ASSESSMENT OF PATIENTS WITH INFLAMMATORY ARTHRITIS USING THERMOGRAPHY

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FIGURE 1. Front view of thermography camera

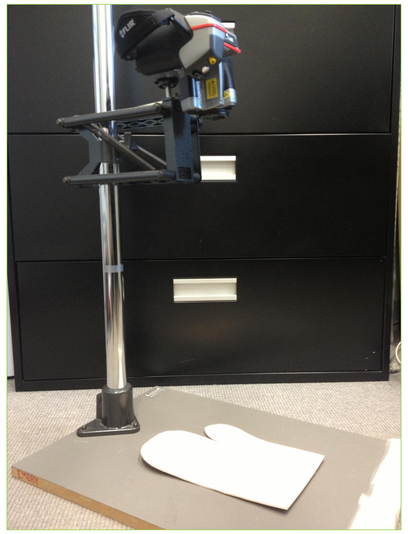

FIGURE 2. View of thermographic assessment stand with hand splint

OBJECTIVE

Thermography is a novel and potentially useful tool for evaluating patients with inflammatory arthritis

As tender and swollen joint counts are liable to inter-observer variation, thermography may assist in the detection of active disease

Our objective was to determine the reliability of thermography measurements of patients with inflammatory arthritis and compare to clinical examination

METHODS

EQUIPMENT

- Thermography camera "FLIR T300 Shortwave Thermovision System" (Figure 1)
- Subjects rested for 15 minute acclimation period
- Camera was maintained at fixed distance (0.5m)
- Subjects used a resting hand splint (Figure 2)

PARTICIPANTS

- Control patients: healthy volunteers from University of Alberta
  - With no history of inflammatory or symptomatic joint disease
- Inflammatory arthritis patients: recruited from Rheumatology outpatient clinic at University of Alberta
  - Patients taking vascular medications or with co-existing vascular disease excluded

PROCEDURES

- Each Patient had separate clinical and thermographic assessment of MCP and PIP joints
- Clinical assessments for swelling and tenderness completed by single blinded nurse practitioner
- Thermographic assessments determined spot and area temperature of joints using the thermography camera, by a separate examiner (Figure 3)

RESULTS

In total, 2038 joints were analyzed in 29 control patients and 49 patients with inflammatory arthritis

Inflammatory arthritis patients have a mean temperature 1.58° C warmer than controls of both area and spot temperatures ($p \leq 0.0001$) (Figure 4)

During the patient assessments, overtly swollen joints did not show an increased temperature.

Tender joints, however were colder on average, by 0.3°C ($p \leq 0.008$).

A secondary measure was to determine validity of thermography by correlating findings to other outcome measures.

- For each unit increase (by 1 unit) of the DAS 28, the temperature reduced by 0.47°C
- For each unit increase (by 1 unit) of the clinHAQ, the temperature reduced by 0.67°C.

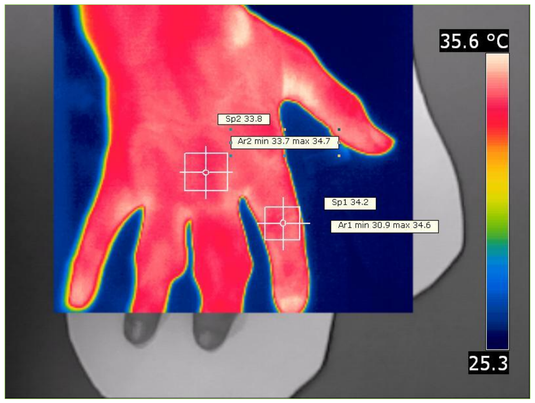

FIGURE 3. Example of spot and area temperature assessment on inflammatory arthritis patient

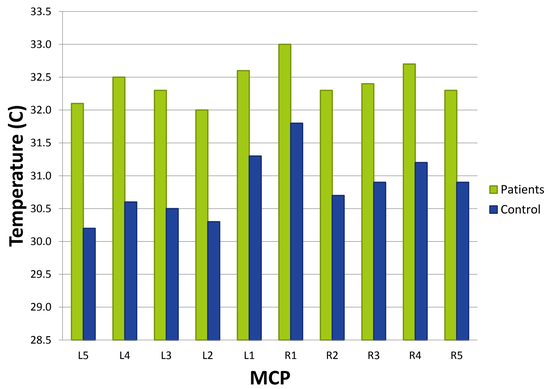

FIGURE 4. Average MCP joint temperatures in patients and control subjects

DISCUSSION

- Thermography is an exciting tool with many potential medical applications
- Previous studies have shown good correlation between thermography and clinical assessment of large joints and supported the use of thermography as an objective tool in inflammatory arthritis
- Similar studies showed poor correlation between thermography and clinical assessment in small hand joints but recent advances in thermography have allowed for more precise temperature measurements
- No studies have been completed comparing the value of thermography versus clinical measures

CONCLUSIONS

This study established the ability to assess surface temperatures of MCP and PIP joints in control and inflammatory arthritis patients. It produced reliable, quantifiable measures of joint temperature to assist in the assessment of disease activity in arthritis. Further study would include prospective analysis of individual patients, as the thermography camera may be useful in longitudinal patient assessment.

REFERENCES

• Cheung PP et al. Reliability of patient self-evaluation of swollen and tender joints in rheumatoid arthritis: A comparison study with ultrasonography, physician and nurse assessments. Arthritis Care Res 2010 Aug; 62(8): 1112-1119.

• Esselinckx W et al. A thermographic assessment of three intra-articular prednisolone analogues given in rheumatoid synovitis. Br J Clin Pharmacol 1978 May; 5(5): 447-451.

• Spalding SJ et al. Three-dimensional and thermal surface imaging produces reliable measures of joint shape and temperature: a potential tool for quantifying arthritis. Arthritis Res Ther 2008; 10(1): R10.

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Allison Edwards was supported by the CRA Abbott Summer Studentship