

THE USES AND ABUSES OF CONTACT LENSES

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THE USES OF CONTACT LENSES By A. Lim Siew Ming.

A recent estimate showed that more than a million pairs of contact lenses have been sold in the United States of America. Their popularity has spread rapidly throughout the world and their introduction into Singapore by several local optical companies justifies a review of their uses and abuses.

What are Contact Lenses?

Contact Lenses are so called because they lie in contact with the anterior segment of the eyeball separated only by a thin layer of fluid. They are thin plastic lenses which are of two main types.

1. The haptic or corneoscleral lenses (Fig. 1) which are large and extend beyond the cornea on to the conjunctiva and are kept in place largely by the lids which lie anteriorly.
2. The microlenses or corneal lenses (Figs. 2 and 3) are smaller and only cover part of the cornea. They measure about 9mm. in diameter and are kept in place largely by capillary suction and surface tension.

They differ from the haptic type in not having a haptic or scleral part. Normally the lenses are fitted close to the anterior corneal surface and ride upwards and nasally in a constant slight movement over the cornea.

In practice they are cheaper, easier to manufacture and to fit than the haptic lenses, although their application is somewhat limited as they are generally unsuitable in cases such as, keratoconus, a high degree of astigmatism and for the patient with prominent eyes.

History

Contact lenses were not recently invented. They are well documented in medical journals and although contributors include technicians, optometrists and ophthalmologists, the role of the last has become more important especially in recent years.

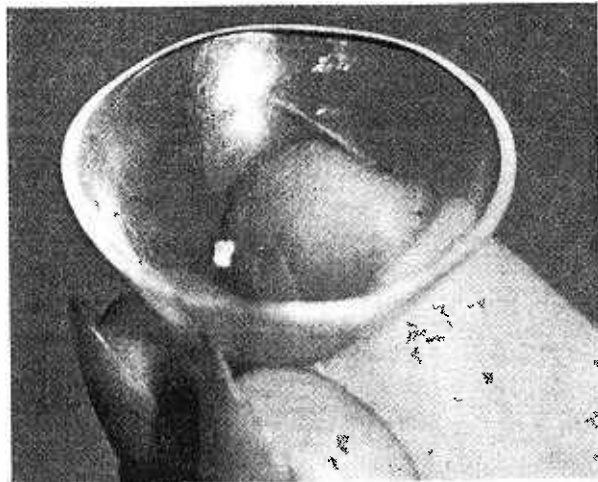


Fig. 1. The haptic or corneoscleral contact lens.

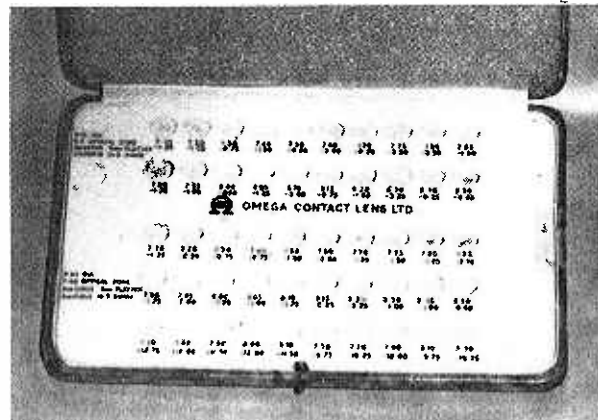


Fig. 2. A trial set of corneal contact lenses.

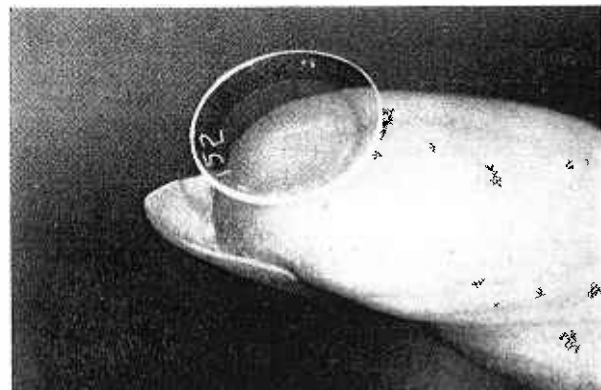


Fig. 3. The corneal contact lens which measures about 9.5 mm. in diameter.

Thomas Young in 1801 was probably the first person to conceive the idea of eliminating the irregular anterior surface of the cornea by substituting an appliance fitted anterior to the cornea. The "hydrodiascope" was a tube of less than 1cm. in length filled with water with a lens placed anteriorly and the ocular part smoothed with wax.

Young's conception was not put into ophthalmic practice until 1887 when Seamisch made use of a contact lens in the treatment of a case of lagophthalmos as a result of surgical removal of a malignant tumour at the lid of a patient's only eye.

Within a few years Fick, Kalt, and Muller treated cases of keratoconus and high myopia with glass contact lenses. The glass used during this initial period was either blown, moulded or ground.

In the following 20 years contact lenses were made on a large scale and the firm of Zeiss was the first to manufacture them. Standard trial lenses were made and the lens which fitted the sclera and cornea most comfortably was chosen, the refraction determined and the required correction ground on to the outer surface.

In the mid-thirties, Dallos of Budapest introduced the technique of moulded contact lenses made to fit the individual globe.

By 1938 plastic contact lenses began to replace glass. They were thinner, lighter, more flexible and almost unbreakable. After the war great technical improvements were made in the production of the haptic contact lenses and the initial optical, wearing and fitting difficulties were largely overcome. In 1950 Tuohy introduced the corneal contact lens in America.

Optical Advantages of Contact Lenses

When a contact lens is placed over the cornea the refractive power of the anterior surface of the cornea will cease to exist optically and will be replaced by the anterior surface of the contact lens which may be ground to correct any refractive error which may be present. This is because the refractive indices of the lens, the cornea, and the fluid between them are almost the same.

Since a contact lens replaces the anterior corneal surface it can correct a refractive error however great and it can also correct a corneal surface deformity however gross. Thus, in severe cases of conical cornea (kera-

toconus) or irregular astigmatism vision can sometimes be improved to almost normal with the use of contact lenses.

Because the cardinal points of the optical systems are displaced less when a contact lens is used instead of spectacles, the magnification of the image formed is smaller in cases of hypermetropia and larger in myopia. Thus contact lenses are useful in cases of anisometropia, high myopia and unilateral aphakia.

Furthermore, their use lessens the prismatic effect of strong spectacle lenses, the limitation of visual fields and the ugly appearance and uncomfortable weight of strong glasses.

The Uses of Contact Lenses

Contact lenses may be used for optical, therapeutic, cosmetic and occupational, or diagnostic and research purposes. The last use will not be described further.

Optical Uses

a) *High myopia*

In high myopia, especially when above 10 dioptres, spectacles have the disadvantages of forming a small image on the retina, and having peripheral aberrations and a rather unpleasant appearance.

Contact lenses are useful in these cases because they give a larger image on the retina and a patient who may only see 6/36 with spectacle correction may see 6/9 with contact lenses. Furthermore, the visual field is increased.

However, their use is associated with the disadvantages of handling problems especially with corneal lenses: with the problem of accommodation and convergence because with the use of glasses the patient required little accommodation and convergence due to under-correction and prismatic effect respectively. Thus with the use of contact lenses, the patient may require reading glasses and prisms. Sometimes orthoptic treatment may even be required.

b) *Astigmatism*

In high degree of astigmatism especially over 5 dioptres, contact lenses abolish the astigmatism caused by the anterior surface of the cornea. However, a small degree of astigmatism is sometimes found to be due to the posterior surface of the cornea or to the surface of the lens. This is commonly known

as residual astigmatism and can be corrected with spectacles or the required cylindrical correction ground on the anterior surface of a haptic contact lens.

In keratoconus, the use of contact lenses is the treatment of choice and has been found to be successful in correcting the high degree of myopic astigmatism in over 80% of cases. There is no doubt about the optical value as it is not uncommon that visual acuity of less than 6/60 has been improved to 6/6 provided that no corneal opacity has developed. Although there are some reports that contact lenses retard the progress and even reduce the degree of coning in this condition, their therapeutic value is doubtful.

The use of contact lenses is particularly important in irregular astigmatism due to old corneal scarring or corneal facets. In these cases, a visual acuity of 6/24 may be improved to 6/6. In the case of scarring, contact lenses are particularly useful when the scars are superficial; their effect being less when the scars are deep.

c) *High hypermetropia and bilateral aphakia*

Although the retinal images are smaller, the advantages of avoidance of peripheral distortions, the limited visual fields, and the necessity of heavy glasses often call for the use of contact lenses. This is particularly useful in young patients with bilateral aphakia and some authorities consider their use as the treatment of choice.

d) *Anisometropia and unilateral aphakia*

In anisometropia of over 4 dioptres, the difference of image sizes between the two eyes with spectacle correction is often not tolerated. In these cases the corneal lenses will reduce the difference between the sizes of retinal images and binocular vision may thus be attained.

In unilateral aphakia, contact lenses are useful for the same reason. The image formed by the aphakic eye with spectacle correction is about 30% larger than the image formed by the phakic eye. This difference cannot be tolerated. The use of contact lenses reduces the difference in the sizes of the retinal image to about 8% and binocular vision can sometimes be attained.

Therapeutic Uses

Contact lenses are useful in cases of lagophthalmos from any cause, in recurrent ulceration

and erosion, particularly in mustard gas keratitis. In lagophthalmos, the contact lenses work on the same principle as a tarsorrhaphy by protecting the cornea.

Contact lenses are also useful in preventing adhesions between the palpebral and bulbar conjunctivae. Thus they may be used in cases of pemphigus and chemical burns. Surgically they are useful for prevention of recurrences after division of symplepharon. In these cases the mould should be as large as possible extending right into the fornices.

One of the difficulties in applying radioactive material accurately to the anterior surface of the eye or the internal aspect of the lid is overcome by the use of contact lenses to which is attached the radio-active material.

In corneal grafting, contact lenses have a part in both the pre-operative and post-operative management. Pre-operatively it has been shown that in many cases where corneal grafting would otherwise have been indicated, considerable visual improvement was found with use of contact lenses alone. This is largely because the irregular astigmatism associated with corneal opacity is abolished by the contact lenses. In the immediate post-operative period a variety of designs have been used to support the corneal graft in order that it may remain in position, often without the use of any direct sutures. This is important in cases where the recipient cornea is of poor quality so that the stitches may not only be difficult to insert but a danger to the safety of the eye. In the late post-operative period it is not uncommon that a high degree of astigmatism due to tilting of the corneal graft requires correction by a contact lens.

Cosmetic and Occupational Uses

There is no doubt that contact lenses can be used to mask deformed eyes such as the phthisical eye or microphthalmia. In albinism and occasionally in aniridia not only can the appearance of the eye be improved but photophobia can be overcome by their use.

However, their use for purely cosmetic reasons is generally inadvisable. Ironically, the most important reason for the increased use of contact lenses is for improved cosmetic appearance in young persons with a mild degree of refractive error; the most frequent are young myopes often associated with some astigmatism.

Certain occupations where the use of glasses is not allowed such as acting on stage and films or certain personnel employed in aviation, the use of contact lenses becomes essential. In certain occupations glasses are a disadvantage such as those whose work requires them to be exposed to the rain, steam, mist and heat. Contact lenses are also often invaluable for sportsmen.

Lastly, in cases where there is an intense psychological dislike for the use of glasses, contact lenses may be justifiably prescribed.

THE ABUSES OF CONTACT LENSES

By R. Loh Choo Kiat

Contraindications to the Use of Contact Lenses

1. General — a) The most important is the lack of a definite indication for their use. The indications have been discussed above. If these are absent, the patient should be advised against the fitting of such lenses.
- b) Where the patient's personal motivation is weak and insufficient, it is not wise to try and persuade such a person to wear corneal or haptic contact lenses unless there is a definite therapeutic indication. Contact lenses are foreign bodies in the eye and no matter how well fitted they are, sometimes patience and perseverance are required of the patient before he can wear them successfully.
2. Ocular — a) Excessive dryness of the eyes due to various conditions, e.g. Vitamin A deficiency. Sjogren's Syndrome. In trachoma, ocular pemphigus and burns, contact lenses, especially the haptic variety may be used under close supervision for therapeutic purposes at certain stages of the disease.
- b) Infections of the lid, conjunctiva, lachrymal sac. They are generally also contra-indicated in acute corneal inflammations and infections.

- c) Local neoplasms e.g. dermoids, pigmented naevi or granulomas, and pterygiums. Pterygiums should be treated first before the lenses can be worn.
- d) Corneal degeneration and dystrophies.
- e) Corneal oedema.

3. Contraindications relating to only Corneal Lenses:

- a) In cases of marked epiphora, because the corneal lenses will float around on the excessive tear fluid.
- b) In marked exophthalmos because the fit will always be poor.
- c) Corneal insensitivity as in neuroparalytic keratitis or resection of the 5th cranial nerve.

Limitations and Disadvantages of Contact Lenses

1. Contact lenses are good for most sports. However there are limitations and the use of corneal lenses in swimming and heavy contact sports such as boxing, football and rugby are not advisable. Haptic forms however may be used. Whilst contact lenses are useful in those who participate in sports, actually those who appreciate them most are the ones whose work is at close range e.g. reading and desk work.
2. For many patients the biggest hurdle to contact lens wear is the introduction and removal of these lenses. Contact lenses require time and patience to learn to insert and remove them and to break them in. Then again, corneal lenses because of their small size, may be difficult to handle especially by patients who already have poor visual acuity.
3. Neither can these lenses be worn by all for the greater part of the day. This is due to intolerance which varies from person to person. The wearing of contact lenses, especially in the initial period is not uncommonly associated with considerable discomfort. No matter how well fitted they may be, they are foreign bodies. In some cases intolerance may be due to poor

fitting. In other cases, intolerance may be psychological in origin. In general, if the personal motivation is strong and there is sympathetic encouragement from the ophthalmologist and the optometrist, this difficulty will be overcome. Patients with allergic conditions especially hay fever, asthma, and allergic states of the skin are difficult to fit and even if fitting is successfully carried out the wearing time is invariably short. Patients with allergic ocular conditions will generally never tolerate contact lenses unless these conditions are controlled. Patients with sensitive skins which have a tendency to sunburn easily especially around the face are usually unsuitable for contact lenses. Their conjunctiva are usually sensitive and irritable.

4. Contact lenses are not well tolerated in dry, dusty and smoky conditions. With dusty atmosphere their use can be dangerous because foreign bodies may be trapped between the lenses and the cornea and can cause complications.
5. In presbyopia especially in myopes. They need extra glasses. This is an optical phenomenon.
6. In cases with a high degree of lenticular astigmatism which, of course contact lenses and especially corneal lenses will not be able to correct.
7. The cost of contact lenses, especially haptic forms, is high compared to that of ordinary spectacles.

Complications

These may be conveniently divided into medical and optical.

1. *Medical Complications*

The medical complications of contact lenses present a problem to ophthalmologists. Fortunately, such complications are infrequent and largely confined to minor superficial abrasion and less often to ulceration of the cornea. Nevertheless, if no proper care or supervision is taken, the damage done may be permanent.

a) *Corneal Abrasion*

Corneal epithelium under a properly fitted contact lens should not reveal areas of epithelial damage when stained with fluorescein and examined with a

slit lamp. It is the improperly fitted lenses that usually cause complications. Recently, Lansche and Lee have stressed the dangerous complications of the use of corneal lenses. They have reported a number of cases, some going on to permanent damage. Injury to the cornea may also arise from mishandling of the lens in the insertion and removal procedures, and from the various detergents and other cleansing solutions which may be harmful to the eyes.

Corneal sensitivity is definitely reduced with the continued wearing of contact lenses and this may lead to a relative degree of unawareness on the part of the patient to the presence of corneal damage and therefore resulting in a delay in seeking treatment.

b) *Corneal Ulceration*

It may follow corneal abrasions as a result of secondary infection. It is also seen in poor fitting lenses where there is contact, particularly at the apex resulting in poor tear circulation and insufficient oxygenation of the cornea. It must be remembered that cornea derives nutrition from the tear fluid too. It may also occur if the contact lens is too tight at the periphery.

c) *Corneal Scarring*

Although rare, it is a complication that must be looked for and the ophthalmologist should be aware of. This could result in permanent visual disability.

d) *Conjunctivitis*

The presence of the corneal lenses as foreign bodies might cause conjunctivitis, particularly if the patient is careless or has become careless in his technique in the cleansing, insertion and removal of the lenses. The continued wearing of such lenses in conjunctivitis might lead to corneal ulceration or abscess formation with dire results.

e) *Intraocular Conditions*

The use of contact lenses is unlikely to cause any intraocular condition but may, in the presence of an existing intraocular condition e.g. iritis, glau-

coma give rise to irritation of the eye when wearing becomes uncomfortable and their use should be postponed until the intraocular condition is treated and controlled.

Prevention of Complications

The prevention of complications must be the aim of the ophthalmologist, the optometrist and the patient himself. Strict personal habits of hygiene must be adhered to by the patient. Only sterile, non caustic, cleansing solutions should be used. Cleaning of lenses with saliva should be discouraged. The patient must be told not to experiment with the lenses, to remove them each night and to build up wearing time gradually. The lenses must not be worn when sleeping or when acute eye infection is present. Insertion and removal techniques must be taught and supervised carefully. Regular checking must be made of the patients' eyes and the lenses.

In the initial period of the wearing of these lenses, there are numerous discomforting symptoms which need not necessarily be complications from the wearing of these lenses. Most of them are adaptive symptoms during the initial period and will gradually pass off after a day or two. Since only an ophthalmologist would be able to confirm or deny the presence of ocular damage, the authors emphasize the *necessity* of his supervision in the fitting of these lenses.

2. *Optical Complications:* These exist in many forms.

a) *Spectacle Blur*

This complication is associated mainly with the use of corneal lenses. Spectacle blur is a transient impairment of vision that comes on when a patient changes from contact lenses to spectacles. This may arise when accidentally these lenses are lost or misplaced. This blur is annoying and may last up to 1-2 hours. This blurring is usually due to slight flattening of the contour of the cornea or corneal apical oedema. Prolonged spectacle blur indicates a poor fit.

b) *Light Intolerance*

Another complication that may arise is increased light intolerance. The

contact lenses behave as a foreign body and render the corneal and conjunctival nerve endings more sensitive to light. Much of this can be reduced and removed by properly fitting lenses.

c) *Sattler's Veiling*

Corneal oedema may develop following the use of haptic contact lenses. This is known as veiling and was first described by Sattler. The cause of this condition is probably due to the interference of oxygenation and excretion of carbon dioxide through the epithelium and is largely mitigated by the use of ventilated haptic contact lenses.

CONCLUSION

There must be a considerable degree of cooperation between the technician who fits lenses and the ophthalmologist. This will only lead to a better selection and fitting of cases for contact lenses and their proper follow up and eye care.

While the fitting of contact lenses can be performed by a trained optometrist it is our belief that close supervision and follow up of such persons fitted with contact lenses must be done by an ophthalmologist. It is to be stressed that the indiscriminate use of contact lenses for the patient with small degrees of refractive error which can be fully corrected with spectacles is usually inadvisable. In Singapore to-day, as it has happened in other countries the numerous advertisements for contact lenses, particularly the corneal variety often only publicise their advantages without even mentioning the dangers and disadvantages. If there is no restraint to their indiscriminate use, their great value to both the ophthalmologist and the trained optometrist may be lost and such a wonderful invention may fall into disrepute.

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