Improving the accuracy of sulcus IOL selection with a validated calculator

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Introduction

Implantation of a three-piece intraocular lens (IOL) in the ciliary sulcus during cataract surgery complicated by posterior capsular rupture (PCR) requires recalculation of IOL power and an adjustment to account both for the relative anterior position of the lens and the difference in A constant.[1,2]

Results

In ninety-one eyes (49.5%), a three-piece IOL was implanted in the ciliary sulcus whose target refraction differed from the pre-operatively selected refractive outcome with a single-piece IOL by more than 1 dioptre (D), as shown in Figure 1.

There was a weak correlation between the power of the desired capsule lens and the extent of the theoretical refractive error (r=0.3).

The error rate for consultants (56%) was not statistically significantly different from trainees' (47%, p=0.2).

Our calculation tool was able to correctly select an appropriate IOL power in this group of patients in all cases (Figure 2).

Method

A calculation interface was developed incorporating A-constant values for a selection of commonly used single-piece and three-piece IOLs as well as guidance relating to IOL power adjustment from in-the-bag to the ciliary sulcus.

This tool was validated on 179 eyes of patients who underwent complicated cataract surgery at the Bristol Eye Hospital requiring the implantation of a three-piece IOL in the ciliary sulcus between April 2016 and June 2021.

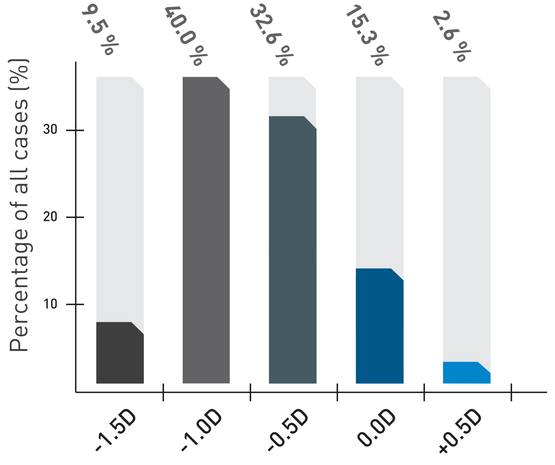


Figure 1: Distribution of theoretical refractive error as a result of incorrect three-piece IOL selection

Conclusions

There was a tendency to underpower sulcus IOLs. A simple calculation tool that eliminates the need for manual adjustment of IOL power intraoperatively may reduce the risk of IOL power calculation error and lead to improved refractive outcomes in patients undergoing cataract surgery complicated by PCR.

Bag to sulcus conversion SA60AT to MA50BM

Bag SA60AT	Sulcus MA50BM	Bag SA60AT	Sulcus MA50BM
40.0	**39.0**	23.0	**22.5**
39.5	**38.5**	22.5	**22.0**
39.0	**38.0**	22.0	**21.5**
38.5	**37.5**	21.5	**21.0**
38.0	**37.0**	21.0	**20.5**
37.5	**36.5**	20.5	**20.0**
37.0	**36.0**	20.0	**19.5**
36.5	**35.5**	19.5	**19.0**
36.0	**35.0**	19.0	**18.5**
35.5	**34.5**	18.5	**18.0**
35.0	**34.0**	18.0	**17.5**
34.5	**33.5**	17.5	**17.0**
34.0	**33.0**	17.0	**17.0**
33.5	**32.5**	16.5	**16.5**
33.0	**32.0**	16.0	**16.0**
32.5	**31.5**	15.5	**15.5**
32.0	**31.0**	15.0	**15.0**
31.5	**30.5**	14.5	**14.5**
31.0	**30.0**	14.0	**14.0**
30.5	**29.5**	13.5	**13.5**
30.0	**29.0**	13.0	**13.0**
29.5	**28.5**	12.5	**12.5**
29.0	**28.0**	12.0	**12.0**
28.5	**27.5**	11.5	**11.5**
28.0	**27.5**	11.0	**11.0**
27.5	**27.0**	10.5	**10.5**
27.0	**26.5**	10.0	**10.0**
26.5	**26.0**	9.5	**9.5**
26.0	**25.5**	9.0	**9.5**
25.5	**25.0**	8.5	**9.0**
25.0	**24.5**	8.0	**8.5**
24.5	**24.0**	7.5	**8.0**
24.0	**23.5**	7.0	**7.5**
23.5	**23.0**	6.5	**7.0**
		6.0	**6.5**

Figure 2: The sulcus lens selection tool for the SA60AT lens

References

1. Hill W. Calculating bag vs sulcus IOL power. Available at: https://www.doctor-hill.com/iol-main/bag-sulcus.htm. Accessed 11 May 2022

2. Devgan U. The Rule of Nines for Sulcus IOL Power. Available at: https://cataractcoach.com/2018/06/25/how-to-determine-sulcus-iol-power-and-ac-iol-power/. Accessed 11 May 2022

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