

Decision of Surgery According to Relation of Roots of Lower Third Molar to Inferior Alveolar Canal in Different Winter Classes of Impaction Depending Only on Orthopan-tomogram. Surgical proSpective from a Retrospective Radiographic Study

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Abstract

Background and objectives:The proximity of inferior alveolar canal to roots of lower third molar is one of the serious challenges facing surgeons during extraction of that tooth. There are different types of this relation, mainly: away, in direct contact and crossing the canal. The aim is to evaluate the relation between roots of lower third molar and inferior alveolar canal, in Winter classification of impaction to decide whether to do surgery or to ask for Cone Beam Computed Tomography first. **Methods:**Orthopantomographs of 206 cases were retrospectively evaluated: the presence of impaction; applying Winter classification; studying roots, numbers; and their relation to the canal (away from, in direct contact and crossing). **Results:** One hundred and twenty-four cases were with lower third molar impaction; mean age (29.5 ± 6.2); mesioangular was the most common type of impaction. In general, 24 (19.5%) cases were away; 51 (40.5%) cases were with a direct contact; 49 (39.5%) cases were crossing the canal. In mesioangular impaction the common relations were in direct contact and crossing the canal. There was large difference in prevalence of single rooted and two rooted teeth, with being two rooted the common one, there were no significant differences in their relation to the canal. Two divergent rooted teeth majority were in direct contact with the canal **Conclusions:**Our results showed that just 19.7%, regarding the relation to inferior alveolar canal are safe to do surgery without radiograph, the rest has the risk of endangering the nerve and 40% needs computed tomography.

Keywords:Inferior alveolar canal; Third molar; Impaction; Inferior alveolar nerve injury.

Introduction

Inferior alveolar nerve (IAN) injury is considered one of the risks that may happen during lower third molar (LTM) surgery. There is a scientific fact that only 0.35 -3%¹⁻³ of cases may develop such complication. However, what matters isn't a percentage but patient's quality of life. As many as 45 % of cases of injury may remain with some altering in sensation³.

In many textbooks and research articles, there are statements about risk factors and predictors to be considered before LTM surgery, to prevent the occurrence of IAN injury³⁻⁵. The examples of such statements may be the following two: "If the root ends of the tooth appear to be close to the inferior alveolar canal on a radiograph, the surgeon must take special care to avoid injuring the nerve"; "if the tooth or roots are in intimate relation with inferior dental canal, the damage can be prevented or minimized only by preoperative radiograph diagnosis and careful dissection". One of these predictors is the proximity of inferior alveolar

canal (IAC) to the roots of LTM. To evaluate this proximity an radiographic view is mandatory, and the one which is mostly used by dentists is the orthopantomogram (OPG). The proximity of roots of LTM to IAC increases the chances of injury to IAN³ Such proximity will be determined by both the course of the canal and the tooth anatomy. The first one, in 48% of cases is considered to be the high type, which means closure to apices of LTM compared to those of first and second molars⁶. It is estimated to be 3-5 mm away from apices of 1st and 2nd molars. The chances of IAN injury seems to be more likely when roots of LTM are in direct contact or crossing the shadow of the superior cortex of the canal. In their study, Jerjes W and coauthors⁷ clarified the fact that chances of nerve damage in cases where the roots are away by $>$ or $=$ 1 mm was just 2%. While the percentage ranges between 42-100 %when the canal was in intimate contact with the roots.

The anatomy of LTM is not predictable⁸. Variations may be in eruption direction, root numbers and configuration,

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and relation to IAC. In many cases, the eruption process may not complete, leading to partial or complete impaction. Hundreds of researches, on LTM impaction, lead to formulation of many international classifications. The most popular one is Winter, where five categories identified: mesioangular, distoangular, vertical, horizontal and transverse⁹. All these classes impose different levels of difficulty in surgery owing to the different depth, inclination, and position of the tooth, and different root pattern. Such differences may have different relation of roots to IAC in different Winter classes. The degree of difficulty of surgery may increase the possibilities of injury by both movements of roots and instrumentation. Such injuries may be expected when the roots crossing the shadow of superior cortex of IAC¹⁰.

The aim of this study is to figure out the percentage of cases that may have surgery, without having CBCT, depending on type of relation of IAC to root apices of LTM in different

classes of Winter's classification and different root number and configuration.

Patients and methods

Retrospectively we reviewed all OPGs (205 cases) of the data base of the radiological department in college of Dentistry/ Hawler Medical University. Digital orthopantomogram images taken by machine FONA X PAN DG PLUS panoramic digital dental x-ray system manufactured by FONA Srl Italy. The study started January 2018 and ended by May 2018. The review included evaluation of presence or absence of impacted LTM. The LTM subdivided using Winter's classification (mesioangular, vertical, distoangular, horizontal, and transverse); then the relationship between IAC and roots of LTM was determined. For the easiness of determination of relation, we suggested three-category of relation: away from (A), in direct contact with (B) and crossing the IAC (C), Figures 1-3.



Figure (1):Radiography of the roots of LTM are away from the IAC.

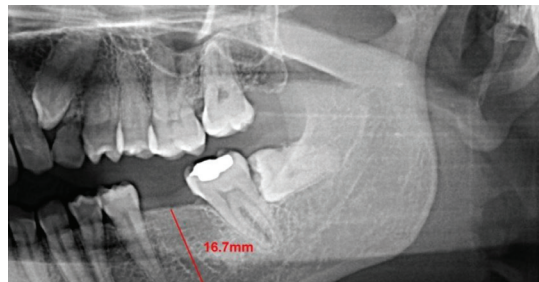


Figure (2):Radiography of the roots of LTM are in direct contact with IAC.



Figure (3):phy of the Roots of LTM are crossing the IAC.

In first category, there is an identifiable space between the shadow of the apices of roots and that of the superior cortex of IAC. In the second one, there is no identifiable space between the shadow of the apices of roots and that of the superior cortex of IAC, and with no signs of crossing each other. In third one, there are signs of crossing between the shadow of the apex of roots and that of the superior cortex of IAC that can be seen as a superimposition of images of

both. The first two regarded as safe surgery group. While the third one considered as the one that needs CBCT before operation. We calculate the same relation in different root numbers and configuration. The data analyzed using Chi-square test and SPSS program. The study carried out after getting ethical approval from ethical committee of college of dentistry in Hawler medical university.

Results

We included total of 205 cases (109 “53%” males and 96 “47%” females) in this study. Out of those, 124 cases having LTM impaction. The age range of those with LTM impaction was from 20-50 with the mean 29.5 ± 6.2 years old. As total, 24 (19.5%) cases were away; 51 (41%) cases were with a direct contact; 49 (39.5%) cases were crossing the IAC, Figure (4). Seventy-five cases (60.4%) were safe to do surgery without having CBCT.

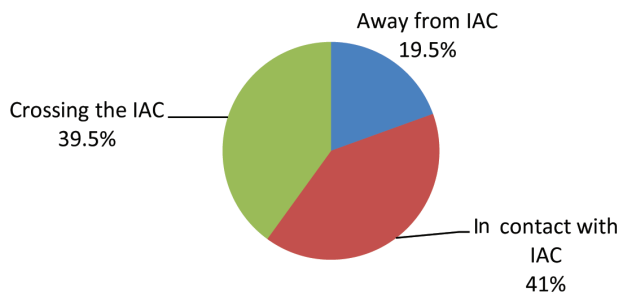


Figure (4): Outline of relation of the roots of LTM and IAC. The difference between male and female was prominent only in cases with crossing contact between the root of LTM and IAC (17 “32%” to 32 “42.1%”) with male predominance. Other two relation categories were close between both sexes (away from IAC: 9 “17%”, 15 “21.1%”; direct contact with the IAC 27 “51%”, 24 “33.8%” for female and male respectively). The number of cases for right and left sides of patients was approximately the same, with the left being ahead of right by 4 and 3 cases in group of direct contact and crossing the canal respectively. There was a large difference in between the prevalence of single rooted and two rooted LTM. Single-rooted teeth were 14 cases (11.3%), and two-rooted were 110 (88.7%). Despite the above-mentioned fact, there was no significant difference in their relation to IAC, Table (1).

Table (1): Relation of impacted teeth to the IAC according to number of roots

| Statistical tests | Value | df | p-value |
|------------------------------|-------|----|---------|
| Pearson Chi-Square | 140 | 2 | 932 |
| Likelihood Ratio | 142 | 2 | 931 |
| Linear-by-Linear association | 012 | 1 | 913 |
| Number of Valid Cases | 124 | | |

By configuration, the majority were two rooted not fused but converge (85 “68.5%” out of total). Out of those, 19 (22.4%), 34 (40%) and 32 (37.6%) were away, in direct

contact and crossing the IAC respectively. Those that have two roots with divergence and with mesial or distal apical curvature, all were with either direct contact or crossing the IAC. In pure divergent roots, direct contact and crossing the IAC comprised 2 “28.6%” and 7 “71.4%” respectively; with distal apical curvature: 2 (66.7%) and 1 (33.3%) respectively; with mesial curvature at apical third were just 3 cases and all were crossing the IAC, Table (2).

Table (2): Relation of impacted teeth to the IAC according to shape of roots.

| Statistical tests | Value | df | p-value |
|------------------------------|--------|----|---------|
| Pearson Chi-Square | 14.160 | 10 | 166 |
| Likelihood Ratio | 15.987 | 10 | 100 |
| Linear-by-Linear association | 6.045 | 1 | 014 |
| Number of Valid Cases | 124 | | |

We had just one case of uncompleted root formation which was away from the canal. Fused roots that comprise (25 “20.2%”) majority were indirect contact with IAC (12 “48%”). The rest were crossing and away from the IAC (8 “32%” and 5 “20%” respectively).

In 61 (49.2%) mesioangular impactions, 12 (19.7%) cases were away from the canal (48% of this category of relation); 23 (37.7%) were in direct contact with IAC (46% of this category of relation); 26 (42.6%) were crossing IAC (53.1% of this category of relation). Out of all mesioangulars, there were 27 female and 34 male. Figure (5), Table (3)

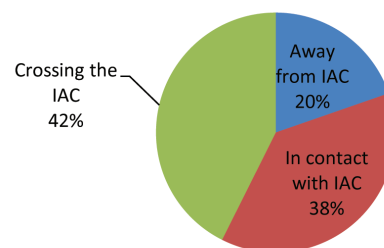


Figure (5): Relation of the roots of mesioangular impacted teeth to the IAC.

In 21 (16.9%) distoangular impactions, 4 (19%) were away from IAC (16% of this category of relation); 11 (52.4%) were in direct contact with IAC (22% of this category of relation), and 6 (28.6%) were crossing the IAC (12.2% of this category of relation). Out of all distoangulars, there were 13 female and 8 males, Figure (6).

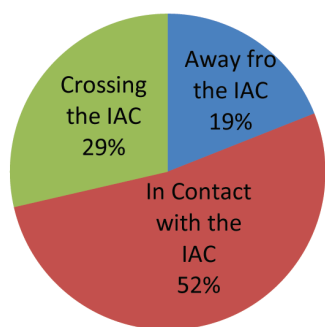


Figure (6):Relation of the roots of distoangular impacted teeth to the IAC

Out of 18 (14.5%) vertical impactions, one case (5.6%) was away from IAC (4% of this category of relation); 7 cases (38.9%) were in direct contact with IAC (14% of this category of relation) and 10 cases (55.6%) were crossing the IAC (20.4% of this category of relation). 7 female and 11 male, Figure (7).

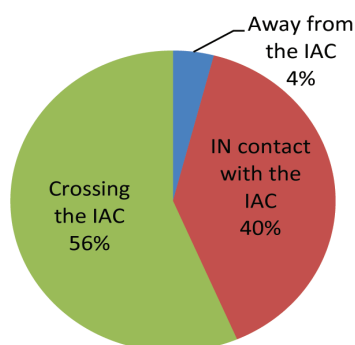


Figure (7):Relation of the roots of vertical impacted teeth to the IAC

In horizontal impaction (24 case “19.4 %”), 8 cases (33.3%) were away from the canal (32% of this category of relation); 9 cases (37.5%) were in direct contact with canal (18% of this category of relation) and 7 cases (29.2%) were crossing the IAC (14.3% of this category of relation), Figure (8).

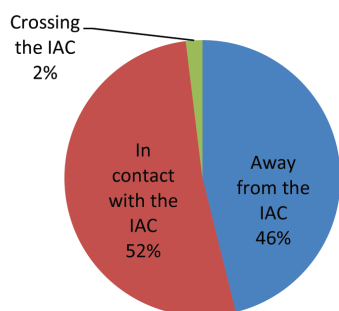


Figure (8): Relation of the roots of horizontal impacted teeth to the IAC

Table (3):Relation of impacted teeth to the IAC according to type of impaction

| Statistical tests | Value | df | p-value |
|------------------------------|-------|----|---------|
| Pearson Chi-Square | 7.516 | 6 | 276 |
| Likelihood Ratio | 7.884 | 6 | 247 |
| Linear-by-Linear association | 644 | 1 | 422 |
| Number of Valid Cases | 124 | | |

Discussion

Oral surgeons may do surgery for LTM without taking radiographs when there is mesioangular impaction, especially those with partial impaction. Such approach may find its explanation from the statements in textbooks where there is confirmation that mesioangular impaction is the easiest one³. Our results showed that cases with mentioned type of impaction just 19.7% are safe to do surgery without taking radiographs (roots away from IAC). Such finding matches the results of Prasannasrinivaset et al¹¹. The rest of mesiangulars which comprises 80.3% are endangering the nerve. Injury to nerve may come from direct trauma by root movements and/or instruments like elevators and burs of bone cutting. Vekas et al¹² declared that there was one case of IAN injury in this group, the fact that excludes this type of impaction from safe category. Regarding the necessity of CBCT in this group, the study showed that 42.6% of cases should have this investigation before surgery. In our opinion, we have to give special attention to horizontal and distoangular types of impaction where surgeon should do sectioning of the crown from the roots and sometimes even the roots from each other. In 66.7% of the horizontal and 81% of the distoangular, where roots are close or in intimate contact with IAC, any uncontrolled sectioning may damage the nerve. Such possibility matches with results of Sarikov¹³ where they found that horizontal impaction is associated with a risk of injury in 4.7% of cases. Other authors found that surgery of these two types of impaction is followed by lingual nerve deficit more than IAN; so it is better to have CBCT in all cases of horizontal and distoangular impaction, at least to avoid injury to the last one. The exclusion may be those with the roots away from the IAC. Despite the type of impaction (inclination), in LTM surgery there is always the issue of root configuration. Root numbers and its shape with curvature they

have effect on surgical extraction, the decision and level of sectioning. Apparently, in our study, root number has no effect on root relation to IAC, because all three categories were not statistically different from each other. Two and converge rooted teeth were the most common among LTM. Only 20% of this root type was away from IAC. The rest 80% were either contacting or crossing the IAC. Because converged two roots have some sorts of hooking in the bone, there are more chances for fracture, sectioning and deep elevator application, which in turn, increases the chances of damage to IAN. None of the two-divergent roots and those with apical curvature was away from the IAC. So, in our opinion, all impacted LTM with two and more roots, with any kind of curvature, especially hooking apical thirds should have CBCT before any intervention. Despite the above-mentioned facts of differences between groups of impaction types and roots, our study could not figure out a significance of the difference between them. Such finding matches with those of Sarikov¹¹. Despite the differences between groups of impaction types and root configurations; they tend to have the same percentage of being away, in contact and crossing the IAC, except for the divergent and the apically curved roots that showed no safety to be away from the canal.

Conclusions

The study showed no significant difference between Winter classes of impaction and different root configurations, regarding the relation of roots of LTM to IAC. Our results showed that just 19.7% may be safe to do surgery without taking radiograph, the rest has the risk of endangering the IAN, 40% needs CBCT and 60% of cases can have surgery with no CBCT.

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