Eye hue and the oculocardiac reflex

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SUMMARY During operations for squint nodal rhythm and other more serious arrhythmias such as heart block and multifocal ventricular extrasystoles, as well as the oculocardiac reflex, are shown to occur more frequently in patients with brown or hazel eyes than in patients with blue or grey eyes.

The oculocardiac reflex is a slowing of the heart caused by various stimuli especially pressure on the lateral part of the eyeball and traction on the medial rectus muscle. It occurs during the majority of operations for squint (Bosomworth *et al.*, 1958; Deacock and Oker, 1962). Previous work by the authors indicated that the incidence of the reflex is related to the eye hue (Fry and Hall-Parker, 1975). The purpose of this study is to confirm this finding and to show that the incidence of nodal rhythm and other more serious cardiac irregularities is also related to the eye hue.

Patients and methods

Three hundred and sixty-three consecutive patients whose squints were treated by medial rectus recession or resection were studied.

ANAESTHETIC TECHNIQUE

Patients over 12 years old were given papaveretum 10 mg, prochlorperazine 12.5 mg, and atropine 0.6 mg intramuscularly an hour before operation. General anaesthesia was induced by Althesin 3 to 5 ml and suxamethonium 20 to 50 mg, and after oral intubation maintained by nitrous oxide, oxygen, and halothane 1%. Patients under 12 years old were given trimeprazine orally 3 mg/kg body weight up to 32 kg, and atropine 0.4 mg if less than 20 kg body weight and atropine 0.6 mg if over that weight, 90 minutes before operation. Anaesthesia was induced and maintained by nitrous oxide, oxygen, and halothane 1% using a Jackson Rees modification of an Ayre's T-piece.

RECORDING THE REFLEX

The heart rate and electrocardiograph (ECG) trace of the first 198 patients were monitored on a

Cardiorater; the remainder had ECG recordings taken from the lead 2 of a Cambridge Transrite 2 in addition. The reflex was deemed to be present if the heart rate fell by 10 beats per minute or more after the first retraction of the medial rectus muscle.

EYE HUE

The patients were placed into 4 groups relating to the eye hue: blue, grey, hazel, and brown. Eye hues were determined under the same strip lighting by a consensus of nursing staff present in the anaesthetic room before the operation was begun.

Results

Table 1 shows the incidence of the oculocardiac reflex following the first retraction of the medial rectus muscle ($P = <0.001$), and the incidence of sinus and nodal rhythms in the patients developing bradycardia ($P = <0.01$).

Table 2 shows the range of cardiac slowing in the cases developing sinus bradycardia and in the cases developing nodal rhythm in association with bradycardia. There is no significant difference between the two groups.

Table 1 Presence of sinus bradycardia, nodal rhythm, and oculocardiac reflex (with percentages in parentheses)

Eye hue	Total	Mean age	Sinus bradycardia	Nodal rhythm*	Oculocardiac reflex†
Blue	128	8.91	28 (21.9)	36 (28.1)	64 (50.0)
Grey	89	8.94	35 (39.2)	31 (34.7)	66 (73.9)
Hazel	78	10.39	14 (18.0)	51 (65.4)	65 (83.4)
Brown	68	8.85	21 (30.9)	37 (54.4)	58 (85.3)
Total	363	9.22	98 (27.0)	155 (42.7)	253 (69.7)

* $\chi^2 = 33.58$, DF = 3, $P < 0.001$

† $\chi^2 = 39.0$, DF = 3, $P < 0.001$

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Table 2 Incidence of nodal and sinus rhythms related to degree of bradycardia

Maximal slowing of heart: beats/minute	0-10	11-20	21-30	31-40	41-50	51-60	61-70	80	Total
Nodal rhythms	7	47	36	29	18	13	3	2	155
Sinus rhythms	5	27	17	17	15	10	5	2	98

Correlation coefficient 0.97. χ^2 test no significance

Table 3 Mean and standard deviation (parentheses) of degree of bradycardia related to eye hue and type of rhythm, with the mean and standard deviation of the mean heart rate at the point of slowest beat and the incidence of extrasystoles and other arrhythmias

Eye hue	Rhythm	No. of cases	Mean slowing	Mean rate at maximal slowing	Extra systoles
Blue	Sinus	28	37.2 (± 17.0)	88.6 (± 22.8)	0
	Nodal	36	32.2 (± 20.0)	88.9 (± 24.9)	2
Grey	Sinus	35	34.0 (± 16.1)	81.2 (± 23.6)	1
	Nodal	31	33.9 (± 16.9)	83.7 (± 23.3)	4
Hazel	Sinus	14	39.2 (± 18.2)	100.6 (± 24.4)	1
	Nodal	51	34.1 (± 13.6)	79.8 (± 24.0)	6
Brown	Sinus	21	40.9 (± 19.5)	79.3 (± 22.0)	0
	Nodal	37	35.0 (± 15.6)	84.2 (± 28.0)	7

The frequency of extrasystoles and other arrhythmias related to eye hue is significant. χ^2 test and Fisher's exact test give $P = < 0.05$. There is no significant difference (χ^2 test) between the mean slowing of the heart rate related to the mean rate at maximal slowing in the various groups

Table 3 shows the range of cardiac slowing and the mean minimum heart rate in the various groups of patients that developed the reflex. There is no significant difference between any of these groups. The figures in the last column indicate that patients with blue eyes are less likely to develop the more serious arrhythmias such as multifocal ventricular extrasystoles, heart block (1 case), and auriculo-ventricular dissociation (1 case) than are patients with brown or hazel eyes ($P = < 0.05$).

Discussion

The increased incidence of oculocardiac reflex in patients with brown or hazel eyes compared with those with blue or grey eyes (Fry and Hall-Parker, 1975) has been confirmed. These results indicate that, while pulse or ECG monitoring should be performed during general anaesthesia for any ophthalmic operation, special vigilance should be exercised if a muscle is retracted or pressure placed upon the eyeball of a hazel- or brown-eyed patient.

Nodal rhythm, extrasystoles, and other abnormal cardiac rhythms occur more often during the oculocardiac reflex in patients with hazel and brown eyes than those with blue or grey eyes. There is no evidence from these figures that this difference is caused by more severe bouts of bradycardia or a raising of the threshold of nodal escape during the relevant periods. Since the incidence of nodal rhythm and other arrhythmias in the various groups is not related to the incidence of the oculocardiac reflex or to the degree of cardiac slowing that is induced, occurring significantly more often than expected in patients with brown or hazel eyes, the authors postulate that there may be more than one mechanism involved in producing the oculocardiac reflex. This effect may act on the neural pathways at any level between the muscles of the eye and the conducting fibres of the heart. It would be interesting to see if the incidence of arrhythmias developing in patients suffering from cardiac damage, especially coronary thrombosis, shows a similar relation to eye hue. If so, the colour of the eye could become a factor in the selection of patients for intensive coronary care.

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