

Corneal Sensitivity in Lepromatous Leprosy¹

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In tuberculoid leprosy only secondary damage of the cornea occurs. Thus, associated with facial palsy there may be exposure keratitis. Many authorities mention corneal anesthesia through invasion of the trigeminal nerve and its sequelae, neuroparalytic keratitis. Only in lepromatous and borderline leprosy with generalized invasion of the body and bacteremia are there specific ocular manifestations of leprosy. The studies here reported support these conclusions in that specific corneal affections were noted only in lepromatous and borderline types.

Many authors mention anesthesia of the cornea in leprosy as a frequent occurrence but unfortunately usually without quantitative assessment (^{6, 12}). "Anaesthesia of the conjunctiva and cornea is almost the rule, when the eye is affected in any way" (⁹). In a case reported by Pillat (¹⁰), there is the precise statement "In both corneas sensibility to the touch, with a stiff hair or a thread of cotton was entirely absent, and even a touch with the finger did not produce the normal lid closure reflex." Some observers (^{7, 8, 9}) have noted that quite frequently keratitis neuroparalytica occurs as a sequel to this anesthesia. Choyce (²) however, found it remarkable that "the cornea stands up to this anesthesia much better than might be expected." Somerset (¹¹) on the other hand, found that anesthesia occurs rarely: ". . . strange to say, gross anesthesia of the cornea is not common. There is usually some loss of sensation in and around the area of infiltration, but a marked neuroparalytic keratitis is a rarity."

The following report attempts to define the occurrence of such anesthesia.

MATERIALS AND METHODS

Only lepromatous or borderline patients having positive, or previously positive skin

smears for leprosy bacilli were investigated. These patients were divided into the following groups:

A. Control group. The corneal sensitivity of 100 patients (200 eyes) was measured. None of these patients revealed any eye complications on examination with a slit-lamp.

B. Patients with damage of the corneal nerves without superficial punctate keratitis.

C. Patients with superficial punctate keratitis but without corneal nerve damage.

D. Patients with superficial punctate keratitis combined with nerve alterations.

E. Patients with facial nerve palsy. Patients with fresh exposure keratitis were not included in this group. Sensitivity was determined only after healing of the cornea. In the presence of corneal scars and pannus due to lagophthalmus only those patients were tested who had at least the upper two-thirds of the cornea intact. Patients with more marked secondary corneal alterations due to lagophthalmus were excluded.

Corneal sensitivity was estimated by the use of von Frei's corneal esthesiometer. The measuring procedure is performed by means of a set of hairs of different lengths and thicknesses. The sensitivity was gauged in gm./mm.². The hairs are placed vertically on the surface of the cornea and bent. The range of the gauge is 1-200 gm./mm.². The physiologic range is 2-5 gm./mm.² in the center of the cornea and 5-10 gm./mm.² at the periphery. Corneal anesthesia was regarded as being present only if the sensitivity over the corneal center was more than 200 gm./mm.². The corneal microscope (Haag-Streit 900) was used for the associated morphologic examinations.

RESULTS

Results for group A are found in Table 1. Seventy-five control cases gave sensitivity values of 2 to 5 gm./mm.² and are listed

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TABLE 1. Corneal sensitivity of control patients (Group A).

No. pts.	Sensitivity up to (gm./mm. ²)
75	5
19	10
5	20
1	30
Average	6.25

together as one unit in Table 1, with the other controls. The calculated average takes this into account. Results for groups B, C, D and E are presented in Tables 2, 3, 4, and 5 respectively.

DISCUSSION

Group A. In 75 patients the sensitivity was normal. Nineteen patients—that is a considerable number—showed a slight, and six patients a moderate hyposensitivity of the cornea without any detectable ocular affection. The average sensitivity was 6.25 gm./mm.², that is, no significant aberration from normal sensitivity.

Although the detected hyposensitivity in certain patients has no clinical importance, the tendency towards hyposensitivity in these cases is remarkable.

Group B. With an average sensitivity of 7.7 gm./mm.² only a small, hardly significant reduction of the sensitivity could be observed. In seven patients among 10, the sensitivity was completely normal. There was no correlation between the severity of the alterations of the corneal nerves, and the reduction of sensitivity; there is even a remarkable discordance between severe nerve alterations and normal functions.

According to Choyce (³) the beaded nerves harbor aggregations of *Mycobacterium leprae*. Now, it is a well known feature that in lepromatous patients, in spite of abundant presence of leprosy bacilli in the nerves, there is only some slight reduction of the sensitivity of the skin—unlike the tuberculoid anesthesia.

Group C. Somerset (¹¹) noted a reduction of sensitivity within superficial punctate keratitis (SPK) infiltrations. We have found practically the same sensitivity over the keratitis-area (near the limbus) as over the central part of the cornea (over the kera-

titis 10.5 gm./mm.², and over the center of the cornea 9.8 gm./mm.²). This implies the apparently paradoxical condition, that the sensitivity over keratitis is normal (because it is situated close to the limbus, where the sensitivity even in normal individuals is 10 gm./mm.²) whereas it is slightly reduced over the healthy center of the cornea.

Group D. In one patient only a moderate hypesthesia could be observed. In all the others the sensitivity was normal or slightly diminished. Referring to this the same reasonings as under group B and C can be applied.

It is amazing, that the corneal sensitivity is not influenced at all by the absence or presence of nerve-alterations. The sensitivity was (average over the keratitis 11.6 gm./mm.², over the center 10.0 gm./mm.²) nearly the same as in group C.

TABLE 2. Cases with nerve involvement (Group B).

Patient	Sensitivity		Morphology of nerves*	
	Rt.	Lt.	Rt.	Lt.
1	5	5	**	a, c
2	2	2	a	a, b
3	5	5	a, c	a, c
4	5	5	b, c	c
5	5	5	a, c	a, b, c
6	5	5	c	a
7	5	5	c	c
8	10	10	a, c	a, c
9	20	10	a, c	a, c
10	20	20	a	b, c
Average	7.7 gm./mm. ²			

* a = cylindrical enlargement, b = beaded enlargement, and c = perineural infiltrations.

** = Nerve on right not involved.

Group E. The average sensitivity of 19.0 gm./mm.² in patients with facial palsy means a moderate but significant hyposensitivity of the cornea. The significance is further confirmed, if patients with unilateral facial palsy are considered: eight patients among 11 with monolateral facial palsy showed on the paralyzed side remarkably reduced sensitivity in opposition to the healthy side.

In three patients there was a severe hypesthesia of 100 gm./mm.². Two of them showed a vascularized, pannus-like scar on the lower third of the cornea, morphologically corresponding to findings seen after repeated exposure keratitis. No evidence for keratitis neuroparalytica could be found. This pannus formation perhaps may give secondary impairment to the corneal sensitivity beyond its limits. It is also possible that the development of such severe exposure keratitis was enhanced by some primary hyposensitivity. The third patient showed a normal cornea. By examination with the slit-lamp of the 33 patients, in only one case was pathologic changes on the

TABLE 3. Cases with superficial punctate keratitis (Group C).

Patient	Sensitivity over				Remarks	
	Keratitis		Center			
	Rt.	Lt.	Rt.	Lt.		
1	—	20	—	5	phthisis rt. iritis rt. & lt. iritis lt.	
2	5	5	5	5		
3	5	5	5	5		
4	5	5	5	5		
5	5	5	5	5		
6	5	5	5	5		
7	10	10	10	10		
8	10	20	10	20		iritis lt.
9	20	10	20	10		
10	20	30	20	30		iritis lt.
Average	10.5 gm./ mm. ²		9.8 gm./ mm. ²			

TABLE 4. Cases with superficial punctate keratitis and with nerve alterations (Group D).

Patient	Sensitivity over				Morphology of nerves*
	Keratitis		Center		
	Rt.	Lt.	Rt.	Lt.	
1	30	**	10	**	a, c
2	5	5	5	5	a, c
3	5	5	5	5	iritis rt, lt., a, c
4	5	5	5	5	b, c
5	5	5	5	5	a, c
6	5	5	5	5	episcleral nodule lt., c
7	5	5	5	5	iritis lt., c
8	5	5	5	5	b, c
9	5	5	5	5	a, b, c
10	5	5	5	5	c
11	5	5	5	5	a, c
12	10	5	10	5	iritis rt., b, c
13	10	5	10	5	iritis lt., c
14	5	20	5	10	b, c
15	20	20	5	5	c
16	20	20	20	20	a, b, c
17	20	20	20	20	a, c
18	50	50	50	50	a, b, c
Average	11.6 gm./ mm. ²		10.0 gm./ mm. ²		

* a = cylindrical enlargement, b = beaded enlargement, and c = perineural infiltration.

** = enucleated.

TABLE 5. Cases with facial palsy (Group E).

Patient	Palsy side	Sensitivity		Morphology of nerves* and remarks
		Rt.	Lt.	
1	Rt	2	2	
2	Lt	5	5	
3	Lt	5	5	
4	Rt	20	2	
5	Lt	5	20	a, b, c
6	Rt	20	5	
7	Lt	10	20	
8	Lt	10	20	
9	Lt	5	50	
10	Rt	20	5	
11	Rt	20	20	
12	Rt & Lt	2	2	
13	"	5	5	
14	"	5	5	Lt. leucoma adherens
15	"	5	5	
16	"	5	5	
17	"	5	5	
18	"	5	5	
19	"	5	—	Lt. total leucoma
20	"	5	10	
21	"	10	5	
22	"	10	10	
23	"	10	20	
24	"	10	20	
25	"	20	20	

TABLE 5.—continued

26	"	20	20	
27	"	20	20	Rt. and Lt. slight keratitis lower $\frac{1}{4}$
28	"	20	20	
29	"	30	5	Rt. slight keratitis
30	"	30	30	
31	"	100	30	
32	"	100	100	Rt. and Lt. pannus lower $\frac{1}{3}$
33	"	100	100	Rt. and Lt. pannus lower $\frac{1}{3}$
Average:		19.0 gm./mm. ²		

* See notes—Table 4.

corneal nerves found and it had normal sensitivity. Antia *et al.* (1,4) believe that the affection of the zygomatic branch of the facial nerve (which supplies the orbicular muscle of the eye) takes place through secondary lead-over from the sensitive branches of the trigeminus nerve. The *M. leprae* pass through anastomosis between facial and trigeminal nerves. So we have to expect in cases with facial palsy also some reduction of sensitivity in the corresponding trigeminal area (that is, also over the cornea, which is especially useful for quantitative estimation of trigeminal sensitivity). Our investigations demonstrated a significant reduction of corneal sensitivity, which lends support to the theory of Antia *et al.*

The fact that morphologic alterations on the corneal nerves are not found in accumulation, does not speak against the theory of Antia *et al.* As the site of the anastomosis is situated more towards the center, there is no need for invasion of the

trigeminal nerve to its most peripheral branches (which—as we could show—has no effect on sensitivity).

These findings concerning sensitivity in facial palsy have practical consequences. Although we could not find any keratitis neuroparalytica, lagophthalmus with even moderate corneal hypesthesia may have destructive consequences for the eye: "The combined effect of the affection of the V and VII cranial nerves results in great interference of the protective mechanism of the eye." (5).

There is need for some adequate prophylaxis (protection of the cornea by ointments, tarsorrhaphy, temporalis-transfer) in order to prevent exposure keratitis and corneal ulcer. According to our own experience facial palsy is the second most important cause of blindness in leprosy, iridocyclitis being the major cause.

SUMMARY

A report of investigations on corneal sensitivity in leprosy is presented. Even in 100 control-persons sensitivity in some patients was slightly diminished, but the average sensitivity was normal. In the case of superficial punctate keratitis and alterations of the corneal nerves only slight hypesthesia was found. A clear diminution of corneal sensitivity was found in association with facial palsy. This supports Antia's theory concerning the pathogenesis of facial palsy in leprosy. No case of keratitis neuroparalytica was found.

Because of the hypesthesia associated with facial palsy, protection of the cornea must be carried out with special care.

RESUMEN

Se presenta un estudio sobre investigación de la sensibilidad corneal en lepra. Aún en 100 personas—controles la sensibilidad en algunos de los pacientes estaba ligeramente disminuida, pero la sensibilidad media era normal. En el caso de queratitis punteada superficial y alteraciones de los nervios corneales se encontró sólo ligera hipoestesia. Se encontró una franca disminución de la sensibilidad corneal asociada a parálisis facial. Esto apoya la teoría de Antia con

respecto a la patogénesis de la parálisis facial en lepra. No se encontró ningún caso de queratitis neuroparalítica.

En vista de la hipoestesia asociada a la parálisis facial, se debe tener un cuidado especial en la protección de la cornea.

RÉSUMÉ

On présente ici le rapport d'études menées sur la sensibilité de la cornée dans la lèpre. Même chez 100 individus témoins, la sensibilité était lé gèrement diminuée chez quelques malades, toutefois, la sensibilité moyenne était normale. En cas de kératite ponctuée superficielle et d'altérations des nerfs cornéens, il n'a été observé qu'une légère hyperesthésie. Une nette diminution de la sensibilité de la cornée a été relevée en association avec la paralysie faciale. Ceci renforce la théorie émise par Antia concernant la pathogénèse de la paralysie faciale dans la lèpre. Aucun cas de kératite neuroparalytique n'a été observé.

Par suite de l'hyperesthésie associée avec la paralysie faciale, la protection de la cornée doit être effectuée avec un soin tout spécial.

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