Ultrasound Gel under Radiant Heat Warmers: Are preterm infants at risk of burns?

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INTRODUCTION
Critically ill preterm neonates regularly undergo ultrasound examination in the neonatal intensive care unit (NICU). The most common examinations are cranial ultrasound and echocardiography. These infants are often nursed under radiant heat warmers for thermoregulation. Concerns were raised on our neonatal unit that ultrasound coupling gel applied to the infant may heat up under the radiant warmer and put the infant at risk of thermal skin injury. The aim of this study was to determine the amount of increase in temperature of ultrasound gel under a radiant heat warmer.

MATERIALS AND METHODS
Ten 10 millilitre blobs of ultrasound gel (EcoGel 200, EcoMed Pharmaceuticals Inc., Ontario, Canada) were placed on an open cot under a radiant warmer (V-3200N Atom Infant-Warmer, Atom Medical Corporation, Tokyo, Japan). The blobs were raised on cotton towels covered with plastic and distributed in the area of the cot where an infant would normally lie. The blobs were approximately 80 centimetres from the element of the radiant heat source. The output of the heat source (heater capacity = 600 watts) was set at maximum throughout the study. The room temperature prior to onset of the study was 24.9°C.

At baseline, prior to placing the blobs under the radiant warmer, the temperature of each blob was taken in sequential order with an electronic thermometer (Orion 290A, Orion Research Inc., Boston, USA) by placing the temperature probe tip in the centre of each blob. At the time of each measurement the probe tip was shielded from the radiant heat source with aluminium foil. After being placed under the radiant warmer the temperature of each blob was taken in the same order as above. The heater was turned on at maximum output for one hour prior to placing the blobs of gel under it. The temperatures of the blobs were taken every 10 minutes up to 60 minutes.

The initial (baseline) 10 measurements gave a mean temperature of 21.5°C with a standard deviation of 0.29. A sample size of ten would be sufficient to show a difference of 0.5°C (α 0.05, β 0.95). Means were compared using the student t test.

RESULTS
The results are summarised in the table. The blobs of gel increased in temperature from a mean of 21.57°C to 26.76°C after 60 minutes - an increase of 5.19°C. The rise in temperature had essentially reached a plateau after 30-40 minutes.

<table>
<thead>
<tr>
<th>Time (mins)</th>
<th>Temperature (°C)</th>
<th>t test*</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>0(baseline)</td>
<td>21.57 (0.29)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>24.19 (0.42)</td>
<td>&lt;0.0001</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>25.65 (0.48)</td>
<td>&lt;0.0001</td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>26.05 (0.52)</td>
<td>0.09</td>
<td></td>
</tr>
<tr>
<td>40</td>
<td>26.61 (0.35)</td>
<td>0.13</td>
<td></td>
</tr>
<tr>
<td>50</td>
<td>26.63 (0.71)</td>
<td>0.94</td>
<td></td>
</tr>
<tr>
<td>60</td>
<td>26.76 (0.40)</td>
<td>0.62</td>
<td></td>
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</table>

*t test comparing means with preceding time period.

DISCUSSION
The skin of the preterm neonate is immature and therefore prone to chemical, physical and thermal damage.1,2 Burns secondary to the application of pulse oximeters and transcutaneous oxygen monitors on preterm neonatal skin have been reported.3,4 There are few data available on the temperature and duration of contact required to burn the skin of neonates. Transcutaneous monitoring of arterial oxygen tension is achieved by the application of skin electrodes, set at temperatures of 42-44°C, for 2-4 hours. Bucher et al5 found that the majority of neonates exposed to sensors heated to 42°C for 24 hours did not suffer thermal burns.

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5. Tibial Collateral Ligament Bursa (Figs. 1 & 3) The tibial collateral ligament is a broad flat ligament that has a deep and superficial component. The deep component is short and inserts onto the margin of the tibial condyle, it’s deep surface attaches to the medial meniscus. The superficial component is long and attaches to the subcutaneous surface of the tibia.

The tibial collateral ligament bursa intervenes between the anterior border of the ligament and the underlying medial meniscus. Immediately posterior to the bursa the deep component of the ligament fuses with the medial meniscus.

6. Bursa between the Tendons of Semimembranosus and Semitendinosus (Fig 2) This bursa is inconstant, it lies between the semimembranosus and semitendinosus. If distended, the bursa may mimic a Baker’s cyst.

REFERENCES


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Transcutaneous monitors are used routinely in neonatal intensive care and are considered safe with appropriate precautions (particularly important in extremely preterm infants8). Ultrasound examinations are commonly performed in preterm neonates who are often nursed in open cots under radiant heat warmers. The thermal safety of the ultrasonic coupling gel under radiant heat warmers has not been evaluated. During an ultrasound examination blobs of coupling gel are applied to the infant’s skin at the point of contact with the ultrasound probe. When the probe contacts the infant’s skin some gel is pushed sideways and these blobs of gel remain in contact with the skin and may lie directly under the radiant warmer. An ultrasound examination of any one region would rarely take more than 1 hour to perform. The infant may lie in the same position throughout the examination. Therefore the maximum time any single blob of gel would lie under the radiant warmer, in contact with the skin, would be one hour. In our study, the maximum temperature reached by the ultrasound gel blobs was 26.76°C. This was achieved after one hour of continuous radiant heat exposure at maximum power. The highest temperature of the gel was less than 2°C above room temperature.

This study demonstrates that the temperature of ultrasound gel under a radiant heat warmer, set at maximum heat output for one hour, increases by less than 6°C. It is therefore unlikely that ultrasound gel placed under a radiant heat warmer for less than 1 hour would lead to thermal injury in the neonate.

REFERENCES