

ATROPHIC RHINITIS SIMPLEX, NASO-OCULAR REFLEX AND KERATO-CONJUNCTIVITIS SICCA

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Lacrimation, according to Duke-Elder (1), is the most common ocular reflex arising from the nose. He recommends rhinological investigation in every unexplained case of tearing. There is no mention in the ophthalmic literature of altered intranasal physiology as the prime etiological factor in Sjogren's syndrome. I deem it a great honor in being invited to present a paper in honor of the 70th birthday of Dr. Maurice H. Cottle. Throughout these many years he has been my teacher, my inspiration, and has made me a better physician. For this, through me, my patients thank him too.

Huizing and Ubbens (2) classify ozena with Sjogren's syndrome as a separate entity from ozena simplex because of the similar albumin and globulin determinations found in collagen diseases. The nose to me is like a carburetor of an automobile. They both follow in principle the law of Bernoulli. Stated very simply, if the flow of air is too thin or as in the problem here, too wide, the body suffers. In the case of ozena simplex there is a loss of moisture and heat on expiration and irritative reflexes originate within the nose upon inspiration. The conjunctiva and cornea may also appear dry, but when the proper amount of the ventricle is obstructed, a respiratory baffle is created and within a matter of five minutes, the eye becomes moist as does the nasopharynx.

The concept of early nasal injuries (3) is most important. Imperceptible injuries in little children may become gross deformities in adult life. Any part or all of the nose may be affected. There may be acceleration of, deceleration of growth or development. The external pyriform aperture may not develop as a result of arrested growth and retain its fetal characteristics. The lobule may not only have a decreased anterior projection but may hypertrophy until it reaches that stage of development when the septum no longer supports it. The nostrils then become rounded, the tip droops and a widening of the base and tip of the nose results. As the lobule decreases in height, the upper lateral cartilage moves away from the septum, the expiratory baffles become less effective and when this process has progressed just enough, moisture and heat are not as efficiently retained. The mucous membrane of the nose, lacrimal passages, conjunctiva and the corneal epithelium begin to dry. On inspiration the air column is too wide, too slow, and does not have the normal projectory. The inferior turbinate and its contiguous structures become irritated. The inferior turbinate is unable to effectively reach the hard nasal septum and the size, velocity and direction of the air stream is altered. Temperature,

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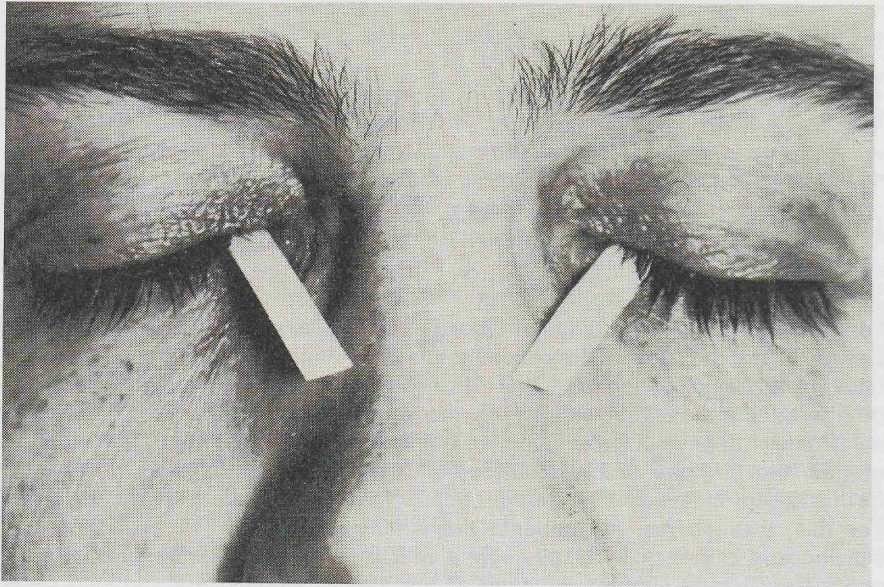


Figure 1. Schirmer test

humidity and barometric pressure also plays a part. On expiration, the baffle effect or resistance of the ventricle is lessened. The more rounded and flattened the nostrils become, the more heat and moisture is lost. The process is continuous. What happens in the nasal mucosa is reflected in the pharynx, conjunctiva and cornea. (4)

Anatomy and physiology:

To Cottle, (5) we owe the concept of nasal disharmony. Briefly explained, the configuration of the nostrils and that of the external pyriform aperture are not in harmony in structure and function. There is a difference of structure and function in the leptorrhine (caucasian), mesorrhine (oriental) and platyrrhine (negro) noses. It is possible to have caucasian type of nose internally and a negroid type of nose externally, as a result of inter-ethnic lineage. The same result can occur following a nasal fracture when the nose is pushed in and therefore widened.

Clinical nasal indices and baffle system: (6)

The normal adult caucasian nose has a high narrow external nasal pyramid with narrow and vertical elliptical nostrils. The posterior wall of the vestibule is not continuous with the floor of the nasal chamber. A well developed caudal end of the nasal septum extends beyond the caudal margin of the upper lateral cartilage. The floor of the pyriform aperture, medial and lateral crura of the lobular cartilage, cul de sac and nasal valve form an inspiratory system of baffles to help still, warm, humidify and offer resistance and direction to the inspired air, and a heat and moisture retaining effect on expiration.

The adult negro nose is broad, flat, and has wide round horizontal nostrils. The nasal aperture is wide, short, and large forward placed inferior turbinates

with a lesser developed system of baffles is present. This structure resembles the caucasian infant nose, offers little resistance to air and has a cooling effect. It is from a study of the two ethnic groups that Cottle (7) developed a method of measuring the clinical nasal index (width of the external pyriform aperture in millimeters divided by the height and multiplied by 100). The tip index is measured in millimeters by measuring the width at the narrowest tip of the nares, divided by the greatest width and multiplied by 100. The dysharmony index is useful where there is a disproportion between the two indexes and acts as a guide in evaluation of signs and symptoms.

The nasal index in the caucasian with ozena may be in the same range as the platyrrhine indicating an arrested development of the pyriform aperture. The nasal index may be normal but the tip index is high in cases of ozena simplex where dysharmony between the nasal opening and pyriform aperture exist. The nasal aperture is much larger and allows for loss of heat, moisture, and decreased resistance during expiration.

Cotton Test: (8)

A small cotton ball is placed into the vestibule to create a nozzle effect on inspiration and a baffle effect on expiration. It must be soft. A hard ball will impede alar movement and cause a feeling of obstruction. If it is too large breathing will be impaired. If it is too small, the patient will not notice any difference in breathing. It must be of such size that the patient will immediately note less effort in breathing, that the air seems to rise and feels cooler. The cotton balls should be used on both sides. The nasal and conjunctival mucosa will usually appear more moist after a period of five minutes. The patient is then instructed to wear the cotton at all times both as a treatment and evaluation for reconstructive nasal surgery.

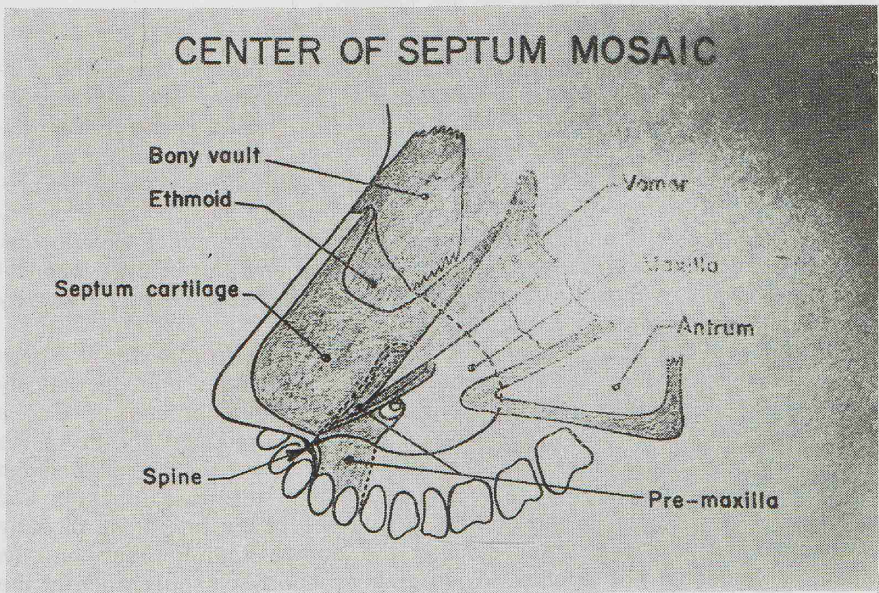


Figure 2.

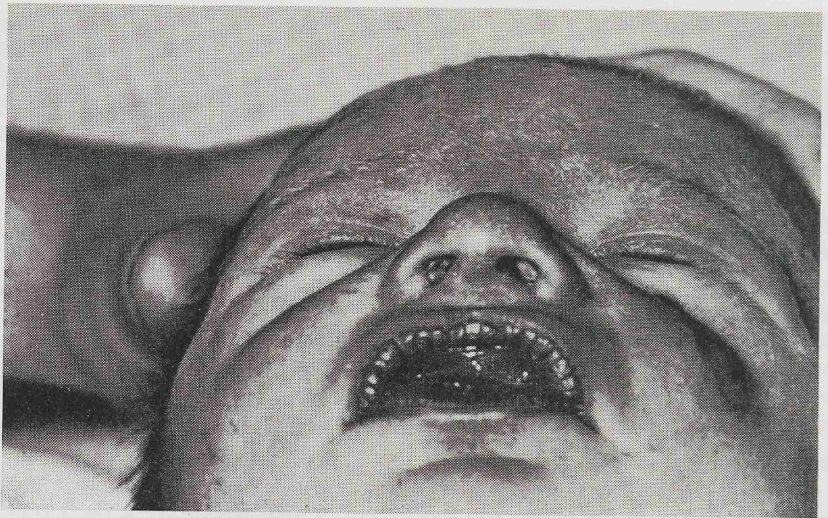


Figure 3. Base view new born

Narrowing base tape test:

There are cases when the cotton ball test is ineffective because of a marked widening of the floor of the vestibule. A piece of one-half inch tape is placed along the alar facial fold, making a turn at the foot of the alae, across the base of the nose to the opposite cheek. This is repeated on the opposite side. The tapes are drawn taut, just enough to narrow the nostril. If done correctly, a sense of decreased effort in breathing and a change of direction of air flow from the pharynx will be noted by the patient.

Keratoconjunctivitis sicca:

Keratoconjunctivitis sicca is characterized by a dry uneven appearing conjunctiva, corneal erosions, filamentary keratitis, a positive Schirmer test (9) and is associated with a ballooning out of the upper lateral cartilage from the nasal septum, widening of the cartilagenous vault, ballooning of the cul de sac, and an increase in width of the vestibule with decreased anterior projection of the lobule and flaring of the nostrils. This results in an insufficiency of the nasal valves (10) and especially the expiratory baffle effect. Naso-ocular reflexes set off by the irritation of the air stream to any part of the trigeminal nerve in the nasal mucosa, naso-ciliary nerve, or the nasopalatine nerve may have an etiologic factor in keratitis. (11)

Keratoconjunctivitis sicca is common. One only needs to look for it. There is a greater incidence in females secondary to the reduced anabolic activity of the thyroid and estrogenic hormones. (12) The aging process is also a factor. With advancing years, the naso-labial angle is reduced, the tip of the nose drops, the nasal valve, the expiratory baffles and the nasal openings widen. Adequate moisture is no longer retained in the nose, pharynx and conjunctiva. "Dry spots on the cornea" (13) is one of the first signs of early keratoconjunctivitis sicca. After staining the cornea with fluoresceine, the patient is requested not to blink. When present, spotty disappearance of the precorneal film and faint staining of the cornea occurs. This condition is a

definite contraindication to the fitting of contact lenses, unless eradicated. It has long been known that diseases of the cornea such as recurrent abscess of the cornea, deep and superficial keratitis, episcleritis and the tragic clouding of a graft after an uneventful corneal transplant, may have an intranasal etiological factor. (1) Clinically, the post operative complications of corneal surgery have been attributed to acute or chronic allergic (14) or infectious processes (15) of the upper respiratory tract. Castroviejo (16) made the statement that "If you are going to engage in corneal surgery, the nose is not an ornament". It is his experience that the post operative corneal complications of corneal surgery do not respond to conservative therapy such as antibiotics, foreign proteins, anti-allergic and steroid therapy but are markedly improved or cured by rhinological surgical intervention. A third etiological concept is that of insufficiency of the nasal valves, the expiratory baffle system and the nasocular reflexes produced by nasal dysharmony (5) of the wide nose syndrome. (17)

The pathologic physiology is much more complex. Ruskin and Mueller (18, 19, 20, 21) have demonstrated the effect of pterygopalatine irritation by an air stream that is too wide, has improper projectory and is too dry. Feldman (22) has demonstrated that the intercellular lipids of the brain, cornea and lens have a similar chemical composition. This lipid membrane between the protein molecules is a vital part of the active transport system.

Representative case reports:

Case 1: F.P., a 51 year old white woman was first examined in January, 1961. She complained of headaches, marked photophobia, constant blinking of the eyelids, squinting, burning and dryness of the eyes. Her nose felt dry. A submucous resection was performed twenty years ago. The cornea and conjunctiva were dry and the Schirmer test was positive. The clinical nasal index was 46, tip index 91, harmony index 50, nasal valves almost 90 degrees, and the cotton test was positive. Examination revealed a dry aged skin, sagging of the cartilagenous vault, marked widening of the base and tip, round nostrils and retracted columella. The nasal septum was flaccid. The nasal mucosa was dry and crusted. In November 20, 1961 a reconstruction of the nasal septum with replacement of bone and cartilage and reconstruction of the nasal pyramid was performed. Much post operative care was given before the patient's symptoms were relieved. Two years later the patient sent a letter stating that her eyes were good, she could drive again and wanted to live again. The constant blinking was gone and that she no longer had to go to bed just to close those tired lids and eyes.

Case 2: D. S., a girl age 18 years whose eyes felt dry and burned and had xerosis of the cornea. She had a positive Schirmer test. The caudal end of the nasal septum was in the right vestibule, there was deviation of the nasal septum to the left and flattening of the nasal bones. Ballooning of the lobular cartilage and a wide nasal valve was present. Her clinical nasal index was 58, the tip index 87 and the cotton test was positive. Reconstructive nasal surgery was performed on January 15, 1963 consisting in the elevation of the boney and cartilagenous vault, gridding of the lobular cartilage and spine repair. She was last examined on May 12, 1964 at which time she was asymptomatic, the corneal epithelium, conjunctival and nasal mucosa were normal.

Case 3: A girl, P. S. age 10 was first examined December 12, 1961. She was a mouth breather since birth. Keratoconjunctivitis sicca and nasopharyngitis sicca were present. She had a positive Schirmer test. Her clinical nasal index was 52 and her tip index 76. The nasal pressures were reduced and she had fetal type nostrils. The nasal septum was 4.5 mm thick. Reconstructive nasal surgery was performed on February 23, 1962. She was last examined August 13, 1967. She is completely asymptomatic. She does not breathe through her mouth and the mucous membranes and cornea are normal.

Case 4: F. N., a 37 year old white female complained of pain and drying of the eyes, repeated sore throats, P.N.D. and constant fatigue. The Schirmer and cotton ball tests were positive. She had a clinical nasal index of 57 and a tip index of 84. The caudal end of the nasal septum was in the left ventricle and the nasal septum was deviated to the right. Ballooning and returning of the upper lateral cartilages was present. There was marked hypertrophy of the lobular cartilage. Nasal surgery was performed on September 4, 1963. The patient has been asymptomatic since the time of the surgery.

Case 5: K. F., a 48 year old male complained of burning and dryness of the eyes. The Schirmer test was positive. The nasal septum was deviated to the right. Both nasal valves were ballooned out. The clinical nasal index was 71 and the tip index was 75. Reconstructive septal and pyramid surgery together with bone implants to the floor and lateral wall of the nose were performed. The surgery relieved the dryness of the eyes, nasal mucosa and pharyngeal mucosa.

Case 6: D. K., female, age 46 presented the picture of a bilateral narrow angle glaucoma. Severe keratoconjunctivitis sicca, pain in the inner canthus of the orbit at the exit of the nasociliary nerve and rhinorrhea (Charlan's syndrome) were present. The nasal mucosa was markedly congested, dried and crusted. Ballooning and returning of the upper lateral cartilages was pre-

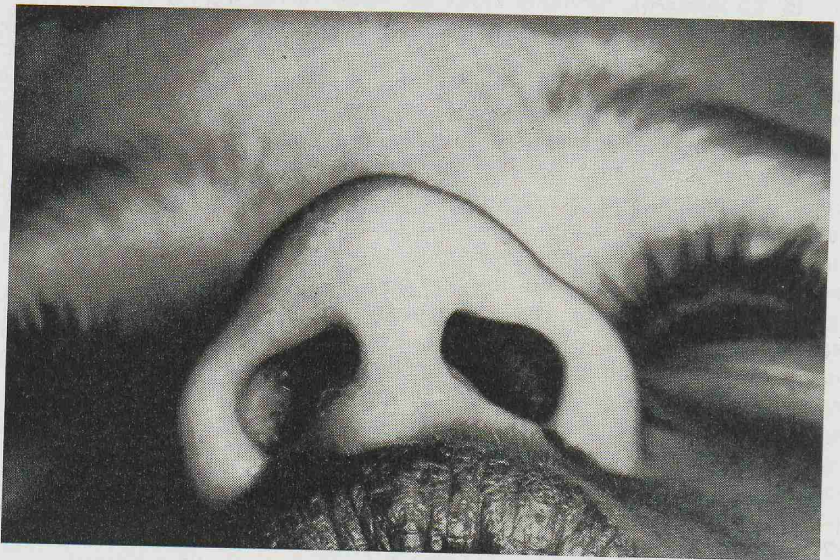


Figure 4. Base view child

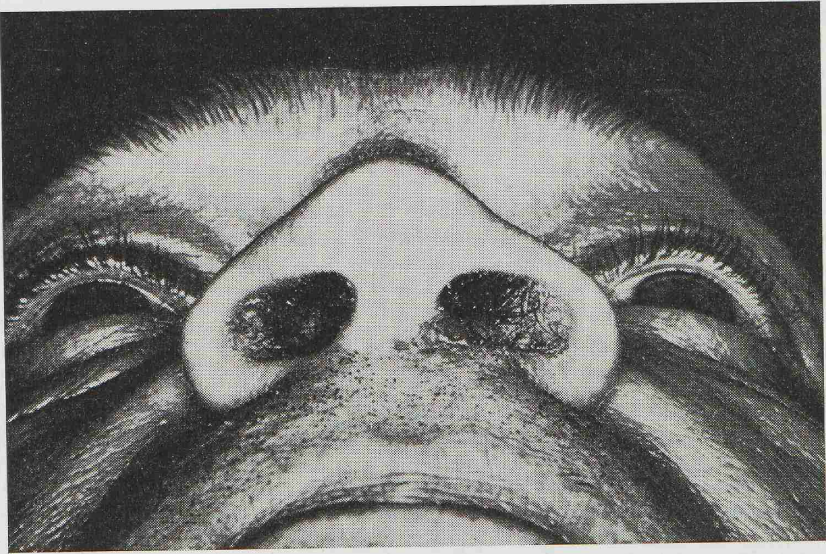


Figure 5. Base view adult

sent. She had constantly recurring periods of asthenopia with blurring of vision. The clinical nasal index was 61, the tip index was 74. The Schirmer and cotton ball tests were positive. Basal iridectomy was able to control the intraocular tension but not the pain and asthenopia. She wore cotton intermittently. Nasal septum and external pyramid surgery was performed one year later. She had a stormy convalescence but the burning, dryness and congestion gradually receded after a period of nine months.

Discussion:

Keratoconjunctivitis and conjunctivitis sicca is more common than the literature indicates. The incidence of Sjogren's Syndrome combined with ozena simplex is common. Just asking the question "Do your eyes tear when you are out in the cold wind?" will almost always bring forth a positive answer from the patient. After a positive Schirmer test has been obtained, place a proper size cotton ball into the nasal vestibule. Within five minutes the conjunctiva will become moist. This has been performed hundreds of times by the author with equable results. Adequate conservative nasal surgery has been performed on well over 100 cases; there have been no failures recorded to date. Many of the patients are in the older age group and as long as they wear the cotton in a proper manner they are symptom free. In essence what must be understood is that in the treatment of keratitis that does not respond to the usual therapy, and where the patient has nasal dysharmony or the wide nose syndrome, surgical correction of the nasal valve and baffle systems must be performed. It is sad that the ophthalmologist is not able to look past the puncta of the lacrimal system or that the rhinologist cannot evaluate the appearance of the cornea and conjunctiva. This condition is more common in females than males. Our youngest age case was that of 4 years while by far and large the most common were in the pre and post

menopausal groups. The factors involved were most complex and consisted of (1) reflex, involving the spheno-palatine ganglion and the sympathetic nerve endings on the intra nasal blood vessels, (2) anatomic, due to loss of baffle effect on exhalation, (3) endocrine, involving the thyroid and other glands which control metabolism, (4) environmental, the air being too dry.

Summary:

An attempt has been made to correlate the pathologic physiology of the open space or wide nose syndrome and that of keratitis and conjunctivitis sicca. Insufficiency of the nasal valve on inspiration and the baffle system on expiration may play a part in the etiology. Altered air currents may set up naso-ocular reflexes. The value of physiologic examination of the external nasal pyramid, the clinical nasal index and the tip index is explained. The use of a cotton ball in the nasal vestibule and narrowing tapes to produce resistance to intra-nasal air currents and increased moistening of the corneal epithelium, mucosa of the conjunctiva, lacrimal system and nasal pharynx is explained. The treatment of keratitis sicca by the surgical correction of the wide or open space syndrome is offered.

REFERENCES

1. Duke-Elder, W. S.: Textbook of ophthalmology., St. Louis, Mo., 1952, Vol. 4, p. 5641.
2. Huizing, E. H. and Ubbens, U. M.: Ozena as a part of syndromes. Internat., Rhin. Vol., 3: 103-116, Jan., 1965.
3. Cottle, M. H. et al: Early nasal injury — a factor in septal, dental and facial deformities. Scientific Exhibit, June, 1956.
4. Petrillo, C. J.: The surgical anatomy and physiology of the nasal vault and lobule. Read before the American Rhinological Society, Chicago, Oct., 19, 1957.
5. Cottle, M. H.: The structure and function of the nasal vestibule, A.M.A. Arch. Otolaryng., 62-173, August, 1955.
6. Williams, R. I.: The nasal index. Amer. Oto. Rhin. and Laryngol., 65-171, Mar., 1956.
7. Cottle, M. H. et al: Correlating nasal examination with respiratory tract function. Scientific Exhibit. A.M.A. June, 1958.
8. Gaynon, I. E.: Lacrimal Insufficiency keratoconjunctivitis sicca and malfunction of the inferior turbinate — in the wide nose or open space syndrome (Cottle). Am. J. Ophthal., 53: 614-618, April, 1962.
9. Duke-Elder, W. S.: Textbook of Ophthalmology, St. Louis, Mo. Vol., 2 p. 1950.
10. Mink, P. J.: Das Spiel der Nasenflügel. Arch. F. Ges. Physiol., 120, p. 210-224, 1907.
11. IBID. Vol., 5, 1952, p. 5641, Duke-Elder.
12. Godlowski, Z. Z.: Allergy and anaphylaxis metabolic error. Vol. 1, Immunometabolic Press., Chicago, 111., 1962.
13. Girard, L. J. Sopor, et al: Contact Lenses, C.V. Mosby Co., St. Louis, 1964, p. 121.
14. Maumenee, A. E.: The influence of donor-receptient sensitization on corneal grafts. Am. J. Ophthal., 34, part 2, 142-152, May, 1951.
15. Castroviejo, R.: Symposium Ocular Allergy. Trans. Am. Acad. Ophthal., & Otolaryng., p. 24-255, Mar.-April 1952.
16. Castroviejo, R.: Lecture course on corneal surgery, New York, 1961.
17. Gunderson, H. C.: The wide nose. Read before the Amer. Rhinol. Soc., Chicago, Oct., 11, 1956.
18. Ruskin, S. L.: Arch. Ophthal., 4-208, 1930. Control of tearing by blocking the nasal ganglion.
19. IBID: Contribution to the study of the splenopalatine ganglion. Laryngoscope, 35: 87, 1925.
20. IBID: The sensory field of the facial nerve. Arch. Otolaryngology 7: 351, 1928.
21. Mueller, L. R.: Die Lebensnerven, Berlin, 1924, Julius Appinger.
22. Feldman, G. H.: Lecture International Congress on corneal and scleral contact lenses, March 20, 1964, Houston, Texas.