

# Keratoplasty sensitivity

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**SUMMARY** Analysis of graft sensitivity showed a return to normal after 3 years in only one-third of the eyes. It is not known whether this is due to regeneration of abnormal or superficial nerve fibres. Contact lens wearers showed less sensitivity than spectacle wearers.

The nerve supply to the cornea, while not being fully understood, has been described in detail in primates and particularly in man (Zander and Weddell, 1951). In contrast to other tissues the nerves function in only one modality, and that is pain. While temperature has been suggested as another sensation, it is not known whether specialised reactions follow such stimulus as compared with pressure in the area producing a sensation of pain.

The nerves in the human cornea have been described as emerging from the corneoscleral junction at various levels, but mostly deep, and then finally ending in the epithelial layer, becoming intimately associated with the deeper epithelial cells. Some fibres are medullated, but some are not. According to Lim (1978), using the monkey as an experimental animal, another system of sensory fibres exists on the corneal surface and originates from the plexus of nerves present in the conjunctiva. This other sensory supply has not so far been shown to exist in man. Also according to Lim, regeneration of corneal nerves occurs after section even at mid-brain level (Lim, 1978).

This study involves the recording of sensory levels in the human keratous cornea that has had graft surgery. Two areas are taken at the periphery (host) and at the centre of the graft. In normal cornea the central zone is about 2 to 3 times as sensitive as the periphery (Millodot and Larsen, 1969). But age, individual apprehension, and even time of the day or month in women will cause some significant change in the degree of sensation (Millodot and Lamont, 1974).

Contact lens wear itself will markedly decrease sensation, especially with hard lenses (Boberg-Ans, 1956), but according to Millodot (1971) some sensation returns after several months of contact

lens wear, the loss of sensation being over zones of corneo-contact lens pressure.

While the keratoconus eye does not have a normal cornea, there is nothing in the literature to suggest abnormal sensation except with obvious complications affecting the nerve supply. Some keratoconic corneas are hypersensitive and cannot tolerate contact lens wear. This may initiate the itching or subnormal pain sensation that results in eye rubbing. The very advanced cone may become severely scarred and then show loss of sensation at the apex.

The group of patients examined were randomly selected, and most had clear successful grafts. The periods from surgery to examination were 7 months to 10 years. Over 50 such eyes were examined with the Bonnet and Cochet regular aesthesiometer of Cochet and Bonnet (1960). This instrument has been used by several workers, and the defects and significant baselines for normal and abnormal response are well documented (Bonnet and Millodot, 1966; Millodot, 1969).

Analysis of the results will help to determine whether graft sensation is present and to what degree, how contact lens wear affects sensation, and also if the peripheral grafted recipient cornea has normal sensation.

## Methods

The patient was asked to remove the contact lens, if worn, the night before examination, and the aesthesiometer was used as directed by the manufacturer's instruction. Beginning with a 'No' response, the nylon thread was decreased in length until a positive response was given, and the length of nylon was noted.

If doubtful responses resulted, the test was repeated at another visit. The patient was seated at the slit lamp and the positioning of the probe visualised under magnification. The eye was stabilised by using the other eye to fixate a light.

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In this test we assumed no clinical significance unless the variation was at least 1 mm alteration in nylon length (see 'discussion').

## Results

Forty-eight grafted eyes were measured. The central graft readings recorded zero sensation in 7 and normal in 14 eyes (above 4 is normal), that is, no sensation 14.6%, subnormal 56.25%, normal 29.2%.

The mean average for centre of graft sensation was 1.8 mm. The peripheral sensation was 4 or over in 8 eyes, and in 1 patient the lowest reading was 0.5, the mean average for the peripheral cornea being 2.66 mm.

Table 1 analyses the average sensation according to the age of the graft from time of operation to taking of measurement.

No instance of normal central sensation was recorded until at least 3 years after surgery. Even at 6 years and over at least a third of the grafts measured could be said to be clinically anaesthetic, and one-third had normal sensation (Fig. 1).

The 27 contact lens wearing eyes had an average sensory response of 1.15, with 2 having normal sensitivity, and the 21 spectacle wearers had an average of 1.97 mm sensitivity, with 4 having normal sensitivity.

## Conclusions

The graft has abnormal sensitivity beginning with zero readings after surgery, and sensation can be recorded in the first year but does not reach normal sensitivity until at least 3 years from time of operation, while contact lenses can be fitted from the sixth week or later and may therefore decrease any sensitivity present. Certainly contact lens

Table 1 *Average sensation according to age of graft from operation to measurement*

Age in years	Average sensation
Under 1	0.5
1—	1.1
2—	1.1
3—	3.0
4—	1.7
5—	1.8
6—	2.0
7—	2.50
8+	1.9

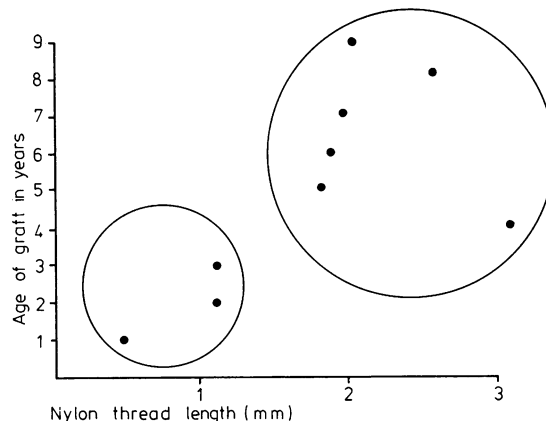


Fig. 1 *Average aesthesiometer results at graft centre*

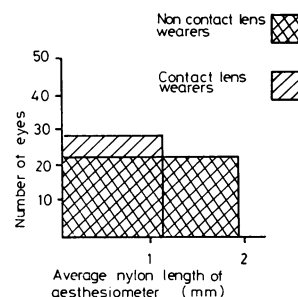


Fig. 2 *Graft eyes, contact lens wearers and nonwearers. Comparison of graft sensation*

tolerance is easier for the grafted eye than the normal. It was found that the sensitivity of contact lens wear in grafted eyes was 1.15 average as compared with 1.97 in non-contact-lens wearing grafted eyes (Fig. 2). But these figures may not be of significance in a clinical sense. Furthermore, a greater proportion of the spectacle wearers were found to be patients with grafts older than 3 years and preferred spectacle wear to contact lens wear even though the latter gave better acuity.

The peripheral graft sensation was within normal, and it must be assumed that, since the average central corneal sensation is half normal, regeneration of nerves from the host into the graft is rarely more than 50% effective. Normal sensation in a graft was not found in more than one-third of the eyes examined. The return of sensation was progressive but relatively static 3 to 4 years after surgery.

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