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Design of a scale for measuring post-surgical complications in third molar surgery

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Abstract. The aim of this study was to design a scale for measuring the extent and severity of post-surgical complications in third molar surgery. A multi-stage study using a quantitative methodology and qualitative interview strategy was employed. The degree of importance of signs and symptoms in the evaluation of post-surgical complications was initially observed using a self-report questionnaire administered to maxillofacial surgeons and surgical residents at the International Conference of Oral and Maxillofacial Surgeons in 2011. Then, using exploratory factor analysis, the items and components of the scale were established, with internal consistency determined using Cronbach's alpha. Finally, a group of experts performed a face validity analysis and provided conceptual definitions for the items and components. Thirty-six signs and symptoms were evaluated by 100 respondents, with the most relevant being 'suppuration' and 'abscess'. Factor analysis of the results identified three factors, defined as 'secondary complication', 'soft tissue infection', and 'osseous involvement' (Cronbach's alpha > 0.7). Finally, a preliminary scale was designed comprised of these three components and 10 items. In this way, a preliminary scale for measuring post-surgical complications was designed to standardize the semiological concepts of post-surgical assessment. This scale will be assessed in a future investigation.

Key words: third molar; third molar surgery; third molar injuries; post-operative complications; oral surgical procedures; reproducibility of results; evidence-based dentistry.

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Third molar extraction is the most frequent surgery performed on the oral cavity.[1] The associated post-operative complications have been reported with different frequencies and magnitudes in terms of severity[2] and can occur intraoperatively (socket bleeding, inferior alveolar nerve damage, or oro-antral communication) or post-operatively,[3] due to inflammation (alveolitis, pain, or swelling), infection (post-operative infection), or other causes (dehiscence, haematoma, presence of bone spicules, and others).[4]

A large number of items are used to define post-surgical complications in third molar surgery,[5] and the quantification of signs and symptoms has been recorded using different methods. The existence of various measuring instruments and models means that in most cases they lack validation and reliability studies. This situation may encourage measurement bias, subjectivity in data recording, and a lack of reproducibility of the measurements. Recent systematic reviews[6–8] have drawn similar conclusions, demonstrating that diagnostic/evaluation criteria and the results of source studies complicate adequate comparisons and homogenization of terminologies.[6,7] In fact, a recent paper by Dodson[9] highlights the critical nature of the lack of consensus in diagnostic criteria of alveolar osteitis, meaning that combining data may be inappropriate.

A further important aspect to consider is that the use of subjective variables requires psychometric measurement instruments, such as pain scales, which include ordinal levels according to the severity of

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this sensation.[10] In addition, patient opinion and experience is also relevant during the measurement procedure and should be considered in the process.[7]

These are all sufficient reasons to advocate the application of mathematical models in the creation and validation of measurement instruments in health care that would render clinical practice more objective and predictable.[11]

The aim of this study was to design a preliminary measurement scale for determining the extent and severity of post-surgical complications in third molar extraction surgery.

Materials and methods

A multi-stage study was conducted to create a scale using a quantitative methodology and qualitative interview strategy (Fig. 1).

In the first stage, an exhaustive search was made of the Science Citation Index Expanded database, accessed via Web of Science (Thomson Reuters); original clinical research articles related to post-surgical complications in the population aged >18 years, published between 2000 and 2010, with no limitation on design, were identified. From these, an initial list was compiled of 38 signs and symptoms observed as post-surgical complications. Then, a structured questionnaire for self-administration was created in English and Spanish, comprising these 38 items, with each being assigned a 5-item Likert scale, from 1 'not important' to 5 'of great importance'. This questionnaire was applied in a pilot study on a group of experts at the monthly meeting of the Chilean Society of Oral and Maxillofacial Surgery and Traumatology held in Santiago in August 2011; the purpose was to review the writing and reading comprehension of the instrument. Once the instrument had been corrected, the degree of importance of the signs and symptoms designated as post-surgical complications were evaluated by presenting the questionnaire to maxillofacial surgeons and post-graduate students attending the XX International Conference on Oral and Maxillofacial Surgery (ICOMS 2011), held in November 2011 in Santiago, Chile. The principal investigator and a collaborator handed the questionnaire out to attendees in the different rooms and meetings. The aim of the questionnaire was explained verbally prior to the respondents reading and giving informed consent; they then proceeded to answer the questionnaire. Distribution of the document among attendees was approved by the scientific committee organizing ICOMS 2011 and was designed in accordance with the bioethical standards set out by Beauchamp and Childress.[12] The following socio-demographic variables of the participants were collected using the questionnaire: area of work (public/private), level of medical attention provided by the hospital (primary/secondary/tertiary), age, level of education in the specialty (specialist in maxillofacial surgery, resident of maxillofacial surgery, or other), function or position (supervisory, academic, clinical, or other), years of work experience, years as a specialist, and continent of origin. The sample size needed to apply this instrument was calculated in accordance with the recommendations of Kline and Streiner,[11] including five to 10 respondents per item of the final instrument to be validated.

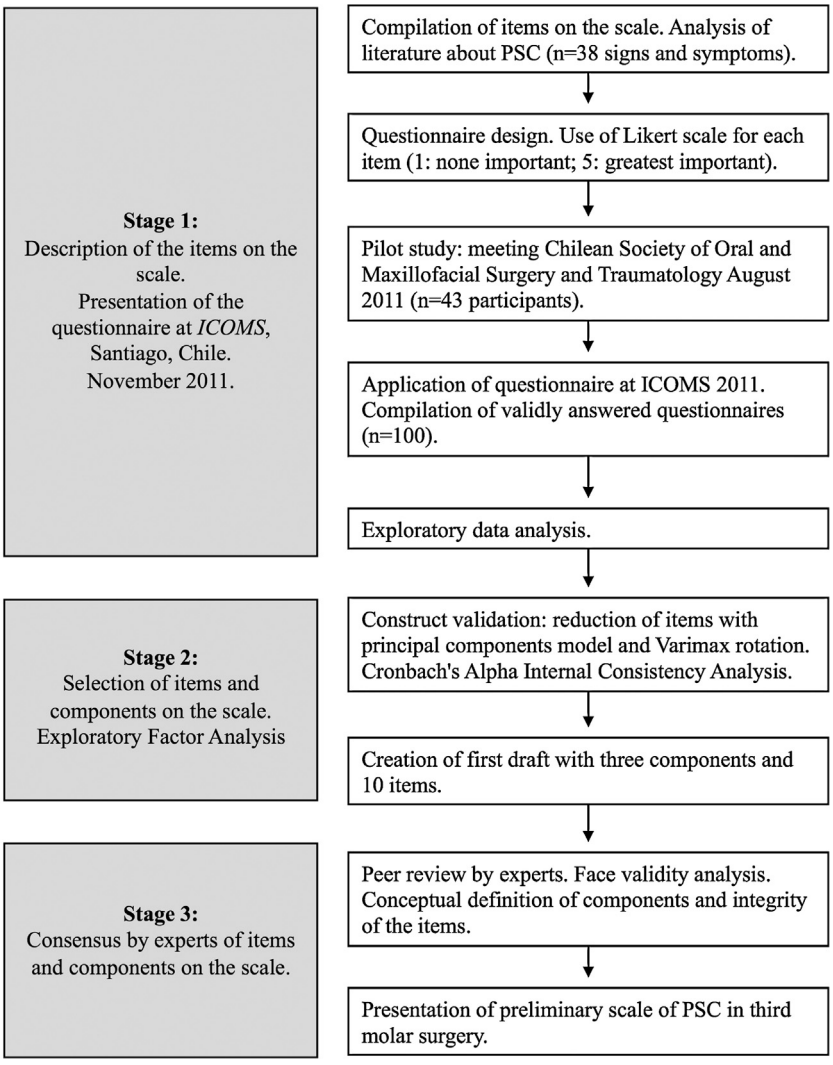

Fig. 1. Stages undertaken in designing the scale of post-surgical complications (PSC) in third molar surgery.

The socio-demographic data of respondents and the numerical values of the results of the Likert scales were analyzed with descriptive statistics using measures of dispersion (standard deviation; SD) and central tendency (mean).

In the second stage, the items and domains of the scale were established through an exploratory factor analysis of the ICOMS 2011 questionnaire results using the principal components model with the Kaiser–Meyer–Olkin (KMO) measure of sampling adequacy and the significance of Bartlett's test of sphericity, with a value of $P < 0.05$. Different orthogonal and oblique rotations were applied, being the most suitable, and the varimax rotation was used to differentiate factors. Load factor values less than 0.2 were eliminated.[13] The number of items was reduced with factor coefficients in more than one factor with differences less than 0.15.[14] In addition, items that presented a