead to inaccurate interpretation of radiographic appearance. Therefore, the radiographic view should not be considered as the primary factor determining the surgical procedure and the skill and the judgment of the surgeon would have an overriding influence.

Conclusion: Radiographs used for assessment of lower third molar surgery is no more considered as an accurate investigation tool but may only support the surgical treatment planning.

Key words: impaction, lower third molar, surgical extraction, wisdom tooth removal, radiographic assessment

INTRODUCTION
Estimating the difficulty of extraction has been dominated by dental factors evident on radiological assessment of the dentition. This is reflected in the development of three classification systems based on dental factors (WHARFE-Macgregor, Winters Lines and Pell & Gregory classification)\(^1\)\(^-\)\(^3\). But opinion on the value of these approaches varies and some authors believe that surgical complexity cannot be estimated pre-operatively using radiographs but is best done intra-operatively and based on the skill of the surgeon\(^4\). We in our surgical practice of removing lower third molars use basic and convenient x-ray such as dental IOPA x-ray or dental Orthopantomograph(OPG) in order to plan and assess the expected intra /post-operative complications\(^4\).

During a period of three months, 20 lower third molars were removed after the surgery. It was noticed in four cases that the pre-operative x-rays exhibited different architecture and root morphology when compared to what was observed in the tooth following removal.

This discrepancy may be best explained by the fact that the x-rays used in routine dental surgical practice are still two dimensional and only one view of the tooth can be visualized in the radiograph. Traditionally the difficulty of third molar surgery has been judged using radiologically assessed dental factors specifically tooth morphology and position. This report presents additional
factors that have a bearing on the difficulty of extraction.

**CASE DESCRIPTION**
The patients operated and shown in this study were males between the ages 25 and 35 years. For each patient, the concerned X-rays and the corresponding tooth after surgery are shown.

**Case 1**
The patient reported to the surgical unit with continuous pain and recurrent swelling clinically diagnosed as chronic pericoronitis and wished to have the left lower third molar removed. Only a small section of the tooth was seen clinically. The OPG (Orthopantomogram) showed the left third molar locked within the ramus (Figure 1). The severity and amount of bone removal was assessed radiographically and the patient was informed about the difficulty that he may experience.

Surgical procedure: Two basic methods of surgical removal are available: a) tooth removal as one unit and b) tooth removal by sectioning/multiple pieces. The tooth was removed in multiple pieces in this patient to avoid unnecessary involvement of vital structures such as soft tissue exposure and excessive bone cutting. Once the procedure was completed all tooth segments were reassembled to confirm that the tooth was completely removed (Figure 1A).

The outcome of the surgery was uneventful. The patient had slight sensitivity of the adjacent tooth (second molar) which was due to the soft tissue pocket/gaping for ten to fifteen days which resolved on its own. Although the tooth had prominent, divergent and separate roots, the x-ray did not show this situation.

**Case 2**
This patient complained of difficulty in opening of his mouth and swelling on his left cheek. He was given a course of antibiotics with analgesics and muscle relaxants for a period of 15 days and then an OPG was taken and evaluated (Figure 2). Although the lower third molar was clinically visible, it had caused a soft tissue pocket leading to recurrent infection with trismus.

Based on the patient request surgical removal of the lower left third molar removal was planned by multiple sections. Once the tooth was removed the sectioned tooth was re-assembled and compared with the x-ray taken for evaluating the completeness of the tooth removal (Figure 2A).
The tooth appeared to involve the nerve canal in the x-ray (Figure 2A). The patient was informed that he may have some loss of sensation in the lip region. Contrary to our expectation there were no problems associated with nerve injury. The appearance was a radiographic error as the white line close to the root seen in Figure 2A, which may suggest the inferior alveolar canal, was the overlapping image of the lingual cortex of the mandible and the roots of the wisdom tooth were on the buccal cortical plate. Injury of the alveolar nerve is said to be quite common if the roots of the wisdom tooth is tilted more towards the lingual cortical plate than the buccal plate.

**Case 3**

This X-ray (Figure 3) is from a patient who had been advised the surgical removal of his left lower third molar. He had bad breath (halitosis) and slight mobility of the adjacent second molar due to lack of bone support (Figure 3). Multiple sectioning of the wisdom tooth was planned as the entire tooth was locked between the second molar and the ramus which was too thick. After surgical removal the two longitudinal sections were compared with the pre-operative x-ray taken, which presented a different picture (Figure 3A).

The healing was uneventful. Though the tooth appeared to have two separate roots in the x-ray (Figure 3A) leading us to follow the tooth splitting technique, it had a single fused root (Figure 3A). Even though the tooth did not involve the inferior alveolar canal which contains blood vessels along with the nerve, intra-operatively we noticed bleeding from the surgical site which was stopped with local...
hemostatic agents (thrombin packs). The bleeding was from the soft tissue incision line where the buccal arterial branches were severed.

It is well documented that the wisdom teeth (both upper and lower third molars) do have root variations and also irregular calcification. This patient was one such case where on one side the root was less calcified than the other, producing an image as two roots when viewed on the x-ray.

**Case 4**

This X-ray is from a patient who had recurrent radiating pain starting from the left part of the cheek and later extending to the ear and then to the left part of the face. He has had disturbed sleep and had been referred to the neurophysician for treatment. Later he visited our unit and the OPG showed a large horizontally-placed lower third molar which failed to erupt and was embedded within the ramus of the mandible. We planned to remove the tooth in one single piece as the radiograph showed (Figure 4) it to have one single root of normal size. But during the operative procedure we noticed that the root was divided at the tip and therefore was removed in segments. The fragments were assembled and compared for confirmation with the pre-operative x-ray (Figure 4A).

Seeing the x-ray findings we had to extend the soft tissue incision for exposing sufficient bone and tooth which would favor the surgical removal. This extension would create insufficient soft tissue to close the wide surgical site as the oral cavity tissue (buccal tissues are not stationary and patient oral habit of chewing will disturb the soft tissue in the surgical area to unite and heal uneventfully. This issue is quite common in routine surgical extraction of third molar where the roots are long and horizontally placed (Figure 4).

This case developed a soft tissue gap in the surgical site which was due to early rupture of the suture placed. It was treated by regular irrigation and re-suturing, and the healing was uneventful.
DISCUSSION

Lower wisdom tooth surgery is a common surgical procedure undertaken by the maxillofacial surgeon. The surgery itself may be complicated and could be associated with undesirable consequences.

The routine dental x-rays presently available are only two-dimensional and the mandible being of unique shape and design may mislead the radiologist as well as the surgeon. Therefore the radiographs should only be considered as a supportive medium for the surgeon in planning the surgery but not as the most appropriate tool for the surgical assessment.

Out of 20 cases operated during a three month period variations were observed between the x-ray picture and the actual tooth morphology in four cases. The third molar usually has a large crown with more than two roots. Some part of the tooth structure and the roots get blocked by the bony mass of the mandible allowing only the lateral/labial or the medial/buccal surface to be visible in the radiographic view, which in addition may be complete or incomplete. This radiographic view may mislead the surgeon contributing to incorrect pre-operative assessment and possible intra-operative and post-operative complications.

Orthopantomogram and intra oral peri-apical x-rays taken from two different planes give a more complete view of the tooth to be extracted.

Recent technology uses three dimensional digital x-ray with the selected pre-set software designed basically for lower third molars which facilitate the assessment of complications and also gives the surgeon the opportunity to plan the surgical procedure so that post-operative complications could be minimized.

We rely on the orthopantomogram which is expected to have 20% magnification and exposes labial/lateral bone cover of the tooth and also shows the total bone length and breadth. Combination x-rays are not used on account of the cost incurred and also with
the aim of reducing the exposure of the patient to radiation.

The basic steps that the surgeon should follow to get the best result in lower third molar surgery are as follows:
1) Minimal incision
2) Minimal retraction of the soft tissues (gums/mucosa) to expose the tooth/bone
3) Limited buccal/lateral bone cutting or trimming, sufficient to expose the available crown/tooth structure
4) Selective tooth sectioning (odontectomy) with selective bone sectioning to separate the tooth from the bone
5) Root removal in fragments by keeping the surrounding vital bone intact
6) Cleaning the bony cavity and the soft tissue which was subjected to the surgery
7) Reassembling the tooth fragments to get the expected tooth architecture.
8) Minimal use of instruments/elevators to exfoliate the roots/crown structures rather than forceps which might damage both hard and soft tissues.

CONCLUSION

Lower third molar surgery is one of the routine dental surgical procedures and it is important to be aware of the limitation of x-ray support. In our practice we use the radiographs to identify any associated anatomical variations and dental pathology like cysts or tumors which may need extensive surgical treatment. Observing the basic rule of tooth splitting with minimal bone cutting and less soft tissue incision/reflection will help to operate on third molars with any type of root variations as described in this paper.

REFERENCES

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