

26th Euro Congress and Expo on

Dental & Oral Health

December 10-11, 2018 | Rome, Italy

Assessment of the efficacy of thermography for the detection of artificially induced fractures in teeth: An *in vitro* study

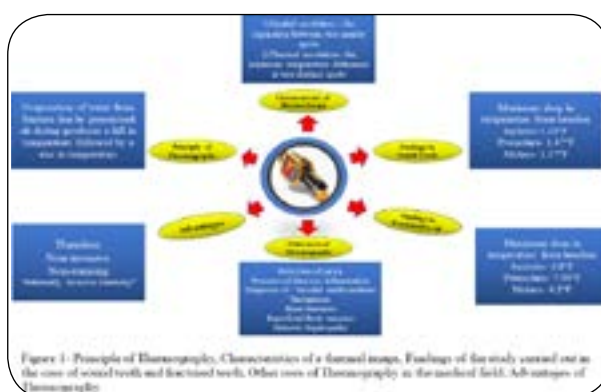
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Statement of the Problem: Most clinicians find it difficult to diagnose vertical teeth fractures due to the complicated and diverse symptoms that vary according to the position and extent of the fracture. Current methods such as radiography, transillumination, use of dyes, and operative microscopic examination have limitations, and the use of dental radiography or microtomography are controversial. Among the newer technologies, data on thermal imaging can be considered as a viable option for detecting vertical fractures.

Purpose of the Study: This study aims to assess the thermal changes associated with dehydration for the detection and quantification of artificially induced fractures in teeth using infrared imaging.

Methodology & Theoretical Orientation: 49 extracted teeth, of which artificial fractures were induced in 31 teeth and 18 intact (without any fracture) control teeth were used, keeping them hydrated at all times. A FlukeTi400 infrared camera was used to capture a video of 60s-10s to capture baseline temperature, 40s drying period where compressed air at 30psi was released onto the occlusal surfaces producing a thermodynamic transient on the tooth surface, and final 10s period for temperature stabilization.

Findings: The maximum drop in temperature from baseline was 1.32°F, 1.47°F, and 1.37°F for the incisor, premolar and molar control groups whereas, it was 4.8°F, 7.99°F and 6.2°F for the fractured groups respectively. This comparison showed a p value of 0.015 for incisors and <0.001 for the premolar and molar group, indicating that thermal imaging can be a very promising method of diagnosis of tooth fractures due to its non-invasive and radiation-free mechanism.



Recent Publications

1. Testori T, Badino M and Castagnola M (1993) Vertical root fractures in endodontically treated teeth: a clinical survey of 36 cases. *Journal of Endodontics* 19(2):87-90.
2. Tokugawa M M, Miura J, Iwami Y, Sakagami T, Izumi Y, Mori N, Hayashi M, Imazato S, Takeshige F and Ebisu S (2013) Detection of dentinal microcracks using infrared thermography. *Journal of Endodontics* 39(1):88- 91.
3. Zakian C M, Taylor A M, Ellwood R P and Pretty I A (2010) Occlusal caries detection by using thermal imaging. *Journal of Dentistry* 38(10):788-795.

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4. Bhat S, Saidath K, Castelino R, Shetty S and Babu S (2016) Dental Applications of Thermography. Archives Medical Review Journal 25(1):84-96.
5. Crandell C E and Hill R P (1966) Thermography in dentistry: a pilot study, Oral Surg Oral Med Oral Pathol. 21(3):316-320.

Biography

Shimpi Manasi Rajendra is currently pursuing her Master's in Pediatric and Preventive Dentistry in India. She endeavours to improve oral health and the overall well-being of individuals, especially children. Using non-invasive techniques, through dedicated research and expertise in clinical practice, she aims to work towards the prevention of dental diseases in the paediatric population. She is currently conducting intense research in the various applications of Thermography in Dentistry.

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