Operating microscope eyepiece heaters

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SUMMARY Precipitation of water vapour from expired air on to exposed eyepiece lenses of operating microscopes can seriously interfere with the surgeon's view. By warming these optical surfaces to temperatures well above the dew point of expired air this problem is eliminated. A pair of small heaters were designed to clamp over the eyepiece tubes of a standard operating microscope and their effectivity assessed.

Water vapour condensation on exposed eyepiece lenses of operating microscopes is more likely to occur at critical periods during surgery because of involuntary alterations of the operator's breathing patterns. The vapour pressure of end expired air exhaled through the mouth is greater than that expressed through the nares because of the air-conditioning role of the turbinates. Prolonged use of adhesive tape to fix surgical face masks to surrounding skin, thus deflecting expired air away from eyepiece lenses, may give rise to skin irritation. Antimisting preparations applied to such optical surfaces provide only a temporary protection against condensation, but warming of the eyepieces to temperatures well above the dew point of expired air will eliminate this problem.

A pair of small heating elements was therefore designed to fit over the eyepiece tubes of a standard operating microscope and their effectiveness assessed.

Apparatus

The heating elements consist of 2 blocks of aluminium alloy which have been drilled out to accommodate 2 small resistors. The blocks are clamped over the eyepiece tubes and fixed by tightening a screw. When in position the heaters do not interfere with the surgeon's view and the mobility of the microscope is unimpaired (Fig. 1). With a power supply of 3.6 W to each element, derived from the light source of the microscope, temperatures at the centre of the exposed eyepiece lenses, the eyepiece tube, and the heaters were recorded before switching on the power supply and subsequently at 12 and 48 minutes.

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Results

The eyepiece lenses become sufficiently warm 12 minutes after the heaters are activated to prevent clouding of the operator's view even when the optical surfaces are breathed upon directly. 36 minutes later the temperature of the eyepiece tube is raised by only a further 4°C (see Table 1). At this

Fig. 1 Eyepiece heaters on operating microscope

Table 1 Temperature recordings

Time (minutes)	Temperature (°C)		
	Centre of lens surface	Eyepiece tube	Heaters
0	22	22	22
12	33	36	41.5
48	36.5	40	46

time a steady state is reached, as the mass of the microscope acts as an effective heat sink.

Comment

Although it is possible to achieve higher initial temperatures by increasing the power rating, sensing devices would then need to be incorporated into the design of the apparatus to prevent subsequent overheating. With the apparatus described the time

required to raise the temperature of the eyepiece lenses sufficiently above the dew point of expired air is not unduly great. As the power is derived directly from the electrical supply to the microscope light source, the twin objects of safety and simplicity of design are achieved.

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