Optical Considerations in Contact Lens Fittings

Irving Baker*

Introduction

The widespread use of contact lenses in the general population is a relatively new mode of therapy which has become available to practitioners and patients alike for the amelioration and correction of vision problems. This popularity and acceptance is the result of a number of factors which have had both some beneficial and questionable results upon the appropriate clinical care of patients and on the practitioners who prescribe and provide this method of therapy.

In order to achieve this level of current popularity and usage it is obvious that these health care devices must be relatively safe to use, fairly easy to maintain, reasonably comfortable to wear and provide users with acceptable levels of vision performance. In addition, social and psychological factors as well as the state of the economy have given impetus to this development.

In order to have achieved the present level of utilization of contact lenses it is understandable and essential that these health care devices and their complementary equipment and their supporting pharmaceutical solutions be developed under controlled and standardized manufacturing and clinical conditions. Such actions and activities have been and will continue to be a requirement and responsibility of the lens manufacturers, the pharmaceutical companies and the prescribers of contact lenses.

Statement of Purpose

However, these essential developments and their resultant effects have obscured — at least, in part — the obvious clinical purposes for prescribing these health or vision aids. To emphasize this point it could be stated that the prescribing and fitting of contact lenses are the means to an end and *not* an end in themselves. In referring to contact lenses (or any other optometrical therapy, for that matter) as "the means to an end" it is meant that the end result of optometrical diagnosis and therapy is to achieve for the patient clear, comfortable, single simultaneous binocular vision within the patient's occupational and avocational vision requirements and environments. A clear distinction must be made between achieving the appropriate clinical results and actually "fitting" a contact lens to the eye of a patient. The former deals with vision function and performance while the latter deals with the eye as an organ and more specifically with the tearlayer and the conjunctival and corneal tissues.

Most of the literature and practice is presently more concerned with "fitting" — albeit an essential part of the therapy — than with achieving optimum and acceptable clinical and vision performance. While this may appear to be too harsh a statement, clinical practice suggests that contact lens failures occur not only as a result of corneal insult, physical discomfort and/or loss of patient motivation, but also, in the longer term, unacceptable vision performance, i.e. the lack of clear, comfortable simultaneous binocular vision even though the clinical criteria of the "fit", i.e. the contact lens — cornea relationship, have been met.

In this latter category of "failures" it is found that the patient's vision requirements or environments have changed, that latent deviations (i.e. divergence excess, divergence insufficiency, convergence excess, convergence insufficiency and/or vertical phorias) are present, that residual astigmatism has not been corrected or has been induced, that high anisometropic refractive errors are present and that myopic patients experience the early onset of presbyopic symptoms.

While some of these problems exist in patients who are wearing spectacles, nevertheless it is important to note that the application of contact lens therapy *per se* can and does aggravate specific clinical conditions. (It is, however, equally valid to say that contact lens therapy is, in some cases, the treatment of choice, e.g. irregular astigmatism, aphakia, keratoconus, high amounts of iso-ametropia). Further, it should be stated that contact lens therapy cannot and should not be expected to resolve or ameliorate all vision problems in isolation from spectacle therapy and/or orthoptics. Obviously, the objective of any optometrical therapy is to provide a patient with safe, comfortable, efficient vision performance.

Criteria for Indicating Clinical Performance

Specifically, with respect to contact lens therapy, the following criteria are proposed with the view of applying them as indicators of clinical performance. The greater the compliance (with the criteria) the more likely the objectives of providing long term, safe, comfortable, efficient vision will be met; the lesser the compliance the less likely the objectives will be met.

Criterion #1. The absence of clinically significant amounts of oedema and/or fluorescine staining and/or invasion of blood vessels as observed with a biomicroscope.

Criterion #2. The presence of an adequate and continuous tear supply (particularly "soft" contact lenses), and appropriate "tear break-up time."

Criterion #3. The absence of clinically significant changes in the appearance of the keratometer mires (distortion) and/or changes in the keratometer measurements.

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Criterion #4. The absence of any significant reduction in corrected visual acuity, distance and near, with spectacle correction ("spectacle blur"). [A corollary to this criterion is — the absence of clinically significant changes in the refractive status of the eye as determined by measurement following the removal of contact lenses].

Criterion #5. The absence of clinically significant amounts of ametropia (spherical and astigmatic) as measured with contact lenses *in situ*. [A corollary to this criterion is — the absence of any significant reduction in corrected visual acuity, distance and near, with the contact lens correction.]

Criterion #6. The absence of any clinically significant oculomotor (including accommodative function) and/or sensory (stereoscopic acuity) anomaly as determined by the assessment of these functions with the contact lenses *in situ*.

Criterion #7. Acceptable patient comfort and wearing time.

In applying (and assessing) these criteria, attention is drawn to the fact that numbers 1-4 deal entirely with the *"fitting"* of the contact lenses, i.e. the contact lens — cornea relationships, tear layer and effects upon these tissues. Criteria 5 and 6 deal directly with the effects these lenses have upon those components of the vision system which relate to clear, comfortable single simultaneous binocular vision, i.e. the input or stimulus patterns which subsequently give rise to visual response and performance. [The physical and physiological effects vs. the optical effects and resultant visual responses.]

This paper is not concerned with "fitting" as such. However, these criteria are important in terms of patient safety, comfort and acceptance, and so must be realized to a great degree if the objectives of the therapy are to be achieved. However, the realization of achieving this level of compliance in itself or by itself does not constitute a "successful case". It merely, but importantly, signifies a successful "fitting" of the contact lenses, an important and integral part — but only a part — of the total clinical picture.

Optical Properties of Spectacle and Contact Lenses

It is with the "other part" of the clinical picture that this paper will attempt to deal with in some detail, i.e. what occurs to the "optical system" in terms of spectacle and ocular refraction, stimulus to accommodation, stimulus to convergence, and size of the ocular images, when a patient is changed from spectacle therapy to contact lens therapy.

This can be put in another way. Spectacle lenses and contact lenses differ in the manner in which they correct ametropia. The optical properties of the two systems differ in many significant respects and, accordingly, make the vision performance of a contact lens wearer quite different from the vision performance of the spectacle wearer. While the patient's vision response to a specific lens system is strongly influenced by the visual acuity obtained through the lens system, the patient's vision response (i.e. performance) cannot be evaluated only in terms of Snellen acuity: optical properties of the lens system (spectacle or contact lens), other than focal power, effect the patient's *total* vision response (performance). Some patients achieve better vision performance with spectacles, others with contact lenses and some achieve clinically acceptable vision performance with either system of correction.

A review of "vision with contact lenses", particularly as a function of the optical properties of both the contact lens and the fluid media present between the lens and the cornea, would now appear to be appropriate.

1. *Ocular Refraction and Spectacle Refraction*

a) In hyperopia, the contact lens power required is always *greater* than is required in a spectacle lens.

b) In myopia, the contact lens power required is always *less* than is required in a spectacle lens. (See figures 24 and 25)

Source: Gorsvenor, T.P. "Contact Lens Theory and Practice" The Professional Press, 1963 Chicago, pp. 72-73.

This variation between ocular refraction and spectacle refraction is a function of the vertex distance and

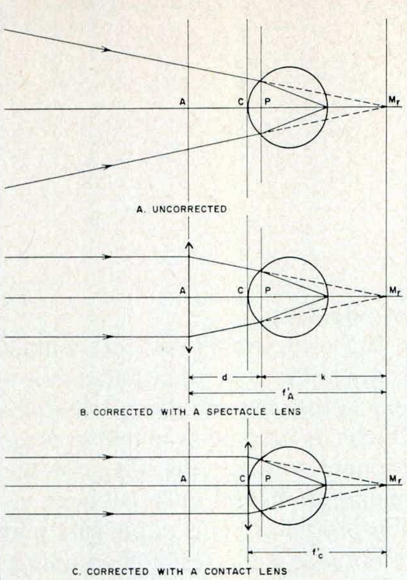

Figure 24. Spectacle and ocular refraction in hyperopia.

lens powers. If lens powers are less than ±4D the difference can be neglected; if greather than ±4D the relationship is expressed by the formula:

$$K \text{ (ocular refraction)} = \frac{F \text{ (spectacle refraction)}}{1\text{-d (vertex dist. in M) } F}$$

Further, it is to be noted that K (ocular refraction) equals the contact lens power *providing* the lens is fitted on K. If the contact lens is not fitted on K (i.e. the low dioptric power as measured by the keratometer) then the power of the contact lens requires modification:

(i) if *steeper* than the flattest meridian, *decrease* plus power (or *increase* minus power) by an amount equal to the number of diopters by which the base curve of the lens is *steeper* than the flattest corneal meridian.

(ii) if *flatter* than the flattest corneal meridian, *increase* plus power (or *decrease* minus power) by an amount equal to the number of diopters by which the base curve of the lens is *flatter* than flattest corneal meridian.

These latter adjustments, of course, do not relate to the fitting of soft contact lenses although, on occasion, the calculation of ocular refraction as the contact lens power for soft lenses does not appear to be consistent with expectations.

2. *Evaluations of Residual Astigmatism*

a) by working definition —

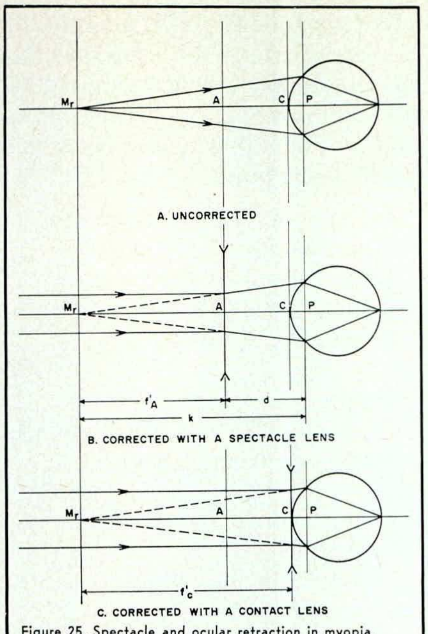

Figure 25. Spectacle and ocular refraction in myopia.

Residual Astigmatism = Total Astigmatism* − Corneal Astigmatism

*Total Astigmatism = Corneal Astigmatism + Residual Astigmatism.

eg.(1)

Spectacle Rx −3.00 D.S./ −1.50 D.C. × 90

K readings 42.50 at 180
42.00 at 90 = −.50 × 90

∴ R.A. = −1.50 × 90 — (−.50 × 90) = −1.00 × 90

Spectacle Rx −3.00 D.S./ −1.50 D.C. × 90*

K readings 42.50 at 90
42.00 at 180 = −.50 × **180***

*Note: Total astigmatism is "against the rule" (× 90) while corneal astigmatism is "with the rule" (× 180). When this occurs it is necessary to transpose the corneal astigmatism into plus cylinder form. Thus—

R.A. = −1.50 × 90 − (−.50 × 180) = −1.50 × 90 − (+ .50 × 90) = −2.00 × 90

When the calculated residual astigmatism is 0.75D or more there is the probability that visual acuity through "spherical" contact lenses will be significantly poorer than with spectacles.

Clinically when this occurs, i.e. estimated residual astigmatism of .75D or more there is the requirement for further evaluation of this element of the optical system. This can best be done — for it is a direct measurement — by using a trial contact lens with the appropriate base curve and measure the refractive status of the eye with the lens in place. This will not only establish the amount of residual astigmatism present (if any) but also will determine the visual acuity (at distance and near) with only the spherical component (equivalent sphere) of the correction in place.

Depending upon the results of this assessment the practitioner is now in the position to counsel the patient appropriately and take the appropriate clinical action. Such action and counsel could be to advise against the use of this form of therapy, to suggest the use of spectacles (containing the measured amount of astigmatism) for specified types of vision requirement or consider the application of non-rotating contact lenses incorporating a front surface cylinder.

3. *Non-rotating or Toric Contact Lenses*

Since residual astigmatism has just been discussed and reference was made to non-rotating contact lenses, reference should be made to the three classes of this type of lens since they do have an effect on the optical system.

(i) Toric front surface lens — a lens with a toric front surface and spherical back surface. This form of lens serves an optical or vision requirement.

(ii) Toric base lens — a lens with a spherical front surface and a toric back surface. This form of lens serves a physical or fitting need, i.e. the lens-cornea relationship may be improved when fitting a "toric cornea". However, the optical properties of this lens cannot be overlooked or neglected since they sometimes increase the astigmatic refractive state, and sometimes they correct or reduce the astigmatism present in the eye. Accordingly, careful evaluation of these possible effects have to be explored with the contact lens *in situ*.

(iii) Bitoric lens — a lens with toric front and back surfaces. This form has the characteristics and features of both the previously noted lenses.

4. *Aberrations*

Contact lenses, because they rotate with the eye (as opposed to the fixed position of a spectacle lens before the eye), eliminate most of the aberrations such as oblique astigmatism, distortion, coma and curvature of the field.

However, contact lenses in *air* have more spherical aberration than spectacle lenses because they have a relatively high curvature for their aperture. However, the contact lens *on the eye* increases the inherent aberrations in the eye. As a result it has been shown that under reduced illumination and the dilated pupil, visual acuity with contact lenses decreased more quickly than with spectacle lenses. This may account for some symptoms of patients who have large size pupils.

5. *Accommodation*

When a patient accommodates to focus on a near object the amount of accommodation required is different depending upon whether the ametropia is corrected by contact lenses or spectacle lenses. To clarify this point it is necessary to review the formulae proposed by Pascal (1) and defined as the "accommodative unit".

For the natural emmetrope, this unit equalled 1.00D, but for the hyperope corrected by spectacle lenses it was always *more* and for the myope similarly corrected always *less*. This can be expressed by the following formulae —

(i) for each diopter of hyperopia, the unit is expressed as 1 + .04 (diopters of H).

(ii) for each diopter of myopia, the unit is expressed as 1 − .03 (diopters of M).

To illustrate, assume that there are three subjects, one a natural emmetrope, the second a corrected hyperope of (+)4.0D and lastly a corrected myope of (−)4.00D all fixating a target at 33 cm.

a) the A.U. = 1 for the emmetrope,
∴ accommodation exerted is 3 × 1 = 3D.

b) for the hyperope,
the A.U. = 1 + .04(4) = 1.16,

∴ accommodation exerted is
3 × 1.16 = 3.48D.

c) for the myope,
the A.U. = 1− .03(4) = .88,
∴ accommodation exerted is
3 × .88 = 2.64D.

It can be stated that when the "near point" is considered the effect of the *spectacle correction lens* varies significantly, and that a corrected ametrope is *not* an emmetrope. On the other hand, the effect of the contact lens correction does not vary significantly when the "near point" is considered, and therefore, the corrected ametrope — in this case is an "emmetrope".

As a result of this optical effect or property, a spectacle corrected myope changed to contact lenses will experience a change in the stimulus to accommodation and this change will require the myope to use *more accommodation* than was in the case when wearing the spectacle correction (see A.U. example). Similarly, the spectacle corrected hyperope changed to contact lenses will also experience a change in stimulus to accommodation with the result that this hyperope will be required to use *less* accommodation than was the case when wearing the spectacle correction. (see A.U. example).

These changes in the stimulus to accommodation which occur when changed from spectacle lenses to contact lenses have a number of clinical implications:

(i) The myope fitted with contact lenses may experience ocular discomfort, difficulty in focussing, headaches when doing close work. Frequently the symptoms subside when adaptation to the increased stimulus to accommodation occurs.

(ii) The myope who is also an incipient presbyope will experience difficulty with the full contact lens correction since there is an *increase* in the stimulus to accommodation.

(iii) The hyperope who is also an incipient presbyope will experience less difficulty with the full contact lens correction (as compared to the spectacle lens correction) since there is a *decrease* in the stimulus to accommodation.

(iv) Since the stimulus to accommodation is altered, (increased in M, and decreased in H), the stimulus to accommodative convergence is altered. Consequently, this change in stimulus could have clinical significance — particularly if the A/CA is high—as it affects oculomotor function.

6. *Convergence*

To fixate, binocularly, an object at a distance closer than infinity, the convergence (in prism diopters) required for an *emmetrope* is equal to the dioptric distance from the object multiplied by the P.D. in centimeters. The convergence required for an *ametrope* when wearing contact lenses is the same as that required by an emmetrope since on convergence the lens rotates with the eyes and the lines of sight remain directed essentially through the centres of the lenses.

However, when a hyperope converges through spectacle lenses (which have been centred for distance) *base out* effect results and consequently the amount of convergence to fixate a "near object" is *greater* than the amount of convergence required by the emmetrope or contact lens wearer. Similarly, a myope converging through spectacle lenses (which have been centered for distance) encounters increasing *base in* effects and consequently the amount of convergence required is *less* than the amount of convergence required by the emmetrope or contact lens wearer. The following examples will clarify these points:

Interpupillary distance 65 mm
(near 60 mm).
Object distance = 33.3 cm
Convergence (△) = P.D. (cm)
× dioptric distance.

Emmetrope
Convergence = 6.5 × 3 = 19.5△
Ametrope corrected with C.L's
C = 6.5 × 3 = 19.5△
−5.00 Myope corrected with spectacles
C = 6.5 × 3 = 19.5△
= 5 × .5 = 2.5 △ BI
Convergence = 17.0△
+5.00 Hyperope corrected with spectacles
C = 6.5 × 3 = 19.5△
△ = 5 × .5 = 2.5 △ B.O.
Convergence = 22.0△

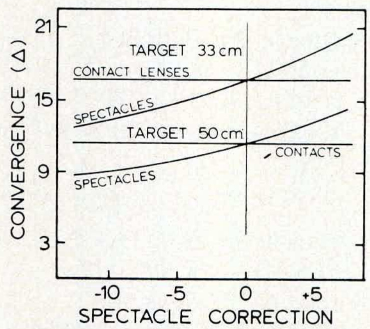

Figure XXIII-8 - Convergence in prism diopters that has to be exerted by patient (P.D. 65 mm.) with the spectacle ametropia shown on the abscissae of the graph, when viewing a target 33.3 cm. and 50 cm., respectively, in front of the spectacle plane when wearing spectacle lenses and contact lenses (from Westheimer, 1962).

Source: (for Figs. XXIII-7 & XXIII-8) I.M. Borish, "Clinical Refraction," The Professional Press, Chicago, Third Edition, 1970, p. 994.

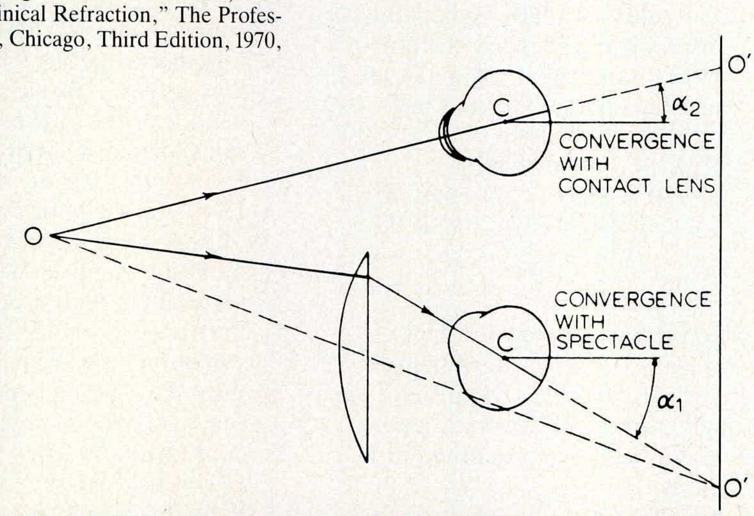

Figure XXIII-7 – Convergence required with plus spectacle lens (α_1) is greater than with contact lens (α_2). O′ is the image of O as formed by the spectacle lens positioned at a distance d from the corneal apex. C is the center of rotation of the eye.

In summary:

The contact lens myope *accommodates more* and *converges more* when fixating a near object as compared with wearing spectacle lenses.

The contact lens hyperope *accommodates less* and *converges less* as compared with spectacle lenses.

This being the case, these optical effects and the changes in the stimulus to accommodation could be clinically significant in some cases of accommodative and oculomotor anomalies. Sometimes they can be used to advantage and sometimes they create problems, e.g. the myope with convergence excess (high A/CA ratio) and the hyperope with convergence insufficiency (low A/CA ratio).

7. *Magnification*

In discussing this optical effect no attempt will be made to derive formulae or deal with spectacle magnification or contact lens magnification specifically. The purpose is to *compare* the size of the retinal image as formed by a contact lens and a spectacle lens. This can be done by the use of two simple formulae:

(1) difference in retinal image size (Spectacle/CL)
$= C.L.M. = 1 - d_1 . F_s$
where d_1 = vertex distance in metres
F_s = spectacle lens power.

(2) %M. = 100 (C.L.M. − 1)

The following examples will clarify the application of the formulae and identify the magnification effects when changing a patient from spectacle lenses to contact lenses.

(i) −10D myope, vertex distance 14 mm.
(1) C.L.M. = 1 − (.014 × −10) = 1.140
(2) %M = 100 (1.140 − 1) = +14% i.e. C.L. image 14% larger than spectacle image.

(ii) +10D hyperope, vertex distance 14 mm
(1) C.L.M. = 1 − (.014 × +10) = 0.860
(2) %M. = 100 (.860 − 1) = −14%
i.e. C.L. image 14% smaller than spectacle lens image.

From these examples it can be seen that the *myope* will always have a *larger* retinal image with contact lenses than with spectacles, and the *hyperope* will always have a *smaller retinal image* with contact lenses than with spectacles. These optical characteristics have some interesting clinical effects and applications.

1. The contact lens hyperope may experience some difficulty at the near point, e.g. reading, since the size of the retinal image has been diminished.
2. If cases of ametropia can be identified as being either axial or refractive then it would be possible to determine whether spectacle correction or contact lens correction would be more suitable. Optically we know that the *relative spectacle magnification* will be *unity* for an *axial ametrope* if a spectacle lens is provided and *unity* for a *refractive ametrope* if a contact lens is provided.

This being the case, these considerations are important in considering which type of lens should be supplied when anisometropia is present. However, the difficulty in practice is to establish whether the anisometropia is *axial* or *refractive*. However, there are some indicators and cases where we may be able to predict whether the ametropia is axial or refractive.

(i) Compare the flat K readings of the two eyes and if they are essentially *equal* the anisometropia may be considered to be *axial* and, accordingly, spectacle lenses are less likely to give rise to aniseikonia; on the other hand if the flat K readings are different in amount and approximately equal to the difference in power between the two eyes, the anisometropia could be considered to be *refractive* and, accordingly, contact lenses are less likely to give rise to aniseikonia.

(ii) Where the axes or amounts of astigmatism are noticeably different between the two eyes, contact lenses would be the treatment of choice since astigmatism is a *refractive anomaly*.

(iii) High spherical ametropia is much more likely to be *axial* than refractive and, consequently, when anisometropia exists in such cases spectacle lenses are less likely to give rise to aniseikonia.

(iv) Aphakia is a condition which is mostly *refractive* and consequently contact lenses afford the only opportunity to restore single binocular vision.

(v) Keratoconus can be classified as *refractive ametropia* and contact lenses (aside from visual acuity) minimize the possibility of aniseikonic effects.

Summary and Suggestions

The review of the optical properties of the "systems", i.e. spectacle lens and contact lens, shows that the two "systems" or corrections differ in many respects and result in the fact that the vision performance of a contact lens wearer and the vision performance of a spectacle wearer can be quite different. In clinical terms these "differences" can be used to advantage, and sometimes these "differences", if not appropriately identified by the practitioner, can create or cause additional vision problems or discomfort for the patient. Since this is the case, it logically follows that prior to prescribing contact lens therapy the practitioner should carefully consider the keratometer findings, the nature and type of the refractive status, the accommodative status and the status of the oculomotor-sensory mechanism.

In other words there should be three "diagnoses" which relate to the vision performance status of the patient at the time of the examination:

(i) Diagnosis of ametropia —
(a) type of refractive error
(b) indications of axial or refractive etiology.

(ii) Diagnosis of the accommodative function.

(iii) Diagnosis of the oculomotor-sensory function.

On the basis of these three diagnoses the practitioner can make certain predictions, select the appropriate form of lens and/or orthoptic therapy and counsel the patient accordingly.

It may very well be that to satisfy the patient's vision needs and vision

cont'd on p. 55

Footnotes to mutual funds roundup

R Fund is eligible for Registered Retirement savings Plans.

(a) All invested in All-Canadian Dividend.
(b) All invested in Grouped Income Shares.
(c) All invested in Montreal Trust Mortgage.
(d) All invested in Montreal Trust Mortgage.
(e) Not currently offered.
(f) Redemption fee: 5% of net asset value, but not more than 9% of investment.
(g) Stock exchange rates on sales, 1% on redemptions.
(k) Redemption charge: $1.50
(m) $5 initial charge.
(n) No sales or redemption charge, minimum investment $100,000.
(o) Less than 0.05%.
(p) Stock exchange rates on sales, one-half rates on redemptions.

Your RRSP may also be invested in a combination of stocks, bonds, or mortgages through participation in mutual funds. As the report points out the weighted average gain made by the equity funds which can or cannot be used for RRSP purposes over the 12 months ended Dec. 31, 1979, was 30.2%.

Their calculation in the table below does not take into account the cost, if any, of purchasing fund shares, and they assume that all dividends paid out are reinvested.

By way of comparison, they list the changes in some of the stock market indexes over the same 12 months that are without benefit of dividend reinvestment:

- Toronto Stock Exchange 300 gained 38%;
- TSE golds were up 82%;
- TSE oil and gas rose 103%;
- Dow Jones industrial average rose 4%;
- New York Stock Exchange composite gained 16%;
- Standard & Poor's 500 rose 12%.

Life Insurance companies also operate investment funds that offer either equity or fixed income features that can be incorporated into your RRSP. The following table taken from the report shows the performance of some insurance company funds sold to individuals without the cost of purchasing the policies taken into account.

How life insurance funds fared

THE TABLE below shows the performance of some life insurance company funds sold to individuals.

Such policies generally contain guarantees of minimum benefits. Costs of purchasing the policies have not been taken into account.

—Total net assets— Dec 31 1979 $000	Change since Dec 31 1978 %			Unit value Dec 31 1979 $	—Change from— Dec 31 1978	Dec 31 1974 —%—	Dec 31 1969
		Equity funds					
12,230	+22	Abbey Life N. American	R	2.20	+27.2	+364.2	+308.7
1,767	+27	Alliance Mutual	R	20.41	+32.9	+131.1	+102.6
6,635	+16	Canada Life E.2	R	50.27	+31.2	+135.4	+141.1
13,947	+26	Canada Life S.9	R	24.92	+31.4	+124.3	+136.5
1,815	+24	Canadian General Life	R	36.97	+24.0	+135.2	+168.5
399	+32	Canadian Reassurance		28.22	+38.0	+206.0	+172.4
615	+35	Citadel Life	R	3.47	+45.4	+156.7	—
18,091	+35	Confederation Life A	R	4.34	+35.3	+162.4	+178.2
35,512	+25	Confederation Life B	R	4.25	+37.3	+159.9	+164.0
17,647	+25	Crown Life (C.C.I.F.A.)	R	24.30	+23.7	+101.5	+107.5
32,129	+48	L'Assurance–Vie Desjardins		27.40	+37.8	+163.0	+117.1
992	+30	Dominion of Canada General	R	14.47	+29.7	+181.0	+181.5
14,313	+30	Dominion Life	R	26.28	+32.7	+112.3	+94.2
14,223	+14	Empire Life	R	12.61	+32.9	+169.4	+164.9
7,262	+40	Equitable Life Canada	R	36.06	+38.6	+158.8	+175.1
1,019	nil	Fidelity Life	R	19.86	+19.6	+92.1	+78.4
34,402	+25	Great–West Life	R	2.67	+37.1	+129.9	—
1,793	+24	Imperial Life — Growth		27.52	+37.6	+132.9	+141.2
4,963	+20	Imperial Life — Retirement Growth	R	27.27	+38.6	+139.8	+159.8
32,640	−19	Manufacturers Life	R	2.52	+37.3	+131.4	—
5,497	+45	Monarch Life	R	5.14	+41.2	+134.0	+178.8
60,031	+18	Mutual Life A	R	39.02	+37.0	+131.6	+111.0
4,418	+46	Mutual Life B		23.07	+40.8	+131.8	—
22,156	+21	National Life	R	56.34	+32.4	+128.1	+139.3
1,616	+23	National Life — Equannuity	R	23.47	+30.9	+122.2	—
9,213	+40	North American Life Growth R	R	21.60	+28.4	+98.0	+110.3
6,633	−2	North American — fixed income B	R	14.80	+2.6	+47.0	—
3,266	+31	Norwich Life	R	2.47	+38.0	+130.8	+100.8
59,523	+38	Prudential Assurance	R	39.94	+38.9	+137.3	+129.8
2,248	+39	Prudential Assurance — Pruvest	R	32.94	+49.4	+153.2	—
33,028	+33	SunFund	R	21.57	+35.7	+141.6	+110.2
		Fixed income funds					
22,467	−1	Canada Life S.19	R	15.62	+0.5	+46.0	—
1,079	+10	Canadian General Life — fixed income	R	23.92	+8.3	+92.1	+136.1
8,620	−2	Confederation Life —C— fixed income	R	2.04	+1.7	+56.8	—
35,848	+24	L'Assurance–Vie Desjardins — bond		22.05	+0.5	+52.4	+117.3
43,622	+14	L'Assurance–Vie Desjardins — mortgage		18.68	+5.3	+59.7	—
2,757	+2	Equitable Life Canada — Bond	R	21.12	+1.8	+53.2	+112.9
3,039	+0.2	Mutual Life — fixed income	R	16.47	+3.3	+53.8	—
		Newer funds (date first offered)				Change since inital offering date	
412	+63	Abbey Life Growth —equity— (Dec/75)	R	2.06	+54.0	+102.7	—
640	+21	Abbey Life Selective — fixed — (Aug/75)	R	1.34	+9.9	+31.5	—
1,955	+45	Canada Life S.29 — money mkt. (Jan./75)	R	15.06	+10.9	+46.7	—

Optical Considerations in Contact Lens Fittings

(cont'd. from p. 43)

problem the use of contact lenses is contraindicated *or* that contact lenses are the treatment of choice *or* the use of contact lenses be complemented by spectacle lenses and/or orthoptics *or* spectacle lenses are the treatment of choice. Whatever the clinical decision, it will be based upon a thorough clinical examination and a consideration of the optical facts related to lens therapy as well as consideration of the patient's personal history, occupational and avocational settings and requirements.

REFERENCE

1. Borish, I.M. Clinical Refraction 3rd Ed., Chicago, The Professional Press, 1970, pp.176-7.

QUEBEC SHARES PRACTICE SURVEY RESULTS

CAO will be receiving the results of an extensive mode of practice survey commissioned by L'Association Professionnelle des Optometristes du Quebec. The APOQ's $18,000 study is part of "Operation Regroupement" designed to help the profession diminish the impact of monopolistic commercial influences in Quebec. One aspect of the survey indicated group practices were more efficient, offering the practitioner a greater return, while offering the public a greater range of services and office hours. Practitioners were also able to see a greater range of cases.

Correction for Book Review

We regret any inconvenience caused by the omission of all the publishing data for "Atlas of Strabismus Surgery" by E.M. Helveston, in our last issue. The remaining details are: Publisher, C.V. Mosby, 1977, Hardcover, 262pp., $42.75.