Surgical Site Infection (SSI): Thermal S&S identified 5 days prior to visible symptoms using Long Wave Infrared Thermography

Deanna Vargo BSN RN CWS FACCWS CWOCN, Dr. Paige Pierce MD

INTRODUCTION:

Surgical Site Infection (SSI) impacts patient care, outcomes and cost; SSI is a cause of morbidity, prolonged hospitalization, and death[1].

Long Wave Infrared Thermography (LWIT) can reveal quantitative assessment data of the pathophysiologic healing process, such as inflammation and infection.

METHODS:

Long Wave Infrared Thermography (LWIT) was added to the daily assessment to image the incision site pre-operatively and then daily for 29 days. The LWIT images were analyzed for thermal relative temperature changes . During the inflammatory phase of healing, the thermal image is expected to show early diffuse inflammation (<2.2°C)[2] resolving by the 4th post-op day (POD)[3].

DISCUSSION

Symptoms of infection/heat were identified via thermal image review, five days before any visible symptoms. The visible symptom on POD 8 was light pink at the distal incision line. Patient had a maximum oral temperature of 99.7°F, only once on POD 3 day, throughout the 29 days monitored.

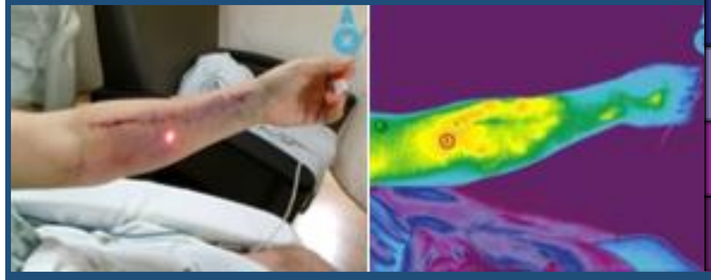
Thermal signs of resolving infection/heat were objectively measured on day one after antibiotics and continued with daily reduction until only normal thermal temperatures were identified. The incision site healed without drainage or dehiscence; the patient recovered without further complications.

LWIT could be utilized to identify and treat early infection, minimize the risk of additional complications, cost and reporting/payment penalties.

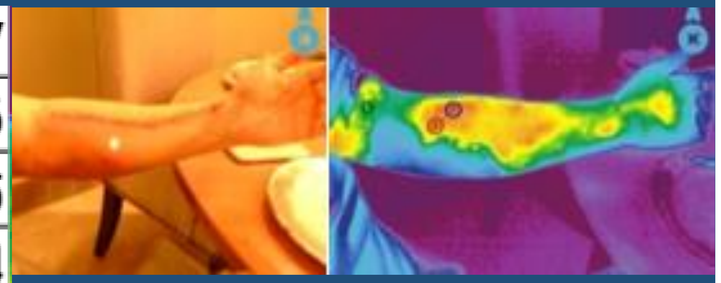
PRE-OP DAY (11/25) 0.2°C.

POD 1 (11/27) 1.6°C.

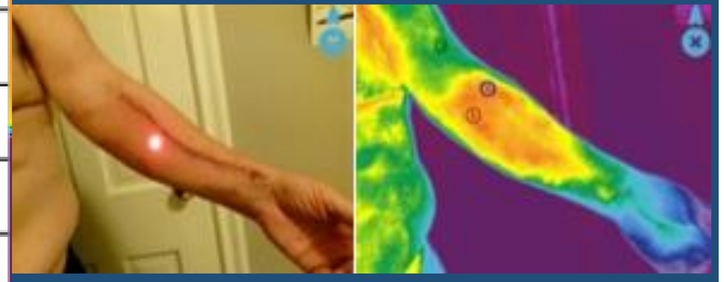
POD 3 (11/29) 2.7°C



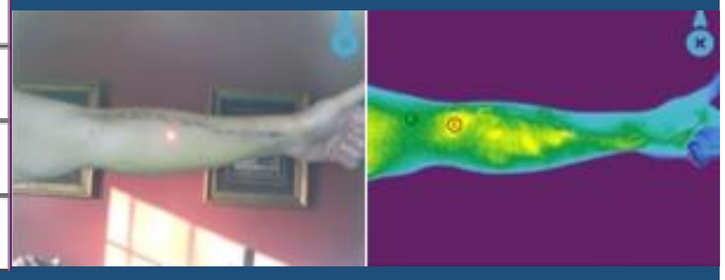
POD 7 (12/3) 4.6°C



POD 8 (12/4) 3.5°C



POD 11 (12/7) 1.7°C



CASE INFORMATION:

- DV is a 55-year-old male with a medical history of hypertension, gout, obesity, **splenectomy**, and vertebral stent.
- DV underwent a Quadruple Coronary Artery Bypass Graft (graft site, left brachial artery) on 11/26.

RESULTS:

- The Left arm incision was assessed as follows:
- **PRE-OP DAY** (11/25), LWIT of Left arm incision; thermal image shows diffuse normal temperature 0.2°C.
- **POD 1** (11/27), LWIT image with a small, demarcated area of 1.6°C.
- **POD 3** (11/29) LWIT, shows an increasing size and heat demarcated area with 2.7°C temperature; visible assessment WNL.
- **POD 7** (12/3) LWIT, thermal image shows demarcation expanding in area and intensity with 4.6°C temperature; visible assessment WNL.
- **POD 8** (12/4) LWIT thermal image demarcation measuring 3.5°C; the first visible assessment of light pink at incision line, no drainage, open areas, or increased pain at the site. Oral temp 98.8°F. Follow up with surgeon, **antibiotics initiated** based on exam, history and thermal images.
- **POD 11** (12/7) LWIT, thermal image showing only diffuse warmth with a return to the normal temperature of 1.7°C.

REFERENCES

1. National Healthcare Safety Network (NHSN) Patient Safety Component Manual. National Healthcare Safety Network. January 2022. Accessed at https://www.cdc.gov/nhsn/pdfs/pscmanual/pcsmanual_current.pdf

2. Chanmugam A., et al. Relative Temperature maximum in Wound Infection and Inflammation as Compared with a Control Subject Using Long-Wave Infrared Thermography. ADV SKIN WOUND CARE 2017;30:406-14 3. Siah C-J.R., Childs C., Chia C.K., & Cheng K.F. (2019). An observational study of temperature and thermal images of surgical wounds for detecting delayed wound healing within four days after surgery. Journal of Clinical Nursing. 28(11-12),2285–2295.