

DIGITAL INFRARED THERMOGRAPHY IN ASSESSING SOFT TISSUES INJURIES ON SPORT EQUINES

Ciutacu Otilia; A. Tanase ; I. Miclaus

Surgery Department, Faculty of Veterinary Medicine of Bucharest, 105 Splaiul Independentei Str.,
Bucharest, otiliaciutacu@yahoo.com

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Abstract: *Thermography* is becoming increasingly popular as an aid to assist with the diagnosis of musculoskeletal and neurological injuries in horses, particularly non-specific lameness. As thermography is completely non-invasive it allows the horse to be examined without being touched, thus causing no stress or discomfort to the animal. We find equine thermography extremely helpful when working in animal/athletic training situations. Equine infrared imaging can detect musculo-skeletal injuries several weeks before they are visually detectable. Later, equine infrared imaging can help the veterinarian follow the horse's response to treatment. Through thermography we discovered some very insidious conditions that lead to lameness (eg. a supraspinous muscle strain; a RDS syndrome-Reflex Sympathetic Distrophy).

INTRODUCTION

Thermography, according to *Dorland's Medical Dictionary* for humans, comes from the Latin words for "heat" and "to write." It is defined as "a technique wherein an infrared camera is used to photographically portray the surface temperatures of the body, based on the self-emanating infrared radiation; sometimes employed as a means of diagnosing underlying pathologic processes, such as breast tumors."

Thermography is an imaging technique, but imaging should be thought of in terms of physiologic imaging and anatomic imaging.

Anatomic imaging is what you can show--a broken bone or tear in a structure such as a tendon (X rays and ultrasound). This structural anomaly indicates a problem, but the image is static. Anatomic imaging only shows what has occurred. Anatomic images can be taken in a series over time and compared to help determine healing or lack thereof, and are needed for diagnosis after thermal (physiologic) imaging has pinpointed a problem area.

Physiologic imaging is a function of metabolic action. Physiologic images can change and might appear prior to anatomic disruption.

Thermography (or thermal imaging) is considered physiologic imaging because as the horse's metabolism changes--a sore tendon heats up--that fact can be discerned.

MATERIALS AND METHODS

We examined through thermography several sport horses that were presented to the Surgical Department of The Faculty of Veterinary Medicine of Bucharest.

The thermograms were performed with a MMS med 2000 device .

We presented and discussed four cases:

Case 1: Felah, Arabian stallion, 14 years old, use in show-jumping.

He has an acute tendinitis of the superficial digital flexor in the left fore leg, and the difference of temperature between the left and the right fore leg is about 1.5°C (*see fig . 1 and 2*).

Fig.1-Felah, 14 years, male; -left fore leg, with acute tendinitis,

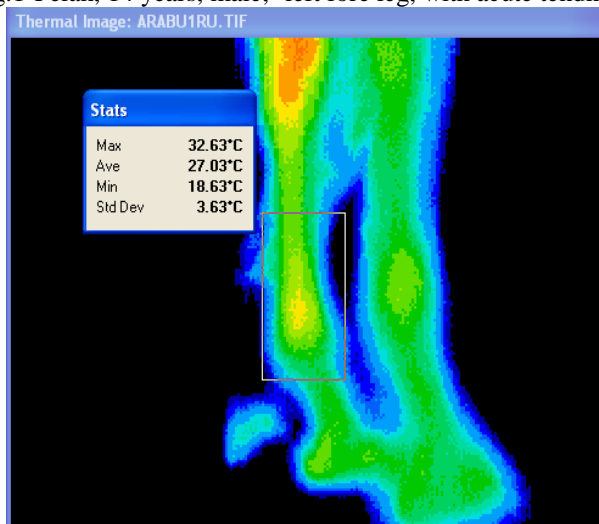
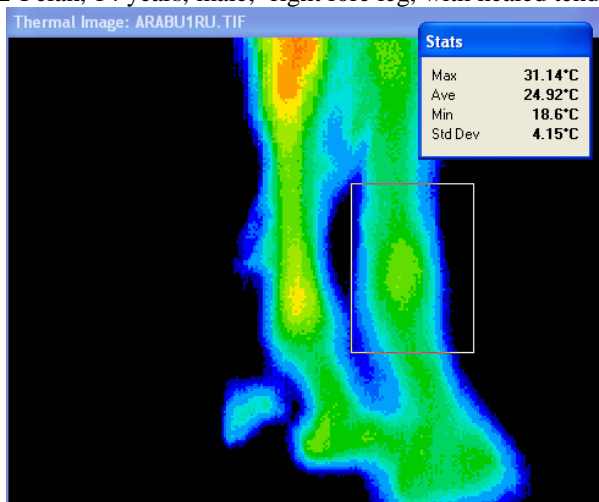


Fig.2-Felah, 14 years, male;- right fore leg, with healed tendinitis.



Case2: Betty-Green, 6years old, Thoroughbred, female, use in gallop races (*see fig. 3 and 4*)

She had a bowed tendon (tendinitis of superficial digital flexor) with a year ago and she was examined to see if the lesion is completely healed and if she will be able to run again this season. After the exam, we saw that the tendon is still hot, so it is not completely healed .

Fig.3 Betty-Green 6 years , female-right fore leg, sound

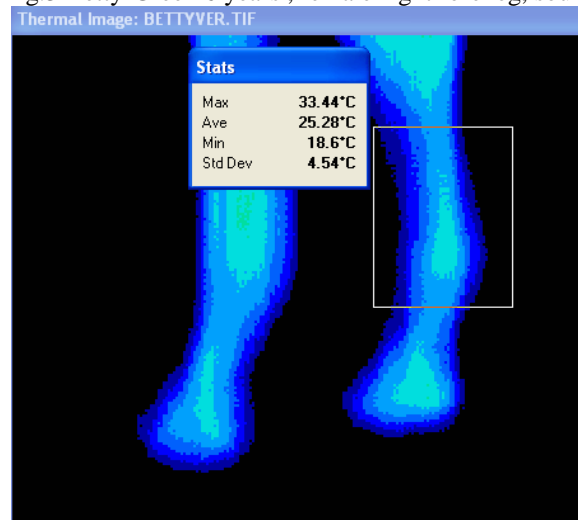
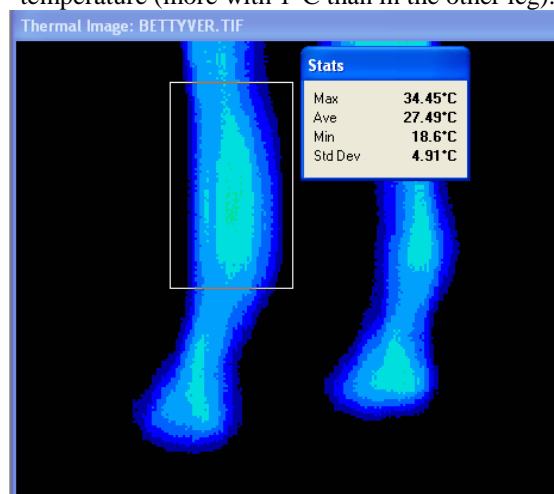


Fig.4 Betty-Green 6 years , female-left fore leg with healed tendinitis. Still there is a significant increased temperature (more with 1°C than in the other leg).



Case 3: Valah, 11 years old , gelding, pleasure horse .He developed a „bog spavain”-distension of the tibio-tarsal joint with synovial fluid-in the right hind leg.

He was clinically sound, but we discovered through thermography that his right hock had a temperature increasea with 2 °C , comparing to his left hock .

See *fig. 5 and 6*.

Fig.5-Valah, 11years, gelding-right hock, with bog spavain

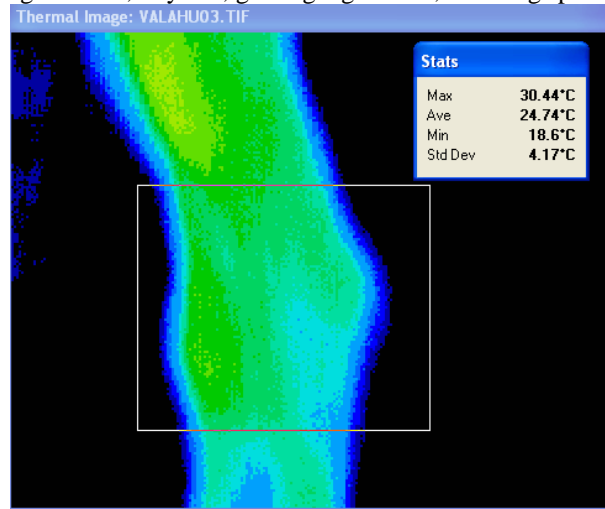
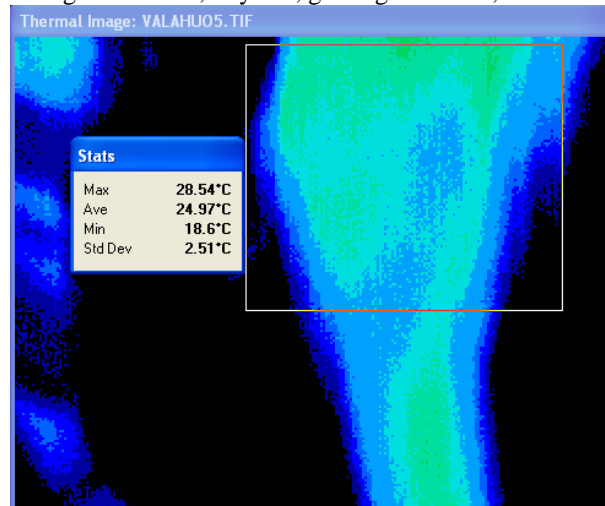


Fig.6- Valah, 11years, gelding-left hock, normal.



Case4: Boss-Green, 12 years old , Thoroughbred stallion, used in show-jumping; he has a RSD(Reflex Sympathetic Dystrophy). The syndrome is characterized by a ΔT , between the affected leg and the normal opposite leg, of 5°C or greater. Often the hotter the atmospheric temperature, the greater is ΔT . The horse is not lame, but he has an uneven gait with his left hind leg, wich is the leg with a very low temearature, comparing to the right hind leg.

See fig 7 and 8.

Fig.7- Boss Green, 12 years, male-right hind leg, with normal temperature

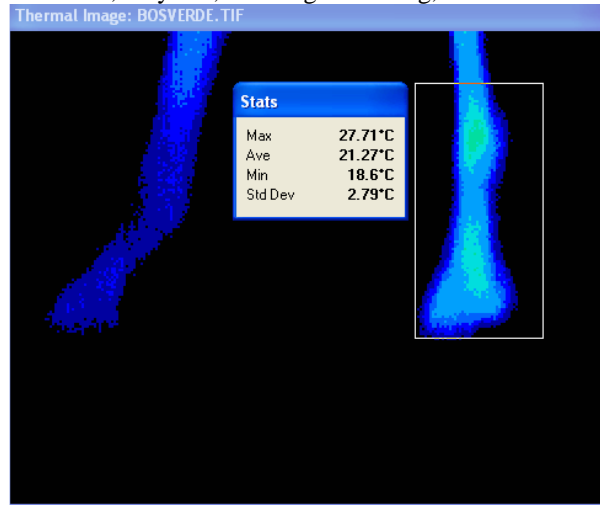
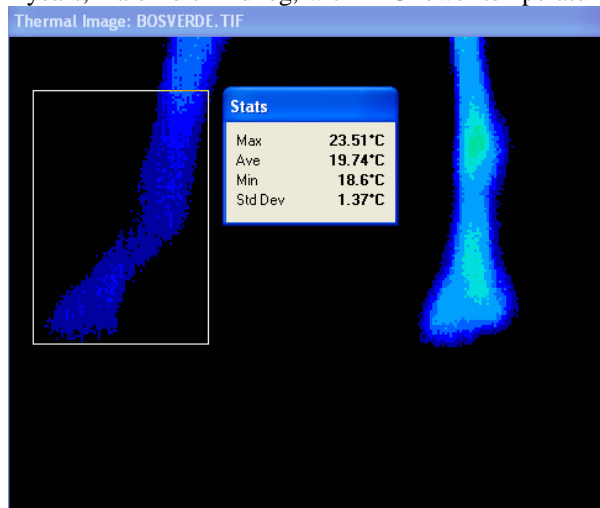


Fig.8- Boss Green, 12 years, male- left hind leg, with 4 °C lower temperature than in the right leg.



RESULTS AND DISCUSSION

It should be remembered that skin temperature in the normal horse is about five degrees cooler than core body temperature. The skin derives its heat from local circulation and tissue metabolism. Also, a horse is warmer down the inside of its body than the outside.

A "hot spot" indicates inflammation or increased circulation.(See **case 1 and 2**). Hot spots generally are seen in the skin directly overlying injury. A cold spot is a reduction in blood supply usually due to swelling, thrombosis, or scar tissue.

Changes of one degree Celsius over 25% of the comparable anatomic structure usually are clinically significant.

Thermography can be used to determine if there is inflammation in an area that was sore on palpation, or to detect an area of increased blood flow when there is no specific pain or signs (subclinical inflammation). Most horses don't have just one problem associated with a lameness.

Thermography also helps in detecting the secondary areas with problems.

Thermography also can be used to assess the vasculature and blood flow to tissues before and after exercise.

With capsulitis/synovitis, as the joint becomes inflamed, the thermal pattern changes to an oval area of inflammation just over the joint.(see **case 3**). This pattern might become evident two weeks prior to the onset of clinical signs. The pattern is similar for tendonitis. (see **case 1 and 2**).A hot spot occurs over the injury site that can be detected about two weeks before there is evidence of swelling and pain over the tendon. *As tendons heal, the temperature becomes more uniform, but remains elevated(case 2).*

Thermal changes correlate well to structural reorganization.

Thermal patterns of the normal flexor tendons are bilaterally symmetrical with the lowest temperature centered over the palmar/plantar aspect of the tendons and the slightly warmer temperature near the fetlock and carpus/hock.

Acute tendonitis(see **case1**) invariably causes a hot spot over the site of the lesion that can be appreciated on both a PA(postero-anterior) and lateral view of the limb. Additionally, these hot spots can be detected up to two weeks before physical evidence of swelling, pain, or lameness is clinically observed.

This modality has great potential for preventing a debilitating injury by detecting an area of concern before it becomes clinically significant and for this reason is often used in upper levels of competition.

Similarly, injuries to the suspensory ligament can be detected allowing for early diagnosis and treatment of this sometimes elusive condition.

In conclusion, thermography is used to evaluate several different clinical syndromes, not only in the diagnosis of inflammation, but also to monitor the progression of healing .

It was found that regular thermographic screening allowed us to find more horses with initial pathological changes in tendons, than those with clinically manifested signs.

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