Factors Predictive of Refractive Error After Toric Lens Implantation

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- The authors have no financial interest in the subject matter of this presentation.

Background

- Cataracts are a leading cause of reversible vision loss in US adults

- 22% of patients undergoing cataract surgery have $\geq$ 1.5 D of astigmatism

- Toric IOL outcomes are generally favorable:
  - 90-95% of patients achieve UCVA of 20/40 or better
  - 81-100% of patients achieve a spherical equivalent within 1 D of target
  - 60-97% of patients achieve spectacle independence for distance

What factors increase the chance of a suboptimal outcome?

Patients and methods

- Single-center, retrospective case-control study of patients (n = 520 eyes) who underwent toric lens implantation by a single surgeon between 2016-2020

- **Exclusion criteria:**
  - BCVA of 20/40 or worse at one month and beyond
  - No data at post-operative month one or three

Cases	Controls
UCVA worse than 20/40	UCVA 20/40 or better
Spherical equivalent > 1 D off target	Spherical equivalent within 1 D of target
Cylinder > 1 D off target	Cylinder within 1 D of target

Uncorrected visual acuity - patients

448 eyes with SA6ATx or SN6ATx lens with BCVA at least 20/40 at 1 month or 3 months post-op

Excluded **81** eyes aimed for near (sphere ≥ -1.00)

367 eyes aimed for distance

23 eyes with UCVA worse than 20/40 (cases)

344 eyes with UCVA 20/40 or better (controls)
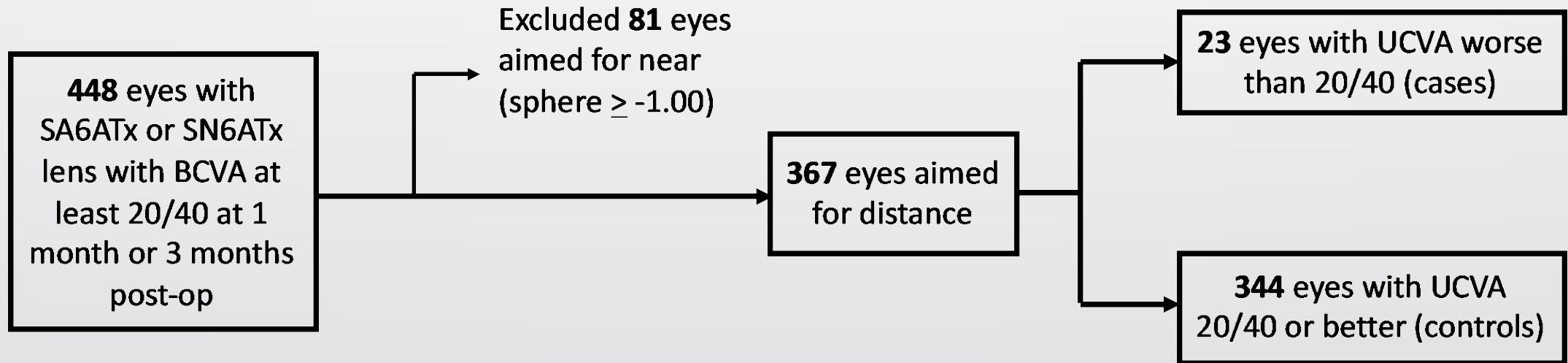
Uncorrected visual acuity – demographics and biometry

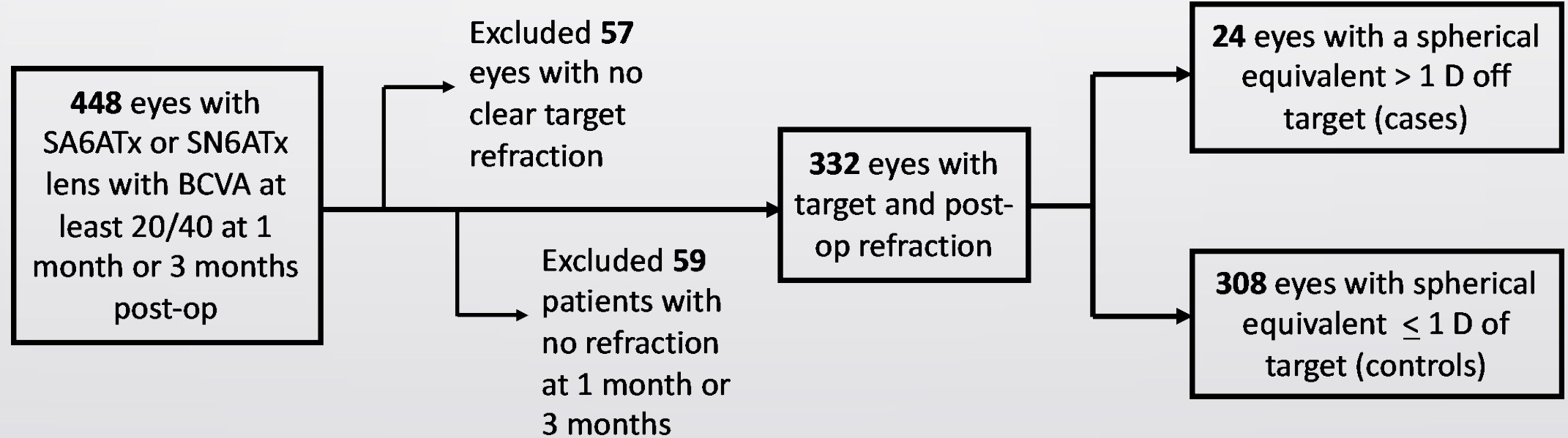|	Cases (n=23)	Controls (n = 344)	p-value
Gender (% female)	82.6	65.4	0.09
Right eye (%)	43.5	52.3	0.38
Age, mean years (SD)	65.6 (8.6)	68.0 (8.8)	0.20
Axial length, mean mm (SD)	24.8 (1.6)	24.6 (1.7)	0.50
Anterior chamber depth, mean mm (SD)	3.3 (0.5)	3.3 (0.4)	0.89
Astigmatism, mean D (SD)	2.4 (1.9)	1.6 (0.8)	0.11
Lens power, mean D (SD)	17.6 (4.4)	18.3 (5.0)	0.47

Uncorrected visual acuity – exam findings
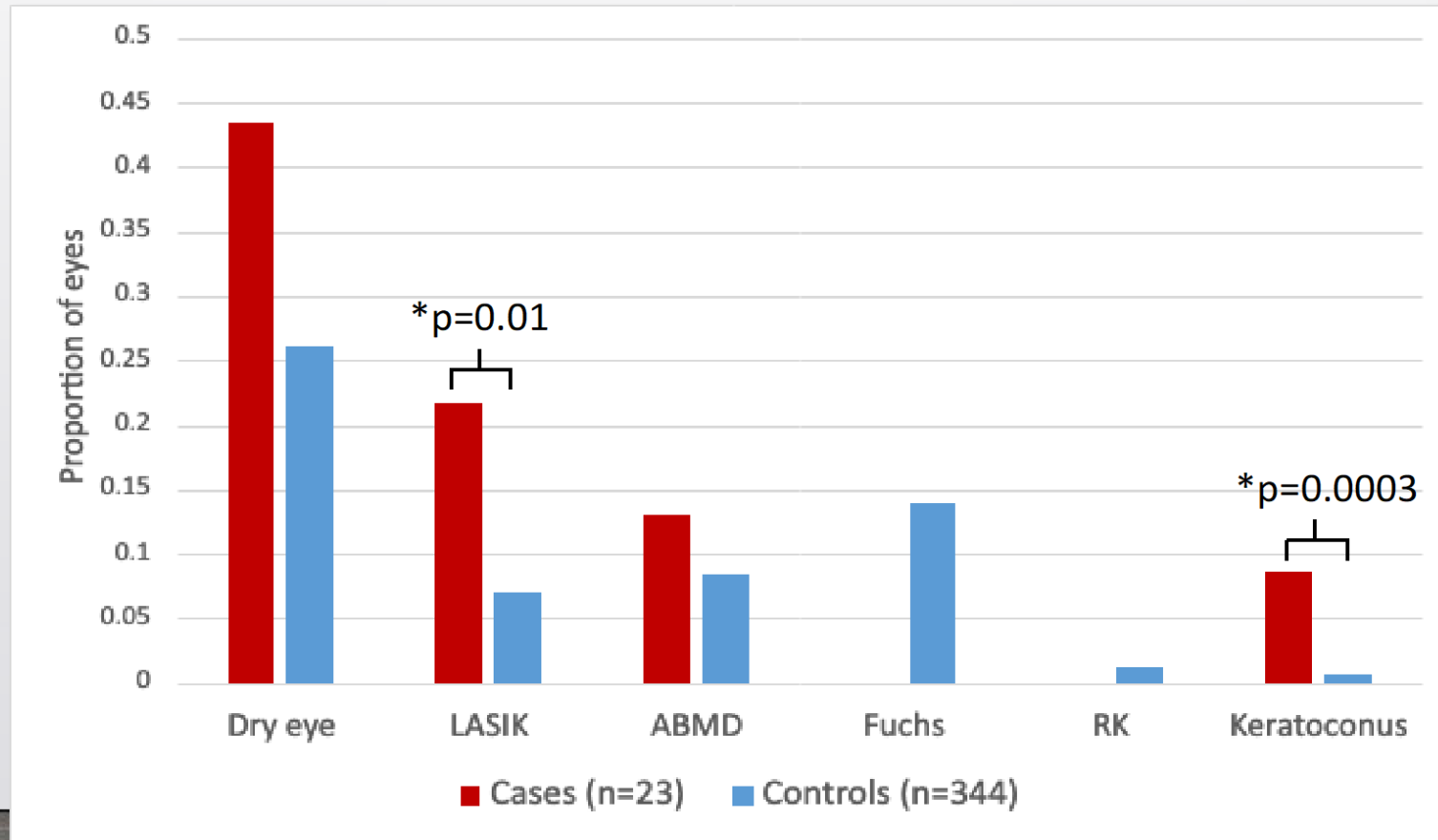
Uncorrected visual acuity – Toric cylinder power
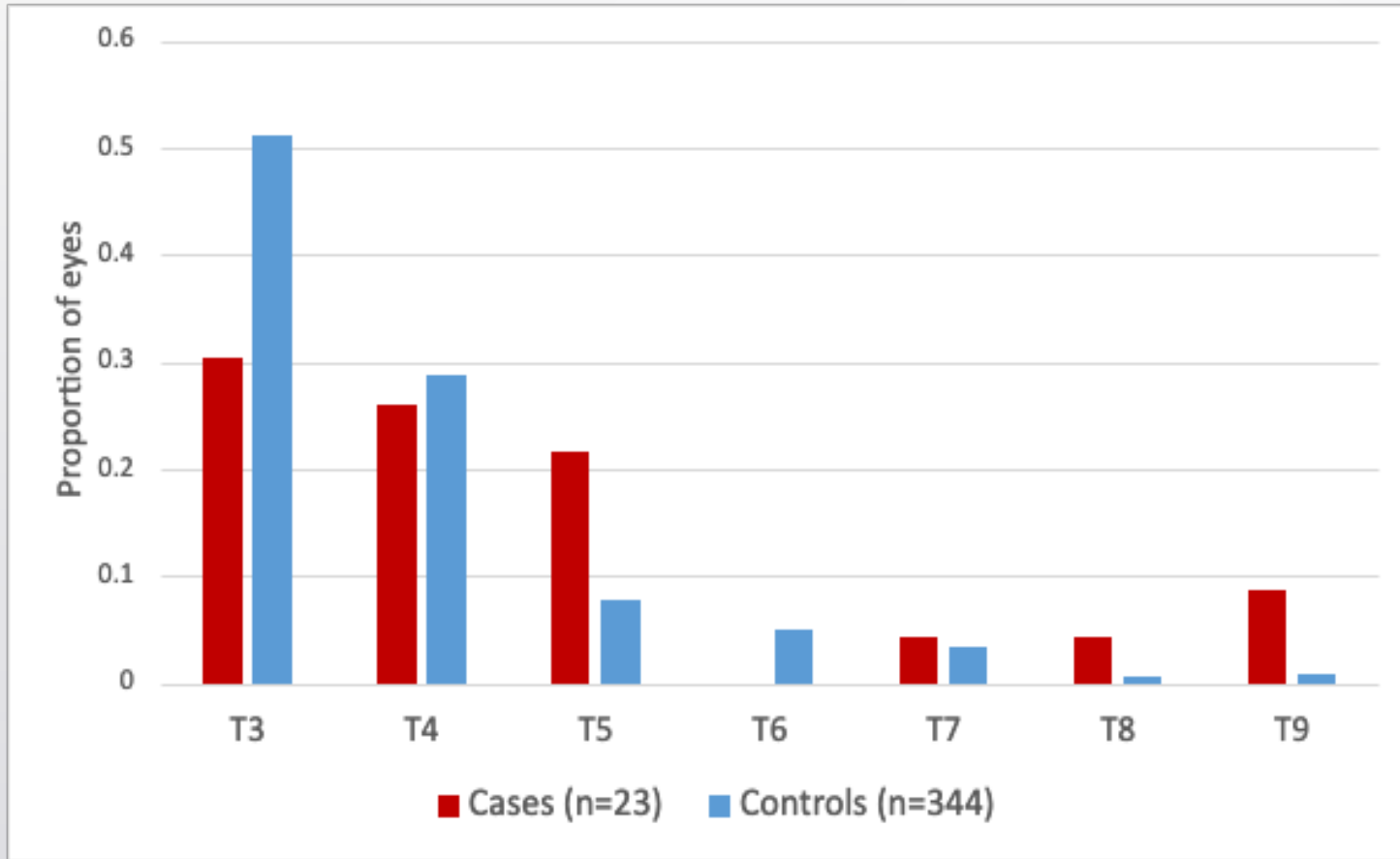
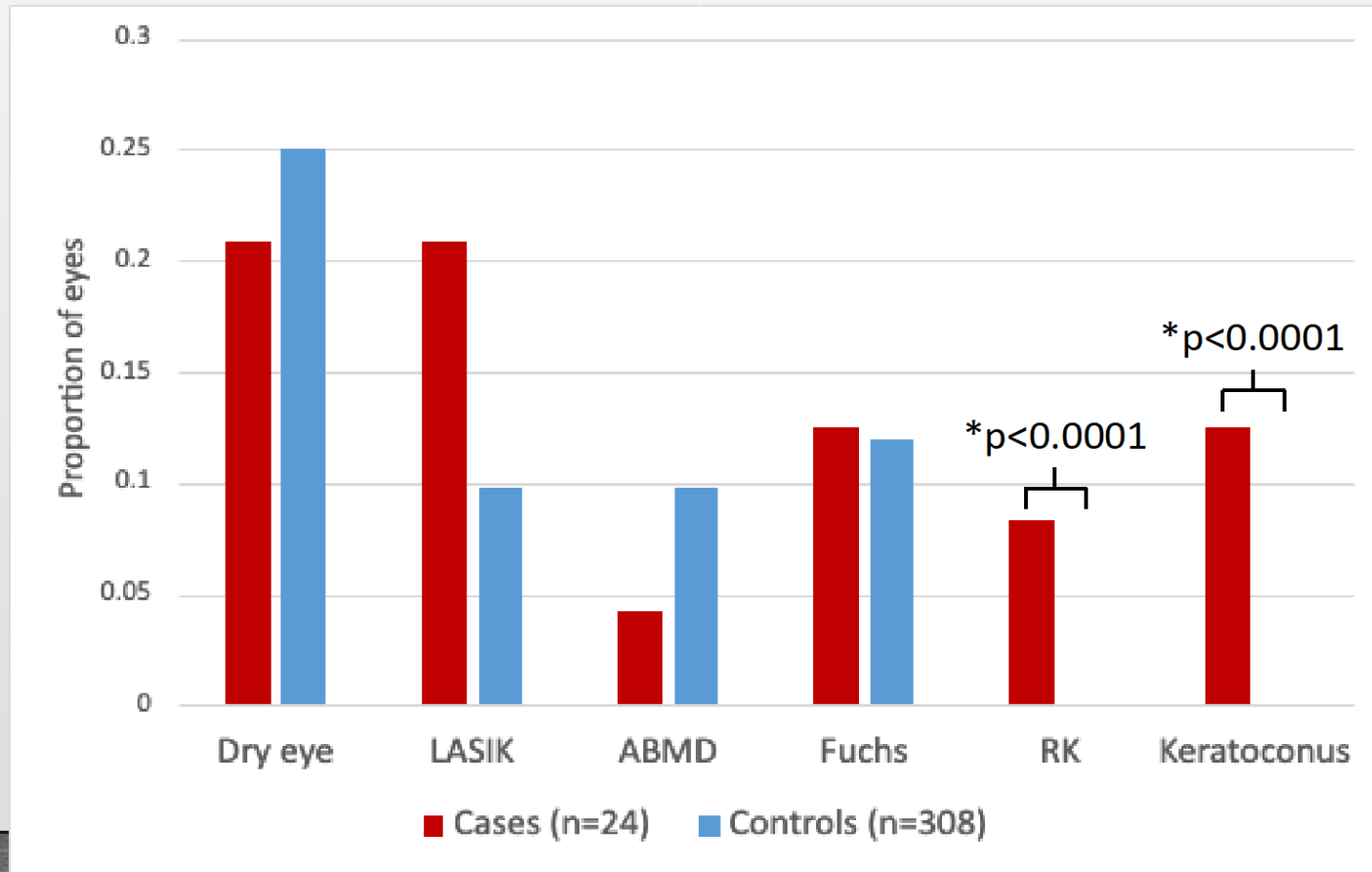|	Cases	Controls
% Lenses ≥ T5	39.1%	17.8%
P Value	p=0.008	

Spherical equivalent - patients

Spherical equivalent – demographics and biometry

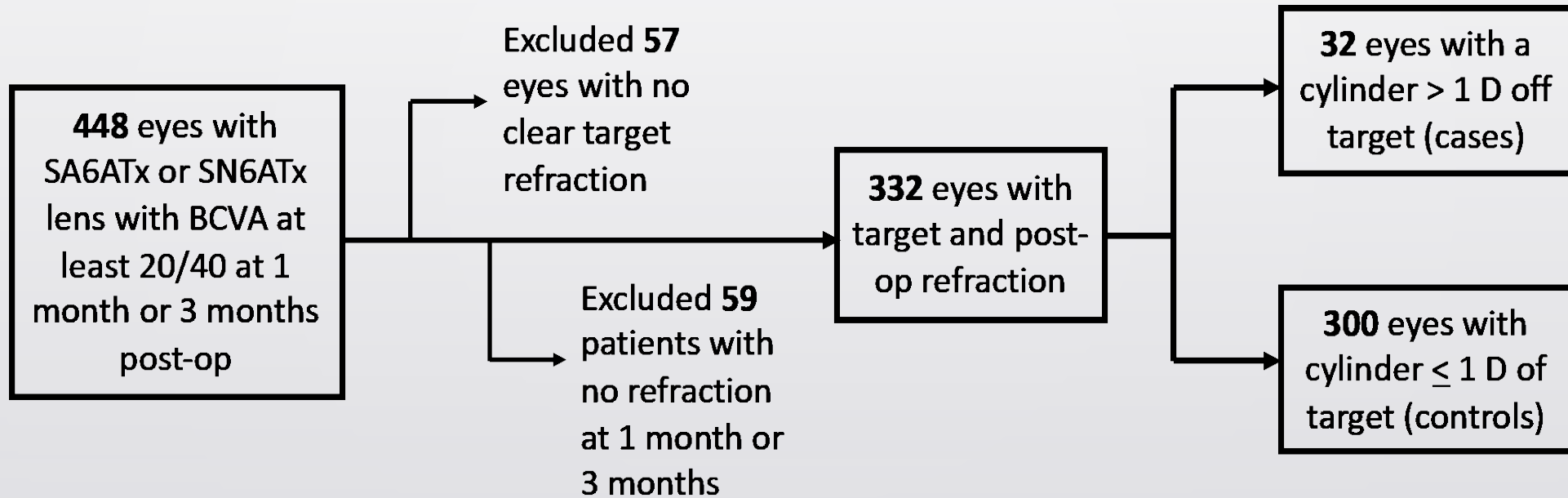|	Cases (n=24)	Controls (n = 308)	P-value
Gender (% female)	62.5	64.6	0.84
Right eye (%)	46.0	52.3	0.54
Age, mean years (SD)	66.2 (7.4)	67.2 (9.8)	0.53
Axial length, mean mm (SD)	24.6 (1.8)	24.6 (1.6)	0.87
Anterior chamber depth, mean mm (SD)	3.3 (0.5)	3.3 (0.4)	0.87
Astigmatism, mean D (SD)	2.4 (2.0)	1.5 (0.8)	0.05
K_{mean}, mean D (SD)	43.8 (4.5)	43.9 (1.8)	0.90
Lens power, mean D (SD)	19.7 (4.4)	18.5 (4.8)	0.21

Spherical equivalent – exam findings

Spherical equivalent – Toric cylinder power
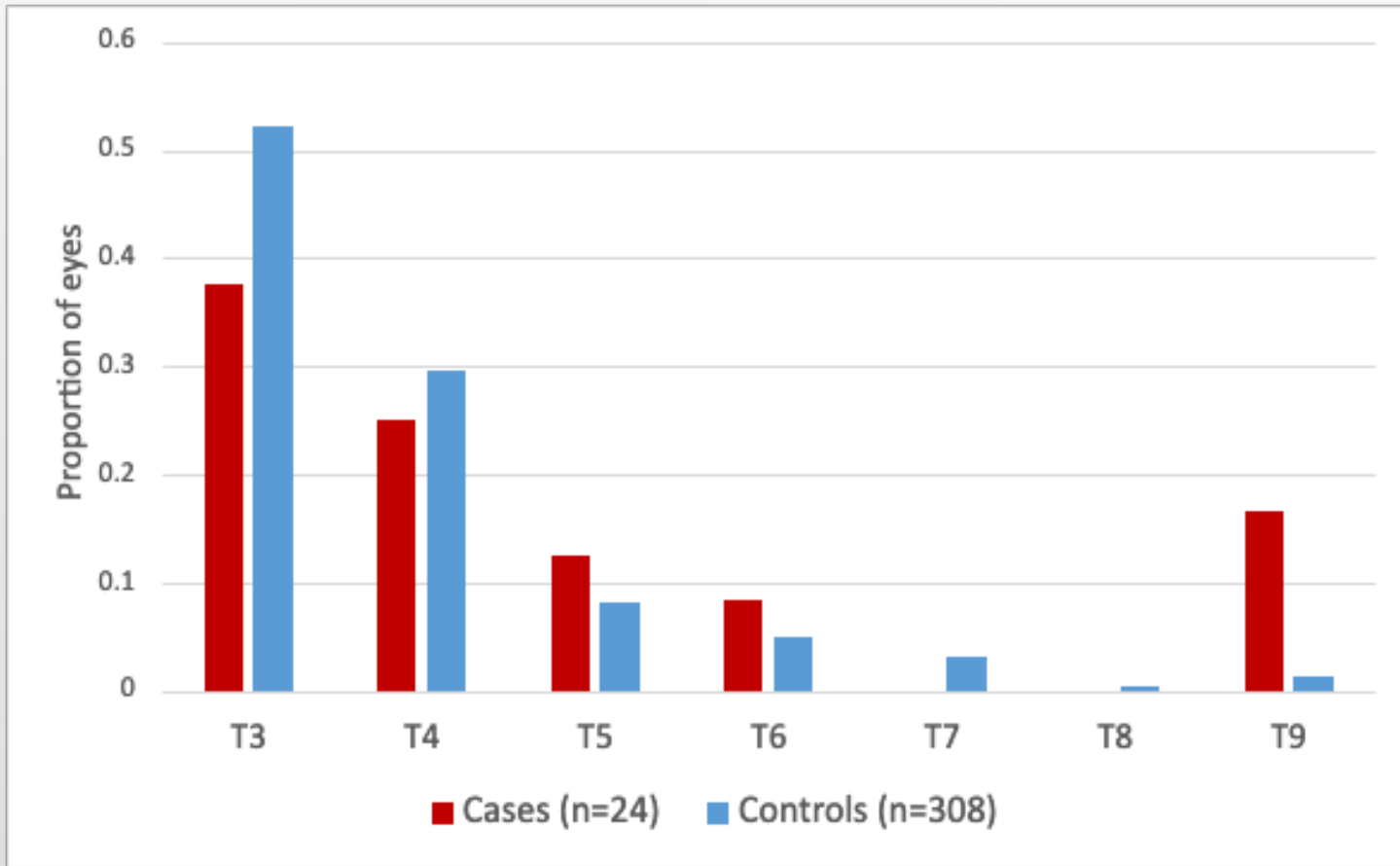
	Cases	Controls
% Lenses ≥ T5	37.5%	17.9%
P Value	p=0.02	

Cylinder - patients

448 eyes with SA6ATx or SN6ATx lens with BCVA at least 20/40 at 1 month or 3 months post-op

Excluded **57** eyes with no clear target refraction

Excluded **59** patients with no refraction at 1 month or 3 months

332 eyes with target and post-op refraction

32 eyes with a cylinder > 1 D off target (cases)

300 eyes with cylinder < 1 D of target (controls)

Cylinder – demographics and biometry

	Cases (n=32)	Controls (n = 300)	P-value
Gender (% female)	65.6	64.3	0.88
Right eye (%)	47.9	52.3	0.46
Age, mean years (SD)	66.8 (9.6)	67.2 (9.7)	0.83
Axial length, mean mm (SD)	24.7 (1.7)	24.6 (1.7)	0.76
Anterior chamber depth, mean mm (SD)	3.3 (0.3)	3.3 (0.4)	0.31
Astigmatism, mean D (SD)	2.4 (1.6)	1.5 (0.8)	0.007
K1, mean D (SD)	41.8 (2.5)	43.2 (2.0)	0.003
K2, mean D (SD)	44.1 (2.6)	44.8 (2.2)	0.21
K_{mean}, mean D (SD)	42.9 (2.4)	44.0 (2.0)	0.03
Lens power, mean D (SD)	19.6 (3.3)	18.5 (4.9)	0.09

Cylinder – exam findings
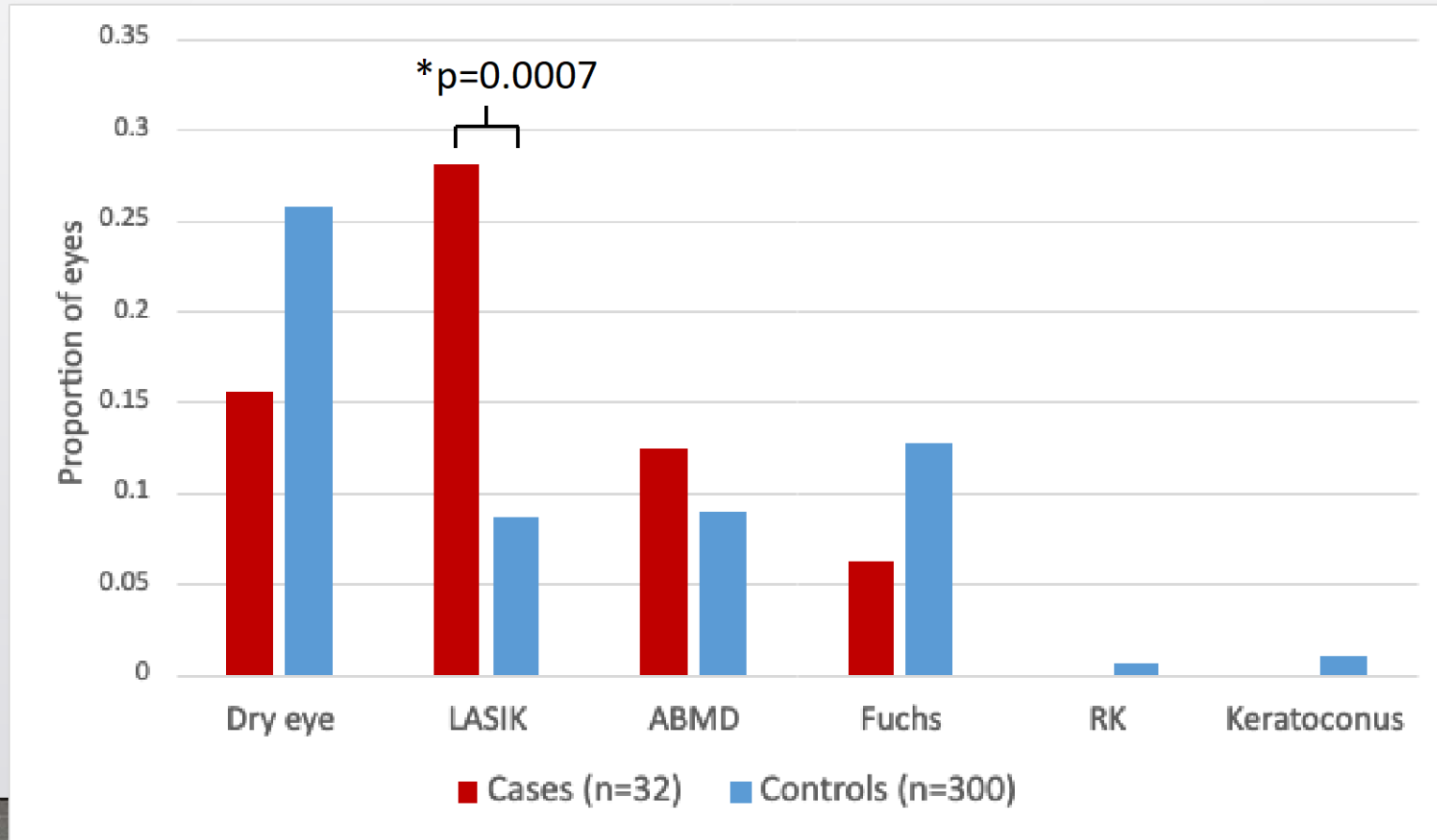
Cylinder – Toric cylinder power
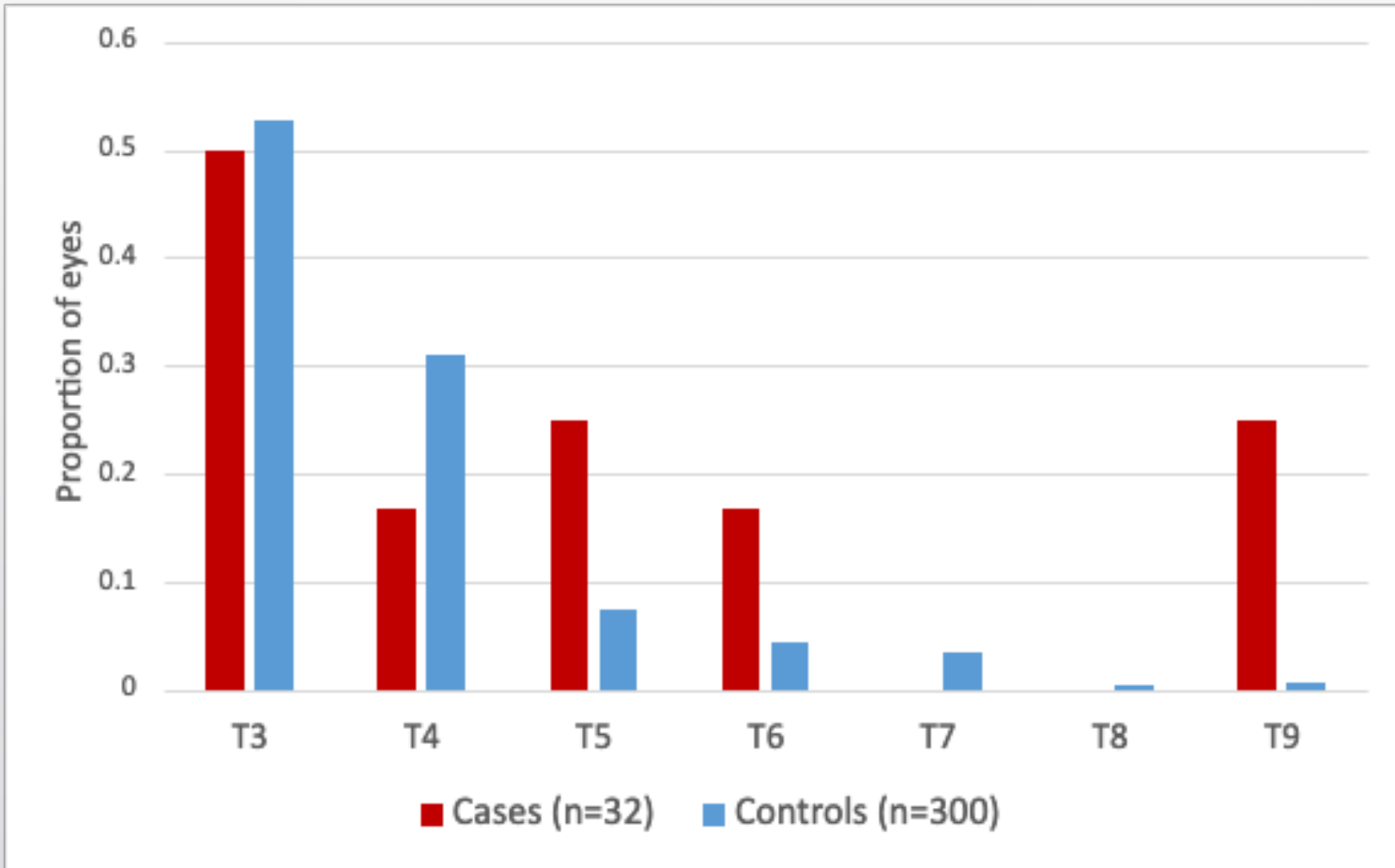
	Cases	Controls
% Lenses ≥ T5	66.7%	16.0%
P Value	p<0.0001	

Discussion

Factors associated with suboptimal outcomes:

- Prior LASIK surgery

- Prior RK surgery

- Keratoconus

- Higher astigmatism

Factors not associated with suboptimal outcomes:

- Dry eye

- Anterior basement membrane dystrophy

- Fuchs endothelial dystrophy

Conclusions

- Overall, most patients undergoing toric lens implantation have favorable outcomes

- Prior LASIK or RK surgery, keratoconus, and higher astigmatism may predispose patients to suboptimal outcomes

- May help surgeons better counsel their patients about expectations

- Optimizing comorbid conditions before surgery and using multiple methods to measure IOL calculations can help achieve the best outcomes for patients

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