5. Operation room equipment

Antistatic equipment and apparatus

Precautions need to be taken against the build-up of static electricity to avoid creating a risk of explosion. The risk of electrostatic ignition is particularly high in the immediate surroundings of anaesthetic apparatus and its attachments. Flammable gas mixtures escaping from the anaesthetic breathing circuits are rapidly diluted to a nonflammable level within a few centimetres of the point of escape. The zone of risk associated with flammable anaesthetics is now recognized as extending for 25 cm around any part of the anaesthetic circuit, or of the gas pathways of an anaesthetic apparatus. All portable equipment that is liable to be located within this zone when the anaesthetic apparatus is in use should be antistatic. In addition to eliminating electrostatic materials on such equipment, all metallic parts should be continuous and have an effective antistatic contact with the floor, e.g., by being fitted with antistatic castors. Although the electrostatic risk can be eliminated for a period by applying an antistatic polish to exposed surfaces of plastic parts, it must be remembered that these polishes (which are often water-soluble) are liable to be washed off when the equipment is cleaned, or to be rubbed off during use.

Oxygen alone is not flammable and, while it is possible to ignite fibres contaminated with oil or grease by an electrostatic spark in an oxygen-enriched atmosphere, the risk is small in places such as oxygen tents, unless a flammable gas or vapour is present.

Humidity

High humidity helps combat static electricity. The thin film of water on equipment conducts the static away. But humidity alone cannot be relied upon as an antistatic precaution. A humidifier is liable to fail, and the degree of humidification necessary may be difficult to achieve in very dry conditions. Also, high relative humidity may be uncomfortable for the staff. Humidity is much less effective as an antistatic measure with most plastics and with fabrics that tend to be moisture-repellent. With good antistatic precautions, low humidity does not create a risk, provided the materials do not lose their antistatic properties.

Requirements for antistatic materials, and antistatic tests

The resistance of rubber used for patient tubes, trolley wheels, and other items requiring antistatic properties may need to be checked periodically. Some examples of levels of resistance for various antistatic items (as recommended in the United Kingdom) are listed below:

- antistatic tubing forming the main connection between the patient and an anaesthetic machine: 25 000 ohms minimum, 1 megohm maximum;
- mattresses and pads: 5000 ohms minimum, 1 megohm maximum;
- fabrics: 50 000 ohms minimum, 100 000 megohms maximum;
- footwear: 50 000 ohms minimum, 50 megohms maximum;
- castor tyres: no lower limit, 1 megohm maximum.

The resistance of some antistatic materials may increase with age and use. The recommended upper limit for all equipment in service is 100 megohms. If the resistance rises above this it is considered to have lost its antistatic properties and may have to be withdrawn from use.

Antistatic rubber should be marked with a yellow line and be printed with the word "antistatic" where it is practical to do so. The instrument recommended for testing antistatic properties is an insulation tester, having an open-circuit voltage of about 500 volts DC. A typical insulation tester has a voltage characteristic such that the voltage falls as the test resistance falls. Significant errors may occur if the voltage across the test resistance falls below 40 volts DC.

Test method

For most of the tests, small test clips are used as electrodes. When testing flat surfaces, use clean metal electrodes having a flat surface of about 625 mm^2. Select, and wet, two areas, each of approximately 625 mm^2 (25 mm × 25 mm), on the item to be tested, the test area being chosen so that the result represents the resistance of the longest discharge path through the article. Where difficulty is experienced in wetting the surface, e.g., of rubber, a wetting agent, such as detergent, should be added to the water. The test areas will usually be at the extreme opposite ends, e.g., of tubing and breathing bags, or on the top and bottom surfaces of pads and mattresses. On thin sheeting, the test areas should be on the same surface with about 50 mm of dry surface between them. Both surfaces of thin sheeting should be tested. (Measurements made through the thickness of thin sheeting are unreliable, as they can be influenced by small isolated areas of conductivity.)

For trolley castor tyres, test for continuity between the metal frame of the trolley and the tyre, in addition to measuring the resistance of the tyre. A convenient method for testing trolley tyres is to stand the tyre on a wetted metal plate which is insulated from the floor, e.g., on a piece of rubber sheeting. Make the test between the metal plate and the metal parts of the trolley.

For footwear, one of the electrodes should be placed on a surface that will be in close contact with the wearer and the other on the surface that will be in contact with the floor, when the footwear is in use.

Operating table

An operating table is more than just a table for the surgeon to operate on; it must be possible to adjust it up and down, to tilt the head up and down, and to move it to suit the needs of the operation. As the tables are often very heavy, most of them have wheels and a brake, so that they can be moved about the room. On each side, there is a rail to which clamps can be fastened to hold various attachments as required, for example for the lithotomy position. The antistatic mattresses are filled with foam and have a number of separate sections.

In the older types of operating table, the table is positioned by turning a large knob by hand. With this type, maintenance is fairly simple and limited to keeping the threads of the screws lubricated, and the mattresses in good order. The adjustments will probably work for several years without need of attention.

To prevent the mattresses perishing, apply a little silicone grease to the rubber cover. Check for splits in the rubber covering and repair as necessary. This is important, since such splits allow entry of moisture and particulate matter into the foam and predispose to the growth of bacteria. Simple tears and splits in rubber covers should be repaired using patches and rubber glue, of the type used for the repair of bicycle inner-tubes. To repair a small hole, use glue and a suitable patch. Clean the area to be patched. Rub around the area of the hole with fine sandpaper to roughen the surface a little. Clean off any dust or grit left from the sandpaper