The differential diagnosis of toothache from other orofacial pains in clinical practice

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Background: Teeth are a common and obvious source of orofacial pain. There is a risk that endodontic treatment may be initiated in patients that do not have pulp or periapical pathosis.

Methods: A retrospective survey of a sample of patients referred for endodontic treatment was analysed to determine the accuracy of the diagnosis and to identify non-dental cases. A separate prospective study of complex non-dental orofacial pain cases was performed to determine which cases had previously received dental treatment.

Results: Seventy-seven (88 per cent) of 88 patients referred for endodontic treatment had been correctly diagnosed with solely endodontic problems. Eight (9 per cent) had endodontic plus other orofacial pain problems and three (3 per cent) had no endodontic problems but other orofacial pain problems. Forty-four (44 per cent) of 100 non-dental orofacial pain patients had previously received either extractions or endodontics.

Conclusion: Dentists need to carefully evaluate all toothache patients to ensure that the diagnosis is correct prior to the initiation of irreversible treatment.

Key words: Toothache, endodontics, orofacial pain, diagnosis.

Abbreviation: ESR = erythrocyte sedimentation rate; MPD = myofascial pain dysfunction.

INTRODUCTION

Pain is a common presentation in general dental practice and usually its diagnosis and treatment is straightforward. However, patients with non-dental causes of orofacial pain will also present seeking a dental solution to symptoms which may closely mimic toothache. Correct identification of such patients may be difficult and may occur only after extended irreversible and expensive treatment.

Education about non-dental orofacial pain in textbooks and lectures usually follows a structured description of the presenting signs and symptoms and recommended investigations. In practice, however, patients do not present so neatly and obviously. Usually, the patient has self-diagnosed the problem as toothache and expects quick and efficient resolution of their problem. The unwary dentist may feel obligated to do something to help the patient without first carefully evaluating the patient's pain history, carrying out thorough facial and intra-oral examinations and completing the required diagnostic tests. If the findings do not establish a tooth-related diagnosis or if initial treatment is unsuccessful, then specialist referral is indicated.

The authors of this study have an uncommon opportunity to study dental and non-dental orofacial pain referrals. The practice principals are two full-time specialist endodontists with a wide general dental referral base. Co-located but independently operated is a part-time oral and maxillofacial surgery practice with an interest in complex orofacial pain diagnosis,[1-5] with a wide dental and medical referral base.

The aim of this study was to look at two groups of patients; firstly dental patients referred to the specialist endodontic practice, to determine the accuracy of the presenting diagnosis and secondly, to look at a group of non-dental orofacial pain cases to determine how many have previously received dental treatment for their pain.

MATERIALS AND METHODS

The case records of every tenth new patient referred to an endodontic practice in 2005 were examined. A database of the key parameters of the patient's demographics, diagnostic data, treatment and outcome was prepared and the treating endodontist transcribed the clinical information from the patient record to the database sheet.

The de-identified data were transferred to a stand alone personal computer and analysed by dental students not involved in the patient's management. Appropriate statistical analysis was performed.

A prospective consecutive series of non-dental orofacial pain patients referred to the oral and maxillofacial surgeon by a range of general and specialist medical and dental practitioners was recorded. Patients referred by the endodontists were excluded to prevent duplication. The data collected were simple, "What was the final orofacial pain diagnosis and had the patient

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Table 1A. Diagnostic categories – endodontic

Condition	Characteristics	Investigations
Reversible pulpitis	– Short duration – Reacts to cold and/or heat stimulus – not tender to percussion – no radiographic change	– Check for caries, cracks, restoration breakdown, etc – Bitewing and periapical radiographs – Reproduce symptoms (with appropriate stimuli applied under rubber dam isolation) – Pulp sensibility test – Normal – Periodontal probing
Irreversible pulpitis	– Tendency to have lingering pain to cold and or heat – Not usually tender to percussion – Pain: initially sharp pain then dull, throb, poorly localized, can be spontaneous, wakes at night	– As above – Pulp sensibility test may provoke lingering pain
Pulp necrosis with infection	– May/may not be painful – Can be lingering pain to heat that is relieved by cold	– As above – No response to pulp sensibility tests
Chronic apical periodontitis	– No or minimal symptoms – Only sign is periapical radiolucency – Can have acute exacerbation	– As above – No response to pulp sensibility tests – Periapical radiograph shows periapical radiolucency
Acute apical periodontitis	– Tender to percussion +/- palpation – Pain with chewing – May/may not be pulp symptoms (only if acute irreversible pulpitis)	– As above – Pulp sensibility tests may vary – depends whether acute irreversible pulpitis or a necrotic, infected pulp – Periapical radiograph may/may not show periapical changes
Acute abscess	– Pus accumulation in periapical tissues – Acute tenderness to percussion and palpation – Often intra-oral swelling – Pain with chewing	– As for chronic apical periodontitis
Cellulitis	– Pain often decreased – Facial swelling: indurated, red diffuse – Possible fever, lethargy	– As for chronic apical periodontitis – No response to pulp sensibility tests – Palpate intra-orally and extra-orally to check for deep space infections – Temperature increased

received either endodontic or exodontic treatment in an attempt to gain pain relief?" The diagnostic categories used in both parts of this study are listed in Table 1.

RESULTS

Eighty-eight patient records from the endodontic practice were examined. The demographics of the group are presented in Table 2. Seventy-seven (88 per cent) patients had solely an endodontic problem with eight (9 per cent) having an endodontic problem plus a separate orofacial pain problem. Only four (2.2 per cent) primarily had a non-tooth related problem. All of the non-tooth related pains were in females. The diagnosis details are presented in Table 3.

The treatment, which included the treatment provided by the referring dental practitioner prior to referral, is presented in Table 4. Thirty-six (41 per cent) patients had endodontic treatment initiated by the referring dentist and all of these had an endodontic problem alone. Treatment had not been commenced for any of the patients with a non-endodontic problem. Antibiotics had been prescribed by the referring dentist for 13 (15 per cent) patients – two of these patients had an apical abscess and the other 11 had pain of pulpal

Table 1B. Diagnostic categories – orofacial pain – non-odontogenic

Condition	Characteristics	Investigations
Muscular (MPD, muscle tension headaches, neck pain, whiplash, fibromyalgia)	Chronic dull ache following muscular distribution Muscular dysfunction	Tender muscles Imaging normal Diagnostic block no effect
Arthralgia (Internal derangement, osteoarthritis)	Pain, clicking, locking related to the TM joint	Radiograph or CT may show bone morphology changes MRI show disc abnormality
Psychogenic Atypical facial pain Atypical odontalgia	Abnormal often exaggerate description of symptoms Abnormal response to treatment	Objective tests normal Subjective tests atypical Known previous psychiatric history and treatment
Pathology Chronic infection – Sinusitis – Osteomyelitis	Deep constant pains Signs of inflammation	Abnormal imaging Abnormal blood test – white cell shift – C-reactive protein
Malignancy – Oral SCC – Brain tumour	Usually painless unless advanced Neuralgic pain	Abnormal CT – biopsy
Neuromuscular Dystonia Dystinesia	Abnormal involuntary movements with muscle pain	Abnormal EMG

Table 2. Demographics – endodontic group (n=88)

Age	Mean: 52 years old	Range: 11-78 years
Gender	34 Males (39%)	54 Females (61%)
Medical state	Fit	62 (71%)
	Compromised	26 (29%)
Endodontist	JL – 42* (48%)	
	IT – 46* (52%)	

*There were no differences between the JL and IT patients so they were pooled.

origin without evidence of a spreading apical infection. Hence, antibiotics had been inappropriately prescribed for 11 (85 per cent) of these 13 patients. Seventy-five patients had not been prescribed antibiotics and none of them had an apical abscess. Therefore, the patients that had not received antibiotics had been correctly managed.

The records of 100 consecutive patients referred to the oral and maxillofacial surgeon with pain that was not due to odontogenic origin were examined. The majority were tertiary referrals, with the patient having already been seen by at least one general medical and general dental practitioner, and usually at least one specialist practitioner. Commonly, they had seen more practitioners than that. Forty-four (44 per cent) patients had either had extractions or endodontic treatment in an unsuccessful attempt to treat their orofacial pain. The detailed results are presented in Table 5.

DISCUSSION

This study shows an acceptably high accuracy in the diagnosis of toothache cases referred by general dentists to the specialist endodontists. There was, however, a group with both endodontic and another orofacial pain problem and a still smaller group without any evidence of an endodontic problem, but other orofacial pain issues. The tertiary referral orofacial pain group, however, had received quite an extensive amount of dental treatment without benefit for their pain. The diagnostic groups, where differentiation between toothache and orofacial pain problems were a particular problem, were those with muscular, neuralgic or psychiatric problems.

Patients with a muscular problem (which is commonly myofascial pain dysfunction – MPD), muscle tension headaches and/or chronic neck problems, usually have referred pain to the teeth and alveolus.[5,6] Their histories usually indicate multiple teeth, in particular the last one in the arch, are tender to lateral pressure. This is often more so than to percussion. The results of pulp sensibility tests and radiographic examination are usually normal. Often, when asked, the patient will admit to head or neck pains, but then frequently will tell the dentist that these have "nothing to do with their toothache". Examination of the masticatory and cervical muscles will usually confirm tenderness and dysfunction.

A subgroup of head and neck pain patients is those with fibromyalgia. This is a diffuse musculoskeletal syndrome involving either all of the muscles in the body or unilaterally so. They usually seek, but respond poorly to, physical, non-surgical treatment for their jaw pains and they have a number of features in common with the psychiatric group. A wide range of medical treatments has been reported for fibromyalgia, but there is no effective single treatment.

The one patient with the neuromuscular condition of dystonia had initially been diagnosed some years before as a straightforward MPD problem. The patient all

Table 3. Diagnosis – endodontic group (n = 88)

Endodontic only	– 76 (88%)
– Acute apical abscess	2
– Acute apical periodontitis	7
– Chronic apical periodontitis	15
– Combined Endodontic-Periodontal lesions	12
– Irreversible pulpitis	6
– Irreversible pulpitis + acute apical periodontitis	6
– Irreversible pulpitis + cracked cusp	1
– Irreversible pulpitis + resorption	1
– Irreversible pulpitis + chronic apical periodontitis	1
– Resorption (associated with orthodontic treatment)	1
– Pulp necrosis with infection	3
– Pulp necrosis with infection + acute apical periodontitis	5
– Pulp necrosis with infection + chronic apical periodontitis	18
– Root fracture	11
– Discolouration due to trauma	1
– Trauma + pulp necrosis with infection	1
Endodontic + other	8 (9.1%)
– Muscular	6
– Sinusitis	1
– Tinnitus	1
Other	4 (2.2%)
– Muscular	3
– Non-odontogenic bone cyst	1

Table 4. Treatment – endodontic group (n=88)

Treatment by the referring dentist prior to referral	
Endodontic treatment commenced	36 (41%)
Antibiotics prescribed	13 (15%)
Endodontic treatment completed prior to referral	39 (44%)
Treatment by the endodontists	
• Endodontic treatment:	
completed	85 (97%)
new	46 (54%)
re-treatment	39 (46%)
• Additional treatment	4 (5%)

Table 5. Oral and maxillofacial group

Final non-odontogenic diagnosis compared to the number who had previously had dental (i.e., endodontic and/or exodontic) treatment in an attempt to resolve their pain (n = 100).

Final diagnosis	Number	Prior dental treatment
Muscular	46	17 (37%)
Arthralgia	27	3 (11%)
Psychogenic	9	9 (100%)
Neuralgia	15	13 (87%)
Pathosis	3	2 (66%)
• Sinusitis	1	1
• Malignancy	1	0
• Dystonia	1	1
Total	100	44 (44%)

Fig 1. Panoramic radiograph of a patient who had endodontic treatment, some multiple, to most of her teeth. On brief discussion, she presented with bizarre attitudes towards her health in general and her mouth in particular. She was insistent that she needed more treatment to her teeth. She worked as a secretary in a psychiatric unit. Note: None of the endodontic treatment was provided by the authors.

along had thought that she had toothache and indeed had received extensive dental treatment without benefit. Some 15 months after the jaw pains presented, the neck became involved and she developed the characteristic torticollis-type twisting spasm of her sternomastoid muscle. At that stage, the true nature of the condition was confirmed by a neurologist and treatment, with some benefit, by botulinum toxin injections into the muscle helped to stop the spasms. Despite several discussions, the patient could not see the association between her neck and her jaw pains and has continued to seek dental treatment from a range of practitioners without avail.

Neuralgic pains may closely mimic acute toothache of pulpal origin. Careful examination will confirm that soft tissues and not hard tissues are the triggering points for the pain. The extent of triggering away from the mouth to the lower eyelid and lateral nose for maxillary neuralgias and to the tongue and gingivae for mandibular neuralgias are important diagnostic clues. Interestingly, neuralgias rarely wake patients once they are asleep, whereas toothache is no respecter of the time of day since acute irreversible pulpitis will often wake a patient during the night. The longer the pain history, then usually the easier it is to make a diagnosis that the pain is primarily neuralgic. There is an important subgroup where there is a history of injury to the infra-orbital nerve from cheekbone fractures or to the mandibular nerve from mandibular fracture or removal of wisdom teeth. This is important to elicit. Neuralgic pains are abolished by diagnostic blocks, which can be useful as a diagnostic aid.

Patients with a psychiatric background are easy to misdiagnose if the dentist has not spent some time interacting with the patient before proceeding to dental treatment.[7] The history of pain will usually be unusual and the response to treatment often markedly atypical. Other clues to the correct diagnosis are the past and present medications that the patient has been taking and sometimes there is an unwillingness to divulge aspects of their health history. Failure to correctly diagnose such patients will result in over-treatment or unnecessary treatment (Fig 1).

Patients with intra-articular temporomandibular joint problems, which present as pain, clicking and locking of the jaw, are less likely to receive dental treatment in an attempt to resolve their problem. Conversely, dental treatment may frequently be cited by the patient as either the cause of or the exacerbating factor for their jaw joint problems. Consideration should always be given to using a bite block to support the jaw, particularly for those with a previous history of muscular or arthralgic jaw problems. This reduces any overstrain of the masticatory system.

No patient in this series had vascular pains such as migraines, cluster headache or temporal arteritis. However, such patients are seen occasionally in dental practice and more commonly in orofacial pain practice. Their pains may simulate toothache pains, and diagnostic blocks fail to abolish the pain.

A migraine is a severe debilitating unilateral headache, usually following the temporal artery, but sometimes the facial artery. There is nausea, tendency to vomit, photophobia and the patient is generally non-functional for several hours or days. Between attacks they may have a background muscular pain. It is common for patients to tell the dentist that they suffer from migraines, but on simple questioning it is clear that usually they are talking about bilateral muscle tension headaches.

Temporal arteritis is an uncommon but severe deeply boring headache, which simulates MPD. It most commonly involves the temple, but may also occur following the facial or lingual arteries. Prompt diagnosis by blood tests for raised ESR (above 80 is diagnostic) and arterial biopsy is required as, if untreated, permanent unilateral blindness may occur.

Patients with unresolved pain frequently think that they have infections and commonly have had multiple courses of antibiotics with minimal effect.[8,9] The one patient in the series with chronic maxillary sinusitis had been treated medically and dentally with prolonged and multiple courses of antibiotics. This had not resolved the problem. The diagnosis was made by blood tests and a CT scan, followed by appropriate referral for ear, nose and throat surgery. If there is uncertainty or an issue as to whether a patient has a deep-seated infection, then blood tests will show the white cell shift and C-reactive protein will be elevated. A CT scan will show the site of infection. In the absence of abnormal blood or imaging tests, then almost certainly the patient does not have a chronic bacterial infection and antibiotics should be ceased. The risk of bacterial resistance and the possible adverse reactions to antibiotics need to be discussed with the patient so they understand the management protocol that is being followed. Commonly, patients with a psychiatric

background have a tendency to ascribe their pains to bacterial infections.

Patients with an unresolved, deep-seated pain commonly fear that they have cancer. In the early stages, cancer is not usually painful and only becomes so when nerves are involved or superficial tissues become infected. The fear of cancer is best addressed directly by exclusion with CT scans or other images and biopsy of any lesions. The results, if negative, need to be reinforced to the patient so that the common fear of cancer has been excluded for them. One patient in the series who did present with a cancer had a unilateral pain on swallowing, which initially was thought to be glossopharyngeal neuralgia. The initial CT scan was considered normal, with there being minor anatomical symmetry on one side of the throat. However, the pain persisted and subsequent CT and biopsy confirmed that the patient in fact had a base of tongue cancer involving the glossopharyngeal nerve. Deep pole of the parotid gland and tongue-base cancers are notoriously difficult to diagnose until quite large.[10] The more common oral cancers, however, are usually directly visible and palpable, and they are usually at a non-painful stage by the time the diagnosis is established.

The first step in managing a patient with orofacial pain is to diagnose the nature of the pain and this must be done prior to initiating any treatment. This must include taking a detailed history of the pain from the whole head and neck, not just a tooth or dental, perspective. Practitioners should be aware of any prior history of pains, both generally and in the specific region. Detailed examination of the jaw muscles, jaw joints and sensory nerves should be performed prior to examination of the teeth. A full dental examination should include visual examination, palpation, pulp sensibility tests, and radiographs.[11] The effect of diagnostic or therapeutic blocks should also be considered.

This study showed a relatively low level of initiation of endodontic treatment in patients who were subsequently referred to the endodontists. Of those patients who had received endodontic treatment, most of them had an acute or chronic endodontic disease which had been correctly diagnosed and warranted intervention for pain control. However, the tertiary referral group at some stage in their evolution were likely to have had extractions or endodontics on the basis that the pain felt like toothache and treatment was worth trying. Commonly patients stated that their dentist was doubtful whether treatment would help but followed the patient's wishes.

Similarly, a number of patients had been prescribed antibiotics inappropriately.[8,9] It must be noted that the indications for consideration of antibiotic treatment are only when there are clear signs of bacterial infection and not just a toothache. Such signs include fever, malaise, lymph node involvement, rapid onset (less than 24 hours) and rapid spreading. Only two of the 13 patients who had been prescribed antibiotics had indications for antibiotic treatment.

CONCLUSIONS

This study confirmed that it is appropriate to firstly take a full history, followed by a detailed examination with appropriate tests before commencing any irreversible dental treatment for patients with pain. This advice had largely been followed by the referring practitioners in this study for routine referrals. However, the non-dental orofacial pain group, particularly those subsequently diagnosed as having pain of muscular origin, had often had a considerable amount of dental intervention. Commonly, on discussion with the patient this attempt at treatment had been proposed by the patient and the dentist often had mentioned that they were not sure that the treatment would help, but were going to implement it anyway. This approach is not recommended. If there are no clear signs of dental disease which is consistent with toothache, then referral to a specialist is strongly recommended prior to initiating any treatment.

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