STARS Education and Research Alliance

CREATING KNOWLEDGE | TRANSFORMING CARE

The University Of Queensland
AUSTRALIA

Metro North Health | Queensland Government

STARS Critically Appraised Topic (CAT) Group and clinical bottom line: Orthoptics Team (EyeCAT group)

Specific Question:

Does the use of toric lenses reduce the need for astigmatism correcting glasses and provide a cost-effective option compared to non-toric lenses in adults with aged-related cataracts with <1.5 diopters, having surgery to replace the natural lens in public hospitals?

Clinical bottom line

Systematic review evidence shows that toric lenses provide better clinical outcomes than non-toric lenses in general, but there is a lack of evidence to support their use specifically with patients who have less than 1.5 diopters. One recent Dutch study based on one RCT with short-term follow-up only, showed that toric lenses were not cost-effective compared with non-toric lenses. There is no case to change current clinical practice in STARS.

Why is this important?

STARS cataract service currently uses a cut-off of 1.5 dioptors for providing toric lenses. Toric lenses are more expensive than non-toric lenses but provide better visual acuity. We are uncertain what the evidence is that underpins a cut-point set at 1.5 diopters.

Inclusion Criteria

Toric versus non-toric lenses
Astigmatism correction
Cataract surgery
Adults
Cost effectiveness
Optimal preoperative diopter cut-off for toric lenses
English language
Relevant study types (Meta-analysis, systematic review, cost effectiveness, RCT)

Search dates

2016–2021

Type of Study

Intervention

PICOT

	Description	Search terms
Population and Setting	In patients with cataracts having surgery to replace the natural lens in public hospitals who have < 1.5 diopters	cataract OR cataracts
Intervention or Exposure (ie what is being tested)	toric lenses	toric

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Date CAT completed: 06/10/2021
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Comparison, if any	Non-toric lenses (do not correct for astigmatism)	non toric (included by searching for toric)
Outcomes of interest	Post operative requirement for astigmatism correcting glasses and cost effectiveness	astigmatism OR astigmatic
Types of studies	Meta-analysis, systematic review, cost effectiveness, RCT	

Databases Searched

PubMed, CINAHL Complete, Embase, Cochrane Library

Date of search
18th August 2021

Search Strategies (including subject headings)

PubMed 280 results
"toric"[tiab] AND ("astigmatism"[tiab] OR "astigmatic"[tiab] OR "Astigmatism"[Mesh]) AND ("cataract"[tiab] OR "cataracts"[tiab] OR "Cataract"[Mesh]) AND 2016:2021[dp]

CINAHL Complete (EBSCOhost) 69 results
(TI "toric" OR AB "toric") AND (TI("astigmatism" OR "astigmatic") OR AB("astigmatism" OR "astigmatic") OR MH "Astigmatism") AND (TI("cataract" OR "cataracts") OR AB("cataract" OR "cataracts") OR MH "Cataract") AND PY 2016-2021

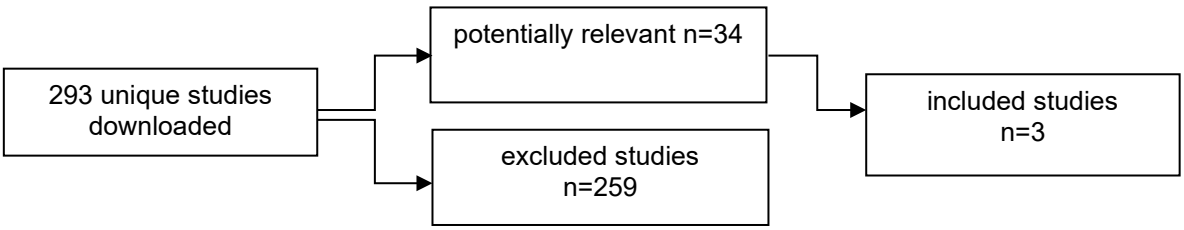
Embase (Elsevier) 268 results
'toric':ti,ab AND ('astigmatism':ti,ab OR 'astigmatic':ti,ab OR 'astigmatism'/exp) AND ('cataract':ti,ab OR 'cataracts':ti,ab OR 'cataract'/exp) AND [2016-2021]/py AND ([article]/lim OR [article in press]/lim OR [review]/lim)

Cochrane Library (Wiley) 103 results (including 1 Cochrane Review, 102 Trials)

ID	Search	Hits
#1	("toric"):ti,ab,kw	336
#2	("astigmatism" OR "astigmatic"):ti,ab,kw	2039
#3	MeSH descriptor: [Astigmatism] explode all trees	613
#4	#2 OR #3	2039
#5	("cataract" OR "cataracts"):ti,ab,kw	8154
#6	MeSH descriptor: [Cataract] explode all trees	1488
#7	#5 OR #6	8163
#8	#1 AND #4 AND #7 with Cochrane Library publication date Between Jan 2016 and Dec 2021	103

Search process
Exported results from databases to EndNote, removed duplicates, also removed non-English articles and trial registrations, conference abstracts, editorials and commentaries. Copied annotated bibliography for search results into word for screening title and abstracts. Studies identified by the search (n=293) were filtered by study design – as this was an intervention question, systematic reviews, meta-analyses and RCT designs were highlighted (n=34). These 34 were sent to CAT group members for review and selection.

Results



First Author, year and type of study	Population and setting	Intervention or exposure tested	Study results	Assessment of quality and comments
Kessel et al., 2016 Systematic review and meta-analysis	Setting: various (pooled results from 13 RCTs) (P) Patients with age-related cataracts and pre-operative corneal astigmatism undergoing phacoemulsification (O) % obtaining postoperative spectacle independence at distance at all times, uncorrected distance visual acuity, residual astigmatism in diopters, number of operative and post operative complications.	Effect of toric IOL implantation (I) vs non-toric IOL implantation (C) Toric n=707 eyes Non-toric n=706 eyes	**Toric superior to non-toric for UCDVA, spectacle independence and significantly less risk for toric group of not achieving UCDVA**	High quality evidence according to CASP systematic review checklist. Evidence is based on few trials with wide variation in diopters.
Simons et al., 2018 Cost-effectiveness analysis RCT design, multicentre	Setting: 2 clinics in the Netherlands. (P) patients with bilateral age-related cataract and regular corneal astigmatism of 1.25D or more undergoing phacoemulsification (mean of sample pre-operative astigmatism 1.98+or-0.83D) (O) cost effectiveness and clinical outcomes (distance spectacle	Effect of aspheric toric IOLs (I) vs aspheric monofocal IOLs (C) Toric (n=33) Non toric (n=44)	Significant differences in favour of toric group for spectacle independence and UCDVA (<0.01). **Societal costs higher in toric IOL group (lenses more expensive, surgical time higher) than non-toric group and QALYs slightly lower for toric IOL group (Toric IOLs inferior from cost effectiveness perspective).**	Quality: not formally assessed Comments: cost effectiveness findings in Netherlands may not be applicable in Australian context. QALY based on general QOL instruments. Also, longer term evaluation of costs (i.e. need/cost glasses across lifespan).

	independence, binocular UDVA and CDVA).			
Waltz et al., 2018 RCT	Setting: 14 sites US and Canada. (P) patients with corneal astigmatism and cataracts for planned phacoemulsification surgery and IOL implantation (requiring cylinder correction of 0.75-1.5 diopters) (O) uncorrected DVA and best-corrected DVA, manifest refraction, keratometry, adverse events, spectacle use, IOL rotational stability.	Comparison toric (I) (n=101) vs non-toric IOLs (C) (n=91)	**Significant better outcomes for toric group for UCDVA and reduced cylinder. No difference in spectacle independence and satisfaction levels at 6 months. No differences in adverse outcomes.**	High quality evidence according to CASP RCT checklist with exception of no confidence intervals reported, no cost effectiveness analysis and did not report on post-operative complications.

Summary

Toric IOLs provide better clinical outcomes than non-toric lenses (improved UCDVA, greater spectacle independence and lower residual astigmatism) in patients with age-related cataracts undergoing cataract surgery. However, there is a lack of evidence to support the use of Toric IOLs with patients who have <1.5 diopters. One recent but small RCT showed some superior clinical outcomes (eg. UCDVA) with toric IOLs compared to non-toric, yet other outcomes were not superior (eg. spectacle independence). Whilst there is no Australian-based health economic study available to date, one recent Dutch study based on one RCT with short-term follow-up only, showed that Toric IOLs were not cost-effective compared with non-toric.

Implications for Practice/research

There is a lack of good evidence upon which to base decisions about the diopter cut-point for decision-making about the use of toric lenses in patients with astigmatism having cataract surgery. In particular, Australian-based cost-effectiveness studies are needed. There is no need to change current practice regarding the cut-point of 1.5 diopters in STARS, this is likely to be a reasonable cut-point given best available evidence.

What would you tweet? (140 characters)

Whilst toric lenses provide better visual outcomes than non-toric, it is unclear which diopter cut-point to use in decision-making. Best available evidence suggests that toric IOLs are unlikely to be cost-effective for patients undergoing cataract surgery in the public health system but further research is needed. (270 characters)

Toric IOLs provide better visual outcomes but are unlikely to be cost-effective compared to non-toric IOLs. More research is needed to justify the diopter cut-points used in decision-making. (162 characters)

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Critical Appraisal Topic Group Team Members

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References

Kessel, L., Andresen, J., Tendal, B., Erngaard, D., Flesner, P., & Hjortdal, J. (2016). Toric intraocular lenses in the correction of astigmatism during cataract surgery: a systematic review and meta-analysis. *Opthalmology, 123*:275-286

Simons, R., Visser, N., van den Biggelaar, F., Nuijts, R., Webers, C., Bauer, N., Beckers, H., & Dirksen, C. (2018). Trial-based cost-effectiveness analysis of toric versus monofocal intraocular lenses in cataract patietns with bilateral corneal astigmatism in the Netherlands. *J Cataract Refract Surg, 45*:146-152

Waltz, K.L., Featherston, K., Tsai, L., & Trentacost, D. (2015). Clinical outcomes of TECHNIS toric intraocular lens implantation after cataract removal in patients with corneal astigmatism. *Ophthalmology, 122*:39-47.