

An observational study of temperature and thermal images of surgical wounds for detecting delayed wound healing within four days after surgery

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Table 1
Participants' Demographics Data Between the Non-infected and Infected Surgical Wound Groups (N=60)

| Characteristics | Infected abdominal surgical wounds n = 15 | | Non-infected abdominal surgical wounds n = 45 | | χ^2 | p-value |
|----------------------------------|--|------------------|--|-------------------|----------|--------------------|
| | F | % | f | % | | |
| Gender: | | | | | | |
| Female | 5 | 33.3 | 22 | 48.9 | 0.56 | 0.45 ^{NS} |
| Male | 10 | 66.7 | 23 | 51.1 | | |
| Ethnicity: | | | | | | |
| Chinese | 13 | 86.7 | 40 | 88.9 | 0.74 | 0.69 ^{NS} |
| Malay | 1 | 6.7 | 4 | 8.9 | | |
| Others | 1 | 6.7 | 1 | 2.2 | | |
| Diagnosis: | | | | | | |
| Carcinoma | 13 | 86.6 | 42 | 93.4 | 0.83 | 0.66 ^{NS} |
| Colon | | | | | | |
| Diverticular Disease | 1 | 6.7 | 2 | 4.4 | | |
| Others | 1 | 6.7 | 1 | 2.2 | | |
| Characteristics | Mean (SD) | Median (Range) | Mean (SD) | Median (Range) | Z | p-value |
| Age (years) | 66 (9) | 65 (48–81) | 64 (9) | 65 (47-82) | -0.46 | 0.64 ^{NS} |
| Body core temperature (°C) | 36.3 (0.3) | 36.4 (35.7–36.8) | 36.4 (0.2) | 36.4 (35.9- 37.0) | -0.26 | 0.79 ^{NS} |
| Peristomal skin temperature (°C) | 34.7 (1.04) | 34.5 (33.3–36.8) | 35.1 (0.7) | 35.4 (33.7-36.3) | -1.63 | 0.10 ^{NS} |

Clinical Data between the Non-infected and the Infected Surgical Wound Groups (N=60)

| Characteristics | Infected abdominal surgical wounds N = 15 | | Non- infected abdominal surgical wounds N = 45 | | χ^2 | p-value |
|-----------------------------------|--|----------------|---|----------------|-------------------|--------------------|
| | F | % | f | % | | |
| BMI category | | | | | | |
| Underweight | 2 | 13.3 | 3 | 6.7 | 0.81 | 0.67 ^{NS} |
| Normal/Pre-Obese | 12 | 80.0 | 40 | 88.9 | | |
| Overweight | 1 | 6.7 | 2 | 4.4 | | |
| Type of surgical procedure | | | | | | |
| Closure of Ileostomy | 11 | 73.3 | 34 | 75.6 | 0.03 ^a | 1.00 ^{NS} |
| Closure of Colostomy | 4 | 26.7 | 11 | 24.4 | | |
| Site of Wound | | | | | | |
| Right Lumbar | 12 | 80.0 | 31 | 68.9 | 1.77 | 0.78 ^{NS} |
| Umbilicus | 0 | 0.0 | 2 | 4.4 | | |
| Left Lumbar | 2 | 13.3 | 8 | 17.9 | | |
| Right Hypochondriac | 0 | 0.0 | 2 | 4.4 | | |
| Left Hypochondriac | 1 | 6.7 | 2 | 4.4 | | |
| Characteristics | Mean (SD) | Median (Range) | Mean (SD) | Median (Range) | Z | p-value |

| | | | | | | |
|---|---------------|-------------------|-----------------|-------------------|-------|--------------------|
| Abdominal Girth (cm) | 85.27 (11.35) | 86.00 (60–106) | 86.04 (9.87) | 86.00 (63–111) | -0.06 | 0.95 ^{NS} |
| Adipose tissue thickness (mm) | 15.60 (6.63) | 18.00 (3–24) | 18.11 (7.73) | 18.00 (5–34) | -0.90 | 0.37 ^{NS} |
| Length of abdominal surgical wounds (cm) | 5.93 (0.65) | 6.00 (5–7) | 6.10 (0.94) | 6.00 (5–10) | -0.43 | 0.67 ^{NS} |

Table 2

Temperature Readings of Surgical Site Surface between the Non-infected and Infected Surgical Wounds (N = 60)

| | | Temperature (°C) | | | | | | Z | p-value |
|---------------|----------------------------------|------------------|-----------|----------------------------|----------|-----------|----------------------------|-------|-------------------|
| | | Non-infected | | | Infected | | | | |
| | | Median | IQR | Overall Median (IQR) | Median | IQR | Overall Median (IQR) | | |
| Immediately | Body core temperature | 36.3 | 35.8–37.3 | | 36.3 | 35.4–37.3 | | -.44 | .66 ^{NS} |
| after surgery | Highest skin surface temperature | 35.1 | 31.6–37.1 | | 34.9 | 33–36.9 | | -2.44 | .80 ^{NS} |
| – Day 0 | Lowest skin surface temperature | 33.0 | 29–35.8 | 33.7 (33.1–34.8) | 32.4 | 31.2–36 | 34.3 (33.3–35.3) | -.01 | .99 ^{NS} |
| (N = 57) | Median skin surface temperature | 33.8 | 30.8–36.4 | | 33.8 | 32.1–36.3 | | -.19 | .84 ^{NS} |
| After | Body core temperature | 36.7 | 36–37.8 | | 36.4 | 35.9–37.0 | | -1.21 | .22 ^{NS} |
| surgery – | Highest skin surface temperature | 36.0 | 32.6–38 | | 35.5 | 33.8–36.6 | | -2.15 | .03* |
| Day 1 | Lowest skin surface temperature | 34.4 | 31.5–36.8 | 35.2 (34.6–35.7) | 33.4 | 31.3–35.8 | 34.6 (33.7–35.2) | -1.84 | .06 ^{NS} |
| (N = 60) | Median skin surface temperature | 35.3 | 32.4–37.7 | | 34.6 | 32.1–36.2 | | -2.07 | .03* |
| After | Body core temperature | 36.5 | 35–38 | | 36.6 | 36–37.2 | | -.53 | .59 ^{NS} |
| surgery – | Highest skin surface temperature | 36.1 | 34.3–37.5 | | 35.8 | 33.9–36.4 | | -2.01 | .04* |
| Day 2 | Lowest skin surface temperature | 34.8 | 32.3–36.9 | 35.5 (34.8–36.1) | 33.9 | 31.9–34.9 | 34.8 (34.1–35.4) | -2.60 | .01* |
| (N = 60) | Median skin surface temperature | 35.5 | 32.6–37.2 | | 34.9 | 33.2–35.6 | | -2.84 | .01* |
| After | Body core temperature | 36.3 | 36–37.4 | | 36.2 | 36–37.4 | | -1.40 | .16 ^{NS} |
| surgery – | Highest skin surface temperature | 36.0 | 33.2–38 | | 35.8 | 34.3–37.7 | | -.79 | .43 ^{NS} |
| Day 3 | Lowest skin surface temperature | 35.2 | 31–37.4 | 35.7 (34.9–36.5) | 34.7 | 32.5–36.3 | 35.5 (35.1–35.9) | -1.16 | .24 ^{NS} |
| (N = 58) | Median skin surface temperature | 35.7 | 32.2–37.6 | | 35.3 | 34–36.5 | | -1.03 | .30 ^{NS} |
| After | Body core temperature | 36.5 | 36–38.9 | | 36.4 | 36.1–37.8 | | -.11 | .91 ^{NS} |
| surgery – | Highest skin surface temperature | 36.1 | 33.9–38.6 | | 35.9 | 33.8–37 | | -.58 | .56 ^{NS} |
| Day 4 | Lowest skin surface temperature | 35.3 | 31.7–37.8 | 35.6 (34.8–36.6) | 34.9 | 31.7–35.8 | 35.6 (34.8–36.1) | -.85 | .39 ^{NS} |
| (n = 50) | Median skin surface temperature | 35.6 | 32.9–38.3 | | 35.6 | 33.5–36.4 | | -.60 | .54 ^{NS} |

p-value determined by Mann-Whitney U test

NS = not significant

* denotes significance on Days 2 to 4 in surgical site surface temperature between non-infected and infected surgical wounds