

Thermography and Oral Pathology

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1. INTRODUCTION

The purpose of this study is to illustrate the clinical use of thermography in identifying asymptomatic dental (oral) pathology. A common cause of dental (oral) infection and inflammation found in this study is in fact due to a common dental procedure, a root canal. Unless the region becomes abscessed, usually over a longer period of time, we are completely unaware that there is an issue.

For years, a debate has brewed between those, who are proponents of root canals, and those, who see root canals as a potential health threat. Current convention is to save a tooth at any cost. Despite multiple research studies that link root-canal treated teeth to cancer and other chronic disease, the majority of people, even health care professionals, do not pay enough attention to dental health. With thermographic imaging, we can identify areas of suspected inflammation and infection because they present with heat. Once an area of concern is identified, it needs further investigation and resolution.

2. MATERIALS AND METHODS

Study population consisted of 20 patients (2 males and 18 females, aged from 42 to 63 years) that visited Thermography Clinic in Toronto, Ontario, Canada with variable complaints. All patients were evaluated with IR imaging and followed up with dental examination that included x-ray and examination of the oral cavity. Patients were followed up with additional dental examinations for up to one year.

Patients were evaluated with FLIR A-320 Infra Red camera, with examination guidelines followed, as set forth by the International Academy of Clinical Thermology.

The IR imaging finding results were summarized. Quantitative variables were described using summary statistics (means, medians, and standard deviations, minimum and maximum values, table 1).

Categorical variables were summarized by giving frequency distributions. Percent of patients with at least one IR imaging finding confirmed by subsequent dental evaluations was the primary endpoint in this study (fig. 1).

Table 1 - Demographic and Evaluation Characteristics

| Parameter | Study Participants (N=20) |
|---|------------------------------|
| Age (years), Mean (SD) | 52.4(6.7) |
| Median | 51.5 |
| Min-Max | 42.0 – 63.0 |
| Gender, n (%) | |
| Females | 18 (90%) |
| Males | 2 (10%) |
| Type of Exam, n (%) | |
| Total Body Scan | 2 (10%) |
| Breast Scan & Facial | 13 (65%) |
| Facial | 5 (25%) |
| Presence of Symptoms, n (%) | |
| Symptoms Present | 6 (30%) |
| No Symptoms | 14 (70%) |
| Number of Months Until First Dental Exam, | |
| N | 20 |
| Mean (SD) | 0.7(0.6) |
| Median | 1.0 |
| Min-Max | 0 – 2 |
| Number of Months Until Second Dental Exam, | |
| N | 10 |
| Mean (SD) | 4.7(2.3) |
| Median | 4.5 |
| Min-Max | 2 – 8 |

SD=standard deviation, Min=Minimum; Max=Maximum

3. RESULTS

Twenty patients with age ranging from 42 to 63 years (mean age \pm SD is 52.4 ± 6.7 y.o.) participated in this study. Eighteen (90%) patients were females. Two patients (10%) had total body scan performed; thirteen patients (65%) had both breast and facial scans, and 5 patients (25%) had a facial scan only. Fourteen patients (70%) did not have any symptoms related to dental pathology. The number of oral cavity findings (“spots”) per patient ranged from 1 to 4 (mean \pm SD is 2.1 ± 1.1). Most of patients had 1 (40%) or 2 (30%) dental cavity

findings (table 2). Following the thermography evaluations, eight subjects (40%) had a dental follow-up exam in less than a month, 12 subjects (40%) had such an exam in 1-2 months. Ten subjects (50%) subsequently had another dental exam; seven of these subjects saw the dentist within the following 6 months. In eleven subjects, (55%), thermographic findings were confirmed during the first follow-up dental exam. In fourteen subjects with 1-2 detected spots, six subjects (42.9%) had confirmed results. Five out of six subjects (83.3%) with 3-4 spots received such confirmation. During the second follow-up dental exam, thermographic findings were confirmed in all 10 subjects evaluated. Notably, in 7 of these subjects results of the first dental evaluations were not confirmatory. When both first and second dental evaluations are taken into account, thermographic findings were confirmed at least once in 18 out of 20 subjects. The high confirmation rate (90%) indicates strong correlation between thermographic and dental exams (table 3).

Table 2 - Thermographic Findings

| Parameter | Study Participants |
|------------------------|--------------------|
| | (N=20) |
| Number of Spots, | |
| Mean (SD) | 2.1(1.1) |
| Median | 2.0 |
| Min-Max | 1 – 4 |
| Number of Spots, n (%) | |
| 1 | 8 (40%) |
| 2 | 6 (30%) |
| 3 | 3 (15%) |
| 4 | 3 (15%) |

SD=standard deviation, Min=Minimum; Max=Maximum

4. DISCUSSION

Pain acts as a warning system that something is wrong. Unless the region becomes abscessed, usually over a longer period of time, we are completely unaware that something is going on. When a patient has no symptoms of pain or discomfort, the assumption is that all is well. If an infection in the area does develop, we have no way of knowing this, as the pain receptors in that area have been removed as in case of root canal treated teeth. If an abscess develops, it will be taken care of – usually as an emergency – but by then, infection could have been setting in for many years and could have already contributed to the development of other health issues. Chronic inflammation has been accepted as “the silent killer” that leads to chronic disease, heart disease, and cancer. Root canals are

inherently susceptible to infection and inflammation.

Over the years at our clinic, we have imaged thousands of women using infrared thermography. In many cases, we have clearly seen cases of inflammation in the dental area using this heat sensing technology. Many of these cases are caused by a low-grade infection and inflammation and have, through further testing, been attributed to dental or oral issues, such as issues related to root-canal treated teeth. Invariably, some cases are very subtle, even asymptomatic for many years, but these cases slowly and continuously affect people's health. With thermographic imaging, we can identify areas of suspected inflammation and infection because they present with heat. Once an area of concern is identified, it needs further investigation and resolution. People living with a chronic source of infection and inflammation will eventually find that their immunity is affected. In some cases, this chronic inflammation and infection will actually promote the growth of malignancy. The natural defense mechanism to fight malignant development is impaired since their immune system is busy dealing with inflammation that has no chance of resolving on its own. The only way this problem can be resolved is by identifying and removing the cause. The infected area has to be properly dealt with before the body can be restored to health.

5. CONCLUSION

The IR imaging procedure provided enormous information about the physiological processes through examining the temperature of the facial area that can be related to the internal process of inflammation or irritation. The early signs provided by the IR imaging can be used as a prognostic indicator in detecting oral and or dental pathology. The merits of a non-invasive IR imaging modality are important in identifying early stages of inflammation not visible by other imaging modalities. The high confirmation rate (90%) indicates strong correlation between thermographic and dental exams.

ACKNOWLEDGEMENTS

We are grateful to Dr. Leon Treger, DDS of Toronto Ontario for providing dental evaluations for this study. With gratitude we acknowledge Dr. Arkady Rubin, PhD of Flemington New Jersey who provided statistical analysis and evaluation for this study. Special mention of Dr. Simon Yu, MD of St Louis Missouri for his clinical experience and observation that contributed to making a

connection between oral pathology and chronic disease which eventually led to this study.

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Table 3 - Confirmation of Thermographic Findings by Dental Evaluations

| Number of Subjects Stratified by Number of Spots n (%) | Confirmed by 1 st Dental Exam | Confirmed by at Least One Dental Exam |
|--|--|---------------------------------------|
| 1 Spot: N=8 | 4 (50%) | 7 (87.5%) |
| 2 Spots: N=6 | 2 (33.3%) | 5 (83.3%) |
| 3 Spots: N=3 | 3 (100%) | 3 (100%) |
| 4 Spots: N=3 | 2 (66.7%) | 3 (100%) |
| All Subjects: N=20 | 11 (55%) | 19 (90%) |

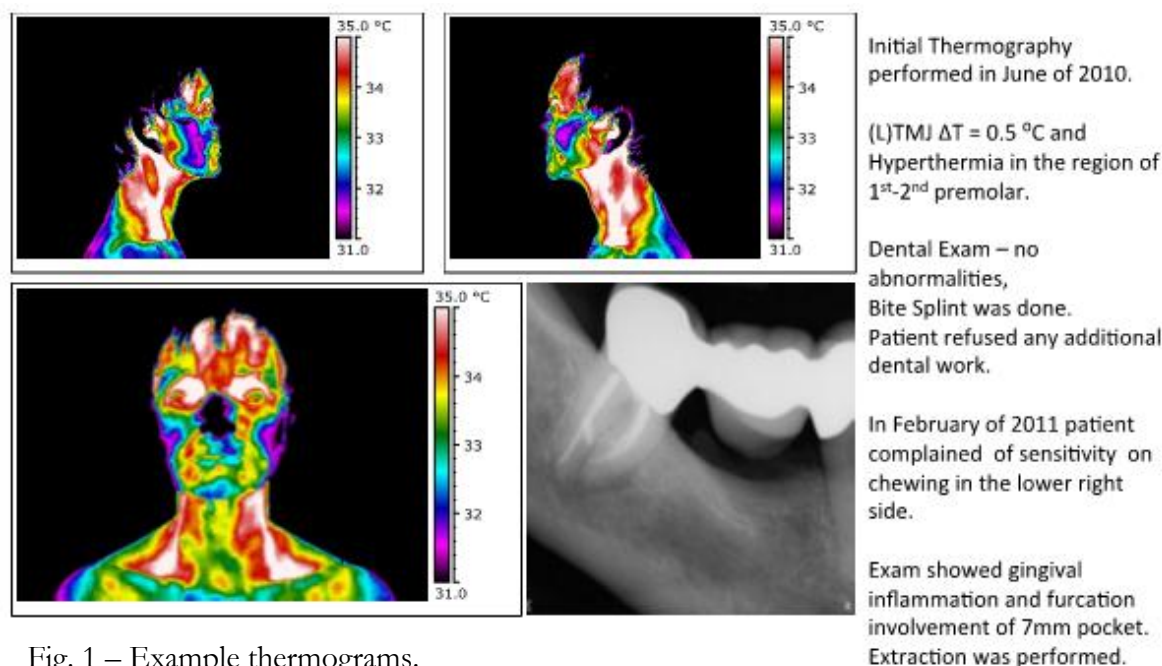


Fig. 1 – Example thermograms.