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# SPECIAL PROBLEMS IN LEPROSY

## OCULAR COMPLICATIONS

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# OCULAR LEPROSY (HANSEN'S DISEASE)

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There are an estimated 10 to 15 million persons with leprosy in the world today. Moreover, of patients with leprosy, ocular involvement has been found in from 6% to 90% of cases, and estimates of blindness vary from one-half to three-quarters of a million patients. These figures, however, represent only an educated guess as to the prevalence of leprosy in the world and the extent of ocular involvement and blindness in the disease. It is significant that most of this data was gathered from field workers in Africa, where ocular involvement is less common, and where the life expectancy is shorter. In Asia, and in the more temperate climates of the world, one would expect the figures to be much higher.

Blindness from ocular involvement in leprosy can often be prevented; in many instances it can be cured, and in some cases it can be delayed for many years. We will discuss the prevention and treatment of the various types of ocular involvement common in leprosy.

## OCULAR INVOLVEMENT

Eyelid Involvement. In over two-thirds of all forms of leprosy, the eyebrows and eyelids are involved and represent a widely known stigmata, recognized by physician and layman alike. The lesions are generally symmetrical in appearance.

Loss of the outer third of the eyebrow is most commonly seen, although the entire eyebrow may be absent. This finding occurs in from one-half to

two-thirds of all patients with leprosy In many instances, hair loss is associated with the typical skin lesions of tuberculoid leprosy which involve the skin of the eyelid and the areas of the supraciliary ridge. In the polar form and the near polar form of lepromatous leprosy, the supraciliary ridge and the skin of the eyelids may also be thickened in association with the partial or total loss of the eyebrow.

Loss of the eyelashes occurs less frequently and generally begins with the whitening of the individual lashes and the splintering of the eyelashes, followed by hair loss. Loss of the lateral aspect, or the lashes in the middle portion of the eyelid, may then occur or the lashes of the entire eyelid may appear sparse.

Along with the loss of the eyelashes, the lid margin eventually develops a rolled appearance, with evidence of marked thickening of the lid itself. In some instances of lepromatous leprosy, a nodular thickening of the supraciliary ridges and/or the eyelid itself occurs, and 1 to 20 nodules (lepromata) may be noted in these areas. Most frequently, the nodules involve the skin of the eyebrows, then the upper eyelids, and least frequently the skin of the lower eyelids. Ulceration of the skin of the eyelid may occur during an erythema nodosum leprosum reaction.

A blepharochalasis (stretching of the eyelid skin due to recurrent edema and infiltration) manifested by thin, wrinkled, and redundant skin may occur in the upper and, less commonly, in the lower eyelid, and a ptosis may be evident which in all forms of leprosy may be marked by the age of forty.

Lagophthalmos (incomplete closure of the eyelids) is found most commonly in patients with tuberculoid leprosy (10 to 50%), but is not uncommon in lepromatous leprosy (6 to 25%). It is commonly associated with total facial nerve paralysis and may be so marked as to cause paralytic ectropion of the lower eyelids. The condition is frequently bilateral but may be asymetric in amount. The etiology is thought to be due to involvement of the seventh cranial nerve with resultant paralysis of the orbicularis oculi muscles. The lagophthalmos may vary from one which is grossly evident to one which is subtle and which becomes apparent only after the patient has kept his eyes closed for a few seconds.

An ectropion of the lower eyelids usually arises in association with the lagophthalmos, but in some instances absortion of the tarsus due to the inflammation may also cause an ectropion of either the upper or lower eyelid. In some instances instead of an ectropion, an entropion may occur from absorption of the tarsus. The entropion may simulate the entropion and trichiasis more commonly associated with trachoma. (The presence of Hansen's disease does not rule out the presence of trachoma and in many instances the two diseases occur concurrently )

Lacrimal apparatus. Although reported cases of dacryoadenitis due to Hansen's disease are rare, decreased or absent tear formation may occur. This is often the result of exposure keratoconjunctivitis, or it may be the result of involvement of the lacrimal gland itself. In over two-thirds of patients with lepromatous leprosy, M. leprae may be found in the tears, even when the external eye appears normal. In some instances, moreover, enlargement of the lacrimal gland may be noted.

A dacryocystitis may occur from direct infection of the lacrimal sac, from the spread of infection, from surrounding skin and tissue, or from infection of the mucous membranes of the nose and of the lacrimal sac. Atresia of the excretory ducts leading to the nose frequently occurs, resulting in epiphora and dacryocystitis. Epiphora may also occur from the ectropion and lagophthalmos as noted above.

Conjunctival involvement. Although the M. leprae organism is frequently found in scrapings taken from the bulbar or the inferior nasal tarsal conjunctiva, there appears to be no specific conjunctivitis associated with Hansen's disease.* Conjunctival injection and keratinization of the conjunctivita is the result of the lagophthalmos and drying of the constantly exposed cornea and conjunctiva. This drying and keratinization, in turn, causes loss of the goblet cells and accessory tear glands and further drying occurs. Eventually, the conjunctiva and cornea begin to look dry and lackluster and take on the appearance of discolored skin.

Subconjunctival, yellow nodules may be found in lepromatous leprosy and in borderline lepromatous leprosy. These lesions arise from extension of lesions of the eyelid skin, either by contiguous growth or by an erosion of the lesions through the tarsus. Limbal subconjunctival nodules may also occur, representing isolated or multiple granulomata that arose in the episcleral tissue. These lesions may progress, causing corneal or scleral involvement. The limbal lesions appear as yellow or white nodules which may gradually ulcerate. Typically, the edge of the ulcer has a raised indurated border and a dirty necrotic base. They are usually located in the superior temporal area.

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* A conjunctivitis may occur in leprosy, but its etiology is no different than that found in associates of the patient who do not have leprosy.

Corneal involvement. Except for the eyelid and eyebrow region, the cornea is the most frequently involved of all ocular structures. In many instances, the corneal changes are bilateral and often symmetrical in appearance.

The most common corneal change is a punctate keratitis, thought to be pathognomonic of leprosy. Other lesions of the cornea include: an avascular interstitial keratitis, leprotic pannus, giant leproma, beading and thickening of the corneal nerves, and loss of corneal sensation with its consequences. (The exposure keratitis, a complication of the loss of corneal sensation and the lagophthalmos though frequently present in Hansen's disease, is not a result of an infection of the cornea itself.)

The individual lesions of the punctate keratitis appear as minute white spots with an irregular outline. They are located most commonly in the upper temporal quadrant and appear like grains of chalk in the epithelial, subepithelial, and anterior stroma of the cornea. The lesions do not take up fluorescein.

The avascular interstitial keratitis begins in the upper temporal quadrant of the cornea at the limbus and then gradually extends centrally to involve the upper one-half of the cornea. The entire thickness of the corneal stroma may be involved near the limbus, but at the advancing edge the lesions are more superficial. In some instances the entire circumference of the cornea may be involved. Vascularization of the cornea associated with the interstial keratitis generally occurs late in the course of the keratitis and is usually scanty. The vascularization generally begins in the superior/temporal quadrant, extends to the superior nasal quadrant, then to the inferior temporal and finally the

inferior nasal quadrant Vascularization is scanty and is present in the anterior stroma. It differs from the pannus of leprosy which is more superficial but which also occurs in the same areas and also arises late in the disease.

Beading and thickening of the corneal nerves is quite common in lepromatous leprosy. The beading is usually transitory, persisting for only a few weeks, but in some instances it may persist or recur, resulting in permanent, white corneal opacities. The beading is usually located near the limbus.

Decreased or absent corneal sensation is quite common in lepromatous and borderline lepromatous leprosy. In such instances the absence or reduction of the corneal sensation frequently results in a more severe exposure keratitis than that seen with seventh craneal nerve involvement alone.(See below).

A giant leproma may also occur in the cornea. It generally occurs from extension of the limbal lesion onto the surface of the cornea and usually involves the superficial cornea. At onset, the leproma may resemble a highly vascularized pterygium. In rare instances, however, an isolated leproma may occur in the central cornea surrounded by a normal appearing peripheral cornea. A sclerosing marginal keratitis may eventuate but is rare.

Exposure keratitis, a frequent cause of blindness, is common. It results from the constant exposure of the cornea and is manifested by loss of the corneal epithelium, by corneal infiltration, and by the eventual vascularization of the inferior cornea. In advanced cases of exposure keratitis, the cornea loses all luster and often appears dull

white. Characteristically, the keratitis is evident in the inferior part of the cornea as compared to the keratitis caused by leprotic involvement in which the superior cornea is affected.

Scleral and episcleral involvement. Both scleral and episcleral involvement in Hansen's disease may be the result of direct extension from adjacent tissue, such as the uveal tract or the eyelids, or the lesions may arise de novo. The episcleritis is usually transient and is seen in lepromatous leprosy. The lesions occur more commonly in the superior temporal sclera and are often nodular. These lesions are commonly associated with the erythema nodosum leprosum reaction.

The nodular scleritis found in lepromatous leprosy is usually chronic and develops slowly over many years, often resulting in thinning of the sclera and staphylomata.

Uveal involvement. Involvement of the anterior uveal tract may be manifested by a low grade uveitis, a violent exudative anterior uveitis, iris pearls, keratic precipitates, the occurence of a solitary lepromata, and atrophy of the iris stroma and pigment epithelium.

The chronic granulomatous iridocyclitis is low grade and generally does not occur until many years after onset of the infection. The inflammation is frequently bilateral and is often so mild that no symptoms or signs are recognized until posterior synechiae develop or until the pupil becomes pinpoint in size. In some instances, iris holes may occur or atrophy of the iris stroma may be evident together with exposure of the pigment epithelium.

In lepromatous leprosy, especially in association with erythema nodosum leporosum, an acute exudative iridocyclitis may be evident. In

such instances there are many large mutton fat keratic precipitates, and dense posterior synechiae often occur. The dense synechiae may lead to occlusion of the pupil resulting in iris bombé formation and an acute glaucoma. After several attacks of an acute exudative iridocyclitis, phthisis bulbi often supervenes.

Iris pearls may be noted on the face of the iris. These are pathognomonic for leprosy and appear as minute white spots located in the interstices of the iris or lying at the pupillary margin. They may be single or multiple and often look like grains of white sand lying on the surface or protruding from the iris. Isolated lepromata of the iris are rare and occur at the area of the anterior chamber angle. These lesions probably represent a forward protrusion of a ciliary body leproma. The lesion may progress to involve the ciliary body, the anterior choroid, the sclera, and the iris. An isolated leproma often leads to phthisis bulbi.

Posterior uveal tract involvement is rare. In most instances involvement of the choroid occurs by spread of the infection from adjacent ciliary body. In these instances, a peripheral deposit of yellow-white, waxy exudate is seen, associated with the destruction of the overlying retina and sheathing of retinal vessels. Uveal effusions may also be noted.

Lens involvement. Complicated cataracts may occur and are usually associated with acute exudative iridocyclitis. In addition, senile cataracts appear to occur earlier in patients with Hansen's disease than in patients of same age without leprosy.

Miscellaneous involvement. Secondary glaucoma is unusual but may occur in association with the iritis and especially with occlusion of the pupil. The fact that it is uncommon is probably due to iris atrophy and ciliary body involvement.

Retinal detachment and phthisis bulbi are common sequelae of the iridocyclitis especially when it is prolonged or uncontrolled

## THE RECOGNITION OF THE VARIOUS TYPES OF OCULAR INVOLVEMENT

To recognize the various types of ocular involvement in Hansen's disease, the examiner should develop a routine for examination of the eyes. Even when only minimal magnification is available to him, most of the important changes within the eye can be seen with a good light source and low magnification. Before examining the eye, visual acuity should be determined.

Eyelid involvement. Loss of the eyebrows and eyelashes are readily apparent, even to the casual examiner. Skin lesions and the thickening of the lids and supraciliary ridge are also easily seen with the aid of a good light source. To check for lagophthalmos, the patient should be told to close his eyelids and simulate sleep. The patient should not squeeze the eyelids closed. The lids are then observed for at least 30 seconds to see if they close fully and remain closed. If they do not close or if they open again, lagophthalmos exists and the patient is subject to the development of exposure keratitis, especially if he does not turn his eye upwards when the lids are closed (Bell's phenomenon).

The position of the margin of the eyelids in relation to the cornea should be noted. Normally, the lashes do not touch the cornea and the lid margin is directly opposite the cornea and eyeball. If the lid turns in this condition, it is termed entropion. If the lid turns out, it is termed ectropion. If there is any degree of entropion or ectropion, damage to the cornea may occur. The patient may complain of a foreign body sensation, redness of the eye, tearing, and a dull pain.

Involvement of the lacrimal apparatus. Epithora, or excessive tearing, is most commonly associated with an ectropion It may be recognized by observing the size of the tear meniscus at the edge of the lower eyelid. Normally, less than 1 mm of tears can be seen on the top of the lid margin. Epiphora is present if the tear meniscus exceeds this amount or if the tears run over the cheek, or, especially, if tearing obscures vision.

A dacryocystitis is usually manifested by the presence of a swelling at the inner canthal area just below the margin of the lower eyelid. It is usually associated with erythema and tenderness.

Conjunctival involvement. Conjunctival keratinization and dryness is characterized by the appearance of a loss of luster of the conjunctiva together with the appearance of wrinkling, discoloration, and a leathery bulbar conjunctiva. It is frequently associated with dryness and keratinization of the cornea. The patient often complains of redness, foreign body sensation, pain, and reduced vision.

Lepromata of the conjunctiva appear as isolated yellowish or white nodules on the tarsal conjunctiva or at the limbus.

Corneal involvement. Until it is far advanced, the punctate keratitis of leprosy is hard to recognize without the use of a slit lamp. When it has progressed, however, the lesions can be seen with a loupe or a magnifying glass. They appear as a haziness of the superior cornea with patches of varying density within the haze.

The avascular interstitial keratitis, when advanced, appears as a soft, white, patchy area located in the superior cornea Early changes can only be seen with a slit lamp. Minimal symptoms of a mild photophobia and circumcorneal injection may be associated with the avascular interstitial keratitis

The pannus of leprosy may be recognized by the finding of medium-sized trunks of vessels running directly from the conjunctival vessels into the cornea. (The fact that the vessels appear to connect directly to the conjunctival vessels suggests that the vessels are superficial and not deep, like those found in advanced cases of avascular interstitial keratitis )

Decreased or absent corneal sensation may be detected by touching the cornea with a piece of waxed dental floss or with a piece of cotton which has been teased out into a fine strand. If the patient blinks or withdraws as the cornea is touched, corneal sensation in intact. If the patient does not blink or withdraw even when the cotton strand or dental floss is bent as the cornea is touched, corneal sensation is reduced or absent. Several quadrants of the cornea should be tested in this fashion.

Lepromata of the cornea may appear as yellow masses in the cornea or as a flesh colored mass growing from the conjunctiva onto the cornea.

The exposure keratitis is located in the inferior part of the cornea and in the area of the cornea normally exposed when the eyelids are open. The patient often has symptoms of redness, foreign body sensation, and pain. The cornea loses its luster, is roughened in appearance, and is often white in the area of involvement. It is more common and severe when lagophthalmos is combined with a loss of corneal sensation but it may occur with lagophthalmos or loss of corneal sensation alone.

Scleral and episcleral involvement. Scleritis and episcleritis are usually associated with redness of the eyes. If a scleritis is present, the patient frequently complains of a dull ache or of pain when the eye is rotated Tenderness may be noted when the area is palpated through the closed eyelid. There is a deep red color which appears bluish if observed in daylight. The redness is often diffuse but is more marked in the area of most intense involvement

Thinning of the sclera appears as a bluish discoloration of the area and if bulging has occured a staphylomata is present

Uveal involvement The low grade uveitis that may occur in Hansen's disease is often associated with minimal symptoms and signs The symptoms are those of a mild circumcorneal redness, tenderness of palpation, mild pain, and mild photophobia. The pupil is small and reacts poorly to light and to near objects. The presence of holes or black spots in the iris, or of a pupil which is drawn aside from the central area may indicate atrophy of the iris.

An acute exudative iridocyclitis is accompanied by pain, redness, and severe photophobia The circumcorneal conjunctiva is injected and the redness has a bluish hue The pupil is small and non-reactive.

Iris pearls cannot be seen without the use of a slit-lamp

Posterior uveal tract involvement can be detected only with an ophthalmoscope, and the peripheral retina cannot be viewed unless the pupil is fully dilated. A yellow-white, waxy exudate may be noted in the far periphery, especially in the superior temporal quadrant.

Lens involvement Normally the lens is not seen when viewed with the unaided eye In instances of cataract formation, the pupil assumes a white, or a yellow-brown color depending upon the type of cataract present As a cataract develops the white or yellow-brown color intensifies.

Miscellaneous involvement. Secondary glaucoma is manifested by symptoms of pain, and a bluish-redness which is more intense in the conjunctiva and scleral surrounding the cornea. The eyeball feels very hard when palpated through the closed lid. The tension may be taken with a tonometer and will be found to be greater than 24 mm of mercury.

## PREVENTION AND TREATMENT

Prevention and treatment of blindness are both important considerations in Hansen's disease. Both the individual working with leprosy patients and the patients themselves must be made aware that most persons with leprosy need not go blind, and that, as far as vision is concerned, most patients can lead a full and useful life.

Eyelid Involvement. Loss of the eyelashes and eyebrows are cosmetic defects only. Transplantation of the hair from the scalp to the area of the eyebrow and to the lid margin can be performed, but such surgery is considered as non-essential. In the United States, for instance, we generally suggest only the use of an eyebrow pencil and the use of false eyelashes which can be placed on the lid margin if the patient is very concerned about the appearance. The blepharochalasis and ptosis are also regarded as cosmetic defect unless the skin becomes so lax or the ptosis so great as to interfere with vision. In such instances standard surgery for removal of the excess skin and for the correction of ptosis can be readily performed. The tissue heals rapidly and the results are similiar to that achieved in patients who do not have Hansen's disease.

Lagophthalmos is one of the major areas of concern for people working with Hansen's disease. As an example, we noted that over 50% of patients living at the Abu Zaabal leprosarium in Cairo, Egypt, had lagophthalmos. Many of these patients had severe problems with corneal exposure and were in need of surgery to correct the lagophthalmos. When lagophthalmos is found initial efforts should be directed at

preventing the eye, and especially the cornea, from drying out To achieve this goal the leprosy worked should use bland ointments and artificial tears at frequent intervals. In most instances these medications can be instilled by the patient himself or by one of his associates. Since the ointment usually blurs the vision, we usually suggest that it be used before retiring and that the artificial tears be used during the daytime at frequent intervals.

When the bland ophthalmic ointment and artificial tears seem to have very little effect, or when there is a severe lagophthalmos and the patient can not close the eyes at all, early surgery should be performed. As a temporizing measure, the cornea should be protected with the bland ointment and the artificial tears as outlined above and the use of a bullar shield should be considered until surgery can be performed. The bullar shield can be applied to the eye with broad tape which completely surrounds the shield creating a moisture chamber that will help to keep the cornea and conjunctiva moist

Over the past decade the use of the temporalis transfer procedure has become popular for the correction of lagophthalmos. The theory of using a muscle which is normally not denervated in Hansen's disease is sound, but the procedure is a formidable and,that most ophthalmologists and dermatologists feel incompetant to perform. Moreover, the procedure requires two to three hours to perform and the patient must be taught to chew frequently in order to cause the eyelids to close. A further complication may arise if the tendons are placed improperly in which case an ectropion or entropion will result. Thus, we recommend that the temporalis transfer procedure be performed only by surgeons skilled in

this technique, or that a simpler and probably more effective procedure be done.

The tarsal sling operation is such a procedure. We first learned it by working with Dr. Margaret Brand at Carville and have found that it is effective, simple to perform, and that it requires only 20 to 30 minutes to do.

To perform the tarsal sling operation, one merely estimates the amount of correction required by drawing the lower lid towards the lateral canthal region. The patient is then asked to close his eyes and the amount of tightening is determined by the amount the lid must pull to the side to give full closure of the eyelids. (The upper lid can also be treated in a similiar fashion if the lagophalmos is severe.) The lid is then prepared and surgery performed under topical anesthesia with the injection of an anesthetic into the area to be incised. A horizontal incision is then made over the lateral canthal tendon and carried down to the periosteum. The skin overlying the tarsus is resected for the predetermined distance. The conjunctiva is resected in a similiar fashion, and finally the lid margin including the eyelashes are resected for the same distance. A vertical incision is then made through the lateral canthal tendon or the tarsus at the lateral border of the eyelid and the tarsus is brought to the periosteum and sutured in place using 4'0 or 5'0 silk. The skin is closed with the same size suture. If the upper eyelid is to also be operated on at the same time, the same procedure is done and the two tendons are sutured to the same place. If an entropion or ectropion is present this can be corrected by placing the sutures properly (higher or lower in the tarsal border respectively.) Finally, the two eyelids are sutured together where they meet at the lateral

border of the orbit A dressing is then applied and the patient is seen the following day Only the skin sutures are removed, usually after five days.

Lid adhesions or tarsorrhapies may also be performed and are often helpful for lagophthalmos, but after a period of several years, drooping of the upper eyelid becomes so marked that exposure of the cornea again becomes a problem.

Ectropion of the lower eyelids can be repaired with one of the standard lid shortening procedures such as the Kuhnt Zymanosky procedure or the Weiss procedure. Since lagophthalmos and ectropion are often associated however, the tarsal sling operation is usually preferred.

An entropion and trichiasis of the upper eyelid is frequently associated with stage III or stage IV trachoma. In such instances, fracturing and suturing of the tarsus as in a Cuenod Nataff procedure seems useful.

Lacrimal apparatus. When there is reduction of tears, artificial tears should be used frequently. If there is no associated lagophthalmos, the use of a bland ointment at night is not necessary. Enlargement of the lacrimal gland, unless severe, usually present no problem. Hot packs may be helpful if the area is tender.

A dacryocystitis should be initially treated with hot packs, and if the area is very swollen and tender, systemic antibiotics may be given including penicillin or its congeners, or a spectrum antibiotic. In some instances the lacrimal sac can be expressed by placing gentle pressure over the area and massaging the sac. If the dacrycystitis persists, a dacryocystectomy may be necessary to control the continuing infection.

Conjunctival involvement. The drying and keratinization of the conjunctiva and cornea should be treated as outlined for lagophthalmos. If there is algophthalmos without keratinization and drying, surgery should be undertaken to prevent it from occuring.

Granulomas of the conjunctiva do not usually respond to therapy. They can be easily removed however, and if they become large and unsightly, the conjunctiva should be anesthetized using topical anesthetics. Some of the anesthetic should be injected under the area of the granuloma and the granuloma excised. Unless a very large area of conjunctiva is removed, it need not be sutured since the conjunctival epithelium rapidly slides over the defect.

Corneal involvement. The punctate keratitis and the avascular interstial keratitis do not respond to therapy. If adequate antileprosy drugs are used, however, the progress of the punctate keratitis and the avascular interstial keratitis is usually arrested

Decreased or absent corneal sensation cannot be treated per se but one should remember that a loss of corneal sensation frequently leads to exposure keratitis. In such instances the patient should be seen frequently. If any lagophthalmos or exposure keratitis is present or develops, a tarsal sling procedure should be performed to protect the cornea by reducing the amount of cornea exposed.

Lepromas of the cornea are usually superficial. Their progression is generally not affected with the use of systemic or topical medication, including cornicosteroids. Lepromas of the cornea can be removed if superficial, but this should not be attempted unless the surgeon is convinced that they do not extend through the depths of the cornea.

Exposure keratitis should be treated in a fashion similiar to the lagophthalmos. Treatment, including surgery, should be started early and the patient should be observed frequently. Individuals working with Hansen's disease will sometimes be surprised at the improvement, even in cases which appear to be far advanced.

Scleral and episcleral involvement. The scleritis and episcleritis of leprosy frequently respond to topical corticosteroids. The drops can be used every two to four hours. The patient should be seen frequently because steroids may cause thinning of the sclera.

Scleral thinning may become so marked as to cause disorganization of the eye. When a diffuse area of scleral thinning is noted, the ophthalmologist may feel that a supportive patch will be of value to support the area. This course requires surgery with the use of periosteum.

Uveal involvement. The low grade iridocyclitis does not respond to convential therapy. Recently Ffytch has alluded to the possibility of prevention of the low grade iridocyclitis by preventing the degeneration of the dilator fibers of the iris. Theoretically this could be done with the use of topical L epinephrine.

The acute exudative iridocyclitis should be treated with topical corticosteroids every two to four hours and the use of mydriatics such as atropine or hyoscine two to three times daily. Systemic corticosteroids may be necessary if the patient fails to respond and especially when the patient has erythema nodosum leprosum.

In instances of a pin point pupil, an optical iridectomy should be performed for vision. If a cataract is also present it can be removed at the same time

Lens involvement. Complicated cataracts can frequently be prevented with the early use of corticosteroids and mydriatics in the treatment of the acute exudative iridocyclitis. Once formed, both complicated and senile cataracts can be removed and healing in patients with Hansen's disease is similiar to that of patients without leprosy. In instances of complicated cataracts, the ophthalmologist must be prepared to deal with the posterior synechiae.

Miscellaneous involvement. Secondary glaucoma associated with an iris bombe and occlusion of the pupil requires emergency care. The synechiae must be broken if possible. Mydriatics including L epinephrine and atropine, as well as corticosteroids, should be used topically. Systemic carbonic anhydrase inhibitors such as Diamox, 0.500 grams stat and 0.250 grams every six hours, should also be given to help reduce intraocular pressure.

Pthisis bulbi represents the end stage of blindness and nothing can be offered to the patient. However, the leprosy worker must remember that this stage can usually be prevented if the patient is observed and treated adequately.

## SUMMARY

We have outlined the types of eye changes found in leprosy. Some of these are rather subtle and require the use of high magnification such as that made possible with the use of the slit-lamp. In addition, we have described methods for the recognition, prevention, and treatment once these changes occur. It is important to remember that blindness in leprosy can be prevented if changes in the eye are dealt with promptly.

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