Light transmission of phototherapy eyeshields

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SUMMARY Twelve types of phototherapy eyeshields showed peak light transmission of < 0·1%, and none transmitted > 0·04% light in the 460 nm spectral region. Commercial eyeshields offered no advantage over locally made ones. The choice of shield may be less important than how it is secured over the infant's eyes.

Recently there has been concern that bright ambient light may be an important factor in the pathogenesis of retinopathy of prematurity, yet small preterm jaundiced infants may be exposed to high levels of light during phototherapy. As a direct consequence of studies in animals that showed the damaging effects of phototherapy light on the neonatal retina, human neonates receiving phototherapy now have their eyes covered routinely with eyeshields. Eyeshields are usually made according to local specifications, although commercial types are available. The effectiveness of most of these eyeshields in reducing the intensity of light, however, is unknown.

This study aimed to determine the light transmission characteristics of various commercial and locally constructed eyeshields commonly used by neonatal units in the United Kingdom.

Methods

Of 20 neonatal units contacted, 15 provided samples of phototherapy eyeshields; 12 types were in common use. These included two commercial eyeshields manufactured specifically for use during phototherapy (Posey 4645, J T Posey Co, and Bili-Mask, Olympic Medical); a commercially manufactured orthoptic eyepatch (Opticlude, 3M); and

![Graph of light transmission characteristics of 12 phototherapy eyeshields. Thickness of locally made eyeshields given in mm.](graph-url)
nine shields that were made of thin woven fabric (single or double layers), coloured felt, cotton wool, or gauze (single or multilayer). Light transmission was measured with a Perkin-Elmer 330 spectrophotometer (sensitivity 0·002%) in the wavelength range 250–800 nm (wavelength accuracy 0·2 nm). This wavelength range contains the spectral absorption peak of bilirubin, which is at 460 nm, and also the spectral region in which the energy from a phototherapy light source is maximal.3

**Results**

The Figure shows the transmission measurements obtained for the 12 eyeshields. The most striking result was the extremely low level of light transmission through any of the patches. Two of the commercial patches (Posey 4645 and Bilimask) showed greatest transmission at the wavelength of 800 nm of less than 0·02%. These low values of transmission were in several cases equalled or improved on by the locally made eyeshields, especially if the patches were made of either fabric, multilayered coloured gauze, or double layered cotton wool and gauze. Even the poorest eyeshield (Opticlude, Orthoptic Eye Patch) had a peak transmission of less than 0·1%. In the critical spectral region of 460 nm none of the samples exceeded a transmission value of 0·04%.

**Discussion**

Our results show that the amount of light transmitted through some commonly used phototherapy eyeshields is low and probably unimportant as a cause of retinal damage. Other studies have reported light transmission values of up to 52·5% for locally adapted eyeshields, as opposed to 1·5% transmission for a commercially available mask.4 Porat et al have also recorded light transmission levels of some 46% behind one layer of stockinette material illuminated by a phototherapy source. Both these studies, however, used standard photographic light meters, which are not specifically designed for carrying out light transmission measurements. Our measurements cast doubt on these studies, which indicate high levels of light transmission through non-commercial phototherapy eyeshields. It is important that measurements are made in carefully designed systems with instruments of the appropriate sensitivity. Photographic light meters would be unable to measure light transmission accurately at the levels we have reported here.

Our measurements also show that commercial eyeshields offer no advantage over many locally made patches. The choice of phototherapy eyeshields may be less important than the need to ensure that the shield is effectively secured and maintained throughout the phototherapy period. Both the study by Bhupathy et al on the short term retinal changes in neonates treated with phototherapy and that of Dobson et al on the long term effects on visual function failed to show any obvious changes in the retinal function of neonates whose eyes were shielded throughout phototherapy.6 7 In contrast, Abramov et al tested forty five 7 year old children who had had phototherapy in the neonatal period and found major defects of cone mediated visual function in those whose eyes had not been shielded during phototherapy.8

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**References**


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