Letter to the Editor

Re-usage of external pacing electrodes results in skin burns

Sir,

A 29 year old woman with a background of poorly controlled diabetes was admitted to our hospital in cardiogenic shock due to acute inferior myocardial infarction and complete heart block. Recycled external electrodes ("stat padz") were placed to the right of the upper sternal border below the clavicle and to the left of the nipple with the centre of the electrode in the mid-axillary line. External pacing was commenced with an output of 90 mA at a rate of 70 stimulations per minute. Mechanical capture was confirmed by echocardiography. Primary percutaneous coronary intervention to the right coronary artery was performed with insertion of a transvenous temporary pacemaker. The patient developed intra-procedurally ventricular fibrillation for which a shock of 200 J was delivered through the external electrodes. The total duration of external pacing was about 90 min. Upon removal of the external electrodes, multiple 2nd degree circumferential skin burns were noticed below the apical electrode with burns and necrotic skin flakes adherent to the electrode (Panel A). No burn was observed in the area of the right sided electrode (see Fig. 1).

Many of our patients do not have medical insurance nor are they able to pay their hospital bills. The price for a set of external pacing electrodes is about 50 USD in our setting. Every patient requiring life-saving treatment will be treated regardless of insurance status. This policy however results frequently in the hospital not recovering cost for consumable products like pacing electrodes. In an effort to reduce cost, external electrodes are re-used – despite the manufacturer’s advice. The gel of re-used electrodes is often dried out with pockets of gel missing in addition to general contamination and cracks (Panel B). We assume that the relatively severe burns in our patient are mainly attributable to in-homogeneities of current distribution in re-used electrodes. The manufacturer advises to open electrodes only before use, discard after 24h or 8h of continuous pacing or in cases where the gel has dried. The policy of re-using electrodes has been abandoned by our institution since.

Defibrillation burns are overall common. 98% of British coronary care units reported such often resulting from recurrent defibrillation during prolonged resuscitation. The severity of the skin injury is a function of peak and cumulative shock energy. Rarely, more than first degree skin burns are being observed. Large electrodes applied to the chest ensure low-resistance electrical contact. The current density distribution under the electrodes is non-uniform, leading to risks of burning. Electrode design aims at improving the non-uniformity of the current density distribution by adding a low resistivity layer between the metal or using circular instead of square-shaped electrodes. A conductive layer of gel at the paddle surface serves to increase conductance and decrease transthoracic impedance between the chest wall and the metal electrodes. Gaps in the gel layer likely resulted in in-homogeneities of current distribution and burns in our patient.

Conflict of interest statement

All authors report no disclosures or competing interests.

References


Fig. 1. (Panel A) Healing 2nd degree circular skin burns in the area of electrode attachment. (Panel B) Re-used electrodes with dried up gel, contamination and folds.
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