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Adverse events during the removal of impacted maxillary third molars

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Abstract. The purpose of the present study was to estimate the frequency of the occurrence of intraoperative adverse events during the removal of impacted maxillary third molars and to correlate predictive variables. A prospective cohort study was carried out involving patients submitted to at least one surgical removal of an impacted maxillary third molar as part of a line of research on third molar surgery developed at the study university. Predictor variables indicative of the occurrence of adverse events during surgery were classified by their demographic, clinical, radiographic, and surgical features. Descriptive and bivariate statistics were computed. In total, 106 patients fulfilled the eligibility criteria, and 204 surgeries were performed. The mean patient age was 22.8 ± 2.2 years and the ratio of women to men was 3:1. Nine different adverse events occurring during surgery were recorded. These events occurred in approximately 6.9% of cases and were significantly associated with the second molar relationship ($P = 0.008$) and periodontal space ($P = 0.05$). The study revealed a low frequency of adverse events during the surgical removal of an impacted maxillary third molar. The results suggest that adverse events during surgery are associated with the second molar relationship and periodontal space.

Key words: molar third; maxillary; intraoperative complications.

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Adverse events are involuntary consequences of health care and occur at an alarming frequency.[1] A large number of these events could be avoided by the adoption of reliable evidence-based practices and the implementation of safety measures,[2] such as the standardization and simplification of procedures and recognition of preoperative factors.

The estimation of possible adverse events is a frequent dilemma for surgeons.[3] Moreover, studies on third molar surgery have focused on the occurrence and treatment of postoperative adverse events,[4,5] with little consideration given to intraoperative events. An analysis of the PubMed database using the descriptors 'adverse events', 'surgical complication', and 'maxillary third molar' revealed no prospective studies beyond the preventive aspect of the occurrence of adverse events and/or surgical complications. Thus, severe adverse events that require complex management are often reported.[6–12]

The best approach to adverse events is not to allow them to occur. For this purpose, it is important to develop a model of factors associated with surgical adverse events.[6] Such a model should allow changes to be made during the act of surgery and assist in the decision as to whether the procedure should even be carried out.[4]

Because of the scarcity of scientific evidence on this issue, the aim of the present study was to estimate the frequency of

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adverse events during the removal of impacted maxillary third molars. The researchers hypothesized that there are predictive variables for the occurrence of adverse events during surgery. The specific aim was to identify and clarify the variables of interest related to such occurrences.

Materials and methods

Study design, location, and eligibility criteria

To address the research purpose, the investigators designed and implemented a prospective cohort study. The study population comprised all patients presenting for the evaluation and management of an impacted maxillary third molar between January and September 2012. To be included in the study sample, patients had to fulfil the following eligibility criteria: (1) indication for surgery under local anaesthesia, and (2) American Society of Anesthesiology (ASA) category I or II. Patients were excluded as study subjects based on the following exclusion criteria: absence of the maxillary second molar, absence of the upper central incisor, absence of the lower central incisor, systemic and/or behavioural disorder that would render local anaesthesia unviable, pregnant or lactating women, recent irradiation, cognitive impairment that would render the comprehension of the study objectives impossible, and non-acceptance of the methodology. All patients signed statements of informed consent, and the study received approval from the university ethics committee.

Interpretation and recording of predictive variables

The predictor variables were categorized into the following groups: demographic (gender, age, and body mass index (BMI)), clinical (maximal mouth opening and associated pathologies), and radiographic (level of occlusal plane, available retromolar space, impaction angle, number of roots, root curvature, tooth relationship with maxillary sinus, relationship with the second molar, depth of the elevator tip, crown width, and periodontal space). Table 1 summarizes the predictor variables and their definitions. Predictor variables were recorded by a single examiner. Further data were obtained from digital orthopantomography (panoramic picture). After the initial examination, the patients were randomly sent to a single previously calibrated senior surgeon who had had no contact with the patients in the pre-selection phase and was blinded to the previously collected data.

Interpretation and recording of adverse events

Adverse events (primary outcome variable) in the present study were defined as any undesirable, unintentional result affecting the patient at the time of surgery that would not have occurred if the operation had gone as planned, requiring additional management beyond that originally planned by the surgeon (yes/no). To avoid subjectivity and imprecision, qualitative terms (secondary outcome variables) such as small complication or large complication were purposely avoided in the reports. The revised definition suggests that an adverse event is not a fixed reality.

Record of adverse events

Immediately prior to surgery, the surgeon wrote down the entire surgical plan for the case, from incision to suturing. During the procedure, an examiner verified the technical manoeuvres used for the extraction and recorded any intraoperative event that required management beyond that which was originally planned. The duration of surgery from incision to suturing was also recorded (operative variable).

Surgical technique

All procedures were carried out in the same surgery unit using the same instruments, high-speed drills (80,000–150,000 rpm, conical bit number 702), and materials. Local anaesthesia was administered (3% lidocaine with noradrenaline at 1:50,000) for the regional blocking of the greater palatine and posterior superior alveolar nerves following aspiration. No sedation method was used in the present study. All extractions were carried out with the standardized general method for the surgical removal of impacted third molars as described by Farish and Bouloux.[13]

Statistical methods

Descriptive and bivariate statistics were computed, and a model was adjusted to explain each of the predictor variables. A model was first adjusted for each predictor variable considering all independent variables with a level of significance up to 15% ($P < 0.15$). Adjustment of the final model was performed using a backward stepwise procedure, maintaining only those variables with a level of significance up to 5.0% ($P < 0.05$). SPSS version 15.0 software (SPSS Inc., Chicago, IL, USA) was used for the statistical calculations.

Results

In total, 204 surgical interventions were performed in the 106 patients included in the study. Bilateral extractions were necessary in 98 patients, but all interventions were carried out on different occasions. The mean patient age was 22.8 ± 2.2 years. The ratio of females to males was three to one (72.5% and 27.5%, respectively). Approximately one in every five patients was overweight ($BMI > 25\ kg/m^2$).

Optimization of oral health (48%), orthodontic indication (27.5%), pain (15.7%), and associated lesions (caries, periodontal disease, inflammatory lesion, and others; 98.8%) were the most frequent reasons for removal of the maxillary third molar. Most cases had a maximal mouth opening greater than 45 mm (74.5%), maxillary third molars with one fused root (52.0%), non-dilacerated root (92.2%), a radiolucent periodontal space (97.0%), and no associated pathologies (90.2%). The root apex was related to the maxillary sinus in more than half of the cases (78.4%).

Based on the Winter classification, the most frequent tooth position was vertical (76.5%), with a medium or low occlusal plane level (32.4% and 39.2%, respectively). Crown morphology was non-bulbous in 79.4%. There was contact between the second and the third molars in 71.6%, and the retromolar space was greater than 3 mm in 74.5%, with the elevator tip depth between 4 and 6 mm in 71.6% of cases. The mean surgery time was 6.6 min (range 2.3–34.3 min).

Nine different intraoperative events required additional management beyond that originally planned and were recorded as adverse events. These events occurred in approximately one in every 15 surgeries (6.9%; 14/204 surgeries) (Fig. 1). The surgical technique most often used for the removal of maxillary third molars was the use of an elevator alone (55.9%). A positive association was found between the degree of difficulty and the occurrence of intraoperative adverse events (Table 2).

Table 3 displays the bivariate associations between the predictive variables and the occurrence of adverse events.

The odds ratios revealed that the likelihood of adverse events during the surgical removal of an impacted maxillary third molar is greater (1) if there is a close