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Knowledge, Awareness And Practice Among Dental Practitioners Towards The Use Of Magnetic Resonance Imaging (MRI) In Dentistry.

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ABSTRACT

To assess the knowledge, awareness and practice regarding the use of MRI as a diagnostic imaging modality in dentistry among dental practitioners in a private dental clinic. It is reported in the literatures that MRI techniques have a widespread application in dentistry and are useful in analysing the intracranial lesions, tumour staging and TMJ diagnosis in cases of internal derangement, preoperatively before disc surgery. MRI is a recently developed imaging modality that totally replaces conventional X-ray generating equipment and film. Essentially it involves the behaviour of protons in a magnetic field. In this technique, the patient is placed within a very strong magnetic field (0.5-1.5 Tesla). The patient's hydrogen protons, behave like small magnets to produce the Net Magnetization Vector (NMV) which contributes to the magnetic movement which runs along the long axis of the patient. The greatest advantage of MRI is that it's non-invasive and ionizing radiation is not used and high resolution images can be reconstructed in all planes. With its widespread applications in dental field, an increasing awareness and knowledge of MRI as a valuable diagnostic imaging modality should be encouraged among the dentists.

Keywords: Magnetic resonance imaging, protons, non invasive, non ionising , imaging

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INTRODUCTION

MRI is a recently developed imaging modality that totally replaces conventional X-ray generating equipment and film.(1)Essentially it involves the behaviour of protons in a magnetic field.(2)In this technique, the patient is placed within a very strong magnetic field(0.5-1.5 Tesla).The patient's hydrogen protons ,behave like small magnets to produce the Net Magnetization Vector(NMV)which contributes to the magnetic movement which runs along the long axis of the patient.(3)MRI techniques are useful in analysing the intracranial lesions ,tumour staging,TMJ diagnosis in cases of internal derangement, preoperatively before disc surgery.(4)Its main advantage is that it is non-invasive and ionizing radiation is not used and high resolution images can be reconstructed in all planes.(5)Though it has many advantages it has certain disadvantages which include increased scanning time, contraindicated in patients with cardiac pacemakers, cochlear implants, increased cost of the equipment.(6)This survey aims to find out the awareness ,knowledge and attitude regarding the use of MRI as a diagnostic imaging modality in dentistry among the dental practitioners in private dental hospitals in Chennai

MATERIAL AND METHODS

The present descriptive study is questionnaire-based cross sectional survey of dental practitioners in Chennai City, Tamil Nadu, India carried out during the month of June 2017.

Study area

The study was carried out in private dental hospital in Chennai.

Study population

Study population comprised of dental practitioners in Chennai.

Study sample

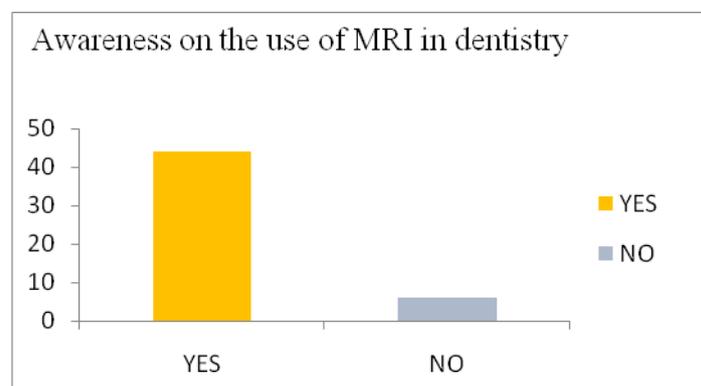
Dental practitioners were selected by means of simple random sampling for the study.

Study design

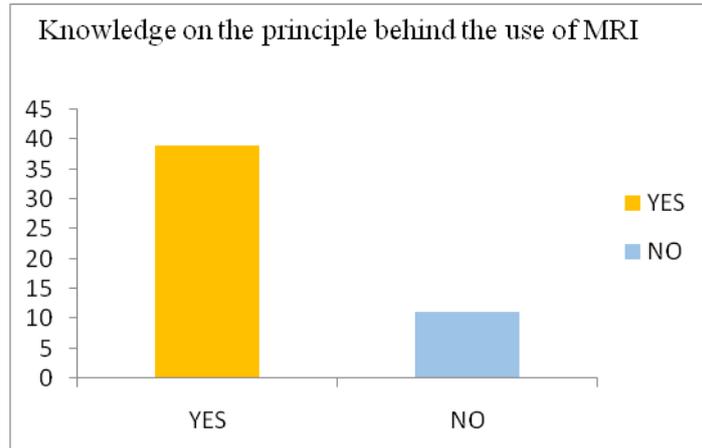
The questionnaire focussed on knowledge-based questions, options, attitude based questions to assess the level of use of MRI as a diagnostic imaging modality in dentistry.

The purpose of study and procedure to fill up the questionnaire was explained to the dentists. The questionnaire was distributed to 50 dental practitioners including both males and females of varied age groups (20-30 years) in Chennai.

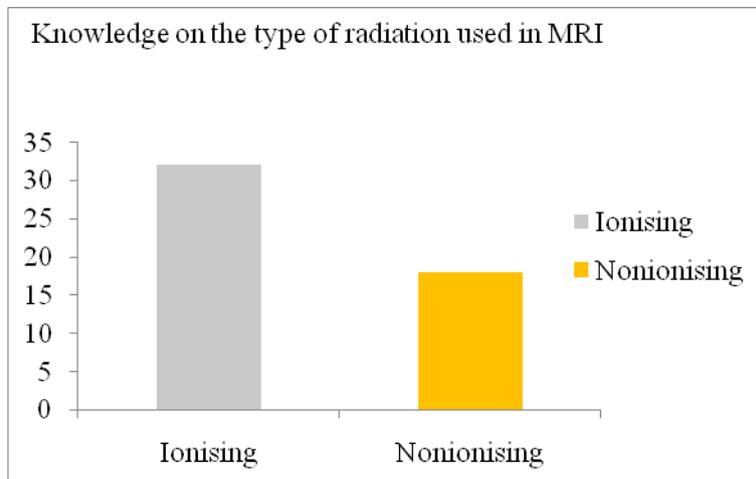
RESULTS



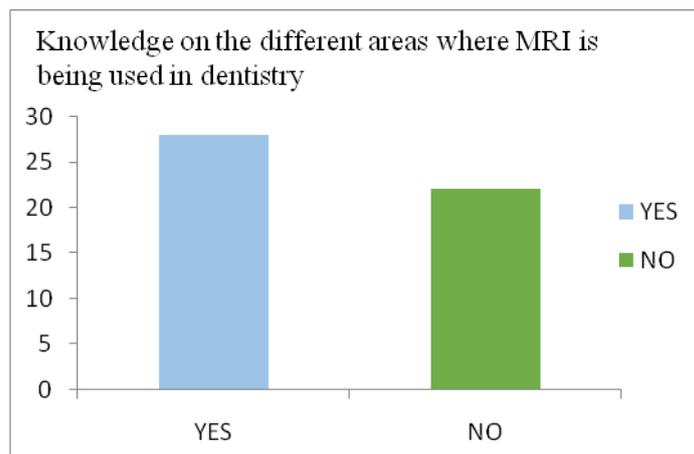
Graph 1: indicates that 44(88%) dentists were aware of the use of MRI in dentistry.



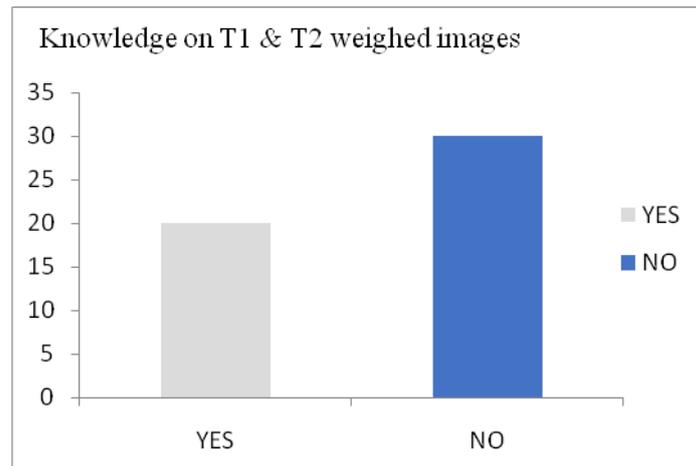
Graph 2: indicates that 39(78%) dental practitioners had knowledge on the principle behind the working of the MRI.



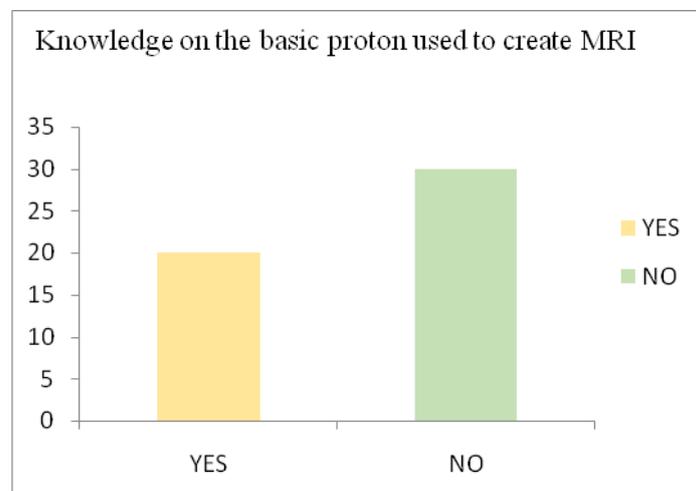
Graph 3: indicates around 32(64%) dental practitioners felt that ionising radiation was used in MRI, while 18(36%) felt that non ionising radiation was used in MRI.



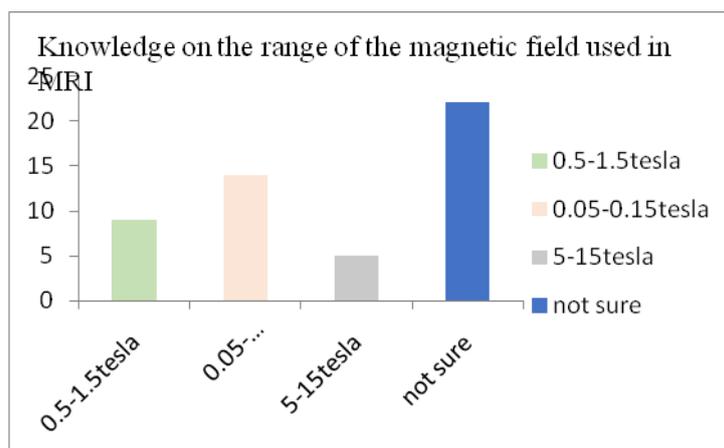
Graph 4: indicates that 28(56%) dental practitioners had knowledge on the various areas where MRI was used in dentistry and their uses.



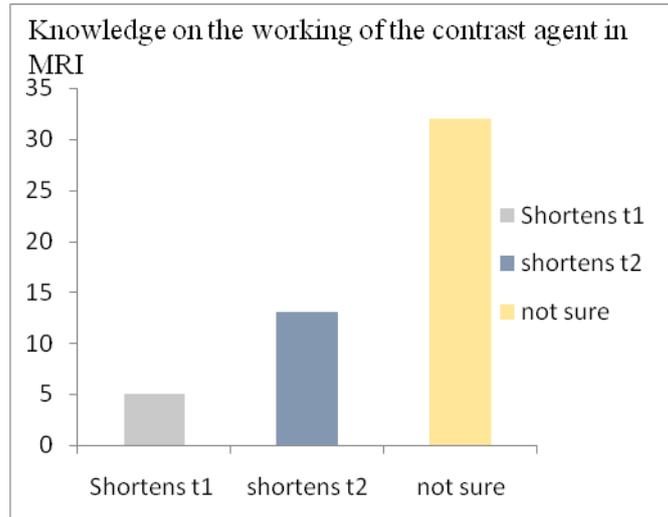
Graph 5: indicates that 20(40%) dental practitioners had an idea about T1 and T2 weighed images in MRI.



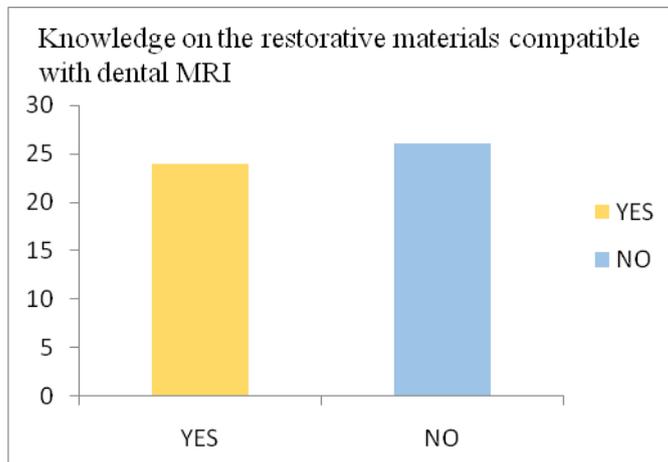
Graph 6: indicates that 20(40%) dental practitioners knew the use of hydrogen atom as the basic proton used to create the MRI.



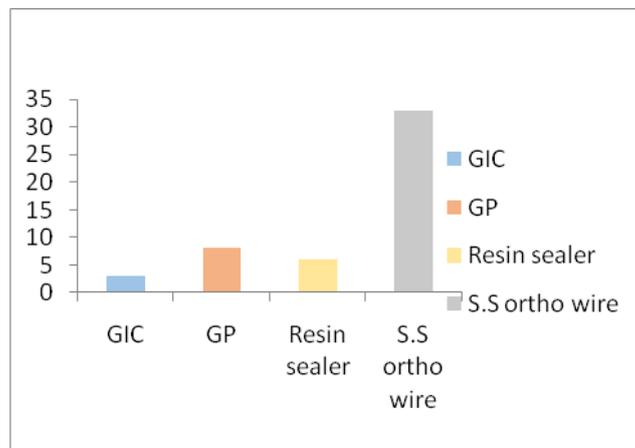
Graph 7: indicates that around 9(18%)of the dental practitioners felt that 0.5-1.5tesla was the range of the magnetic field used to create the MRI,while 14(28%)felt it was 0.05-0.15 tesla,5(10%)felt it was 5-15tesla and 22(44%)were not sure of the range of the magnetic field to create the MRI image.



Graph 8: indicates that 5(10%)dentists felt that the contrast agent in MRI works by shortening the T1 relaxation time of the tissues, 13(26%)felt that the contrast agent works by shortening the T2 relaxation time of the tissues,32(64%)were not sure how the contrast agent in the MRI works.

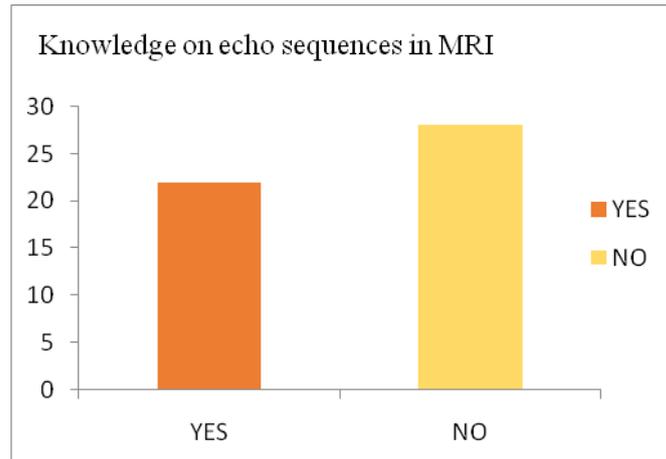


Graph 9: indicates 24(48%) dentists knew about the restorative materials compatible with dental MRI.

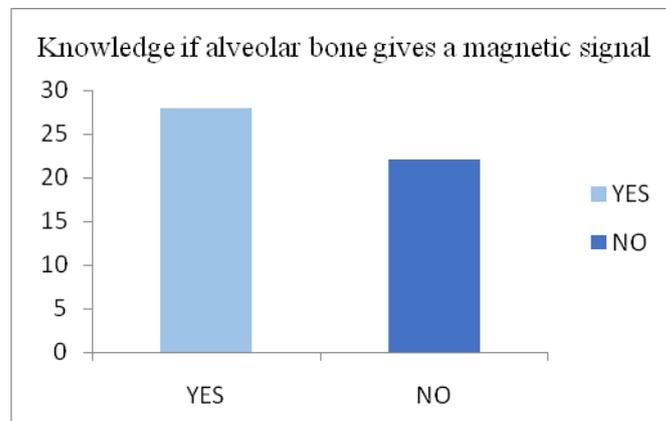


Knowledge on the material incompatible with MRI

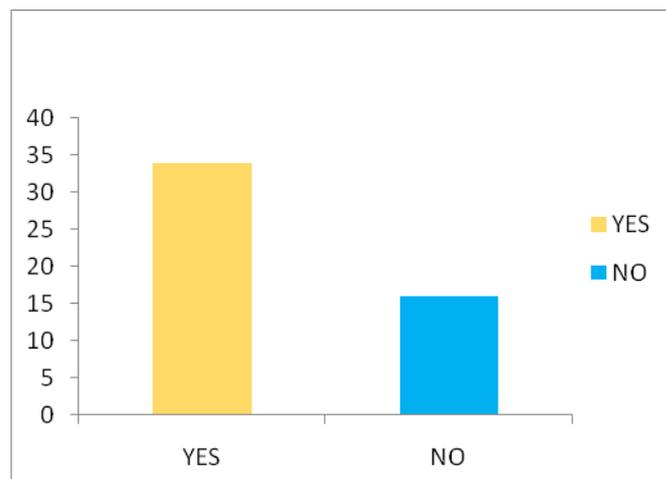
Graph 10: indicates that 3(6%) of the dentists felt that GIC was incompatible with MRI,while 8(16%)felt it was gutta percha,6(12%)felt it was resin based sealer and 33(66%) of them stainless steel orthodontic wire.



Graph 11: indicates that 22(44%) were aware of the different echo sequences available in MRI.

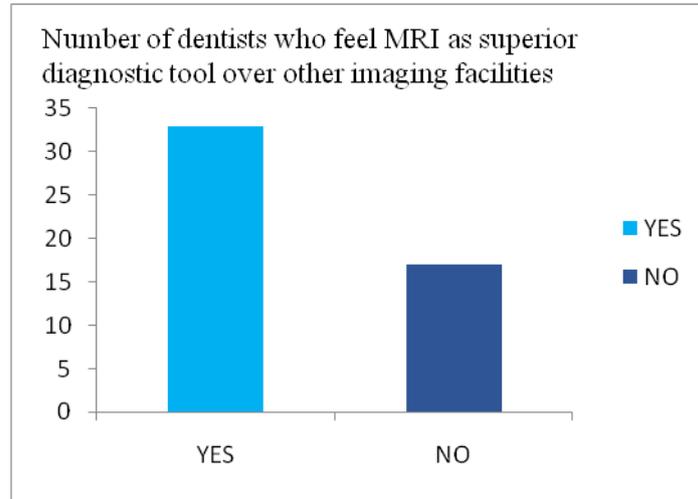


Graph 12: indicates that 28(56%) suggested that alveolar bone gives a magnetic resonance signal while 22(44%) suggested that alveolar bone does not give a magnetic resonance signal.

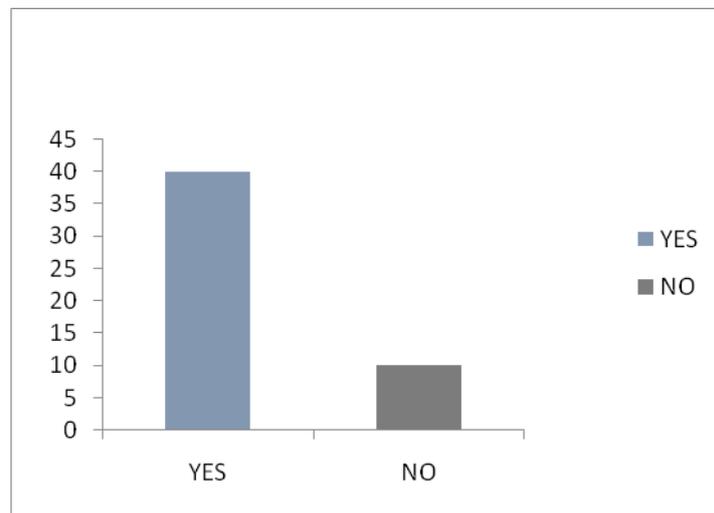


Knowledge on contraindications of MRI

Graph 13: indicates that 34(68%) knew about the various contraindications for MRI.



Graph 14: indicates that 33(66%) considered MRI as a superior diagnostic imaging modality over other imaging facilities.



Graph 15: indicates that 40(80%) wished to have more CDE programmes to increase the knowledge of MRI, its applications and uses in dentistry.

Number of dentists who wish to have more CDE programmes to enhance the knowledge of the use of MRI in dentistry

DISCUSSION

Around 88% of the dentists were aware of the use of MRI in dentistry. This shows that MRI techniques are being used by majority of dentists as they have widespread applications in dentistry ,used for diagnosis of temporomandibular joint diseases, inflammatory conditions of the facial skeleton, examining salivary glands, maxillary sinuses,masseter muscles, detection of early bone changes such as tumours, fractures.(7)Certain special MRI sequences can also detect the compression of the trigeminal nerve by the superior cerebellar artery, so proves of diagnostic value in case of trigeminal neuralgia.(8) MRI uses multislice,spin echo pulsating technique where 90 degree pulse is applied to a selected slice of tissue.(9)The patient’s hydrogen atoms contribute to the magnetic movement. Around 78%of the dental practitioners were aware of the principle behind the use of MRI.MRI technique has a great advantage that it does not use ionising radiation and gives excellent detailing on the soft tissues, and is non invasive.(10).Around 64%dentists were aware that no ionising radiation was used in MRI.Studies have been demonstrated on the use of 3D UTE MRI for the identification of dental caries.Dynamic Contrast Enhanced(DCE)MRI was very useful in differentiating salivary gland tumours ,identifying odontogenic myxomas etc.,(11)Around 56%dentists were aware of the

various areas where MRI was used in dentistry. Tissues can be characterised by two different relaxation times-T1 & T2. T1 is the longitudinal relaxation time, which is the time constant which determines the rate at which the excited protons return to equilibrium. T2 is the transverse relaxation time which is the time constant where the excited protons reach equilibrium or go out of phase with each other. MRI images are obtained on this basis as T1 & T2 weighted images. Around 40% of the dentists were aware of this T1 and T2 weighted images. (12) Gadolinium is the most commonly used contrast agent to improve the clarity of the internal structures. (13) This contrast agent shortens the T1 relaxation time of tissues giving a high signal on T1 weighted image. Only 10% of the dentists answered that the contrast agent works by shortening the T1 relaxation time, while 26% felt it worked by shortening the T2 relaxation time of tissues, while 64% of them were not sure of the working of the contrast agent in MRI. Different echo sequences are available in MRI which include Static spin echo, gradient echo, cine loop or pseudo dynamic echo, echoplanar echo etc., (14) 3D SE pulse sequence can be used to obtain 3D images of native and worked out teeth, and subsequently imaging of the structure and quantification of the volume of teeth cavities can be done. (15) Around 44% of the dentists were aware of these different type of echo sequences available in MRI. Bone does not give a magnetic resonance signal and 56% were aware of the same. Ferro magnetic substances like stainless steel orthodontic wire, cobalt chromium wire are incompatible with MRI and can produce artefacts. Glass ionomer cements, resin based sealers are more compatible with dental MRI compared to the conventional amalgam materials. (16) Around 48% of the dental practitioners were aware of the restorative materials compatible with dental MRI. Although MRI has many advantages, it cannot be used in patients with cardiac pacemakers, surgical clips, and cochlear implants. The potential risks of MRI in patients with ferromagnetic implants or materials is due to the induction of electric currents. (17) Around 68% of the dentists were aware of the various contraindications of MRI. MRI technique has also proven to produce tooth surface digitisation with an accuracy and precision sufficient for dental restorations and for detecting resorption of root in orthodontic cases. (18)

CONCLUSION

MRI has thus proved to have widespread applications in dentistry and studies have shown that MRI serves superior in providing high contrast in identification of mandibular nerve and bony dental structures compared to cone-beam CT images. (19) MRI also has also proven to establish the link between gingivitis and atherosclerosis (20) has found its way in diagnosing various TMJ disorders and also in implant imaging, in initial bone assessment and as a guide during the pilot drilling. Thus MRI and its newer modifications could pave way for a simple, non invasive, efficient imaging modality in dentistry.

RECOMMENDATIONS

More number of CDE programmes, workshops, hands on training can be conducted frequently to increase the awareness, knowledge of the use of MRI in dentistry among the dental practitioners.

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