Journal of Advanced Medical and Dental Sciences Research

@Society of Scientific Research and Studies *NLM ID: 101716117*

Journal home page: www.jamdsr.com doi: 10.21276/jamdsr Indian Citation Index (ICI) Index Copernicus value = 100

(e) ISSN Online: 2321-9599; (p) ISSN Print: 2348-6805

Review Article

Treat the fear with accurate diagnostic tools- A review article

[1]Shweta Kumari, [2]Yesh Sharma

[1]Intern, Pacific Dental College and Hospital, Udaipur, Rajasthan, India;
[2]Reader, Department of Conservative Dentistry and Endodontics, Pacific Dental College and Hospital, Udaipur, Rajasthan, India

ABSTRACT:
Cracked tooth refers to an incomplete fracture of a tooth that may involve the pulp. Both vital and non-vital teeth can develop cracks. The causative factors include previous restorative procedures, excess occlusal forces, developmental conditions that result in the formation of weakened tooth structure, trauma, etc. Most commonly involved teeth are the mandibular molars mainly due to the wedging effect of the maxillary mesio-palatal cusp onto the central fissure of the mandibular molar. The crack can involve the crown or the root of the tooth or both.
Diagnosis of this condition becomes challenging due to varied clinical features. Common symptoms involve pain on releasing the bite due to snapping of the segments or due to independent movement of the fractured segments. This writes up deals with the classification, epidemiology, diagnosis and management of cracked teeth, evaluation of crack, nature of symptoms, determining the prognosis and using current, short- and long-term strategies for successful management.

Received: 25 December, 2024 Accepted: 28 January, 2025

Corresponding author: Shweta Kumari, Intern, Pacific Dental College and Hospital, Udaipur, Rajasthan, India

This article may be cited as: Kumari S, Sharma Y. Treat the fear with accurate diagnostic tools- A review article. J Adv Med Dent Scie Res 2025; 13(2):43-54.

INTRODUCTION

Crack is a line on the surface along which it has split without breaking apart while fracture is cracking or breaking of the material (Ellis, 2001; Banerji, Mehta and Millar, 2017). Cracked tooth has been defined as "A fracture plane of unknown depth and direction passing through tooth structure that, if not already involving, may progress to communicate with the pulp and or periodontal ligament" (Ellis, 2001).

Cracked tooth is a common dental hard tissue disease[1].The crack is the way for bacteria to invade the dental pulp. And the deeper the bacteria are colonized in the crack, the more serious the inflammatory reaction of the dental pulp is. Subgingival cracks may lead to isolated narrow, deep periodontal pockets that can act as a pathway for bacterial invasion and may also lead to tooth loss[2]. Therefore, cracked tooth is the third major cause of tooth loss after caries and periodontal disease.

This condition mostly occurs in patients aged 30 years to 50 years with an equal frequency of occurrence in males and females (Hiatt, 1975; Snyder, 1976; Ellis, Macfarlane and McCord, 1999).

Its etiology mainly includes large and complex fillings, defective cavity design, developmental defect of fossa and groove, abrasion, dental erosion and caries, excessive occlusal force, bruxism and occlusal trauma[3].

The clinical symptoms of teeth are usually related to the depth and direction of cracks. Two patterns of crack formation have been put forth. The first occurs when the crack develops centrally and follows the dentinal tubules to extend into the pulp, the second occurs when the crack is peripherally located resulting in cuspal fracture. When pressure is applied to such cracks, the fractured segments separate resulting in movement of dentinal fluid, stretching and stimulating the odontoblastic process, thereby stimulating the nociceptors in the pulp. Five types of cracked teeth have been identified by

The American Association of Endodontists in a document titled "cracking the cracked tooth code". They are- craze lines, fractured cusp, cracked tooth, split tooth, vertical root fractures[4].

Clinical Features: The patient gives a history of discomfort, pain on biting or on consuming cold beverages. 'Rebound pain' on releasing the bite after chewing fibrous food is the most common feature (Cameron, 1964)[5].The patient may have difficulty identifying the affected tooth as there are no proprioceptive fibres in the pulp chamber. The tooth is normally not tender to percussion and vitality testing shows a positive response (Ehrmann and Tyas, 1990; Lynch and McConnell, 2002).

On clinical examination, a cracked tooth may show extensive intracorneal restorations (Geurtsen, 1992). The patient may also give a history of extensive dental treatments followed by occlusal adjustments or replacement of restorations which failed to relieve the pain[6].

DIAGNOSIS

Clinically, the diagnosis of cracked tooth is often diagnosed by combining the patient's medical history to assist clinical examination and auxiliary examination results.

1. Probing

Probing may be used to explore the suspected area of a cracked tooth. Patients often feel sharp pain when probing is applied to the crack (figure 1).

Figure. 1 Probing

2. Bite test

Bite test is also important, in which patients may show severe pain when they bite a cotton roll or cotton swab with the affected tooth (figure 2). Patients are made to bite on various items such as toothpick, cotton roll, rubber abrasive wheels, orange wooden sticks or commercially available tooth sloth (Ehrmann and Tyas, 1990). Biting causes the fractures segments to separate[7]. On releasing the bite, the segments snap together eliciting pain. It should be emphasized that the bite tests may not be able to distinguish pain between maxillary and mandibular origin. Moreover, the application of force is risky to the affected tooth and may cause further crack propagation, so it is sometimes not recommended[8] (Figure 2).

Figure 2. Bite Test

3. Vitality test

The sensitivity to temperature stimulation usually indicates that proximal or near-pulp cracks. The high sensitivity to cold stimulation and the positive of bite test can diagnose cracked tooth. Kim et al. believed that root canal therapy should be performed when there is obvious cold stimulation pain in cracked tooth[9](Figure.3).

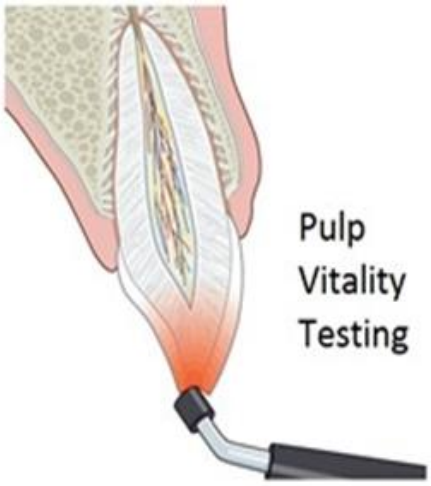

Figure 3. Vitality test

4. Dye test

Dyes can be used to dye cracks in order to see cracks clearly. Commonly used dyes include methylene blue, iodine tincture and gentian violet. However, this method may take several days to see the effect, or even require wearing a temporary crown[10]. Furthermore, the dye test can only detect the location of the crack but have difficulty in assessing progress.

Besides, when bacteria enter the crack, this decay is easy to be colored but the dye is difficult to re- move, that will affect aesthetics and repair. The toxicological effect of dyes is unknown which limits its application[11] (Figure 4).

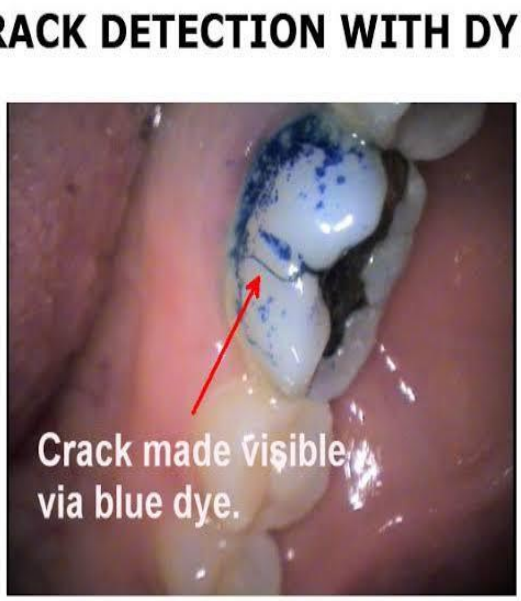

Figure 4. Dye Test

5. Transillumination

Transillumination refers to the use of light guide fibers to illuminate the tooth surface and the light perpendicular to the crack will be diffracted, thereby locating the crack. The yellow light is more capable to diagnose cracks. Some scholars have specially designed a crack detection lamp with appropriate brightness which can not only refract at the crack but also facilitate the observation of clinicians[12].

Other studies have also shown that 810 nm diode laser or 1300–1310 nm near infrared laser has good targeting ability for cracks. If there is a large area of filling in the affected tooth, the

original filling should first be removed to assess the degree of cracking, the condition of the pulp, and the remaining tooth tissue structure (Figure 5).

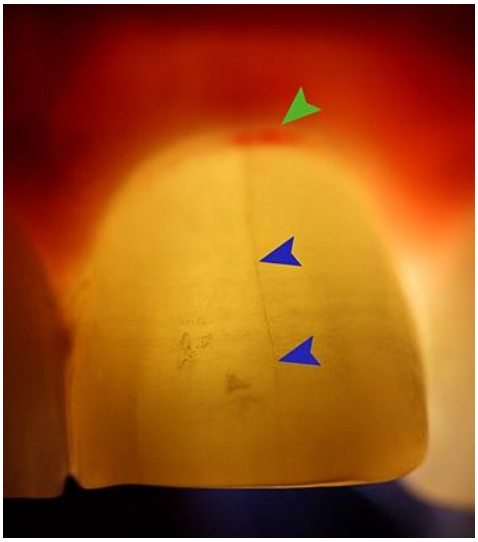

Figure 5. Transillumination

6. Microscope detection

It is difficult to detect on naked-eye visual inspection when the crack width is less than 18 µm, and dental surgery microscope can be used to assist in locating cracks (Figure 6).

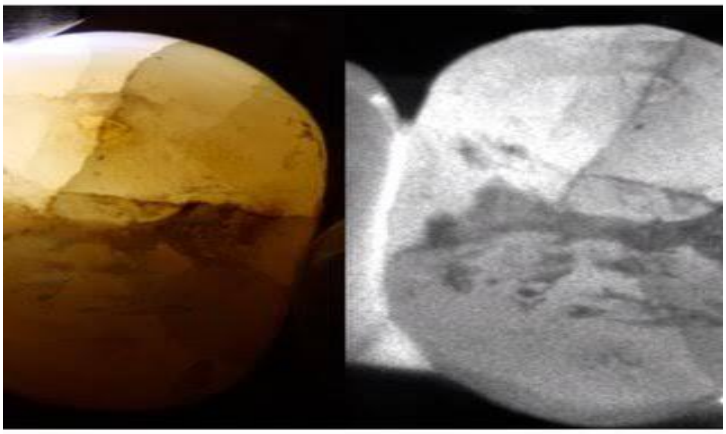

Figure 6. Microscope detection

7. Periodontal probing

The presence of separate, narrow, deep periodontal pockets at a site of the suspicious tooth may indicate a hidden crack extending subgingival. The depth of the periodontal pocket may mediately reflect the extension of the crack to the subgingival indirectly. Due to the deep periodontal pocket could also be used as a bacterial invasion route to infect the pulp. Studies have shown that the rate of pulp necrosis is higher for affected teeth with periodontal probing depth greater than 4 mm caused by cracks. Moreover, when the depth of narrow deep periodontal pocket was more than 4 mm caused by cracks, that may have an un-favorable prognosis (Figure 7).

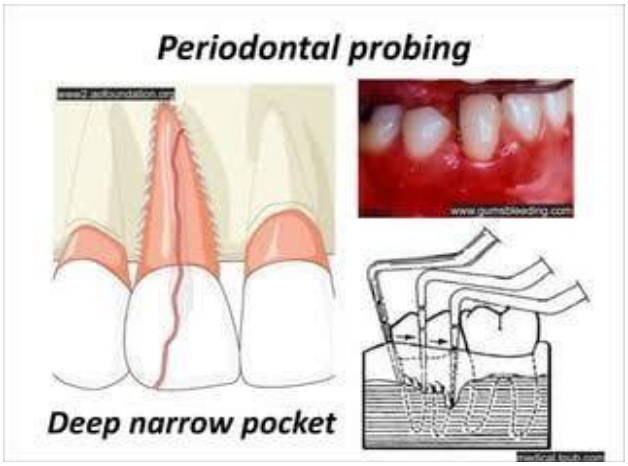

Figure 7. Periodontal probing

8. Others

a. Auxiliary diagnosis band

When the above methods still fail to diagnose, a stainless-steel orthodontic band can also be worn on the suspicious teeth. If the clinical symptoms of the patients are relieved after 2–4 weeks, the diagnosis is correct. In addition, the band can be used to fix the cleft teeth as external splint[12].

b. Quantitative percussion diagnostics

Quantitative percussion diagnostics (QPD) are commonly used to detect peri-implant osteointegration. And due to the presence of cracks, the tooth tissue on both sides of the crack can be slightly moved under the action of QPD, so QPD can be used to detect hidden cracks and locate the presence of cracks that cannot be detected by light transmission, for instance, the cracks where were interproximal or beneath the gingival/bone complex[13].

9. Imagological Examination

Periapical films are commonly used for dental clinical examination, but their ability to identify tooth cracks is not ideal. Cracks can be mediately judged by the situation of periodontal or periapical bone. As a clinical quantitative analysis method at present, Cone Beam Computed Tomography (CBCT) is not ideal for the identification of cracks. Some literatures have pointed out that CBCT is still difficult to identify cracked tooth with a width of less than 50 μm even under appropriate parameters. Guo XL et al. scanned artificial root cracks by combining different voxel parameters with different CBCT units and the experimental results showed that the selected parameters of CBCT affected the identification of root cracks. However, due to the different parameters of each machine and the midcult of clinicians to adjust the para-meters, CBCT is not clinically effective in diagnosing cracked tooth. In addition, studies have shown that cracks are easily secondary to the filling, and the filling is generally high-density under CBCT. The influence of filling artifacts makes it more difficult to identify cracked tooth under CBCT.

The diagnosis and judgment of cracked tooth have always been a long-standing problem. Delay in treatment leads to crack propagation, bacterial invasion leads to pulp infection, and finally causing serious pulp and periodontal disease, which becomes the main cause of tooth loss. Therefore, the early diagnosis and treatment of cracked tooth are very important in relieving pain, restoring the function of the affected teeth and improving prognosis. Early detection and diagnosis are important to limit crack propagation. It is essential to find a method that can be used for clinical quantitative evaluation of cracked tooth.

a. MicroCT

MicroCT has a high recognition rate, which can locate cracks with a width of a few tenths to tens of microns and identify enamel and dentin accurately. Generally, it is used as the gold standard for crack detection in cracked teeth research[14]. However, because of its high restrictions on the volume of the detection sample and the long detection time, it is generally only used in researches. Moreover, MicroCT is not considered as suitable method for diagnosis of tooth crack in routine clinical practice because of the high radiation doses which violates the concept “as low as reasonably achievable"(ALARA). (Figure. 8a and 8b)

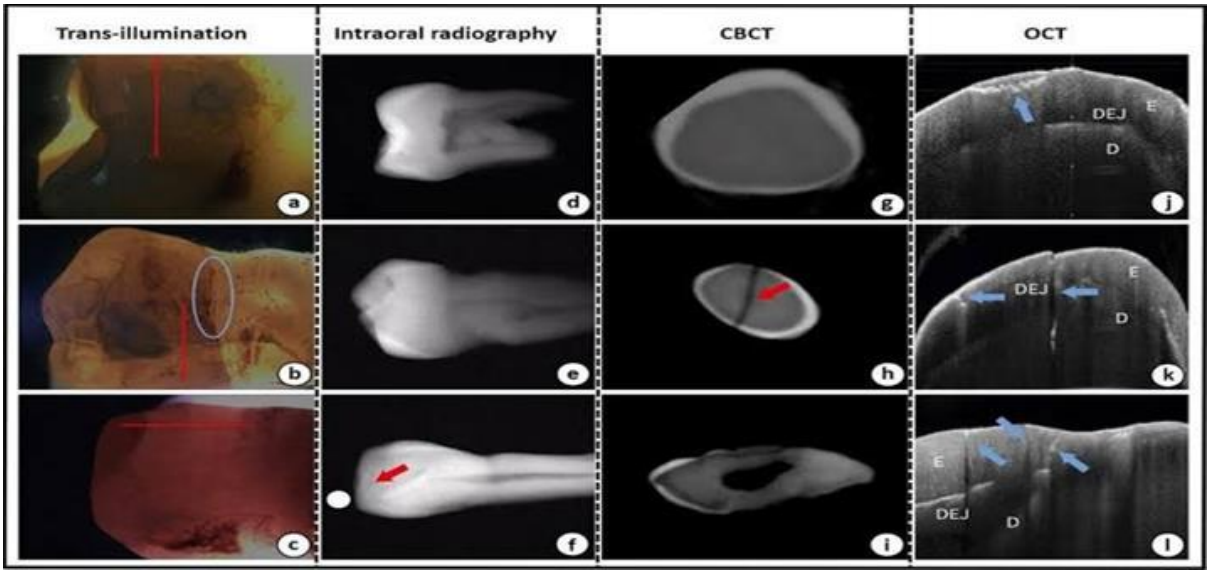

Figure 8. Mircro CT(a)

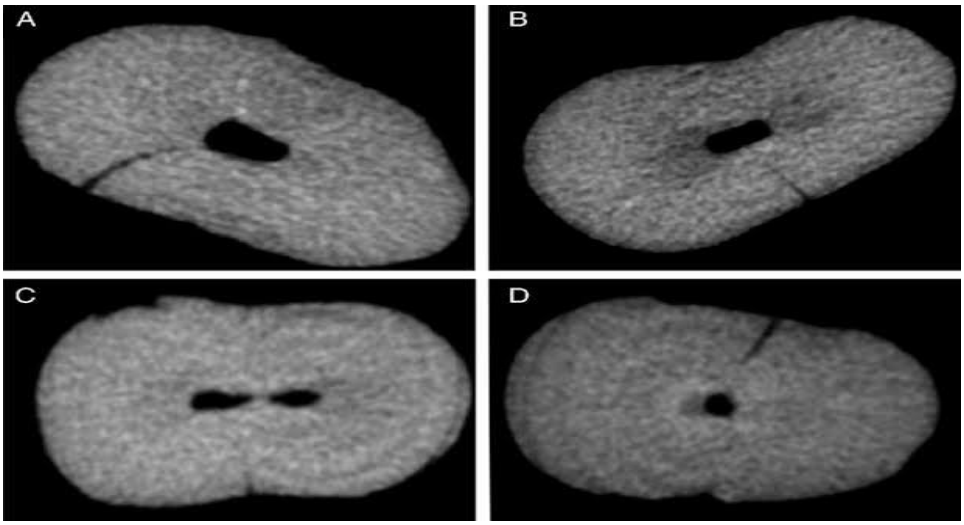

Figure 8. MicroCT (b)

b. OCT/SS-OCT

Optical coherence tomography (OCT) is a noninvasive imaging method, which can provide high-resolution cross-sectional images of biological internal tissues. It uses infrared light wave to reflect internal microstructure, which is similar to ultrasonic pulse echo in principle. At present, it has been applied in several clinical departments such as ophthalmology, cardiology and dermatology. As one of the derivatives of OCT, swept-source optical coherence tomography (SS-OCT) is an ideal scheme that can break through the speed bottleneck of OCT. SS-OCT uses a longer wavelength for imaging deeper biological tissue penetration. In addition, the swept frequency light source has high transient coherence so that it can achieve a deeper longitudinal imaging range. Moreover, SS-OCT system can provide extremely high imaging speed. Studies have shown that SS-OCT has high sensitivity and specificity in detecting caries and cracked tooth, especially at near-infrared wavelengths of 1310 nm. Both in vivo and in vitro experiments have proved the possibility of SS-OCT for the detection of cracked tooth. Although the main experimental subjects were cracks in the enamel layer, the experimental results of Imai K showed that SS-OCT has the ability to recognize the enamel and dentin layer and can identify cracks in the dentin layer.

Due to its shallow penetrating depth of about 3 mm, the use of SS-OCT is limited. The ability of SS-OCT to identify full-thickness cracks in tooth hard tissue remains to be promoted. OCT and SS- OCT is difficult to image root crack at sub-gingival zone. In addition, the long detection time, the difficulty of avoiding motion artifacts, limited penetration depth and scanning range, the influence of the special optical characteristics of tooth hard tissue on the detection results and the high cost of equipment are all the difficulties faced by SS-OCT in the detection of cracked

teeth. At the same time, the contrivance of adaptive probe is necessary with the objective to ensure the operability of oral clinic[15].

c. Magnetic resonance imaging

Magnetic Resonance Imaging (MRI) is a common method of soft tissue examination, which is often used to diagnose temporomandibular diseases and maxillofacial tumors in oral clinics. In recent years, it has also been applied to the diagnosis of dental diseases.

However, the hard tissue of the tooth has low hydrogen density, less binding water, and short relaxation time cause the low signal dental hard tissue shows in MRI, which is difficult to capture. Some scholars use ultrashort echo capture time technology to display the mineralized tissue of tooth, such as sweep image with Fourier transformation (Swift) to obtain the clearer signal of tooth hard tissue.

TylerJ. Schuurman concluded by comparing the MRI and CBCT's detection results of root cracks in excised teeth after root filling that MRI is better than CBCT in identifying partial hidden cracks and root filling or crown filling has little effect on MRI imaging (figure 9).

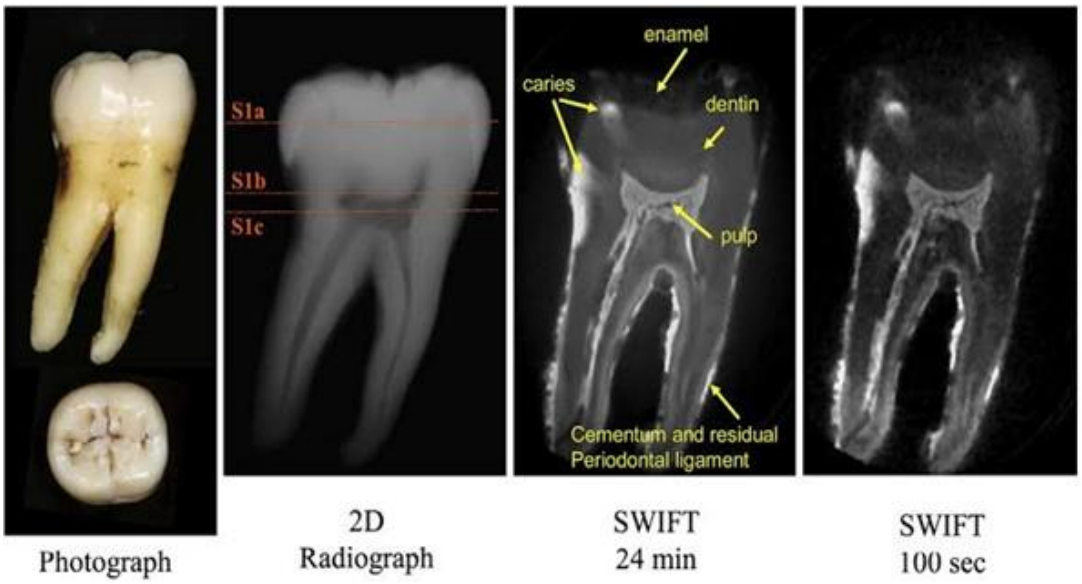

Figure 9. Magnetic resonance imaging

1.1. Contrast medium-assisted imaging

Contrast medium is a commonly used imaging auxiliary means, the principle of which is to inject contrast medium into demic tissues or organs to improve the imaging contrast for the sake of achieving the observation purpose. Commonly used contrast includes gastrointestinal barium, indocyanine green for retinography and iodine reagent for angiographies. This provides a new direction for dental radiography. Theoretically, after the contrast medium is introduced into the crack, the crack is easier to identify when the transmission density under X-ray is higher than that of tooth hard tissue.

The experimental results showed that when using a preestablished detection system and the projection light transilluminates the crack at a vertical angle, the crack depth obtained by analyzing the size of the dark area behind the crack is almost equal to the actual crack depth (figure 10).

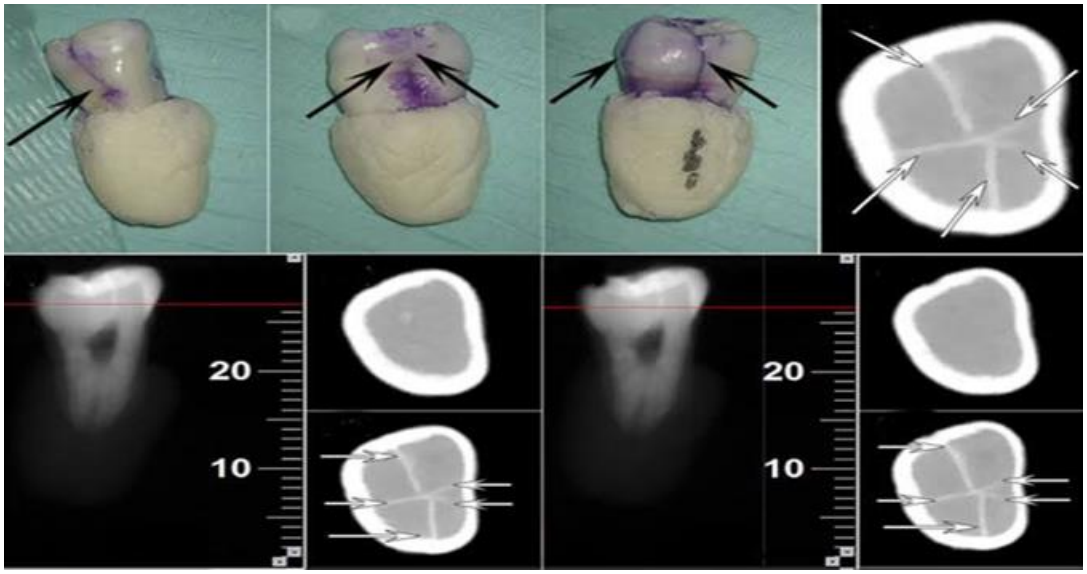

Figure 10. Contrast medium-assisted imaging

1.1. Nondestructive testing technology

As an essential technology to ensure product quality and equipment safety, non-destructive testing has been widely used. Conventional nondestructive testing includes X-ray testing, ultrasonic testing, magnetic particle testing, penetration testing, eddy current testing as well as acoustic emission testing, infrared testing and so on. Some scholars tried to apply these nondestructive testing techniques to the detection of tooth hard tissue.

1.1.1. Ultrasonic testing technology

Ultrasonic testing technology is a nondestructive testing method, which has the characteristics of wave length, high resolution and no danger. It is expected to be used in the detection of human teeth. Ultrasonic has the ability to penetrate the hard structure and it is very effective in detecting physical discontinuities. It can even detect cracks narrower than the wavelength, which lays a theoretical foundation for ultrasonic wave to detect cracked teeth. Culjat MO et al. simulated a set of ultrasonic detection system that can be used to detect cracked tooth, which provided a theoretical basis for the application of ultrasonic testing in cracked tooth detection.

1.1.2. Laser ultrasonic technology

Laser ultrasonic (LU) technology is a new nondestructive testing method, which uses pulsed laser to generate ultrasonic and describes the defect characteristics by detecting the reflection, scattering and attenuation of ultrasonic signals. The laser can focus on small objects with complex shapes in a non-contact way which solves the problem of insufficient operating space. The laser energy of LU can be kept at a low level to ensure lossless thermoelastic operation that making it appropriate for crack detection.

In addition, when using LU detection system, we should pay attention to the influence of laser on tooth hard tissue, dental pulp and periodontal tissue. It has been pointed out that some patients may feel pain when locating cracked teeth with semiconductor laser of 810 nm, and the pain of individual patients can last for one second in spite of there is no evidence that the pulp inflammation of in- dividual teeth after several years is directly related to laser irradiation.

In addition, laser irradiation can also cause structural damage to tooth hard tissue. At the same time, whether the vibration of tooth hard tissue caused by irradiation will extend the crack range needs to be further verified.

1.1.3 Optical polarization imaging system

Based on the optical birefringence characteristics of the tooth surface, Tien YH et al. constructed an optical polarization imaging system and used this system to detect the excised teeth with cracks. The results show that the system can preliminarily detect the cracks, but the detection results are not completely consistent with the actual depth on the tissue section.

1.1.4. Quantitative light induced fluorescence

Quantitative light induced fluorescence (QLF) is a new optical technology for the diagnosis of dental caries and the detection of dental plaque. Some researchers have tried to use it in cracked tooth detection, and the improved system considers using the maximum fluorescence loss value to preliminarily evaluate depth of crack.

The results showed that the maximum fluorescence loss value increases with the increase of crack depth, and there is a close correlation between the crack depth and the maximum fluorescence loss value. The clinical

test results show that the improved system is expected to be used in enamel crack detection.

1.1.5. Photoacoustic tomography

Photoacoustic tomography (PAT) is a new non-destructive and noninvasive biomedical imaging technology, which has been used in enamel crack detection.

1.1.6. Anisotropic X-ray dark field tomography

The research of anisotropic X-ray dark field tomography (XDT)provides a theoretical basis for XDT in the detection of tooth cracked teeth.

1.1.7. Digital image processing system

In addition, Chunliangzhanget al. established a set of digital image processing system to simulate the stress change of cracked teeth during chewing, which provides a new reference method for clinical diagnosis of cracked teeth.

1.1.8. Vibrothermography

The principle of Vibrothermography (VibroIR) is that the defect generates heat by friction under ultrasonic vibration. And the defect is detected by the temperature change, moreover, the smaller the crack width is the more obvious the temperature change is.Matsushita TMet al. tried to detect artificially created cracks extending to the root with different parameters of VibroIR.The experimental results show that the depth of dentin crack can be detected by using VibroIR under appropriate parameters.

However, whether vibration will increase the crack range and its effect on dental pulp needs to be considered. The application of nondestructive testing technology in industry and other fields is becoming more and more mature, and extending it to more disciplines will be the direction that related majors should strive for.

MANAGEMENT

A novel ultra conservative approach for the management of cracked tooth syndrome: This method involves the placement of bonded, direct supra coronal resin onlay restoration for the treatment of incompletely fractured teeth (Banerji, Mehta and Millar, 2017) This technique provides conservative, effective, predictable, emcient and economical approach for short to medium term management of cracked tooth syndrome.

- Supra occlusal restoration is prepared. It should be contoured flat to limit lateral loading.
- This non bonded composite splint has to be tried intraorally to check for alleviation of symptoms of rebound pain from the diagnosed tooth.
- The effected tooth is cleaned and conditioned with 37% phosphoric acid prior to placement and curing of the composite resin.
- The occlusal surface of this restoration should result in slight disocclusion. Upon lateral excursion posterior teeth should no longer be in contact.
- Periodic evaluation is carried out every week.
- Once occlusion is equilibrated and no symptoms are present, the direct composite splint is replaced with definitive restoration.
- Further follow up is carried out to check for outcome.

With the advent of CADCAM technology, these onlay splints can be designed chairside once the diagnosis of cracked tooth syndrome has been established. Different protocols have been advocated for the management of cracked tooth syndrome which involve removal of the fractured cusp followed by restoration of the defect, subtractive occlusal adjustment to splinting or immobilization of the affected tooth. Subtractive occlusal disocclusion will not avoid flexing of the tooth on occlusal loading. Cusp reduction followed by restoration with an overlay will serve as an ideal treatment option (figure 11).

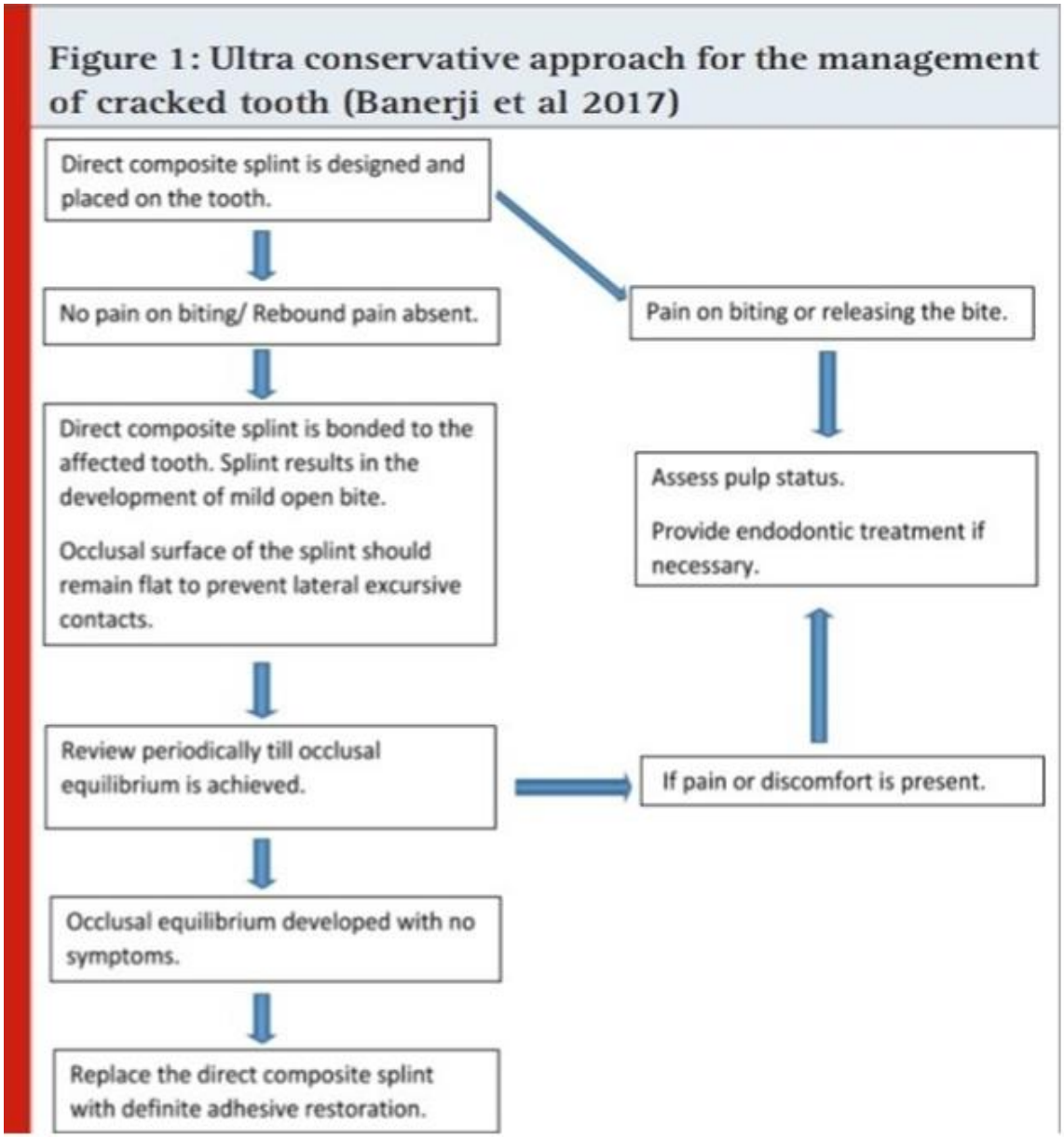

Figure 11. Vibrothermography

Immediate Management of Cracked Tooth syndrome

Unless the affected cusp has been separated off during removal of an existing restoration, acute management generally involves the use of immediate extra coronal circumferential splints (copper rings, orthodontic bands, provisional crowns) or by the application of direct intracoronal or extracoronal splints following tooth preparation (Ehrmann and Tyas, 1990; Clark, Sheets and Paquette, 2003) . Acute splints like copper rings and orthodontic bands when used, should be well contoured, adapted circumferentially and should not interfere with the occlusion (Ehrmann and Tyas, 1990) (figure 12).

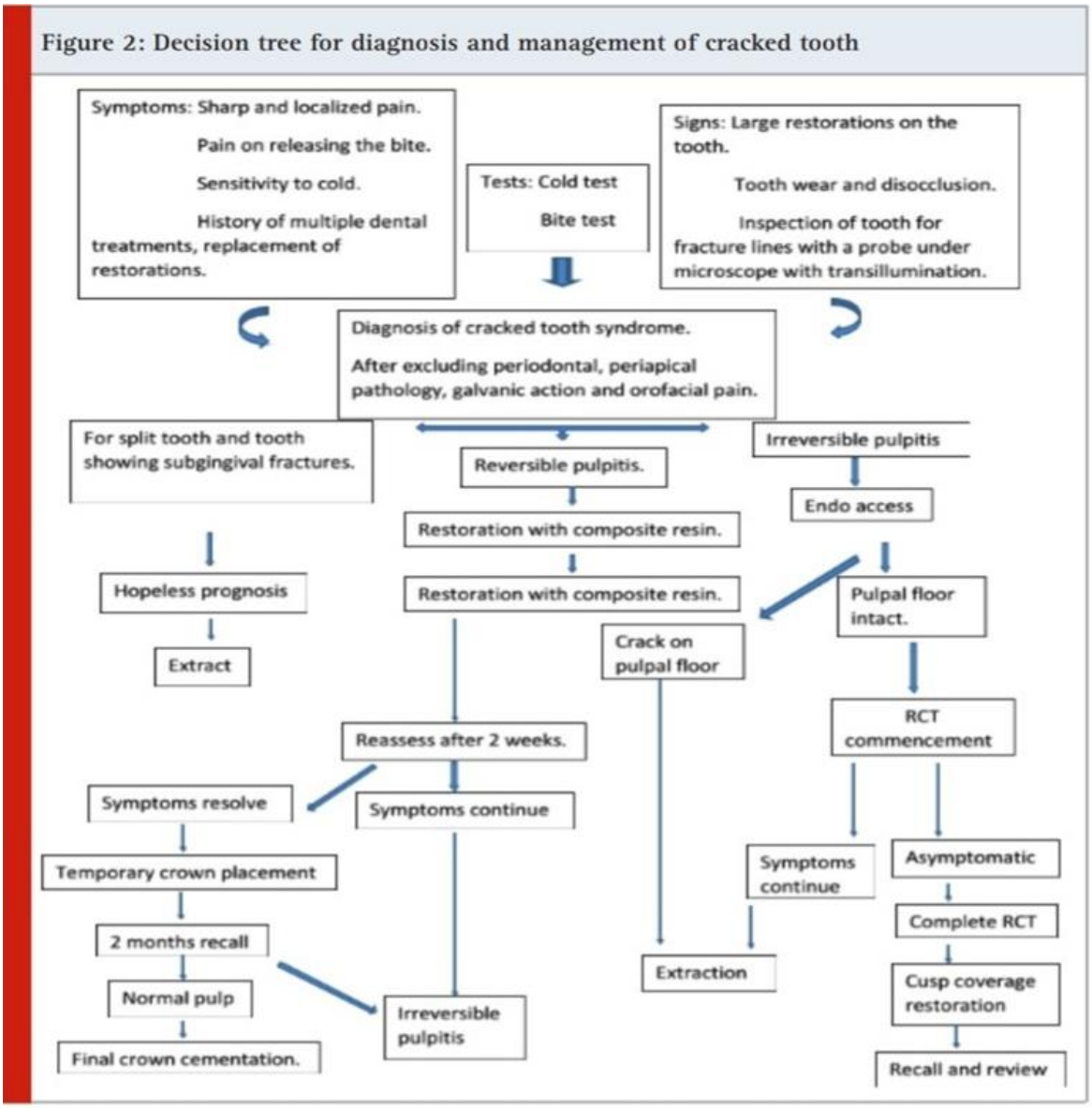

Figure 12. Immediate Management of Cracked Tooth syndrome

Long term management of cracked tooth syndrome

For a tooth with a crack that has extended into dentin, the fracture toughness of the tooth will have been reduced. Hence a restoration should be designed such that it provides both cuspal protection and limits the cuspal flexure (Banerji, Mehta and Millar, 2017). This is achieved by designing an onlay, overlay or crown (Hood, 1991; Imai et al., 2012). These restorations can be fabricated both by direct and indirect methods.

Direct Onlay Restorations

Direct onlays to treat incompletely fractured teeth can be formed using silver amalgam or composite resin (Davis and Overton, 2000; Opdam et al., 2008). With the advent of adhesively retained materials, silver amalgam overlays have been out of practice. Use of direct resin onlays have shown long term successful outcomes. It is esthetic and less invasive when compared to silver amalgam overlays (Opdam et al., 2008; Banerji, Mehta and Millar,2010).

Indirect Restoration

Provides superior mechanical properties within the oral cavity are requires less operator skills when compared to placement of direct onlay restoration (Azeem and Sureshbabu, 2018).

Intraoral composite inlays provide good esthetics along with the merit of ease of adjustment and repair. The use of indirect composites has shorn long term successful outcomes. They also provide more conservative preparation when compared to full coverage restorations. However, full coverage crowns have been suggested to be the most suitable form of treatment for the management of cracked tooth syndrome. It provides resistance form that helps to dissipate occlusal forces over the entire prepared tooth as

well as retention form that provides effective immobilisation[16].

CONCLUSION

The patient with cracked tooth syndrome may present with varied signs and symptoms making the diagnosis challenging to a practitioner. A detailed dental history and a thorough clinical examination aids in the diagnosis of this condition. Since the quantitative detection of tooth crack can be classified as the nondestructive detection of cracks in hard tissue. The methods that can be used for nondestructive and quantitative detection of cracks could equally apply to cracked tooth. And the special physical and chemical properties of tooth can also be considered as the direction of detection. The earlier the condition is diagnosed, the easier it would be to treat and better would be the prognosis. This condition can be managed by either immobilization of the tooth, subtractive occlusal adjustment, reduction of the fractured crown or by providing intracoronal and onlay restorations. Recently, an ultra-conservative technique of management has been proposed which uses supra occlusal restoration to disocclude the teeth. Once occlusion is equilibrated, the supra occlusal restoration is replaced with a full coverage crown. Further studies have to be carried out to check the long-term outcomes of this technique as well as to compare this technique with other alternative techniques in order to conclude any one as a superior technique. The decision to save the cracked tooth by the practitioner comes from a thorough knowledge of this condition, proper diagnosis and skillful management.

REFERENCE

1. American association of endodontists.cracking the cracked tooth code, Endodontics: Colleagues for Excellence, 1997.
2. Kahler B, Moule A, Stenzel D. Bacterial contamination of cracks in symptomatic vital teeth. Aust Endod J 2000;26:115–8.
3. Yang SE, Jo AR, Lee HJ, Kim SY. Analysis of the characteristics of cracked teeth and evaluation of pulp status according to periodontal probing depth. BMC Oral Health 2017;17:135.
4. W. Geurtsen, T. Schwarze, H. Gunay, Diagn, Ther, Prev Crack tooth Syndr Quintessence Int, 34, 2003, pp. 409–417.
5. Mamoun JS, Napoletano D. Cracked tooth diagnosis and treatment: an alter- native paradigm. Eur J Dent 2015;9:293–303.
6. Li L, Luo X. Research progress in diagnosis and treatment of cracked teeth. J Clin Stomatol 2017;33:372–4.
7. Snyder, D. E. (1976) 'The cracked-tooth syndrome and fractured posterior cusp', Oral surgery, oral medicine, And oral pathology, 41(6), pp. 698–704.
8. Stanley, H. R. (1969) 'The cracked tooth syndrome', The Greater Milwaukee dental bulletin, 35(5), pp. 164–173.
9. Teja, K. V., Ramesh, S. and Priya, V. (2018) 'Regulation of matrix metalloproteinase-3 gene expression in inflammation: A molecular study', Journal of conservative dentistry: JCD, 21(6), pp. 592–596.
10. Trushkowsky, R. (1991) 'Restoration of a cracked tooth with a bonded amalgam', Quintessence international , 22(5), pp. 397–400.
11. Türp, J. C. and Gobetti, J. P. (1996) 'The cracked tooth syndrome: an elusive diagnosis', Journal of the American Dental Association , 127(10), pp. 1502–1507.
12. Y. Yang, G. Chen, F. Hua, Q. Yu, W. Yang, Biting Pain Reprod tooth slooth: aid Early Diagn Crack tooth Quintessence Int, 50, 2019, pp. 82–87.
13. Banerji S, Mehta SB, Millar BJ. Cracked tooth syndrome: Part 1: aetiology and diagnosis. Br Dent J 2010;208:459–63.
14. Kim SY, Kim SH, Cho SB, Lee GO, Yang SE. Different treatment protocols for different pulpal and periapical diagnoses of 72 cracked teeth. J Endod 2013;39:449–52.
15. Hasan S, Singh K, Salati N. Crack tooth syndrome: overview of literature. Int J Appl Basic Med Res 2015;5:164–8.
16. Pai S. Diagnosis and management of cracked tooth-decision analysis. Biosci Biotechnol Res Commun 2020;13:457–63.