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An Analysis of the Accuracy of Prediction of Intraocular Implant Power in the Myopic Patient

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Summary
A series of 90 eyes of 88 myopic patients who underwent extracapsular cataract surgery with intraocular lens implants (IOLs) between 1984 and 1989 were analysed in a retrospective study. The axial length as obtained by ultrasonic A scan and keratometry readings were applied to the SRK1 and modified SRK (SRK2) formulae[1–3] and the result compared with the actual post-operative state achieved.

Myopic patients receiving lens implants of 17 dioptres (D) or less were identified by a search of the operating theatre records. The axial length was obtained using an Allergan Humphrey A scan biometer and the corneal curvature was assessed with Haag-Streit keratometer. The post-operative refractive error (assessed at least four months after surgery) was compared with the predicted outcome of the SRK1 and modified SRK formulae.

The IOLs used in these patients were: IOLAB 107G; Coburn 66 UV; Coburn 72 UV; Cilco SK21 and Rayner 870 UV.

For data analysis the post-operative refractive error was converted to the spherical equivalent (SE).

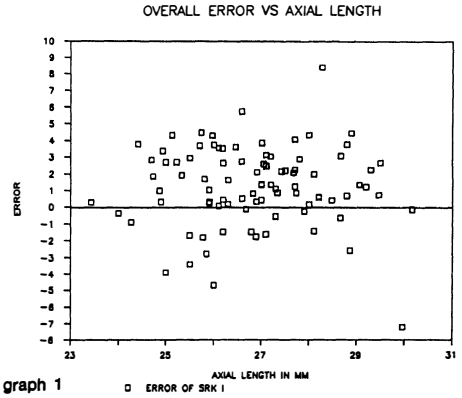
The SRK1 formula is $P = A - 2.5\,L - 0.9\,K$, where P is the implant power, A is the A constant of the IOL, L is the axial length (in mm) and K is the average corneal curvature (in dioptres).

The SRK2 formula is modified such that if:
$L < 20.0$ mm then $A1 = A + 3$
$L < 21.0$ mm then $A1 = A + 2$
$L < 22.0$ mm then $A1 = A + 1$
$L < 24.5$ mm then $A1 = A$
$L < 24.5$ mm then $A1 = A - 0.5$

The mean axial length of eyes in this study was 26.9 mm. The maximum was 30.16 mm and the minimum 24 mm.

Results

Using the SRK1 formula the average absolute error was 2.16 D with a range of −7.2 D to +8.5 D (Graphs 1 and 3). Using the SRK2 formula the average absolute error was 2.07 D with a range of −3.5 D to +7.8 D (Graphs 2 and 3).



graph 1

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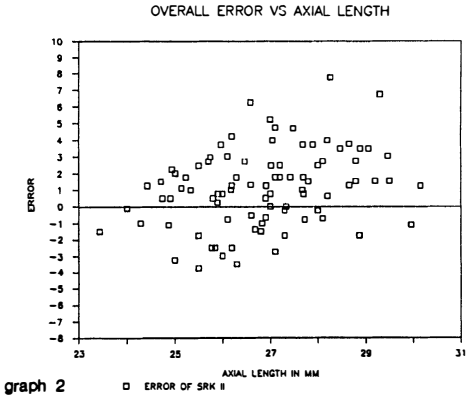


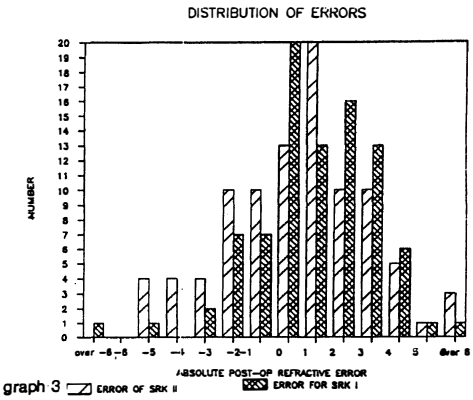
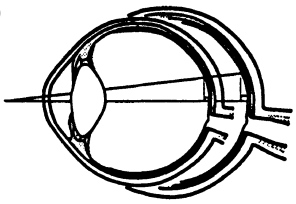


Fig. A *Comparison of Accuracy of Prediction of IOL Power.*

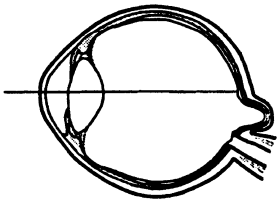
Data source	Number of eyes	Error (%) < 1D	1 to 2D	< 2D	Worst error + (D) −
Sanders 1980 (emmetropes)	923	81	15	4	6 5
Hoffer 1981 (hypermetropes)	63	86	9	5	2.5 2.6
Sanders 1981 (emmetropes)	654	84	14	2	3.8 3.1
Our study SRK1 (myopes)	90	30	22	48	8.5 7.2
Our study SRK2 (myopes)	90	36.7	26.7	36.6	7.8 3.5

fig. b



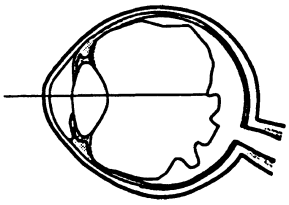
Off axis A scan in a longer myopic eye may result in a greater error of axial length

fig. c



A scan missing a posterior pole staphyloma will result in a large post operative myopia

fig. d



Reading from the posterior hyaloid face, especially easy if there is disbelief in the true extremely large axial length
Again, post operative myopia will result

Conclusions

The wide variability of errors obtained in this study when compared with other workers using the SRK formula for emmetropic[2,5] and hypermetropic patients[4] suggests that the accuracy of prediction of the IOL power is reduced in patients with axial myopia. (Fig. A) We suggest that the errors may arise from multiple sources:

(1) A relatively small error in alignment of the ultrasound beam in a long eye will induce a proportionately larger error in the measured axial length. (Fig B)

(2) If the ultrasound beam misses a posterior pole staphyloma the axial length will be falsely short. (Fig. C)

(3) If the true axial length exceeds the limits of the biometer (32 mm) the sonic reflection of PVD may be mistaken for the retinal echo. (Fig. D)

(4) The anterior chamber (AC) depth will be greater in the long eye and thus the A constant of the IOL may well be incorrect.

We are unable to find any statistical link between any of the variables (axial length, corneal curvature or A constant) and the refractive error obtained. It may be that there were inaccuracies in the pre-operative measurements or that other factors (such as AC depth) should be taken into account.

Key words: Implant (IOL). Myopic. Prediction.

References

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