

# Corneal sensitivity in myasthenia gravis

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**SUMMARY** Corneal touch thresholds were measured in 11 people suffering from myasthenia gravis (MG) and in a control group of 20 subjects. The mean threshold in MG was 75.6 mg (SD 52) and in the control group 18.9 mg (SD 7.3); thresholds were thus significantly ( $p < 0.01$ ) raised in MG. Although it is not possible to say whether the sensory deficit is due to MG or to the treatment, the results implicate acetylcholine in sensory transduction in the cornea.

The clinical picture in myasthenia gravis (MG) is well established, and has recently been reviewed by Grob.<sup>1</sup> The disease is characterised by weakness of skeletal muscles, especially those innervated by the cranial nerves. Sensory complaints of numbness and tingling are encountered in about 10% of cases, especially close to the onset of the disease. The incidence of the disease is about 1:20 000.

We were interested in a possible association between myasthenia gravis and corneal sensitivity because of the high cholinergic activity in the corneal epithelium<sup>2,3</sup> and its association with corneal innervation.<sup>4,5</sup> We therefore measured corneal touch thresholds in patients suffering from myasthenia gravis and found an abnormally high incidence of reduced sensitivity.

## Materials and methods

Corneal sensitivity was measured with a Cochet-Bonnett aesthesiometer, filament diameter 0.12 mm (Lunneau et Coffignon, Paris) mounted in a holder attached to a slit lamp. This allowed movement of the instrument in X, Y, and Z directions, permitting good control of the approach to the cornea. Subjects fixated a light 30° above the horizontal, and the filament of the aesthesiometer was applied normally to the cornea about 1 mm from the inferior limbus to minimise apprehension.<sup>6</sup>

Stimuli were applied to the cornea initially with the filament of the aesthesiometer extended to its maximum effective length (6 cm), which produces a force

of 11 mg (area 0.013 mm<sup>2</sup>). Six stimuli were applied at this length. The filament was shortened in 5 mm increments and 6 stimuli applied at each length until the subject responded (by pressing a buzzer) that the stimuli were felt.<sup>7</sup>

Blank stimuli were included to test for reliability. Threshold was taken as the filament length to which the subject responded 50% of the time. The procedure is preferable to one using suprathreshold stimuli, since these raise thresholds.<sup>8</sup> Data were converted to force (in mg) for analysis.

Subjects suffering from myasthenia gravis were referred to us by the MG Association of Australia. Clinical details are given in Table 1. We measured thresholds in a control group of 20 subjects, who were

Table 1 Case details of subjects with myasthenia gravis

Subject	Age (yrs)	Medication	Duration of MG (yrs)	CTT (mg)	
				RE	LE
1	26	Pyridostigmine	1.0	52	52
2	61	Pyridostigmine Prednisone	3.5	145	145
3	37	Pyridostigmine	6	36	36
4	65	Pyridostigmine	0.8	75	36
5	43	Pyridostigmine Prednisone	12	52	145
6	70	Pyridostigmine Prednisone Imuran	14	145	16
7	25	Pyridostigmine	3	100	145
8	56	Pyridostigmine Azathioprine	0.75	16	16
9	58	(Thymectomy)	19	16	13
10	36	(Thymectomy)	5	16	16
11	40	(Thymectomy)	3	12	13

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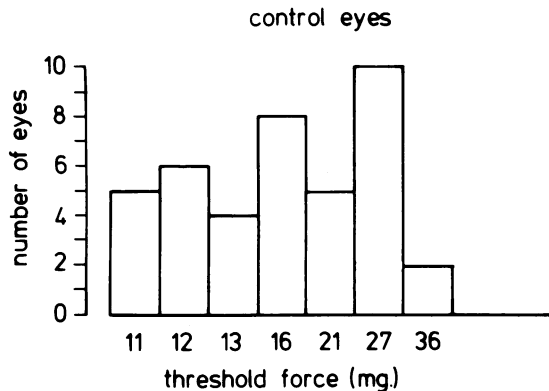


Fig. 1 The distribution of corneal touch thresholds in 20 normal subjects, used as a control group in this experiment. The threshold force increments correspond to 0.5 cm decrements in the length of the aesthesiometer filament.

untrained observers selected randomly from our general clinic. The age distributions of the two groups were similar (experimental group, mean 47.0 years, SD 15.7; control group, mean 44.6 years SD 13.9). The experimental group consisted of two brown eyed subjects, four green eyed, and five blue eyed. The control group consisted of nine brown, six green, and five blue eyed subjects. Therefore eye colour suggests that the control group should have less sensitive corneas than the experimental group, other factors being equal.<sup>9</sup> All subjects were free of visible corneal abnormalities, and none wore contact lenses. So far as we could establish, the eyelid musculature of the patients with myasthenia gravis functioned normally.

## Results

The results of this study are summarised in Figs. 1 and 2. The mean corneal touch threshold (CTT) in myasthenia gravis was 75.6 mg (SD 52), while in the

control group the mean threshold was 18.9 mg (SD 7.28); thresholds in myasthenia gravis were significantly higher than normal ( $p < 0.01$ ). An inspection of Fig. 2 shows that the touch thresholds of myasthenia subjects were not normally distributed. They could be divided into two groups, one of which had normal sensitivity and the other markedly reduced sensitivity.

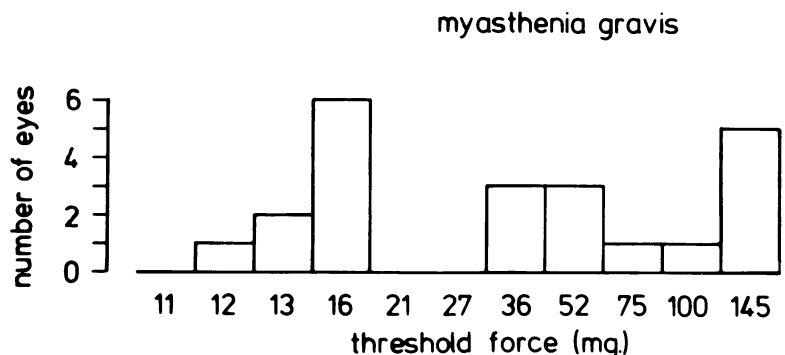
## Discussion

Of the 11 subjects with myasthenia gravis three had been successfully treated by thymectomy and were currently free of problems without medication. These three subjects had normal corneal sensitivity. Of the other eight subjects five had sensitivity significantly below control levels in one or both eyes ( $p < 0.01$ , CTT 75 mg). It is possible that the control group in this study was abnormally sensitive. However, even if previously published control groups are used, these five cases are abnormally insensitive<sup>10</sup> ( $p < 0.05$ ).

It is not possible to say whether the reduction in sensitivity in these cases is due primarily to the myasthenia gravis or to the treatment, since we did not examine any case prior to treatment. Nor is it possible to deduce the likely origin of the sensory deficit from our present understanding of sensory transduction in the cornea. Although a number of studies has revealed the corneal nerves to have cholinergic properties,<sup>15,11</sup> others have produced contradictory evidence.<sup>12,13</sup> The results of this study are consistent with the hypothesis that corneal sensory nerves have cholinergic properties, but do not provide conclusive evidence that transduction is mediated by acetylcholine.

Finally we note that, where the cornea is likely to be exposed to injury or infection, those who suffer from myasthenia gravis are at a greater risk than normal, suggesting that caution is required in these cases.

Fig. 2 The distribution of corneal touch thresholds in 11 subjects suffering from myasthenia gravis. Each eye is included as a separate point; for other details see Fig. 1.



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## Corneal sensitivity in myasthenia gravis.

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