Special tests tend to be associated with confirming an endodontic diagnosis, but in fact should be inclusive for identifying other dental diseases. The following are special tests that collectively can often reveal a reasonably accurate diagnosis.

**PERIODONTAL**
Record pocket depth at 6-8 points around a tooth. If there are multiple pockets over 3mm around a tooth then a full-mouth periodontal assessment should be performed in order to ascertain whether there is a general periodontal issue. Isolated pockets around a tooth may indicate an endodontic problem, e.g. vertical fracture, perforation, or simply a draining sinus tract.

**PERCUSSION**
This reveals the health of the periodontal supporting structure and not the health of a suspect pulp. Simple causes for percussive tenderness may be hyperocclusion due to a recent high restoration, excessive orthodontic forces, recent trauma, acute gingival/periodontal disease, or an apical periodontitis/abscess of endodontic origin.

**MOBILITY**
Mobility gives an indication of the condition of the periodontal support, which may be affected by hyperocclusion or excursive interferences (fremitus), or an acute expansive inflammation and destruction due to an periodontal or endodontic abscess.

**TRANSILLUMINATION**
Alongside a fibre-optic light source under magnification, transillumination can reveal hairline fractures within the crown of a tooth or around restorations that may be a source of both pulpal and periodontal symptoms.

**PULP VITALITY TESTS**
Helps to discern the health of the pulp and commonly thermal and electric tests are used. It must be remembered that these tests only give an indication on the condition of the pulp, but not of the supporting periodontium or the presence of an apical abscess.

Vitality tests need to be used with care to obtain reliable responses. False negative responses can be due to large restorations with little or no exposed tooth tissue to apply the test, or aged dentitions that have reduced pulp spaces due to physiological (tertiary) dentine.

Conversely, false positive responses can arise in very anxious patients that interpret the pressure sensation of applying the testing device rather than the actual pulpal response, or contacting the gingival tissues (electric current or cold leakage when testing close to the gingival margin), or indeed overexposure of the test on a tooth that can in itself give an exaggerated response.

Heat testing can involve either application via hot water in a syringe onto individual teeth that are isolated by rubber dam, or via a heated gutta percha stick or ‘greenstick’ composite, but must be used with caution. If the patient’s response is similar to their complaint then this is a good sign of a degenerating pulp.

Cold testing is more common and there are

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many proprietary products available - such as Roeko Endo-Frost (Coltene) (Figure 1) - that are better than traditional ethyl chloride, which gives poor responses in heavily restored teeth or through modern indirect restorations of porcelain and composite. The method for reliable vitality testing is:

1. Pre-warn the patient that they may feel the stimulus using non-threatening terminology, eg they might feel a ‘sudden tingle or sensation’ rather than ‘pain’. Also advise the patient to raise their hand as soon as they feel the sensation and reassure them that you will immediately remove the stimulus so they feel that they are in control

2. Baseline pulpal response of the patient should be obtained by testing the contralateral teeth, teeth adjacent to the suspect tooth, then finally the suspect tooth

3. Application to the thinnest part of the tooth enamel or restoration (usually the cervical margin or incisal edge) with a small applicator (Figure 2) to avoid false positive responses from the adjacent teeth or gingival tissues.

4. Note the character of the response, eg sharp, dull, throb; duration (lingering, immediately dissipates after test, returns after some delay); location (patient is able/unable to specify the tested tooth, radiates at a distance away).

Vitality tests are by no means definitive on their own at determining the health of the pulp but will give a reasonably good idea of its health.

LOCAL ANAESTHESIA

Selective local infiltration of individual teeth in the vicinity of the symptoms either by a periodontal or intraosseous technique may determine whether the pain is ‘pulpitic’ by anaesthetising the affected tooth. It may even identify symptoms that are of non-dental origin if, for instance, the local anaesthetic does not relieve the symptoms, eg persistent vague pain in the lower left quadrant or left mandible of a myocardial infarct after a successful ID block.

RADIOLOGY

Film and, more recently, digital imaging is often the defining diagnostic tool that can reveal pathological changes in the supporting structures. The image created must be methodically assessed in a ‘crown-down’ approach to pick up clues on the overall condition of the tooth:

1. Crown level: Extent of caries and cavitation, fractures, size of the pulp chamber, and extent of mineralisation that can indicate a degenerating pulp

2. Cervical (radicular) level: Periodontal architecture; furcation dentine in multi-rooted teeth; assess size of the pulp space and canal spaces
3. Mid- and apical root: Follow the periodontal ligament space down the root and examine for deviations from the norm; assess the size of pulp space

4. Apical tissues: Pathological changes may be quite subtle and may only be discernible as deviations from the normal health after the disease process has extended out of the pulp space for some time. Examine for:
   - Widening of the periodontal ligament
   - Breakdown of the lamina dura (ie the cortical bone that lines the alveolar socket)

   • Loss of trabeculated bone (rarefaction).
   • Radiographs do have their limitations as the image created can be affected by numerous factors such as incorrect exposure technique, angulation, processing errors, performance of the radiosensitive device (film or CCD), and ‘noise’ from surrounding anatomy.
   • Magnification or digital enhancement of images is very helpful for closer examination of the images.

   Digital imaging brings other benefits such as lower X-ray doses for the patient, instant image presentation, ability to communicate images to colleagues, easy record keeping and archiving. An additional and valuable benefit for the patient is that the clinician can display the radiograph in front of the patient to discuss and educate them on the cause of their symptoms, the disease process, and then the treatment options that would appropriate for them (Figure 3). This will relieve much of their anxiety and improve acceptability of treatment. However, conventional radiographs do not always show all pathosis on an affected or suspect tooth. For example, occasionally one can come across a previously root-filled tooth that presents with persistent pain but without any obvious signs on a radiograph.

   In such cases, adopting cone-beam computer tomography (CBCT) with a small volume of exposure can be very useful at revealing intraosseous lesions in the periradicular tissues that are ‘invisible’ to conventional radiography (Figures 4a-c).

   However, it is worth noting that although a small-volume CBCT scan may give a lower exposure dose compared to a conventional CBCT scan, the overall dose is still significantly higher than for conventional radiography. This facility should therefore not be used routinely for every suspect endodontic case but only to elucidate other diagnostic tests that have been inconclusive.

   By this stage, all the necessary information will have been collated and a provisional diagnosis can be made. Table 1 shows a classification for endodontic conditions.

**SUMMARY**

In summary, it is important to understand that an endodontic diagnosis is developed from the accumulation of facts collected from the initial presentation of the patient until the final clinical test. At each stage clues are gathered that build up an overall picture of the situation and helps the clinician decipher the most likely diagnosis, and never relying on a single piece of evidence.

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