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Review

Risk of wound infection and safety profile of amoxicillin in healthy patients which required third molar surgery: a systematic review and meta-analysis

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Abstract

The aim of this systematic review and meta-analysis was to assess the risk of surgical wound infection and the adverse effects of amoxicillin in healthy patients who required excision of third molars. We identified eligible reports from searches of PubMed, Medline®, the Cochrane Library, Imbiomed, LILACS, and Google Scholar. Studies that met our minimum requirements were evaluated using inclusion and exclusion criteria and the Oxford Quality Scale. Those with a score of 3 or more on this Scale were included and their data were extracted and analysed. For evaluation of the risk of infection the absolute risk reduction, number needed to treat, and 95% CI were calculated. For evaluation of the risk of an adverse effect the absolute risk increase, number needed to harm, and 95% CI were calculated using the Risk Reduction Calculator. Each meta-analysis was made with the help of the Mantel-Haenszel random effects model, and estimates of risk (OR) and 95% CI were calculated using the Review Manager 5.3, from the Cochrane Library. A significant risk was assumed when the lower limit of the 95% CI was greater than 1. Probabilities of less than 0.05 were accepted as significant. The results showed that there was no reduction in the risk of infection when amoxicillin was given before or after operation compared with an untreated group or placebo. In conclusion, this study suggests that amoxicillin given prophylactically or postoperatively does not reduce the risk of infection in healthy patients having their third molars extracted.

Keywords: Amoxicillin; Healthy patients; Prophylactic administration; Postoperative administration; Third molar surgery

Introduction

Removal of wisdom teeth is a standard procedure in oral surgery, and is routine for general dental practitioners as well as oral and maxillofacial surgeons.[1] Most operations on third molars are done without operative difficulties. However, sometimes there can be complications, the most common of which are wound infection, dry socket, sensory nerve damage, haemorrhage, and pain. Less common are severe trismus, iatrogenic damage to the adjacent second molar, and iatrogenic mandibular fracture.[2]

The overall incidence of wound infection after extraction of third molars has been reported to be in the range of 0%–27%,[3,4] and it has been suggested that the rates are higher after mandibular bony impactions than after any other type of extraction, which reflects the increased surgical trauma. It

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has also been suggested that systemic antibiotics may be of value to prevent wound infections in patients with gingivitis, pericoronitis, or generally debilitating diseases.[5]

It is broadly accepted that antibiotics should be given to treat established infections or to prevent infections in high-risk patients. However, the systematic use of antibiotic prophylaxis in patients with no individual risk factors is controversial, lacks a scientific basis, and cannot be considered acceptable. In numerous circumstances the threat of infection is so low that the risks derived from the use of an antibiotic exceed the potential benefits. In many cases, the antibiotic chosen is not ideal when the bacterial spectrum is considered, nor are the duration of treatment, timing, or route.[6]

The risks of the indiscriminate use of antibiotics lead to the development of resistant organisms, secondary infection, toxicity, and allergic reactions, and 6%–7% of patients who are given antibiotics have some kind of adverse reaction.[7] The antimicrobial drugs seem to have only a marginal benefit when a clinically uninfected tooth is being removed.[8] Current publications do not support the use of antibiotics in healthy patients who require excision of third molars and the results of such studies are contradictory.[9–12] Some previous reports have assessed the efficacy and safety of antibiotics together.[11,12]

Amoxicillin is the most commonly-prescribed antibiotic because it has adequate pharmacological properties and a broad cover of dental pathogenic bacteria, but the clinical studies are contradictory.[6,13–15] The aim of this systematic review and meta-analysis was therefore to assess the risk of surgical wound infection and adverse effects of amoxicillin in healthy patients who required removal of third molars.

Patients and Methods

Identification of studies

We sought double-blind, randomised, clinical trials of amoxicillin compared with no treatment or placebo. Several different searches were used to identify eligible reports from PubMed, MedLine, Cochrane Library, Imbiomed, LILACS, and Google Scholar. The key words used were: "amoxicillin", "antibiotic treatment", "prophylactic antibiotic treatment", "postoperative antibiotic treatment", "third molar surgery", "oral surgery", "maxillofacial surgery", "dentistry", and "odontology". Each abstract was read before we obtained the complete paper. All studies published up to 2014 were eligible.

Inclusion and exclusion

Papers were included if they were randomised, double blind or triple blind, clinical trials; if the patients were American Society of Anesthesiologists (ASA) class I; if the study compared amoxicillin given before or after operation with an untreated or placebo group for the extraction of third molars; if there was a clinical diagnosis of surgical wound infection; and if the report was published in English or Spanish. They were excluded if more than 20% of those entered were lost to follow-up, or if they also used immunosuppressive drugs.

Two research workers independently read and evaluated each complete paper, so both evaluated each study. Once they had done this, each evaluation was checked by the other worker. Any disagreement was resolved by consensus, and with the aid of another experienced research worker. The authors were contacted for additional information, or if any point was not clear.

Evaluation of quality

Next the quality of the clinical trials was assessed using the Oxford Quality Scale.[16] Points were awarded as follows: was the study randomised? If yes, add 1 point; was the randomisation procedure reported and was it appropriate? If yes, add 1 point, if not, deduct 1 point; was the study double blind or triple blind? If yes, add 1 point; was the method of double or triple blinding reported, and was it appropriate? If yes, then add 1 point, if not, deduct 1; and were withdrawals and those who did not complete the trial listed? If yes, add 1 point.

As before, the evaluation with the Oxford Quality Scale by one research worker was checked by the other, and all differences were similarly resolved. Those studies that met the inclusion criteria without exclusion points, plus an Oxford Quality Score of 3 or more, were included in the systematic review and meta-analysis.

Extraction of data

The data extracted for each included study were authors' names, design (parallel or crossover), drug given before or after operation, size sample, route by which the drug was given, period of evaluation, number of patients with alveolar wound infections, and number of adverse effects.

When a study had several treatments, data from those groups that met the requirements were extracted (an amoxicillin group and an untreated or placebo group). Others groups in the same study that did not meet the requirements were not considered in the statistical analysis. When a study had 2 or more groups given amoxicillin, the cases of infection were collected in one group and were compared with the untreated or placebo group.

Statistical analysis

First, we made an overall evaluation of the risk of wound infection using amoxicillin compared with an untreated or placebo group. Next, we evaluated the risk of infection by comparing amoxicillin (before or after operation) with an untreated or placebo group. Finally, we made an overall evaluation of the adverse effects. To evaluate the risk of infection