Cracking the pain dilemma

Pain is a protective mechanism and a warning sign that damage has occurred so it’s important that a general practitioner has the ability to recognise a patient’s threshold. Dr Daniel Flynn explains

The busy general practitioner is often faced with a difficult diagnostic dilemma when a patient presents with pain of pulpal origin that is not localised to a specific tooth. The pain can be generalised or sometimes even radiate to another quadrant. A systematic approach is essential in these cases so that the correct diagnosis is attained, thereby allowing the appropriate treatment to be executed. This avoids the embarrassment of providing treatment, but without alleviation of the symptoms.

The art and science of diagnosing a patient’s pain is an essential tool in the armamentarium of the general practitioner. A good understanding of the underlying biological processes is essential. Following a thorough history, the diagnosis can be made in a majority of cases. The clinical examination and special tests are then used to ascertain which tooth fits the diagnosis.

What is pain?

Pain is a protective mechanism to warn us when damage occurs in the tissues. A-delta fibre activation results in short sharp pain and may be activated in healthy and inflamed pulps. These fibres are peripherally placed and are the first activated. The deeper c-fibres are generally dormant and are only activated during health when a prolonged and intense stimulus is applied to a tooth. Stimulation of these fibres are associated with dull throbbing pain, but once inflammation has spread deep into the pulpal tissue, these fibres become sensitised to the point where pulse pressure or even body temperature can activate them. This is why occasionally a patient will present with severe pulpitis pain, which is relieved by holding ice against the tooth. The ice decreases the temperature below the required threshold and prevents the apparent spontaneous firing of the fibres.

It may come as a surprise, however, to learn that a large proportion of pulpitis cases are asymptomatic. However, when one considers the number of cases of apical periodontitis found on routine radiography where the patient has never been aware of symptoms this phenomenon becomes more apparent. The pulpal tissue has regressed from vitality through the inflammatory stages and has become necrosed and infected without the warning signs of pain. The exact reason for this is not fully understood, but recent research suggests there are local opioid systems present in the pulp, which could modulate the pain. There are also likely to be central mechanisms that prevent the pain registering in the cerebral cortex.

Making sense of tests

The limitations of the clinical tests need to be understood. Thermal and electrical tests stimulate the pulpal tissue in a manner that may not be clinically relevant.

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<th>Tooth</th>
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<th>Cold Air</th>
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neural fibres in the pulp and do not assess the actual blood supply, which determines vitality. You should not rely solely on a sensitivity test when making a diagnosis. The main purpose of these tests is to:
1) Reproduce the symptoms the patient complained of
2) Localise the symptoms
3) Assess the severity of the symptoms

I use a refrigerant spray (-50°C) for thermal tests, along with the electric pulp test as standard. A tooth in the contralateral quadrant and adjacent teeth should be used to provide baseline information as there can be a large variety in the responses of patients to stimuli. The teeth should be dry and the stimulus placed at the cusp tip of molar teeth and near the incisal edge of incisor teeth corresponding to the area of greatest innervation in the underlying pulpal tissue. If one suspects that the stimulus is being conducted to an adjacent tooth via metal restorations a piece of rubber dam may be placed in the contact area to act as an insulator.

Always remember that neither the history nor the clinical findings alone are sufficient when reaching a diagnosis. I will try and highlight some of the difficulties one may encounter in the case report below and demonstrate the systematic approach that I take.

Avoiding the pitfalls

A 47-year-old female presented for consultation and reported a history of short sharp pain from the LL7 on hot stimulation or occasionally on eating. The patient was asymptomatic on the day of the appointment. The patient reported root canal treatment of LL7 was initiated around six months previously, which did not alleviate the symptoms.

In this instance there was no pain from the LL7 however the LL7 exhibited painful symptoms on contact with the hot water. This was confirmed by giving a buccal infiltration of 2.2ml two per cent lignospan and adrenaline 1:80,000 around the LL7 and re-challenging the left hand side with hot water. Following a negative response to this test the amalgam was removed on LL7 and a crack was identified on the distal aspect of the tooth extending towards the centre (figure 5). The crack was stained with methylene blue to aid identification and examined under microscopical visualisation. Azir-oxide eugenol filling and an orthodontic band were placed which alleviated the symptoms.

However, two months later the patent reported spontaneous short sharp pain on the LLHS. Pain on heat stimulation had also returned now localised to LL7. The LL7 was tender to percussion and had lingering pain following sensitivity testing with cold and the electric pulp tester.

A diagnosis of: Cracked-tooth syndrome with development of irreversible pulpitis and acute apical periodontitis associated with LL7 was made.

The following treatment options were discussed with the patient:
1) To monitor
2) Root canal treatment
3) Extraction +/- prosthetic replacement

It must be emphasised that antibiotic therapy does not relieve the symptoms of pulpitis and should never be prescribed in these instances. In fact the vast majority of symptomatic endodontic cases may be treated with canal instrumentation and analgesic drugs. We rarely pre-prescribe antibiotics in our practice.

Carrying out treatment

Consent was obtained and root canal treatment was initiated on UL7. The extent of the crack was investigated. As a general rule of thumb, if the crack extends on the floor of the pulp chamber the long-term prognosis of the tooth is considered guarded/poor and this information is relayed to the patient so they can make an informed decision.

In this case, a large pulp stone was encountered in the pulp chamber and a pulpotomy was performed. A pulpotomy alone will relieve over 90 per cent of the symptoms of irreversible pulpitis. This is because the vast majority of inflammatory mediators and pulpal tissue is located in the coronal portion of the tooth. If one is not confident that all the pulp tissue can be removed and the canals completely chemo-mechanically prepared, it is better not to place a file into the canals but just to remove coronal pulp tissue and place a dressing. In this case all symptoms resolved following the pulpotomy and the tooth is being treated.

On clinical examination, the patient had good oral hygiene and no periapical radiolucent lesions indicated on UL7. The LL7 was tender to percussion and had lingering pain which did not alleviate the symptoms. The following tests were conducted with the outcomes shown:

The radiographic examination confirmed the LL7 and UL5 to be root treated. A periapical radiograph suggested that there was no obvious pathosis associated with LL7 despite the over-extended root filling. A bitewing radiograph revealed an overhanging distal amalgam restoration in UL5.

When the patient was given hot water to drink the symptoms were reproduced. The upper and lower teeth were individually isolated with rubber dam and hot water was syringed onto each tooth in order to identify the source of the symptoms. In this instance there was no pain from the LL7 however the LL7 exhibited painful symptoms on contact with the hot water. This was confirmed by giving a buccal infiltration of 2.2ml two per cent lignospan and adrenaline 1:80,000 around the LL7 and re-challenging the left hand side with hot water. Following a negative response to this test the amalgam was removed on LL7 and a crack was identified on the distal aspect of the tooth extending towards the centre (figure 5).

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Some clinicians elect to place composite restorations prior to undertaking treatment to ensure that the correct tooth is being treated. On occasions patients have taken a significant amount of anti-inflammatory medication and this can complicate the picture as there are no symptoms on the day and none of the teeth produce an exaggerated response when pulp testing. Often I tell the patient to return in two to three days and redo all the tests, rather than hastily begin treatment if there is doubt as to the offending tooth.

The reason for an exaggerated response to pulp testing when there is pulpal inflammation is that the threshold for firing of the nociceptors has been reduced by inflammatory mediators and there is nerve sprouting which increases the number and distribution of fibres that may be activated.

In the above case a conservative treatment approach was initially taken. Some clinicians elect to place composite restorations, others place temporary/permanent cuspal coverage restorations and some electively devitalise the pulp. Thus it can be seen that not only is it difficult to detect and correctly diagnose cracks but the treatment can also pose difficulties.

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Qualified from the Dublin Dental Hospital, Trinity College, Dublin in 2002. Daniel has recently joined the EndoCare team headed by Dr Michael Shahan. Daniel lectures and provides hands-on courses for general practitioners. He also teaches endodontics at the Eastman Dental Institute for Oral Healthcare Sciences. For further information call EndoCare on 020 7224 0999, email reception@endocare.co.uk or visit www.endocare.co.uk.

\section*{Discussion}

Diagnosis of a cracked tooth can be very difficult. In this case root canal treatment had been completed on the LL7 without the alleviation of pain, yet the patient was convinced that the symptoms were originating from this tooth.

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The sharp pain, which did not linger, was exacerbated when tea or other hot liquids contacted the area around LL7.

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