

Thermography Detects Subclinical Inflammation in Chronic Tophaceous Gout

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Thermography, an imaging technique using radiation in the infrared range, has a long history in medicine, with reports in rheumatology dating back over 40 years¹. It has also been long described as a measure of treatment response to nonsteroidal antiinflammatory drugs for gout². Despite this, broad application of thermography has not been established because of a lack of precision and perceived limited value³. In a recent systematic review of the literature, thermography was not identified as an assessment tool in clinical trials of chronic gout⁴. However, recent advances in thermographic techniques sug-

gest use in various medical applications including breast cancer detection, diabetes assessment, burn care, and others⁵.

We describe a case of subclinical hyperemia detected over gouty tophi in a 42-year-old man with a history of chronic tophaceous gout. Monosodium urate deposition in the first metatarsophalangeal (MTP) joints and the right, but not the left, olecranon bursa was seen on ultrasonography. Conventional radiography showed erosions with overhanging margins in MTP joints, but no abnormality in the elbow. On clinical examination, the involved elbow was not erythema-

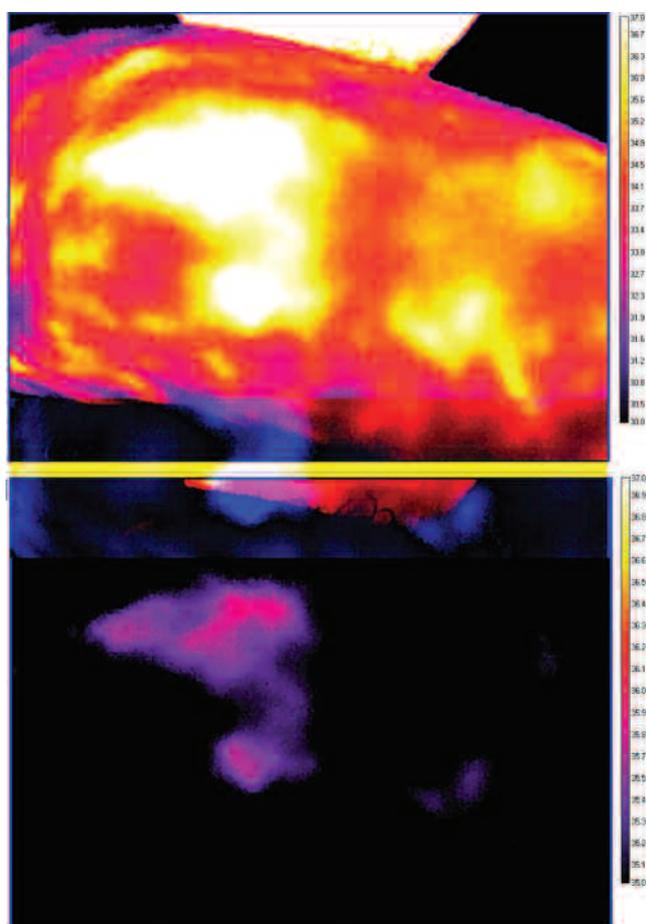


Figure 1. Affected right elbow: surface temperature $\geq 30^{\circ}\text{C}$ (top) and $\geq 35^{\circ}\text{C}$ (bottom). Maximum temperature measured was 36°C .

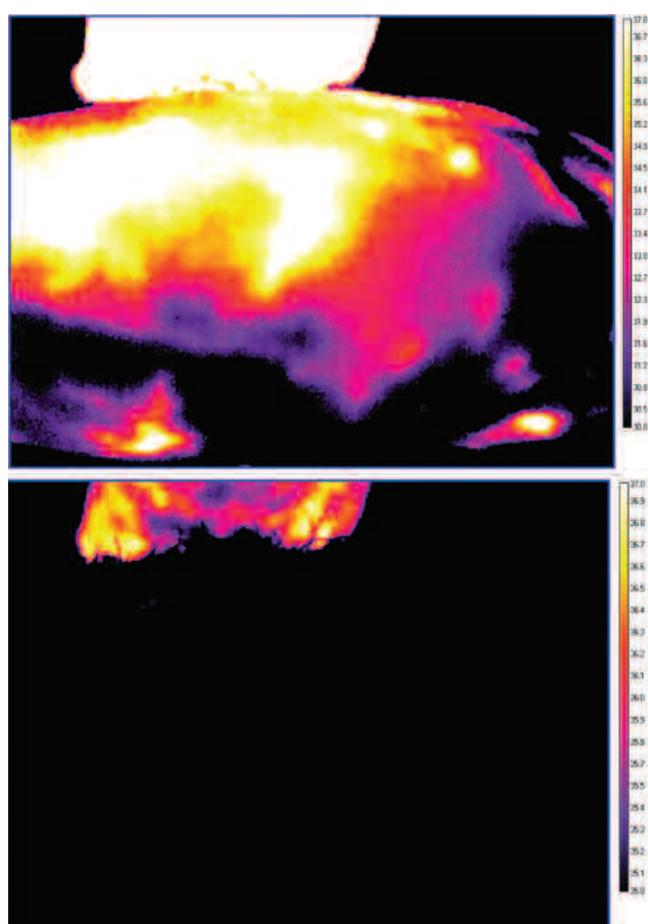


Figure 2. Unaffected left elbow: surface temperature $\geq 30^{\circ}\text{C}$ (top) and $\geq 35^{\circ}\text{C}$ (bottom). Maximum temperature measured 35.1°C .

tous or warm. Serum urate levels were elevated at 9.9 mg/dl. Sedimentation rate and C-reactive protein had remained within normal limits. A thermal imaging camera (T400; Flir Systems Inc., Wilsonville, OR, USA) was used to compare elbows. The camera has 320 × 240 pixel resolution and thermal sensitivity of 0.05°C at +30°C. The maximum temperature was higher by about 1°C in the affected side (Figure 1) versus the unaffected side (Figure 2). Hyperemia and neovascularization were confirmed with power Doppler ultrasound on the affected side (Figure 3) but not on the unaffected side (Figure 4). A Toshiba Xario XG ultrasound unit with a PLT-1204BT transducer with a gray-scale frequency of 18 MHz and a Doppler frequency of 7.2 MHz was used.

Thermography correlated well with Doppler ultrasound and may be a safe, inexpensive imaging modality to document subclinical inflammation in patients with chronic tophaceous gout.

REFERENCES

1. Boas NF. Thermography in rheumatoid arthritis. *Ann NY Acad Sci* 1964;121:223-34.
2. Ring EF, Collins AJ, Bacon PA, Cosh JA. Quantitation of thermography in arthritis using multi-isothermal analysis. II. Effect of nonsteroidal anti-inflammatory therapy on the thermographic index. *Ann Rheum Dis* 1974;33:353-6.
3. Assessment: Thermography in neurologic practice. The American Academy of Neurology, Therapeutics and Technology subcommittee. *Neurology* 1990;40(3 part 1):523-5.
4. Dalbeth N, Schauer C, MacDonald P, Perez-Ruiz F, Schumacher HR, Hamburger S, et al. Methods of tophus assessment in clinical trials of chronic gout: A systematic literature review and pictorial reference guide. *Ann Rheum Dis* 2011;70:597-604.
5. Head JF, Elliott RL. Infrared imaging: Making progress in fulfilling its medical promise. *IEEE Eng Med Biol Mag* 2002;21:80-5.

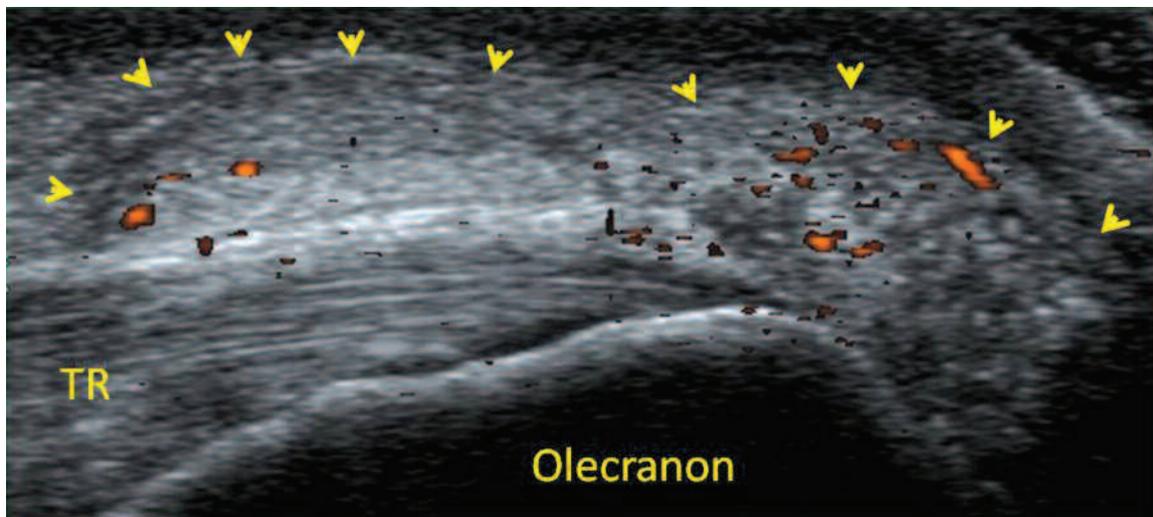


Figure 3. Affected right elbow: hyperechoic material representing monosodium urate tophus (arrowheads) is seen overlying insertion of triceps tendon (TR) into olecranon. Power Doppler signals indicated hyperemia.



Figure 4. No Doppler signals seen over the unaffected, contralateral left elbow. Hyperechoic, tophaceous material is absent.