Chapter 6

Thermal Evaluation of Myogenous Temporomandibular Disorders and Myofascial Trigger Points in the Masticatory Muscles

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ABSTRACT

It is known that the myofascial trigger points (MTP) and myogenous temporomandibular disorders (TMDs) cause regional sympathetic hyperactivity in local temperature due to the cutaneous vasomotor activity and, for detection of functional changes, thermography is used as an complementary diagnostic imaging method. This chapter intends to study two masticatory muscles, masseter and anterior temporalis, in measurement of the cutaneous temperature of volunteers with and without myogenous TMD and MTP. Results: The temperature levels measured at both muscles regions in myogenous TMD volunteers were significantly lower than those measured in controls. Infrared imaging indicated differences between referred and local pain in MTPs of 0.5°C. Conclusions: Infrared imaging measurements seem to indicate that it can be used as an aid in complimentary diagnosing of TMDs and MTPs in masticatory muscles.

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INTRODUCTION

Temperature is a long established as a diagnostic sign and thus an indicator of health. In 400 B.C., Hippocrates wrote “In whatever part of the body excess of heat or cold is felt, the disease is there to be discovered” (Brioschi et al., 2010). The beginning of the infrared temperature measurement started, in 1800, with the discovery of the infrared radiation by Sir William Herschel (Brioschi et al., 2010; Haddad, 2001).

During the World War II, military research in monitoring infrared systems allowed the beginning of a new era in thermal diagnosis. In the 50s was developed the first generation of infrared tracking for military applications, named FLIR (Forward Looking InfraRed) (Sanches, 2009). However, the first medical publication using infrared thermography was in 1956, by Dr. Ray N. Lawson of McGill University (Montreal, Canada) (Lawson, 1956). The first dental research using infrared thermography was done by Crandell and Hill in 1966 (Crandell & Hill, 1966). Since that time, many researches were done in Dentistry (Haddad, Brioschi & Arita, 2012; Haddad et al., 2014; Canavan & Gratt, 1995; Johanson, Kopp & Haraldson, 1985; Gratt et al., 1989; Gratt & Sickles, 1993; Gratt & Sickles, 1995; Gratt & Anbar, 1998; Dworkin et al., 1990; Fillingim et al., 1996; Pogrel et al., 1989; Christensen, Vaeth & Wenzel, 2012; Kawano et al., 1993; Gratt et al., 1994; Leonardi et al., 1991; Anbar, Gratt & Hong, 1998; Weinstein et al., 1991; Biagiioni et al., 1996; Berry & Yemm, 1971; Berry & Yemm, 1974; Mongini et al., 1990; Gratt et al., 1996; Dibai-Filho et al., 2014; Dibai-Filho et al., 2015).

Medical infrared thermography is a nonionizing and noninvasive imaging technique that allows the real-time representation of the skin surface thermal distribution into images (Brioschi et al., 2010; Haddad, Brioschi & Arita, 2012; Haddad et al., 2014). The skin temperature distribution depends on the heat exchange processes between skin tissue, local vasculature and metabolic activity (Brioschi et al., 2010; Haddad, Brioschi & Arita, 2012; Haddad et al., 2014; Merla & Romani, 2008). Natural vascular heat emissions that present on the human face can provide physiologic indicators of underlying health or disease. All of these processes are mediated and regulated by the autonomous nervous system to maintain the thermal homeostasis (Brioschi et al., 2010; Haddad, Brioschi & Arita, 2012; Haddad et al., 2014; Merla & Romani, 2008). The resultant thermal image indicates the amount of heat given off by blood flowing within and beneath the skin and muscles. As the amount of blood circulating within and beneath the skin layers varies, so does the skin temperature. Only the body surface and a superficial layer 6 to 10 mm in depth is surveyed and recorded using thermography.

The literature clearly documents that, in a normal situation, blood flow through the skin of most body parts produces a nearly symmetrical thermal pattern (Haddad, Brioschi & Arita, 2012; Canavan & Gratt, 1995; Gratt & Sickles, 1993; Gratt & Sickles, 1995; Gratt & Anbar, 1998; Vardasca et al., 2012). The presence of biological dysfunctions can affect the heat balance or exchange processes, resulting in an increase or a decrease of the local skin temperature. Quantitative and qualitative changes in infrared heat emission by the skin have been reported to occur in a variety of diseases. These changes include conditions involving facial structures, such as temporomandibular joint (TMJ) disorders, atypical facial pain (atypical odontalgia), nerve damage and repair following oral surgery, headache, inflammation of the lacrimal drainage system, and psychogenic facial pain (Merla & Romani, 2008).

Anatomical and functional information of the structures of interest are the basis of radiology interpretation. For recognizing diseases it is necessary to understand and identify the anatomical structures and its variations. Many diagnosis of some facial diseases (e.g.: bone alterations, caries, temporomandibular joint disorders, etc) may be done through medical imaging techniques, however the most conventional
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