INPLASY PROTOCOL

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Corresponding author:
Karina Devito

karina.devito@ufjf.br

Author Affiliation:
Federal University of Juiz de Fora.

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None declared.

Can infrared thermography replace other methods for evaluating the presence and intensity of neurogenic and musculoskeletal orofacial pain in adult patients? A systematic review

Devito, KL[1]; Americano, JP[2].

Review question / Objective: **To investigate the question "Can infrared thermography replace other methods for evaluating the presence and intensity of neurogenic and musculoskeletal orofacial pain in adult patients?", the following PECO question was formulated:**
P – Adult patients with a history of neurogenic and musculoskeletal orofacial pain
E – Subjected to infrared thermography
C – Submitted to other evaluative methods of presence and intensity of orofacial pain
O – Correlation of infrared thermography with other evaluation methods of presence and intensity of orofacial pain.

INPLASY registration number: This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 24 March 2023 and was last updated on 24 March 2023 (registration number INPLASY202330091).

INTRODUCTION

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Rationale: Pain measurement is a complex task due to the different components involved, including individual and subjective aspects. Therefore, establishing an effective and safe evaluation method for orofacial pain is very important. Infrared thermography has gained ground as an alternative diagnostic modality, as it is a painless, non-invasive, non-ionizing and low-cost method. This technique reveals body temperature distribution, detects functional, nervous and vascular alterations through a real-time image, based on the capture and transmission of infrared radiation emanated by human skin. Thus, knowing the relationship between pain and temperature, the need for a correct assessment to arrive at the diagnosis of orofacial pain and ensure an assertive treatment approach, the present study proposes to evaluate infrared thermography as a possible diagnostic tool for assessment of neurogenic and musculoskeletal orofacial pain in adult patients.

Condition being studied: Orofacial pain is a pathology associated with the soft and hard tissues of the head, face, and neck, potentially originating from pulp and periodontal, vascular, glandular, muscle, bone conditions, involvement of the sinuses and joint structures. Epidemiological studies estimate the significant presence of orofacial pain affecting the world community, with approximately 22% of the adult American population having this condition.
In order to meet the needs of each patient, it is essential that the professional obtain as much information as possible about the patient's pain experiences, as they are individual and subjective. This information should be obtained through evaluative methods, such as a detailed report of the pain history and adequate clinical evaluation, including a physical examination of the dental region and head and neck. Pain scales, such as the visual scale, and validated assessment instruments, such as DC/TMD (Diagnostic Criteria for Temporomandibular Disorders) and RDC/TMD (Research Diagnostic Criteria for Temporomandibular Disorders) can also be used. However, they are methods with implications and limitations regarding their application. For the application of the visual scale, it is essential that the patient is fully conscious and collaborative, in addition to being a subjective assessment. The RDC/TMD and DC/TMD require a lot of training and mastery by the examiner regarding these assessment instruments, as they are exams with several axes and specific criteria.
On the other hand, infrared thermography can be an auxiliary exam in the diagnosis of pain as it is a fast and noninvasive method that reveals in real time the microcirculatory dynamics on the skin surface, detecting the extension of functional, nervous and vascular alterations caused by inflammatory processes, endocrine disorders or oncological conditions.
Although there are controversial results regarding the accuracy of thermography as an auxiliary diagnostic tool, in general, the literature has highlighted the usefulness of infrared thermography to distinguish between healthy people and patients affected by orofacial syndromes, which are characterized by an asymmetric thermographic pattern.
As the published systematic reviews involving thermography and orofacial pain are limited to the diagnosis of TMD, not evaluating other chronic and very frequent painful conditions in the orofacial region, the present study proposes to investigate, through a systematic review, whether infrared thermography can replace other methods of assessing the presence and intensity of neurogenic and musculoskeletal orofacial pain in adult patients.

METHODS

Search strategy: A detailed search was performed in five databases: PubMed

(Public Medline), SciELO (Scientific Electronic Library Online), Web of Science, SciVerse Scopus (Scopus) and Cochrane Library. An additional gray literature search (OpenGrey) and Google Scholar and a manual search of the references of included studies were also performed.

Mesh descriptors (Medical Subject Headings) used for orofacial pain were: "Facial Pain", "Facial Neuralgia", "Myofascial Pain Syndromes", "trigeminal Neuralgia", "Neuralgia", "Myalgia", "Muscular Diseases", "Musculoskeletal Diseases", "Temporomandibular Joint Dysfunction Syndrome", "Temporomandibular Joint Disorders", "Joint Diseases", "Craniomandibular Disorders", "Cranial Nerve Diseases", "Trigeminal Nerve Diseases" e "Trigger Points". The non-mesh descriptors used for orofacial pain were: "Face Pain", "Orofacial Pain", "Neuralgic Facial Pain", "Craniofacial Pain", "Myofacial Pain", "Craniofacial Pain Syndrome", "Facial Pain Syndrome", "Myofacial Pain Syndrome", "Myofascial Pain Syndrome", "Myofascial Trigger Point Pain", "Trifacial Neuralgia", "Neuropathic Pain", "Nerve Pain", "Muscle Pain", "Muscle Soreness", "Muscle Tenderness", "Muscular Disease", "Myopathy", "Muscle Disorder", "Myopathic Condition", "Musculoskeletal Disease", "Orthopedic Disorder", "Myofascial Pain Dysfunction Syndrome ", "TMJ Syndrome", "Temporomandibular Joint Syndrome", "Temporomandibular Joint Disorder", "TMJ Disorder", "Temporomandibular Disorder", "Temporomandibular Joint Disease", "TMJ Disease", "Joint Disease", "Arthropathy", "Craniomandibular Disorder", "Craniomandibular Disease", "Cranial Nerve Disease", "Nervus Cranialis Disorder", "Cranial Nerve Disorder", "Cranial Neuropathy", "Multiple Cranial Neuropathy", "Cranial Nerve Palsy", "Trigeminal Nerve Disease", "Trigeminal Neuropathy", "Trigeminal Nerve Disorder", "Cranial Nerve V Diseases", "Fifth Cranial Nerve Diseases", "Trigger Point" e "Trigger Area".

The Mesh descriptors used for infrared thermography were: "Thermography" and "Thermometry". The Non-Mesh descriptors used for infrared thermography were: "Infrared thermography", "Temperature mapping", "Infrared thermometry", "Infrared measurement", "Infrared thermography diagnosis", "Infrared thermography oral", "Infrared thermography pain", "Infrared thermography injury", "Infrared thermography dentistry", "Infrared thermal", "Infrared thermal imaging", "Digital infrared termal", "Infrared thermal image", "Thermography diagnosis", "Thermography myofascial", "Thermography orofacial", "Infrared imaging", "Infrared image", "Temperature infrared" e "Infrared temperature measurement".

The Boolean operators "AND" and "OR" were used to make the association between the uniterms.

Participant or population: Participants included in the study will be: adult patients (aged 18 years or older) with a history of neurogenic and musculoskeletal orofacial pain.

Intervention: The exposure factor is the infrared thermography exam. All included participants must undergo infrared thermography examinations of the maxillomandibular region to aid in the diagnosis of neurogenic and musculoskeletal orofacial pain.

Comparator: For control/comparison purposes, all patients submitted to infrared thermography must also have been submitted to other evaluation methods for the presence and intensity of orofacial pain.

Study designs to be included: Clinical trials, case-control studies, cohort studies and clinical cases with more than three patients were included. Literature review, systematic or scope review, letter to the editor, book chapter, clinical case with up to three patients, animal studies and ex-vivo or in-vitro laboratory studies were excluded.

Eligibility criteria: Studies that used infrared thermography as an evaluation method for

adult patients with neurogenic or musculoskeletal orofacial pain were considered eligible. No restrictions on language or year of publications were applied. Clinical trials, case-control studies, cohort studies and clinical cases of more than three patients were included. Exclusion criteria were: (1) literature review, systematic and scope review, letter to the editor, book chapter, clinical case with up to three patients; (2) animal studies; (3) ex-vivo or in-vitro laboratory studies; (4) studies with population under 18 years old; (5) studies that do not meet the objective of the systematic review; (6) studies without a control group; (7) studies in which infrared thermography was applied in different regions of the orofacial region; (8) studies related to cases of non-neurogenic or musculoskeletal pain; (9) studies where infrared thermography was used comparing treatments; and (10) studies without comparative orofacial pain scale.

Information sources: A detailed search was performed in five databases: PubMed (Public Medline), SciELO (Scientific Electronic Library Online), Web of Science, SciVerse Scopus (Scopus) and Cochrane Library. An additional grey literature search (OpenGrey) and Google Scholar and a manual search of the references of included studies were also performed. If necessary, the authors will be consulted for clarification and providing additional data.

Main outcome(s): The main outcome of this review will be neurogenic and musculoskeletal orofacial pain, defined in infrared thermography by the average temperature of specific regions of the face. These data will be correlated with the results of other evaluation methods of presence and intensity of orofacial pain. It is worth mentioning that the data has not yet been extracted.
After extracting the data and assessing the risk of bias, a homogeneity test will be applied to verify the consistency of the effect of the included studies. If there is homogeneity between the studies included in the review (consistent effect size), performing a meta-analysis will allow obtaining a better estimate of this effect size and its 95% confidence interval. If heterogeneity is considered high and unexplainable, the systematic review will not be accompanied by a meta-analysis.

Quality assessment / Risk of bias analysis: As the included studies are observational with association measures, the Joanna Briggs Institute (JBI) tool will be used to assess the risk of bias.

Strategy of data synthesis: It is expected that the extracted data can be evaluated qualitatively and quantitatively. After the qualitative synthesis of the studies, the homogeneity test will be applied to verify the consistency of the effect of the included studies. If there is homogeneity between the studies included in the review (consistent effect size), performing a meta-analysis will allow obtaining a better estimate of this effect size and its 95% confidence interval. If heterogeneity is considered high and unexplainable, the systematic review will not be accompanied by a meta-analysis.

Subgroup analysis: The analysis of subgroups will depend on the methods used in different studies to assess pain. If necessary and possible, there will be subgroups defined by pain evaluation methods, for example, a subgroup for studies that associate infrared thermography with visual pain scale, another subgroup for studies that associate infrared thermography with RDC/TMD.

Sensitivity analysis: In order to identify statistical, methodological or clinical heterogeneities, multiple sensitivity analyzes can be applied, considering possible selection bias, publication bias, low quality studies, etc.

Language restriction: There will be no restriction by language.

Country(ies) involved: The authors are Brazilian researchers.

Keywords: Infrared thermography; orofacial pain; diagnosis.

Contributions of each author:

Author 1 - Karina Devito - Teacher advisor, definition of the PECO question, definition of eligibility criteria and search strategy, evaluation of references, data extraction, risk of bias assessment, data analysis, manuscript review.

Email: karina.devito@ufjf.br

Author 2 - Julia Americano - Application of the search strategy, evaluation of references, data extraction, risk of bias assessment, data analysis, manuscript writing.

Email: julia_ierto@hotmail.com