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British Journal of Oral and Maxillofacial Surgery xxx (2014) xxx–xxx
BRITISH Journal of Oral and Maxillofacial Surgery
www.bjoms.com

Use of metronidazole as part of an empirical antibiotic regimen after incision and drainage of infections of the odontogenic spaces

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Accepted 4 September 2014

Abstract

The combination of amoxicillin/clavulanate and metronidazole is a widely-accepted empirical regimen for infections of the odontogenic spaces. Once adequate drainage has been established micro-organisms are less likely to grow and multiply, particularly anaerobes. This may obviate the need for anaerobic coverage after drainage in healthy hosts. We studied 60 patients in this randomised prospective study, the objective of which was to evaluate metronidazole as part of an empirical antibiotic regimen after drainage of infections of the odontogenic spaces. Samples of pus were sent for culture and testing for sensitivity. Amoxicillin/clavulanate and metronidazole were given to all patients. After incision and drainage the patients were randomly allocated to two groups. In the first group both antibiotics were continued, and in the second metronidazole was withdrawn. The groups were compared both clinically and microbiologically. There were no significant differences between the groups in the resolution of infection. Thirteen patients ($n = 6$ in the 2-antimicrobial group, and $n = 7$ in the amoxicillin/clavulanate group) showed no improvement during the 48 h postoperatively. Overall there was need to substitute another antibiotic for amoxicillin/clavulanate in only 6 cases. Six patients in the amoxicillin/clavulanate group required the addition of metronidazole after drainage. We conclude that in healthy subjects metronidazole is not necessary in the period after drainage, but its prescription should be based on assessment of clinical and laboratory markers of infection.

Keywords: Odontogenic; Space infection; Antibiotics; Empirical

Introduction

Systemic antimicrobial treatment has been an important adjunct to surgery in the management of infections of the odontogenic spaces. A rational approach to selection of appropriate antibiotics is based on scientific data and contemporary experience of the microbiology of oral infection,[1] and the combination of amoxicillin/clavulanic acid and metronidazole has become widely accepted.[2] Metronidazole provides excellent anaerobic coverage and is an effective supplement to penicillins.

The use of antibiotics should be restricted to reduce the development of bacterial resistance and to minimise adverse reactions. We therefore designed a study to find out which antibiotics were optimal in the management of these infections. Once adequate drainage has been established by incision of the infected space, the environment alters and may discourage multiplication of micro-organisms, particularly anaerobes. This might obviate the need for metronidazole to be continued after drainage. We have therefore evaluated the withdrawal of metronidazole after incision and drainage had been completed.

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http://dx.doi.org/10.1016/j.bjoms.2014.09.002

Please cite this article in press as: Bali R, et al. Use of metronidazole as part of an empirical antibiotic regimen after incision and drainage of infections of the odontogenic spaces. *Br J Oral Maxillofac Surg* (2014), http://dx.doi.org/10.1016/j.bjoms.2014.09.002

Patients and methods

This double-blind, randomised prospective study was done during the period October 2011–October 2013, and we studied 60 patients with infections of the odontogenic spaces. Patients were excluded if they were allergic to penicillins, if they were taking antibiotics at the time or had had incision and drainage elsewhere, if they were medically compromised, or if they were pregnant.

Pus was aspirated and sent for culture and sensitivity testing before antimicrobial treatment was started. The anaerobic transport medium used was HiCulture™ transport swabs (a modification of Stuart's medium) with alternative thioglycollate medium. The isolation and culture techniques were based on the standard protocol recommended by the Clinical Laboratory Standards Institute.[3]

Antibiotics were started for all patients before incision and drainage in the form of amoxicillin 1000 mg/clavulanate 200 mg injected intravenously 8-hourly together with an intravenous infusion of metronidazole 500 mg 8-hourly. Appropriate anaesthesia was decided in consultation with the anaesthetist. The site was incised and drained, and the focus of infection removed with copious irrigation. The diagnosis of which spaces were involved was confirmed intraoperatively. Drainage was maintained with a corrugated rubber drain. Postoperatively patients were randomly allocated to two groups by block randomisation.

In one group amoxicillin/clavulanate and metronidazole were continued after drainage, and in the second group only amoxicillin/clavulanate was continued, and metronidazole was stopped. In all patients the site was regularly irrigated with hydrogen peroxide, saline, and povidone iodine (Betadine®). If the swab showed that the organism grown was resistant to amoxicillin/clavulanate, an effective antibiotic was substituted.

As soon as the clinical and the laboratory findings indicated that the infection was under control the antimicrobials were given orally rather than intravenously. Patients were followed up for 4 weeks. The clinical and laboratory findings were monitored by staff who were unaware of the antibiotic regimen given postoperatively. The treatment was considered to have been effective if the patients' condition improved within 48 h. Those patients who showed no clinical improvement after 48 h had their wounds explored again. The decision to substitute, add, or discontinue any antibiotic was made by a third party (between 48 and 72 h) based on clinical and laboratory findings, and the results of culture and sensitivity testing.

Collection of data

Patients' age, sex, focus of infection, and number and type of spaces involved were recorded. We compared clinical variables including change in degree of swelling (measured by thread and scale), changes in the amount of pain (measured by visual analogue score), presence or absence of pus, improvement in mouth opening, and dysphagia or dyspnoea (if symptoms were present). Improvement in systemic variables including heart rate, body temperature, and respiratory rate were assessed using the criteria for the systemic inflammatory response syndrome (SIRS).[4] Laboratory tests included microbiological cultures, white cell count (WCC), and concentration of C-reactive protein (CRP).

Measurements were made postoperatively at 24, 48, and 72 h, and 7 days.

Analysis of data

A database was constructed using Microsoft Excel (Microsoft, Redmond, WA). The statistical analysis was done with the help of SPSS software (version 15.0, SPSS Inc, Chicago). Results are expressed as number (%) or mean (SD), as appropriate. The significance of differences was assessed using Student's *t* test, the Mann-Whitney U test, or the chi square test, as appropriate.

Probabilities of less than 0.05 were accepted as significant.

Results

Clinical results

The mean age of the patients in the 2-drug group was 33 (13) years and in the amoxicillin/clavulanate alone group 34 (13) years, with equal numbers of men and women. The anatomical sites of the infections are shown in Table 1. These differences did not differ significantly, and neither did differences in size of swelling, perception of pain, discharge of pus, or improvement in dysphagia, at any time. Only 3 patients (2 in the 2-antimicrobial group and 1 in the ampicillin/clavulanate alone group) complained of mild dyspnoea on admission. Fourteen and 16 patients, respectively, initially presented with trismus (interincisal distance <20 mm).

Twenty-one and 23 patients in the 2 groups, respectively, (44/60) fulfilled the criteria for SIRS, and 14 patients in and 17 patients, respectively, had temperatures of >38 °C (100.4 °F) on admission. None of these differences was significant, and nor were any differences between WCC or concentrations of CRP (Tables 2 and 3). Only 13 patients ($n=6$ and $n=7$ in the 2 groups, respectively) showed no improvement clinically or microbiologically during the first 48 h postoperatively.

Microbiological findings

Results of cultures are shown in Tables 4 and 5. Most aerobic organisms in both groups were sensitive to amoxicillin/clavulanate, and there was no significant difference between them. Anaerobic organisms were sensitive to amoxicillin/clavulanate in 13 cases in each group, but slightly

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