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Leading article

Microbiological examination and antibiotic sensitivity of infections in the head and neck. Has anything changed?

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Abstract

Because of the growing concern about antibiotic resistance, we aimed to investigate whether the microbiological picture and antibiotic sensitivity of infections in the head and neck have changed in the last 30-40 years. We retrospectively studied 150 patients admitted for inpatient treatment of infections in the head and neck, and searched published reports from the last 30 – 40 years for comparison. There were 85 male and 65 female patients (mean age 39 years, range 1-95). Most infections originated from the teeth (n = 111) and skin (n = 16), and the submandibular (69%) and buccal (67%) spaces were involved most often. Multiple spaces were involved in 94 patients. Swabs were taken for culture and sensitivity in 102 cases, and microorganisms were isolated in 91 (89%), of which 67 (74%) were aerobic infections and 24 (26%) were anaerobic. Bacteria were isolated in 87 (96%) cultures of which 60 (69%) were Gram-positive. Gram-positive cocci were isolated in 62% of cultures. The most common bacteria isolated were streptococci. Seventy percent of the bacteria were sensitive to amoxicillin and 84% to amoxicillin and metronidazole; 14% (*Staphylococcus aureus* from infections of the skin) were resistant to penicillin. A comparison of our results with those found in previous reports shows no significant change in the microbiological picture and antibiotic sensitivity of odontogenic infections in the head and neck over the last 30 – 40 years. Amoxicillin still treats these infections effectively.

Keywords: Changes; Microbiology; Antibiotic; Head; Neck; Infections

Introduction

Antimicrobial agents have been used to treat bacterial infections for the last 70 years, yet bacteria probably evolved around 3.5 billion years ago.[1]

Space infections in the head and neck have affected mankind since recorded history, and signs of dental abscesses and evidence suggesting osteomyelitis have been found in the remains of early Egyptians.[2] In 1928, Sir Alexander Fleming observed that colonies of the bacterium *S aureus* could be destroyed by the mould *Penicillium notatum*. The routine use of penicillin did not begin until the 1940s when Howard Florey and Ernst Chain developed a powdery form of the antibiotic, and its discovery substantially changed the treatment of infections in the head and neck.[3] However, soon after the mass production of penicillin had begun in 1943, microorganisms began to develop that were resistant to antibiotics. To combat this, penicillin-resistant antibiotics were synthesised, but resistance has also developed to these newer drugs.[2]

Infections in the head and neck affect the visceral spaces and their contents.[4] Although the prevalence of space infections in the area has decreased since antimicrobial drugs became available, they continue to cause serious morbidity and death.[5–7] In addition to systemic toxicity, more serious complications such as life-threatening obstruction of the

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Table 1
Type of infection.

Infection	No. (%) (n = 150)
Periapical	104 (69)
Skin	16 (11)
Postoperative	8 (5)
Periodontal	7 (5)
Cellulitis	5 (3)
Salivary	5 (3)
Unknown	5 (3)

Table 2
Incidence of facial space(s) involved. Data are number (%).

Facial space	Single space abscess (n = 56 patients)	Multiple space abscess (n = 94 patients)
Submandibular	27 (48)	76 (81)
Buccal	25 (45)	75 (80)
Submental	4 (7)	13 (14)
Sublingual	0	14 (15)
Periorbital	0	9 (10)
Submasseteric	0	5 (5)
Masseteric	0	4 (4)
Pterygomandibular	0	2 (2)
Peritonsillar	0	0

airway, mediastinitis, pericarditis, thrombosis in the internal jugular vein, epidural abscess, and erosion of the carotid artery, may result.[8–10]

As concern about antibiotic resistance is growing we aimed to investigate whether the microbiological picture and antibiotic sensitivity of space infections in the head and neck have changed over the last 30 – 40 years.

Methods

We retrospectively studied 150 patients admitted for treatment of space infections in the head and neck between April 2011 and December 2013 at Northampton General Hospital.

We included details on age, sex, smoking status, associated medical conditions, source of infection, facial space(s) involved, antibiotics given, previous antibiotic treatment, duration of hospital stay, microbiological findings, sensitivity or resistance, and complications. We searched reports from the last 30 – 40 years for comparison.

Results

We studied 85 male and 65 female patients, mean age 39 years (range 1 – 95). Of these 72 (48%) were smokers, 29 (19%) were immunocompromised, and 102 (68%) had diabetes. A total of 23 (15%) had a drug allergy, most of whom were allergic to penicillin (n = 14, 61%). From onset the mean delay in presentation was 6 days (range 0-19) to accident and emergency (A&E), and 3 days (range 0-14) to a general dental practitioner or general medical practitioner. A total of 96 (64%) referrals were from A&E, 35 (23%) from dentists, and 19 (13%) from general practitioners.

Most infections were odontogenic (n = 111, 74%) and 16 (11%) originated from the skin (Table 1). A total of 56 (37%) patients had a single facial space abscess and 94 (63%) had involvement of multiple spaces (n = 198). Table 2 shows the incidence of the spaces involved.

Fifty-nine patients (39%) had been prescribed antibiotics orally by their dentist or general practitioner before presenting to the hospital. Patients had taken antibiotics for a mean of 4 days (range 1-10) before they presented to A&E.

During inpatient stay, 49 patients were given a single antibiotic intravenously, and the remaining 101 were given a combination of antibiotics. Co-amoxiclav (86%) was used most commonly when only one antibiotic was given, and the combination most commonly used was amoxicillin and metronidazole.

All 150 patients were given antibiotics intravenously and they had a mean of 6 doses (range 2-19) during their stay in hospital. Seventeen patients were treated only with antibiotics, 21 had incision and drainage under local anaesthesia, 3 had incision and drainage under general anaesthesia, 11 had a tooth extracted and incision and drainage under local anaesthesia, 16 had a tooth extracted under general anaesthesia, 81 had a tooth extracted and incision and drainage under general anaesthesia, and one patient had an examination under anaesthetic.

The mean time from presentation to treatment was one day (range 0-2) and from treatment to discharge was 2 days (range 0-8). The mean duration of hospital stay was 3 days (range 1-10).

Swabs were taken in 102 patients. Microorganisms were isolated in 91 (89%) of which 67 (74%) were aerobic infections and 24 (26%) were anaerobic. All infected samples had their anaerobic sensitivity tested. Bacteria were isolated in 87 (96%) cultures, and *Candida albicans* was identified in 4 samples. Sixty-nine percent of the bacteria were Gram-positive, and Gram-positive cocci were isolated in 62% of cultures. The most common bacteria isolated were *Streptococcus viridans*, which were found in 64 out of the 91 patients with infected swabs (70%). Other common bacteria included *Staphylococcus aureus*, prevotella, and Group C streptococcus (Table 3). *S aureus* was isolated only from infections originating on the skin.

Antibiotic sensitivity tests showed that 70% of the bacteria in the infected swabs were sensitive to penicillin, 84% to penicillin and metronidazole, 14% to flucloxacillin, and 2% to ciprofloxacin, meropenem, and gentamicin. Fourteen percent were resistant to penicillin. All of the latter were *S aureus* from skin infections.

Eighty-three percent of patients were discharged taking antibiotics orally. According to clinical records, none