RESEARCH ABOUT EVALUATION OF LOCOMOTORY SYSTEM OF SPORT EQUINE THROUGH DIGITAL INFRARED THERMOGRAPHY

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Abstract. The thermographic research has been made on a number of 16 sport equines, the majority of them were show jumping horses. Some of them were clinically sound, others were presenting clinical signs of different locomotory injuries. Thus, thermography was used for valuation purposes of locomotory system, in some cases, and in others, these methods were very useful in assessing the localization and the extent of the pathological process. At the same time, thermography was used to assess and to monitor the healing process of some old locomotory injuries, in few cases.

Thermography proved to be a very sensitive and accurate method of diagnosis, in the same time being less invasive, very easy to apply in the field condition, and causing no stress or discomfort on examined animals.

INTRODUCTION

Thermography is the pictorial representation of a surface temperature of an object (8).

It is a noninvasive technique, that measured emitted heat. The heat is generated continuously through the body, and spreaded to the skin, by radiation, convection, conduction and vaporisation. (4, 1)

For that, usually, the skin temperature is about 5 °C lower than the core body temperature (which is 37.5–38 °C, on equine) (6).

The skin take it’s heat from the local circulatory system, and from the tissues metabolism, which is usually constant, and that is why the variations on skin temperature is due to changes in the local circulation. (11, 12).

Normally, the veins are warmer than the arteries, because they are draining the blood from the areas with increase metabolic activity. (10, 13). That is why the medial regions of the distal limbs, that are crossed by epifascial veins, have usually bigger temperatures than the lateral parts. (2)

MATERIAL AND METHOD

The thermographic screenings have been made by a MMSmed2000, with interface PC2000/e device. The research was made on 16 show jumping horses. The animals were examined on the stable, with respecting the following rules: out of daylight, in the dark, out of draught, in an ambiental temperature between 15-25 °C, in order to avoid the thermal losses through transpiration. The patients were adapted to the ambiental temperature, and were examined before the daily training. They were also out of cold showers, liniments, bandages.
or other medication that could modify the skin temperature, with 48 hours before the examination.

The thermograms were made circumferential, from 4 different incidences, to establish if a „cold spot” or a „hot spot” is constantly present.

RESULTS AND DISCUSSIONS

Among the 16 animals examined, 7 (43.75%) were clinically sound after physical examination, and 9 (56.25%) presented different locomotory injuries, with clinical expression. From 16 cases, 5 patients (31.25%) had joint problems, which had been localized through thermography, 2 patients (12.5%) had muscular tears, with no clinical expression, only a decrease of sport performances. 5 patients (31.25%) had tendons injuries, which were on the acute stage, on subclinical stage, or were recovering from older tendon injuries, 6 patients (31.5%) presented different foot problems—mostly on the hoof structures—usually without clinical expression yet, due to poor shoeing and hoof imbalances.

The first two images (fig. 1 and 2) represent the thermogram of a patient with podal troubles, without lameness, but with a decrease of performance activity. It can be notice a temperature difference of 2.79°C between the thoracic hooves, with the highest temperature on the on the left fore hoof, these facts being of a pathological significance, because any difference of temperature, of more than 1 °C, between two symmetrically anatomical regions it is considered to be abnormal.

![Thermal Image](image.png)

Fig. 1. Cosmic, CSR, M, 14 years, right fore limb, lateral view

The third figure (fig.3) represents the thermogram of case 15, an old tendonitis of superficial digital flexor tendon of the right fore limb.

The temperature difference between the sound leg and the one we investigated, is about 2.62°C, which is indicating a recurrence of the old tendon lesion. In that case, thermography help the trainer to adjust the training programme for that horse, in order to keep him safe, without overexertion of locomotory system.

The 4-th figure is the thermogram for the case 9, diagnosed with a muscle tear of the semitendinous muscle on the right hind, and it is showing the difference of temperature of 2.7 °C between the right tight and the left tight.
Fig. 2. Cosmic, CSR, M, 14 years, left fore leg, medial view.

Fig. 3. Romanian Dance, PSE, M, 15 years, thoracic limbs, metacarpal regions, right fore, medial view, up; left fore, lateral view, down.
Fig. 4. Edina, F, 11 years, CSR, lateral view of the right tight, up; lateral view of the left tight, down.

Fig. 5. Redvarna, PSE, F, 5 years, caudal view of the right tight, up; left tight, down.
The 5-th figure (case nr. 14), is also a thermogram of an old muscle tear, in the caudal part of the semitendinous muscle. The temperature difference between the two symmetrical regions is about 1.1 °C. In that case, the muscle lesion is about to heal up.

In table 1 I presented a synthesis of the analysed cases, with the clinical and thermographical diagnoses (the 1-st Annex to „RESULTS AND DISCUSSION”)

CONCLUSIONS

Thermography, when combined with a thorough clinical examination, is an excellent modality for the assessment of lameness. It is particularly helpful when determining areas of inflammation in the upper limbs, but can also be readily used to assess inflammation on lower limbs.

It has been useful in assessing cases of palmar foot pain and has helped to identify areas, other than the navicular bone, that may be the source of pain.

It has also been useful in the assessment of joint problems, as well as tendon and ligament problems.

Since the method is noninvasive, it can readily be used, and with recent technological advances, the equipment is completely portable and can readily be taken to farms, arenas and so on.

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<table>
<thead>
<tr>
<th>Case no.</th>
<th>Horse name</th>
<th>Age</th>
<th>Sex</th>
<th>Service</th>
<th>Clinical diagnosis</th>
<th>Thermographical diagnosis</th>
<th>Type of lesion</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>ADA</td>
<td>8</td>
<td>F</td>
<td>Show jumping</td>
<td>Hock arthroses</td>
<td>Chronic, degenerative arthritis</td>
<td>Chronic, degenerative, with locomotory disfunction</td>
</tr>
<tr>
<td>2</td>
<td>ANDA</td>
<td>13</td>
<td>F</td>
<td>Show jumping</td>
<td>Sound</td>
<td>Subclinical inflammation, of left fore, right hind</td>
<td>Subclinical inflammation, without locomotory disfunction</td>
</tr>
<tr>
<td>3</td>
<td>BETTY GREEN</td>
<td>5</td>
<td>F</td>
<td>Gallop races</td>
<td>Chronic tendinitis of Superficial digital flexor of left fore leg</td>
<td>Old tendinitis of the superficial digital flexor tendon</td>
<td>Chronic inflammation, with tendon fibrosis, without functional signs</td>
</tr>
<tr>
<td>4</td>
<td>BOSS GREEN</td>
<td>12</td>
<td>M</td>
<td>Gallop, show jumping</td>
<td>2-nd degree lameness of left fore leg</td>
<td>Acute inflammation of the scapulo-humeral joint of the left fore leg</td>
<td>Acute inflammation, with lameness</td>
</tr>
<tr>
<td>5</td>
<td>CONTE</td>
<td>8</td>
<td>M</td>
<td>Show jumping</td>
<td>2-nd degree lameness of left fore leg, with acute tendinitis of the superficial digital flexor tendon</td>
<td>Acute tendinitis of the superficial digital flexor tendon, on the left fore leg</td>
<td>Acute inflammation, with 2-nd degree lameness,</td>
</tr>
<tr>
<td>6</td>
<td>COSMIC</td>
<td>13</td>
<td>M</td>
<td>Show jumping</td>
<td>Sound</td>
<td>Subclinical inflammatory process on the left hind distal limb, due to poor shoeing</td>
<td>Subclinical inflammation, without locomotory disfunction</td>
</tr>
<tr>
<td>7</td>
<td>DAN</td>
<td>8</td>
<td>M</td>
<td>Show jumping</td>
<td>2-nd degree lameness of right hind hoof</td>
<td>Acute inflammation on the right hind hoof</td>
<td>Acute inflammation on the right hind hoof, with lameness</td>
</tr>
<tr>
<td>8</td>
<td>DORA</td>
<td>8</td>
<td>F</td>
<td>Show jumping</td>
<td>Sound (stiff gait)</td>
<td>Subclinical inflammatory process on the left fore- hoof and pastern; subclinical inflammation right hind hoof</td>
<td>Subclinical inflammation, without locomotory disfunction</td>
</tr>
<tr>
<td>9</td>
<td>EDINA</td>
<td>11</td>
<td>F</td>
<td>Show jumping</td>
<td>Sound</td>
<td>Inflammatory process on the right tibia, in the semitendinosus muscle, with elevated temperatures on the entire right hind leg</td>
<td>Subclinical inflammation/muscle tera, right hind leg, tight region</td>
</tr>
<tr>
<td>10</td>
<td>ENOL</td>
<td>5</td>
<td>M</td>
<td>Show jumping</td>
<td>Sound</td>
<td>Very good thermal pattern; right dorsal carpal region</td>
<td>Old skin scar healed, on the right dorsal carpal region</td>
</tr>
<tr>
<td>11</td>
<td>FELAH</td>
<td>14</td>
<td>M</td>
<td>Show jumping, dressage</td>
<td>Chronic, nodulous tendinitis on the both fore legs, healed, without lameness</td>
<td>Subclinical inflammation on both check ligamanets on the fore legs ; recurrence of the old lesions</td>
<td>Chronical nodulous tendinitis of the boht check ligaments of the fore legs , with recurrence</td>
</tr>
<tr>
<td>12</td>
<td>GARIBALDI</td>
<td>8</td>
<td>M</td>
<td>Show jumping</td>
<td>Sound</td>
<td>Subclinical inflammation on the left hind hoof, on the heels region</td>
<td>Subclinical inflammation, without locomotory disfunction</td>
</tr>
<tr>
<td>13</td>
<td>IALOMI TA</td>
<td>13</td>
<td>F</td>
<td>Show jumping</td>
<td>3-rd degree lameness of left hind leg; abscess on the coffin joint of the left hind hoof</td>
<td>Acute inflammation on the coffin region of the left hind hoof</td>
<td>Acute inflammation, with lameness</td>
</tr>
<tr>
<td>14</td>
<td>REDVARNA</td>
<td>5</td>
<td>F</td>
<td>Show jumping</td>
<td>Sound</td>
<td>Healed muscle tear in the semitendinosus muscle, right hind leg</td>
<td>Subclinical inflammation; healing muscle tear</td>
</tr>
<tr>
<td>15</td>
<td>ROMANIAN DANCE</td>
<td>14</td>
<td>M</td>
<td>Show jumping</td>
<td>Old tendinitis of the superficial digital flexor tendon, right fore limb</td>
<td>Acute inflammation on the caudal metacarpal region of the right fore leg</td>
<td>Recurrence of the old tendinitis, with subclinical inflammation by the time of exmination</td>
</tr>
<tr>
<td>16</td>
<td>VALAH</td>
<td>12</td>
<td>M</td>
<td>Leisure horse</td>
<td>Acute tendinitis of the superficial digital flexor tendon , on the right fore leg; vesicle spavain, left hind leg</td>
<td>Acute inflammation on the superficial digital flexor tendon, right fore limb; subclinical inflammation on the left hock</td>
<td>1-st degree lameness, right fore leg, with acute inflammation; subacute inflammation on the left hock</td>
</tr>
</tbody>
</table>

The 1-st annex to „RESULTS AND DISCUSSIONS”; Table 1: Synthesis of analysed cases, with clinical and thermographical diagnosis