

# **THE ROLE OF INFRARED THERMAL IMAGING (THERMOGRAPHY) IN ELECTRICAL INJURIES (EI)**

Hooshang Hooshmand, M.D., Masood Hashmi, M.D. and Eric M. Phillips

Neurological Associates Pain Management Center

1255 37<sup>th</sup> Street, Suite B

Vero Beach, FL 32960

## **ABSTRACT**

In our study of 411 consecutive Electrical injury (EI) patients (in publication) [1], the disease followed a stereotypical pattern. The electricity enters, and passes through the path of the least resistance [1, 2]. This path consists of oxygenated, rapidly circulating arterial blood. In its wake the electricity damages the thermoreceptor sensory nerves in the wall of blood vessels. As a result, the electricity causes neuropathic pain, complex regional pain syndrome (CRPS) [1], spinal cord dysfunction, myelogenic seizures and limbic system dysfunction [1, 2].

As far as we are aware, the only disease in medicine with exclusive, *sin equa non* thermal changes on Infrared thermal imaging (Thermography) is electrical injury. The most characteristic thermographic finding in EI is the "button hole" sign (Fig.1) at points of entrance or exit of electricity. The epicenter of the damage area is hyperthermic, surrounded by concentric hypothermic isotherms (Fig.1). The hypothermic surround is so intense that it conceals the small central hyperthermia. It requires impeccable and detailed technique to identify the central "button hole" hyperthermia (Fig.1). Limiting the test to standard technique, and not increasing the sensitivity, will show nothing but a hypothermic extremity masking the "button hole" sign. The second typical thermographic finding in EI is hyperthermia in precordial and posterior thoracic areas. This is due to the electrical injury involving the richly innervated structure of cardiac sympathetic plexus. The thermographic signs are important in diagnosis of EI injuries in face of EMG/NCV and MRI tests being invariably normal. EMG/NCV are positive in less than 5%, and MRI in less than 2% of cases [1].

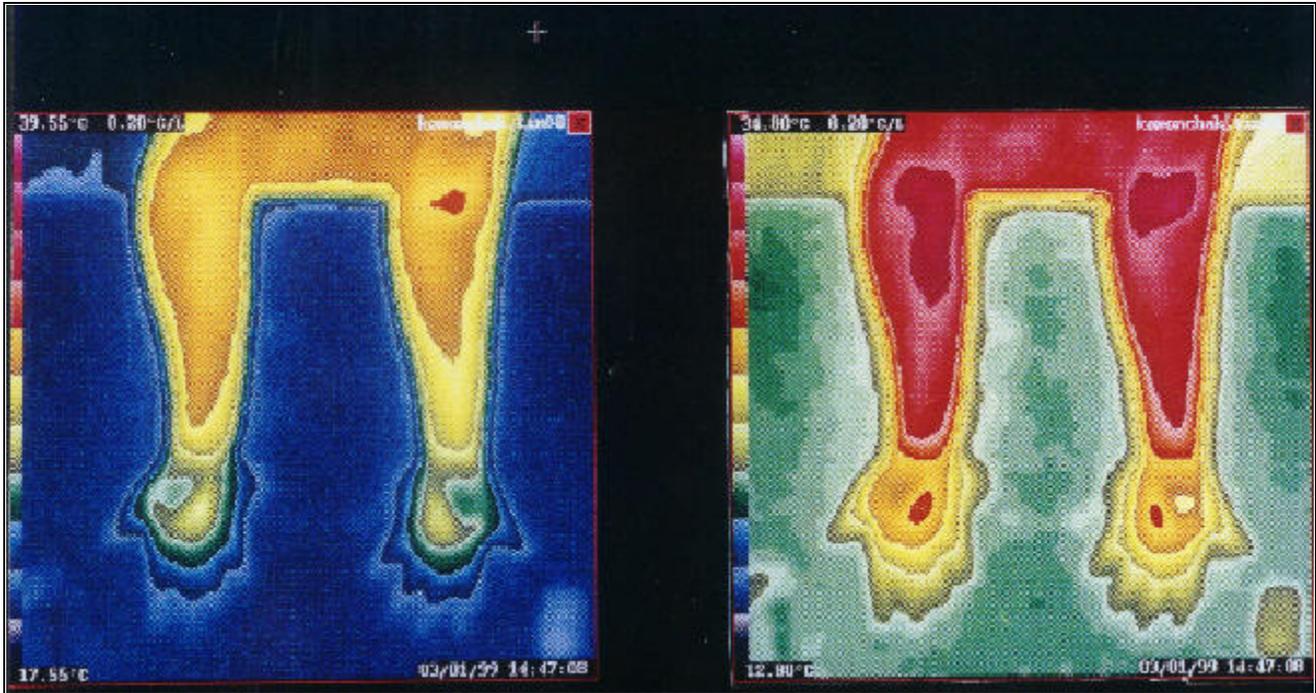


Fig. 1 - Central hyperthermic areas of entrance and exit in electrical injury. The permanent hyperthermic damage is surrounded by vasoconstrictive hypothermia. Only after increasing the thermal sensitivity (right) the lesions were identified. This "button hole" sign is exclusively seen in electrical injury.

## References

1. Hooshmand H, Petrilla F, Phillips E.M.: Long term effects of electrical injuries. Industrial lightning strikes: A study of 411 patients. In Press.
2. Hooshmand H, Radfar F, Beckner E: The neurophysiological aspects of electrical injuries. Clin Electroencephalography 20:111-120, 1989.