

TRACHOMA AS AN AETIOLOGICAL FACTOR IN GLAUCOMA*

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TRACHOMA is one of the major causes of blindness, especially in the East. The common sequelae of corneal involvement by trachoma are only too well known, but the hypertensive aspect of the trachomatous process leading to blindness has not been adequately explored. Conflicting reports have appeared in the literature regarding the relationship of trachoma and ocular hypertension. Müller (1900), de Wecker (1900), Cuénod and Nataf (1930), MacCallan (1936), Adamantiadis (1937), Sédan (1939), Bietti (1947), and Boles Carenini and Cambiaggi (1957) have reported a higher frequency of glaucoma among trachomatous than among non-trachomatous subjects. On the other hand, Guarino (1914), Lagrange (1922), Bailliart (1928), Terson (1928), Trantas (1937), and Pasino (1957) have said that the two conditions are independent. In view of the paucity of reports from India where trachoma is rampant and poses a serious national health problem, and the inconclusive results obtained in other countries, the present work was undertaken to find the relationship between trachoma and glaucoma, if any.

Materials and Methods

Between January and October, 1963, 114 adults who attended Gandhi Eye Hospital, Aligarh, mainly for complaints arising from trachoma and 41 non-trachomatous adults were investigated. Most of the trachomatous subjects were in Stages III and IV (WHO, 1962). In all 225 trachomatous and 82 non-trachomatous eyes were examined. These were first assessed for the presence and stage of trachoma, especially in respect of corneal and limbal involvement, and were then investigated in the glaucoma clinic by the following methods:

- (a) Biomicroscopy, to record the number of visible aqueous veins, using 20× magnification of the Haag-Streit slit lamp;
- (b) Funduscopy;
- (c) Applanation tonometry, using the Goldmann applanation tonometer;
- (d) Schiötz tonometry;
- (e) Gonioscopy with the Goldmann contact lens, grading the angle according to the method of Scheie.

The data thus obtained were subjected to statistical analysis to assess the significance of the trachomatous process in the development of glaucoma.

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Results

Aqueous Veins

The number and location of the aqueous veins in each eye were recorded and the average number per eye was calculated for each group. The difference is significant (Table I).

TABLE I
FREQUENCY OF AQUEOUS VEINS IN NON-TRACHOMATOUS AND TRACHOMATOUS EYES

Group	Total No. of Eyes	Total No. of Aqueous Veins		Standard Deviation
		Total	Mean per Eye	
Non-Trachomatous	82	112	1.366	± 1.648
Trachomatous	225	204	0.907	± 1.217

Intra-ocular Pressure

The average ocular tension in trachomatous and non-trachomatous eyes was 14.978 (± 4.964) and 13.560 (± 1.814) respectively. Comparison of the tension range of the two groups, using applanation values, showed that seventeen of the 225 trachomatous eyes had tensions above 20 mm. Hg, whereas in all the 82 non-trachomatous eyes the tensions were below 20 mm. Hg (Table II). Even the eyes with normal tensions in the trachomatous group had a higher mean level than the non-trachomatous eyes. Values below 10 mm. Hg were neither significant nor sufficient for comparison in the two groups.

TABLE II
RESULTS OF APPLANATION TONOMETRY IN NON-TRACHOMATOUS AND TRACHOMATOUS EYES

Ocular Tension (mm. Hg)	Non-Trachomatous Eyes		Trachomatous Eyes	
	No.	Per cent.	No.	Per cent.
Below 10	1	1.2	1	0.4
10-15	67	81.7	152	67.6
16-20	14	17.1	55	24.4
Above 20	0	0	17	7.6
Mean	13.56098		14.97778	
Standard Deviation	± 1.8139		± 4.9640	

Gonioscopy

Amongst the trachomatous eyes eighteen (8.0 per cent.) had a closed angle (Grade IV), while all the non-trachomatous eyes had an open angle (mostly Grade I). There was a tendency for heavier trabecular pigmentation (Grades III and IV) in trachomatous eyes (Table III, opposite), as well as a significantly greater tendency for goniosynechia. The frequency of iris processes was greater in the non-trachomatous eyes (Table IV, opposite).

TABLE III
APPEARANCE OF THE ANTERIOR CHAMBER ANGLE IN 225 TRACHOMATOUS
AND 82 NON-TRACHOMATOUS EYES

Grade	Trabecular Pigmentation				Angle Width			
	Non-Trachomatous Eyes		Trachomatous Eyes		Non-Trachomatous Eyes		Trachomatous Eyes	
	No.	Per cent.	No.	Per cent.	No.	Per cent.	No.	Per cent.
Nil	4	4.9	9	4.0	—	—	—	—
I Mild	29	35.4	67	29.8	49	59.8	104	46.2
II Moderate	42	51.2	101	44.9	31	37.8	72	32.0
III Heavy	7	8.5	39	17.3	2	2.4	31	13.8
IV Very Heavy	—	—	9	4.0	—	—	18	8.0

TABLE IV
APPEARANCE OF THE ANTERIOR CHAMBER IN 225 TRACHOMATOUS AND 82
NON-TRACHOMATOUS EYES. (GONIOSYNECHIAE AND IRIS PROCESSES)

Grade	Goniosynechia				Iris Processes			
	Non-Trachomatous Eyes		Trachomatous Eyes		Non-Trachomatous Eyes		Trachomatous Eyes	
	No.	Per cent.	No.	Per cent.	No.	Per cent.	No.	Per cent.
Nil	79	96.3	194	86.2	13	15.9	73	32.4
I	3	3.7	24	10.7	31	37.8	65	28.9
II	—	—	5	2.2	29	35.3	65	28.9
III	—	—	—	—	9	11.0	20	8.9
IV	—	—	2	0.9	—	—	2	0.9

Discussion

Boles Carenini and Cambiaggi (1957) studied the morphology, frequency, and distribution of aqueous veins in trachomatous and non-trachomatous eyes and our findings are in complete agreement with theirs, in that there is a significant reduction in the number of aqueous veins in cases of trachoma (Stages III and IV), but no alteration in their morphology. The reduction in number can be attributed to the perivascular infiltration and subsequent cicatrization by trachoma, which obliterates the aqueous veins along with the perilimbal vessels. This interference with the aqueous outflow leads to a gradual rise in intra-ocular pressure. Bietti (1963) also takes the same view.

The mean ocular tension in the trachomatous group is significantly higher than in the non-trachomatous, none of the latter as against seventeen of the former having a tension above 20 mm. Hg (Table II). Detailed study of individual cases revealed that eighteen eyes (8 per cent.) in the trachomatous group but only two in the non-trachomatous group had established glaucoma.

The narrowing of the angle of the anterior chamber, goniosynechia, and heavier trabecular pigmentation in trachomatous eyes appear to be due to the inflammatory

involvement of the limbus and cornea during the active trachomatous infection, which may cause a subclinical toxic or allergic reaction in the angle. The trabecular pigments may have been dispersed from the iris root.

Contrary to the observations of Larmande and Coulliaud-Maisonneuve (1955), iris processes were less numerous in the trachomatous eyes in our series. This cannot be taken as conclusive, however, as goniosynechiae may have obscured them. The number of iris processes cannot be directly related to the trachoma because they are formed at the time of mesodermal cleavage during the development of the anterior chamber.

Summary

An investigation of 225 trachomatous eyes in 114 individuals and 82 nontrachomatous eyes in 41 individuals by biomicroscopy, funduscopy, appplanation and Schiötz tonometry, and gonioscopy revealed that the trachomatous eyes had a higher mean ocular tension, a lower average number of aqueous veins, a narrower anterior chamber angle, heavier trabecular pigmentation, and an increased tendency to the formation of goniosynechiae.

It is suggested that trachoma predisposes towards glaucoma by producing obstructions to the aqueous outflow.

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