Visual information and imaging technology in endodontics

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In addition to intra-oral and panoramic radiographs, various visual techniques are available for endodontic treatment today. Above all, information obtained through the dental microscope has become essential.

"See better, do better" is a slogan in modern endodontics. The dental microscope is a wonderful tool for problem-solving in endodontics, for instance for the removal of broken instruments and root-filling materials, finding missed canals, perforation repair, diagnosis of tooth fractures, evaluation of marginal integrity of restorations, precise manipulation in periradicular surgery and deep dental caries, and confirmation of root-canal cleanliness. Yoshioka et al. (2002), for example, reported that the rate of detection of root-canal orifices under a microscope was significantly higher than the number detected with the naked eye. It was also found that surgical loupes were relatively ineffective compared with the microscope.

In addition, computed tomography (CT) is becoming increasingly popular among endodontists, particularly in the assessment of difficult cases and for problem-solving in endodontic treatment. Higher use (34.2 per cent) of CBCT was demonstrated by a recent web-based survey of active members of the American Association of Endodontists in the US and Canada (Daley et al, 2010). Owing to its high radiation dosage, however, careful consideration is needed before taking CT images. Consequently, a project team from the Japanese Association for Dental Science presented a report in 2010 on the use of CT in dentistry, and a joint position statement by the American Association of Endodontists and American Academy of Oral and Maxillofacial Radiology was issued in February 2011. The combined use of the dental microscope and CT for apicectomies was approved as an advanced dental technology by the Ministry of Health, Labor and Welfare in Japan in 2007, and seven Japanese dental hospitals have been using the technology since 1 February 2013.

Optical coherence tomography (OCT) is a high-resolution imaging technique that allows micro-scale imaging of biological tissues over small distances. It was introduced in 1991 and uses infrared light waves that are reflected from the internal microstructure within the biological tissues (Shemesh et al. 2008). There have been reports on its use for intra-canal imaging, diagnosis of vertical root fracture (Yoshioka et al. 2013) and perforations. Since OCT is non-invasive and free of radiation, this technology may be very useful for endodontic diagnosis and treatment (Figs. 1a-2).