

# A multivariate statistical analysis on variables affecting inferior alveolar nerve damage during third molar surgery

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## FULL PAPER DETAILS

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**Aim** The risk factors associated with inferior alveolar nerve damage during third molar surgery were investigated.

**Material and methods** Surgeries performed during a period of 50 months by a single expert surgeon were reviewed. Only those surgeries that met the selected inclusion criteria were considered for this study. The following tests were applied for the statistical analysis: the Kolmogorov-Smirnov test, the principal components analysis, the Mann-Whitney U test, the two-tailed exact Fisher test and the Bonferroni sequential correction. **Results** The surgical difficulty index, multi-rooted third molars and changes in the inferior alveolar nerve running in relation to the tooth roots are predictors of nerve damage. **Conclusions** Computed tomography is mandatory when the nerve is superimposed on the tooth root on the orthopantomography. **Scientific rationale for study** Lower third molar extraction is one of the most common procedures in oral and maxillofacial surgery, and it is burdened by the risk of inferior alveolar nerve damage. Understanding which factors are able to predict this complication is therefore essential in correctly programming surgery. **Principal findings** Surgical difficulty index, multi-rooted third molars and changes in inferior alveolar nerve running in relation to the tooth roots are predictors of nerve damage. **Practical implications** If, on the orthopantomography, the nerve is superimposed on the tooth root, a computed tomography is mandatory to define all of these variables.

## EDITOR'S SUMMARY

One of the difficulties of any research or any experiment is refining the study down to a single question or analysis. In so many cases the potential, multi-factorial nature of any puzzle means that trying to tease out the various possible influences and interrogate just one of them is maddeningly complex. It also means that the results of any research are incredibly vulnerable to questioning and doubt because one or more 'other' factors have possibly been insufficiently considered or controlled for.

However, one has to start somewhere and this paper makes a small but very considered attempt to do just this in the vexed field of potential inferior alveolar nerve (IAN) damage in relation to third molar surgery. Because this is an area of operation of which we are all familiar whether directly as clinicians or one-step removed as referrers and those responsible for continuing care, it is also one for which we are conscious of

the debilitating human consequences of IAN damage. Although, thankfully, rare it remains a serious issue and all further steps that we can take to minimise or eliminate such a risk are to be strived for and welcomed.

There is considerable and growing literature on the subject but in acknowledging this the authors of the current paper have attempted to single out any particular factors which influence the risk of injury. Not unexpectedly the degree of surgical difficulty, multi-rooted third molars and the proximity of the nerve to the roots were found to be closely correlated with the development of paraesthesia. Conversely, other considerations found previously to be of influence such as age, gender and duration of surgery were not significant factors in this study.

The single most striking recommendation is that when in two dimensions, on a panoramic or other radiograph, there is shown a proximity of the roots to the

IAN, then a three-dimensional image as provided by a CT scan is strongly advised.

Looking ahead, the authors would like to investigate more of the variables analysed in the present study including being performed by more than one surgeon, with different surgical experience and from different surgical centres, thereby moving the research on a step at a time.

Stephen Hancocks  
Editor-in-Chief

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**IN BRIEF**

- IAN exposure during third molar surgery cannot be considered a 'warning sign' of nerve damage.
- The crown luxation should preferably be performed in a direction ipsilateral to the IAN running.
- Difficult surgeries, multi-rooted teeth and changes in IAN running in relation to tooth roots are real predictors of IAN damage.

**COMMENTARY**

Paresthesia resulting from traumatic injury to the inferior alveolar nerve during third molar surgery, while relatively uncommon and usually temporary, is nonetheless a major cause of concern to both surgeon and patient. Scientifically supported knowledge of anatomical and physiologic factors associated with inferior alveolar paresthesia could reduce this concern by identifying low *versus* high risk patients. Efforts at prevention could then be concentrated on high risk patients.

This paper provides a multivariate statistical analysis of the following putative risk factor categories: 1) patient characteristics; 2) radiographic signs; and 3) clinical/pathological findings. A total of 63 surgical patients between the ages of 16 and 57 of both genders with symptomatic third molars were the subjects of this retrospective study. One proposed risk factor, surgeon expertise, was controlled by having all surgeries performed by the same experienced surgeon. Specific risk variables examined were gender, age, impaction depth, root morphology, tooth position with respect to the radiographic mandibular canal, and amount of bone between the tooth and the nerve intraoperatively. The duration and difficulty of the operation were also evaluated.

As might be expected, the results showed that the degree of surgical difficulty, full bony (*vs.* partial bony) impactions, multirooted third molars and the proximity of the roots to the nerve showed a strong positive correlation with the development of paresthesia. Contrary to expectations based on prior literature, neither age, gender,

horizontal position, duration of surgery nor bony separation correlated with the incidence of paresthesia.

In those at highest risk of developing paresthesia due to the two dimensional proximity of the molar roots to the inferior alveolar nerve on a panoramic X-ray, CT scans are strongly recommended by the authors. These provide the surgeon with a three-dimensional view of the roots with respect to the nerve. The decision to perform a scan must be made with regard to the relatively high cost of the procedure.

The authors caution that the results of the study are limited by its small sample size, retrospective design and dependence upon the work of a single surgeon.

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**AUTHOR QUESTIONS AND ANSWERS****1. Why did you undertake this research?**

Lower third molar extraction is one of the most common procedures in oral and maxillo-facial surgery. Inferior alveolar nerve damage is one of the most relevant complications in this kind of surgery and it often results in medico-legal litigation. Understanding which factors are able to predict this complication is essential in correctly programming surgery and in obtaining a real informed consent from the patient. Several studies have been performed to search for variables which were associated with the risk of inferior alveolar nerve damage during third molar surgery but literature data were not unanimous. Moreover, no technical strategies have been described to limit the risk of nerve damage. The aim of the present research was to evaluate whether and which patient-, tooth-, and surgery-related variables were associated with a high risk of inferior alveolar nerve damage during third molar surgery.

**2. What would you like to do next in this area to follow on from this work?**

A prospective study should be performed in which all variables analysed in the present study are used and in which surgeries should be performed by more than one surgeon, with different surgical experience and from different surgical centres. Moreover, at least two different surgical techniques could be randomly applied by each involved surgeon to verify whether different technical strategies may also be considered risk variables in inferior alveolar nerve damage. Finally, a wider sample should be analysed to increase the statistical significance of data results.