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INFRARED THERMOGRAPHY IN DROMEDARY CAMELS WITH INJECTED AND STRETCHED LIPS IN CAMEL BEAUTY PAGEANTS

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ABSTRACT

This study was carried out during the events of the 5th King Abdulaziz Camel Festival (KACF), Saudi Arabia. It was designed to evaluate the infraed thermography (IRT) in 4627 dromedary camels with either injected lips with cosmetic medicine or stretched lips. Ninety camels with healthy lips were tested for IRT and were used as a control group. During the KACF, 14 camels were found to be injected by cosmetic fillers in the lips and 60 had stretched lips. When tested by IRT, the injection sites appeared darker than that the surrounding tissue. The stretched lips appeared longer, flabby and puffy. When tested by IRT, the mucosal surface in the stretched lips appeared lighter and heterogeneous compared to the darker and homogenous pattern in the non-stretched lips. In conclusion, IRT proved highly feasible for the diagnosis of injected or stretched lips in camel beauty pageants.

Key words: Beauty pageants, camel, cosmetic medicine, infrared thermography, plastic surgery

The camel beauty shows hosted in Saudi Arabia have high fame due to high prize money and camels are enrolled from various countries. Some camel owners resort to performing plastic surgery for their camels through injection of cosmetic fillers in the head region or stretching the lips to win the competitons (Tharwat and Al-Hawas, 2021).

Infrared thermography (IRT) can measure the surface body temperature from skin surface points to external inflammations or differences in blood circulation (Stelletta *et al,* 2012). The infrared camera measures the thermal energy discharged from the surface and converts it into an electrical signal proportional to the power of the infrared radiations (Usamentiaga *et al,* 2014). The camera lens has a capacity to read the temperature when taking a photo or immediately afterwards without using a computer (McCafferty, 2007; Cilulko *et al,* 2013).

In human medicine, the technology of IRT is used in several disorders such as studying the circulatory and lymphatic systems, rheumatic diseases, cosmetic surgery and in cancer diseases especially for the diagnosis of mammary gland cancer in women (Fauci *et al,* 2001; Vargas *et al,* 2009). In veterinary medicine, IRT is currently used in the diagnosis of inflammation of the sensitive structures of the hoof and the mammary tissue (Schaefer *et al,* 2004; Stelletta *et al,* 2007). Infrared thermography has also been used for scanning mammary stress induced by milking (Tangorra *et al,* 2019) and to measure stress and fear of humans in sheep (Cannas *et al,* 2018). In camels, the feasibility of utilising an infrared-thermographic technique for early diagnosis of mastitis in dairy camels has also been investigated (Samara *et al,* 2014).

This study was carried out to evaluate the feasibility of IRT in camel beauty pageants with either injected or stretched lips.

Materials and Methods

Camels

This study was carried out during the events of the 5th season of the KACF in the Kingdom of Saudi Arabia (November 29th - December 28th, 2020). A total number of 4627 camels (*Camelus dromedarius*) were thoroughly examined especially for injection of cosmetic fillers in the head region as well as stretching the lips. Of them 90 healthy camels (72 females and 18 males) aged 2 to 10 years were used as a control group based on a history of absence of diseases,

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normal haematological and biochemical parameters and complete absence of skin lesions (tested by IRT). In addition, a total number of 74 camels with injected (n=14) or stretched lips (n=60) aged 5 to 10 years were also examined by IRT.

Thermography of the camel lips

The thermographic camera used was a FLUKE® TiX580 (USA) (thermal sensitivity of 0.05°C, temperature range of 20 negative degrees to 1000°C, automatic hot/cold detection). The infrared camera was also equipped with laser pointer, LaserSharp® Auto Focus for consistently in-focus images and laser distance meter that calculates distance to the target for precisely focused images and displays distance on screen. Thermographic measurements of the injected and stretched lips were taken at 7.00 to 10.00 AM. During the festival period, ambient temperature was minimum 6-17°C (11.5±4.7°C) and maximum 20-27°C (24.5±3.0°C), relative humidity 26-80% (50.7±18.7%) and wind speed 11-23 km/h (15.2±6.3 km/h).

Results

Camels evaluated by IRT were selected on the basis of absence of scars, injuries, or any skin diseases, which could interfere with the thermographic temperature. Camels enrolled for the study was of various colours including white, black, red, yellow, flame, and brindle that are represented in the beauty contests. The average age of the camels ranged from 5 to 10 years, and their weights ranged from 450 to 700 kg. Of the 4727 examined camels during the 5th KACF, 14 animals (0.30%) were found to be injected by cosmetic fillers in the upper lips and 60 camels (1.27%) had stretched lips. None of these animals had a history of recent illness.

Abnormalities of the injected lips included swelling, hardness of the lip tips and presence of multiple and hard nodules. When tested by IRT from the dermal surface, the injection sites appeared darker than that the surroundings. In another case, 5 injected sites were detected by IRT in the mucosal surface of the upper right lip that appeared darker than the surrounding tissue (Fig 1; a, b, c, d). The values of IRT of the upper right and left injected lips were 32.5±2.2°C and 32.7±3.4°C, compared to values of 30.3 ±1.1°C and 30.2 ±2.2°C, respectively in the control group. There were no significant differences between the values in injected lips compared to that in controls (P=0.07 and P=0.16, respectively).

Concerning the group of stretched lips, 3 points were tested by IRT that included upper right lip, upper left lip and lower lip. The IRT values for the 3 sites were 31.0 ±2.6°C; 31.0 ±2.6°C; 31.4 ±2.0°C, respectively compared to values of 30.3 ±1.1°C; 30.2 ±2.2°C; 31.4 ±1.8°C, respectively. There were no significant differences between the values in stretched lips compared to that in controls (P=0.50, 0.48 and 0.90, respectively). Of the 60 camels with stretched lips, 52 lips (88.3%) appeared longer than usual and flabby and in the remaining 7 camels (11.7%) they were longer, flabby and puffy. When tested by IRT the mucosal surface in the stretched lips appeared lighter and heterogeneous compared to the darker and homogenous pattern in the non-stretched lips (Fig 1; e, f, g, h). When the lips of this group were pressed, more saliva came out compared to the healthy lips in the control group.

Discussion

For the Arab peoples, especially in the Gulf area, camels constitute also cultural, literary, heritage and civilizational legacies. During the past decade, there has been increasing interest in camel racing competitions (Tharwat *et al,* 2013; Tharwat and Al-Sobayil, 2015; Tharwat and Al-Sobayil, 2018; Tharwat, 2021). In addition, during the last 5 years camel beauty shows are being held regularly in Saudi Arabia where tremendous prizes are awarded. For this reason, plastic surgery in camels is currently rampant in the Gulf countries (Tharwat and Al-Hawas, 2021).

Thermography is a satisfactory technology for use in animals as it is safe and the infrared camera can be held at a distance from the subject (Stewart *et al,* 2005) and is a non invvoassive tool to study animal welfare (Stewart *et al,* 2005). Air temperature, convection and radiation and insulation influence the body surface temperature of animals which is determined also by the blood flow and metabolic rate of the underlying tissues. Thus, measurement of surface temperature using IRT may detect changes in local blood flow due to infection and/or inflammation (Eddy *et al,* 2001). Infrared thermography captures the spatial temperature profile of a target area and produces a visual map or thermogram of the surface temperature of this area by utilising false colour scales to represent pre-defined temperatures. Infrared thermographic devices contain an array of sensors and algorithms that measure incoming radiation and convert the values into temperatures (Harris-Bridge *et al,* 2018).

In veterinary medicine, the results of IRT use are controversial. In a study conducted on dogs,

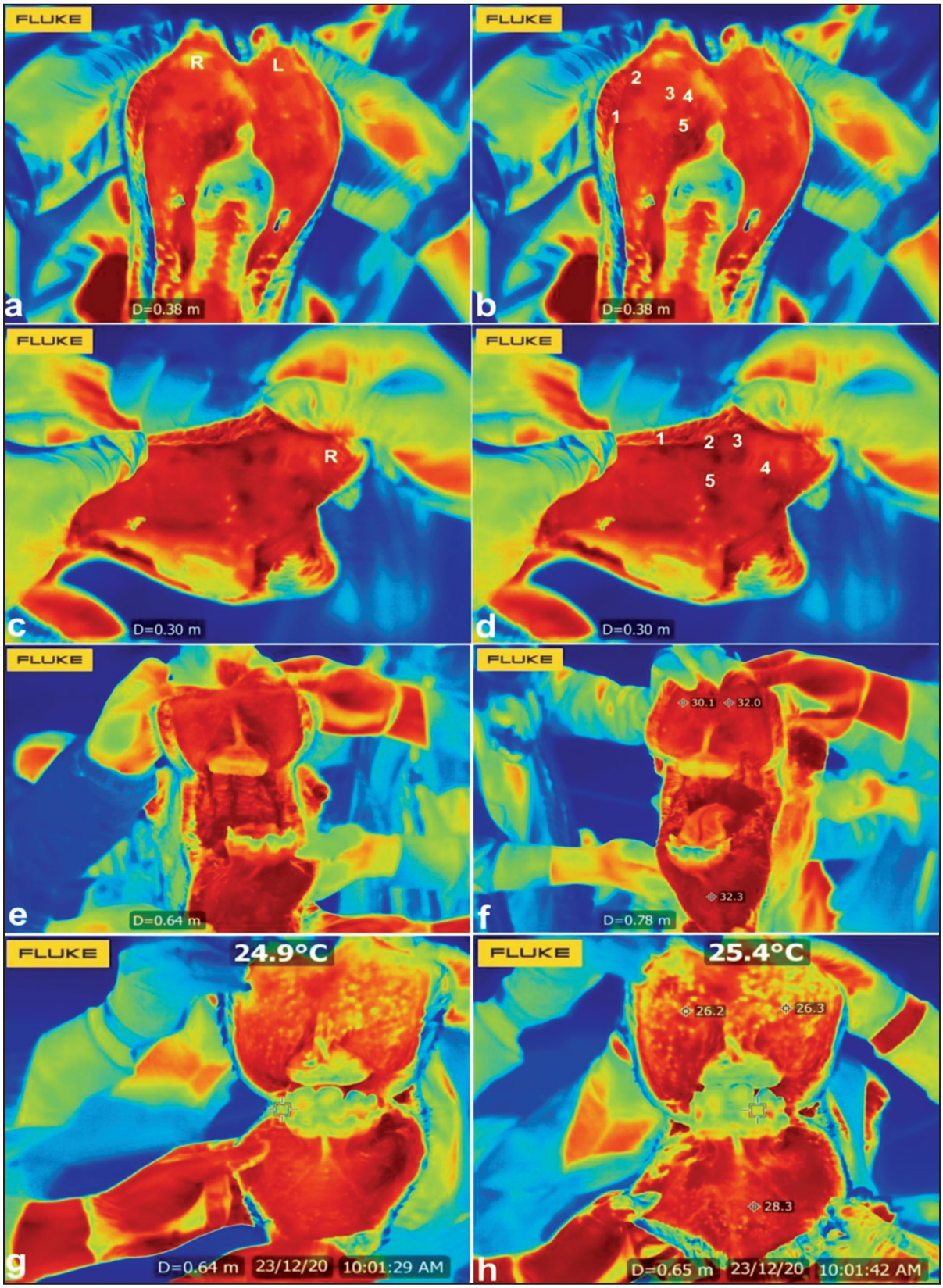

Fig 1. Infrared thermography of injected and stretched lips. Images a-d show injected upper lip in a camel where 5 injected sites (1-5) were detected and appeared darker than the surrounding tissue. Images e-h shows infrared thermography of stretched lips in a camel. The mucosal surface in the stretched lips appeared lighter and heterogeneous compared to the darker and homogenous pattern in the non-stretched lips. R=upper right lip; L=upper left lip.

Omobowale *et al* (2017) concluded that temperature measure obtained using non-contact infrared thermometry (forehead and nasal region of the head) was poor in consistency and agreement compared to rectal thermometry and usefulness of infrared thermometry in routine clinical practice depends on accurate calibration and therefore not recommended. On the contrary, in a study conducted on cattle by Stumpf *et al* (2021) concluded that by thermography of the udder lateral side, the clinician will be able to accurately predict an animal's rectal temperature.

Cosmetic medicine is a rapidly growing field in humans, and it includes minimally invasive treatments using resorbable dermal fillers, with hyaluronic acid fillers being the most commonly used products. The use of fillers has 5 major complications; it includes 1; injection site complications as erythema, edema, pain and ecchymosis 2; inappropriate injection technique related complications as formation of palpable nodules, visible implants, over- or under correction 3; allergy and hypersensitivity reaction 4; vascular adverse effects due to inadvertent intravascular injection of a filler and 5; wide varieties of bacterial, viral and fungal infections (Schutz *et al,* 2012; Shahrabi-Farahani *et al,* 2014; Kassir *et al,* 2020). Because of the high awards in camel beauty contests, some methods of cheating are carried out in some participated camels such as injection of the lip fillers or stretching the lips (Tharwat and Al-Hawas, 2021).

Injection of cosmetic lip fillers in this study led to the induration of the lips tip and formation of several hard nodules. By the infrared camera in the current investigation, the injected lip sites appeared darker than the surrounding tissue as its temperature was relatively higher when compared to healthy non-injected lip tissue. The darker appearance of the injected lip sites may be explained by the presence of inflammation near the injection site. Similarly, Stelletta *et al* (2012) stated that abnormal thermal images that can be monitored from skin point to superficial inflammations or alterations in blood flow. It should be clarified that in camels that have been injected since a long time, the image will be different, perhaps due to the disappearance of inflammation in the injected areas. Therefore, in these situations judgment should be accompanied by physical and ultrasound examinations. With regard to camels with stretched lips, there was no significant difference in temperature between stretched and healthy lips. In addition, stretched lips appeared by IRT lighter and heterogeneous compared to the darker and homogenous lips of healthy camels. The light colour of the image in this group could be explained by saliva retention within the salivary glands as found when examining such lips.

In conclusion, the obtained results of this study clearly showed that IRT, as an indirect non-invasive screening measure, is highly feasible and shows promise for detecting lesions such as injected or stretched lips in camel beauty pageants. However, thermographic monitoring alone is not enough for detecting these lip lesions especially in camels injected since long time. Therefore, a combination of IRT with clinical and ultrasonographic examinations would be a helpful for detecting such pathology.

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