

Background

- Posterior capsule ruptures (PCRs) are frequently reported as one of the most common complication to occur during cataract surgery and are associated with poor visual outcomes,¹ additional complications,² and increased resource use.³⁻⁸
- The Intrepid® Hybrid tip has a rounded polymer edge designed to decrease the risk of PCR during cataract surgery.
- The purpose of this study was to compare PCR rates with the Intrepid® Hybrid tip and conventional metal tips and to calculate the subsequent PCR management costs using an economic model.

Methods

Targeted Literature Reviews

- PubMed was searched in January 2021 using terms such as “Intrepid Hybrid tip”, “phacoemulsification or cataract surgery”, and “posterior capsule rupture” to identify model inputs. Additional reports were identified through supplemental grey literature searches.
- Clinical and experimental studies were included if they used the Intrepid® Hybrid tip or if they reported either PCR rates (overall or resident-specific) or associated resource use.
 - Articles published in 2010 or later in the English language were included.
 - PCR rates were taken from studies with ≥1,000 cataract surgery cases.
- No restrictions were applied to studies that reported PCR-related costs or revenue losses.

Decision Analytic Model

- A model was developed in Excel from the United States (US) health care provider’s perspective for a hypothetical cohort of 1,000 cataract surgery patients. Costs are presented in 2019 USD.
- Costs were determined for cataract surgeries overall and for resident-performed surgeries using their respective PCR rates. No other inputs varied between the two analyses.
- Maximum cost savings with the Intrepid® Hybrid tip were calculated using the highest PCR and vitrectomy rates identified in the literature.
- The model calculated direct costs (phacoemulsification tips, operating room and staff time for subsequent vitrectomy, and additional office visits) and indirect costs (loss of revenue due to fewer referrals and placement of monofocal intraocular lenses instead of advanced-technology intraocular lenses). A 2% decrease in referrals due to PCRs was assumed.

Results

PCR Rates with Conventional Tips

- PCRs occurred in 0.60%-2.39% of cataract surgeries.^{1,9-12} Rates were higher for resident-performed surgeries compared with overall rates, ranging from 0.8%-13.0%^{1,8,9-14} (**Table 1**).

Table 1. Rate (%) of posterior capsule ruptures in cataract surgeries

Article	Surgery	Overall		Residents	
		N	Rate	N	Rate
Khanna 2012* ⁸	MSICS, PE	--	--	1,029	5.6
Ti 2014* ¹	PE	48,377	1.8	10,545	3.4
Clarke 2017* ¹³	PE, ECCE	--	--	1,290	7.0
Low 2018* ⁹	PE	8,738	1.1	3,847	0.8
ESCRS 2018* ¹⁰	PE, ECCE, FLACS, other [§]	324,367	0.6	289	2.1
Donachie 2018* ¹¹	PE	183,812	1.4	49,330	2.0
Melega 2020* ¹⁴	PE	--	--	730	13.0
Oliveira-Ferreira 2020* ¹²	PE	2,937	2.4	752	3.5

* Retrospective study design; † Prospective study design; ‡ Registry, prospective/retrospective not defined; § “Other” cataract surgeries were not defined in the report.
Abbreviations: ECCE = extracapsular cataract extraction; FLACS = femtosecond laser-assisted cataract surgery; MSICS = manual small-incision cataract surgery; PE = phacoemulsification.

PCR Rates with the Intrepid® Hybrid Tip

- In an experimental study, the Intrepid® Hybrid tip required up to 4x the torsional power during phacoemulsification compared to a metal tip before PCR occurred upon contact with the capsule.¹⁵
- Based on these results, the Intrepid® Hybrid tip was estimated to reduce the incidence of PCR by up to 4x when compared to metal tips:
 - This would result in PCR rates ranging from 0.15%-0.60% for phacoemulsification overall and 0.2%-3.25% for resident-performed phacoemulsification.

PCR-related Resource Use

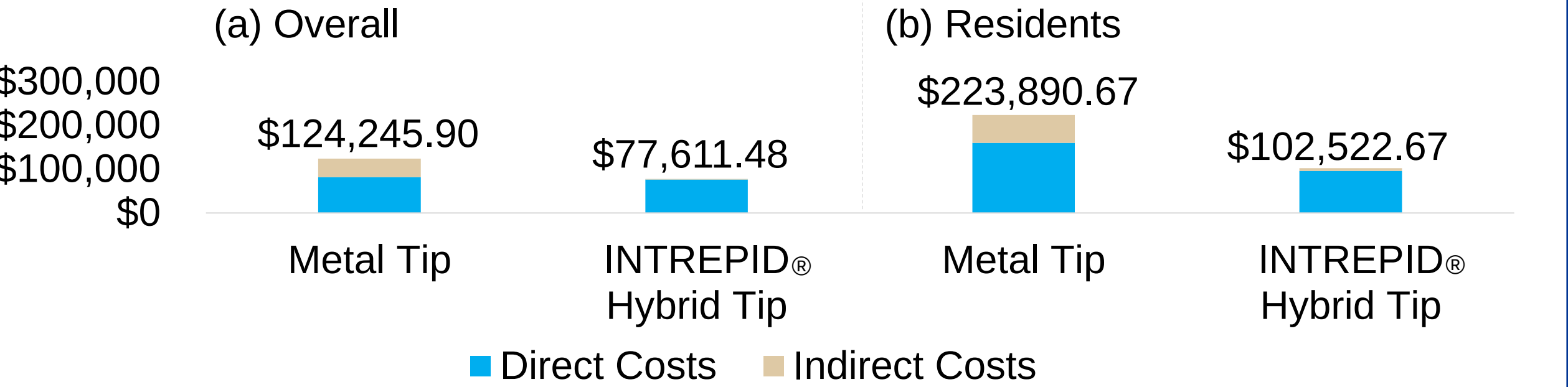
- Three studies (2 retrospective reviews and 1 case-control study) reported that each PCR resulted in an average of 3 additional follow-up visits.^{3, 4, 5}
- Vitrectomy was required to treat 10%-69% of PCR cases (3 retrospective reviews).^{3, 6, 7}

Results continued

Model Results

- Compared to conventional metal tips, the Intrepid® Hybrid tip may have the potential to save US health care providers up to \$46,634.43 in PCR-related costs per 1,000 phacoemulsification cases (**Figure 1a**).
- For resident-performed phacoemulsification, the PCR-related cost savings may reach up to \$121,368.00 per 1,000 cases (**Figure 1b**).

Figure 1. PCR-related cost to US health care providers (N = 1,000)



Discussion and Conclusions

- Using the Intrepid® Hybrid tip instead of a metal tip may help decrease the incidence of PCR during cataract surgery, thereby reducing health care resource use and costs to providers.
- Future clinical studies are required to verify the assumptions made based on experimental data and to account for confounding factors that may impact PCR rates, such as surgeon experience and patient characteristics.

References and Disclosures

1. Ti et al. (2014) *Am J Ophthalmol*. 157(1):180-185.e181. 2. Day et al. (2015) *Eye* 29: 552–560. 3. Lundström et al. (2009) *J Cataract Refract Surg*. 35(10):1679-1687. 4. Ryburn et al. (2020) *Ophthalmic Surg Lasers Imaging Retina* 51(8):444-447. 5. Qatarnah et al. (2012) *Br J Ophthalmol*. 96(1):114-117. 6. Rohart et al. (2008) *Investig Ophthalmol Vis Sci*. 49:380. 7. Gimbel et al. (2001) *Ophthalmology* 108(12):2186–2192. 8. Khanna et al. (2012) *BMJ Open* 2(5):e001035. 9. Low et al. (2018) *J Cataract Refract Surg*. 44(11):1344-1349. 10. European Society of Cataract and Refractive Surgeons (2018) Annual Report. 11. Donachie et al. (2018) Year 3 Annual Report - The Second Prospective Report of the National Ophthalmology Database Audit. Royal College of Ophthalmologists. 12. Oliveira-Ferreira et al. (2020) *J Cataract Refract Surg*. 46(4):555-561. 13. Clarke et al. (2017) *J Cataract Refract Surg*. 43(12):1563-1570. 14. Melega et al. (2020) *Clin Ophthalmol*. 14:4523-4531. 15. Shumway et al. (2019) *J Cataract Refract Surg*. 45 (11):1660-1664.

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