BIG DATA ANALYSIS OF MYOPA SURGERY IN CHINA

An Analysis Based on 1 Million Eyes in the AIER Database



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MYOPIA: THE PRESENT

Myopia prevalence in Asia higher than **Europe and US**

China has the highest prevalence of myopia in Asia

48.5%



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Race (Tay's)	All Ages
Chinese	48.5%
Eurasian	34.7%
Indians	30.4%
Malays	24.5%

Source: Archives of Ophthalmology, Aug 2008; Singapore Medical Journal, Dec1993





MYOPIA SURGERY IN CHINA CURRENTLY

of America, Europe, South Korea and other developed countries.

Region	Country	Population (M)	Percentage of Global Population	LVC Per 1K Population	Percent of Global LVC Procedures		Region	Country	Population (M)	Percentage of Global Population	LVC Per 1K Population	Percent Global L Procedu
United States		332.6	4.3%	1.7	19.2%		China		1,394.0	17.9%	0.5	21.9%
Western Europe	Germany	80.2	1.0%	1.1	2.9%		India		1,326.1	17.1%	0.1	5.8%
	France	67.8	0.9%	0.9	2.0%			Brazil	211.7	2.7%	0.6	4.4%
	United	65.8	0.8%	0.8	1 80/			Mexico	128.6	1.7%	0.6	2.4%
	Kingdom 65.8	03.0	0.070	0.0	1.8%			Colombia	49.1	0.6%	0.3	0.5%
	Italy	62.4	0.8%	1.0	2.0%			Argentina	45.5	0.6%	0.4	0.6%
	Spain	50.0	0.6%	1.5	2.5%		Latin America	Peru	31.9	0.4%	0.2	0.2%
	Other W.	97 7	1 3%	1 1	3 5%			Venezuela	28.6	0.4%	0.0	0.0%
	Europe		1.070					Other LA	145.2	1.9%	0.2	0.9%
	Total Western Europe	423.9	5.5%	1.1	14.7%			Total Latin America	640.7	8.2%	0.4	9.1%
Japan		125.5	1.6%	0.3	1.4%			Indonesia	267.0	3.4%	0.1	0.5%
	Korea, South	51.8	0.7%	2.9	5.1%	Rest	Rest of World	Pakistan	233.5	3.0%	0.0	0.1%
	Canada	37.7	0.5%	2.0	2.5%			Poland	38.3	0.5%	0.3	0.3%
Other Wealthy	Saudi Arabia	34.2	0.4%	1.1	1.3%			Russia	141.7	1.8%	0.4	1.8%
, Nations	Australia	50.9	0.7%	0.5	0.8%			Thailand	69.0	0.9%	0.7	1.7%
	Other Wealthy	113.9	1.5%	1.2	5.2%			Philippines	109.2	1.4%	0.1	0.5%
	Total OWN	288.5	3.7%	1.5	14.9%							
Wealthy Nations	Total	1,170.5	15.1%		50.2%		Source: Market	Scope: 2020 Re	efractive Surg	ery Market Rep	ort	







The rate of myopia surgery in China for the year 2020 stands at 0.5 per 1K people and is far lower than that



BIG DATA ANALYSIS OF MYOPIA SURGERY IN CHINA

Aims

To address the most frequent queries the general puthas pertaining to surgery for myopia; and

To provide selection criteria for myopia surgery bases scientific evidence.

AIER School of Ophthalmology, Central South Universition in association with AIER Eye Research Institute

Based on medical records of more than 1 million eyes undergoing refractive surgery in AIER hospitals within China along with demographic data such as age, occupation, postoperative vision quality and recovery period.

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	Q1:	Is refractive surgery for myopia safe?	
ublic	Q2:	Am I a suitable candidate for refractive surgery?	
	Q3:	What would my vision be like after surgery?	
ed on	Q4:	Which type of surgery should I choose?	
	Q5:	Is refractive surgery for myopia expensive?	
ty,	Q6:	Will refractive surgery damage my eyes?	
	Q7:	Will my quality of life improve following surgery?	
a	Q8:	Will I regret having refractive surgery for myopia?	
	Q9:	What are the potential complications of surgery?	
	Q10:	What are the long term results for patients who have had surgery?	

Source: Questionnaire from Myopia Patients by Aier



ANALYSIS OF PATIENTS UNDERGOING MYOPIA REFRACTIVE SURGERY WITHIN THE AIER EYE HOSPITAL GROUP

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STUDY PARAMETERS

POPULATION

02

01

DURATION

2018 - 2020

Patients undergoing myopia surgery in selected hospitals within **AIER Eye Hospital Group** in Mainland China

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SIZE

1,023,898 Eyes from 520,014 Operations



LOCATION

206 Cities in **29 Provinces**



PATIENT DISTRIBUTION BY AGE

- Range: Aged 17 79 ightarrow
- Mean age: 25.33 ± 6.22 years •
- 3.1% of patients above 40 years old lacksquare
- **Top 3 Age Groups by numbers:** •
 - Age 20 24 43.2% 1.
 - Age 25 29 19.2% 2.
 - Age 30 34 14.3% 3.

Age 30-34 74,110 | 14.3%

Age 25-29 99,936 | 19.2%



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PATIENT DISTRIBUTION BY GENDER

- Male 57.82%, Female 42.18%
- 18.13% of females underwent ICL surgery vs 5.96% of male patients
- Male patients outnumbered female patients in the under 24 age group due to occupational demands (e.g. joining the military or police force)
- In patients above 25 years of age, females outnumbered male due to cosmetic reasons and also improving quality of life





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PATIENT DISTRIBUTION BY OCCUPATION

Students: 42.1% Business and Service Industry: 12.3% **Professionals and Technical** Personnel: 6.4% **Corporate and Institutional Staff: Corporate and Institutional Staff** 3.8% 19,708 | 3.8%



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PRE-OP REFRACTIVE ERROR

- Myopia classification (Low, Moderate, High, Extreme)
- Low myopia (-3.00D < SE ≤ -0.125): 12.76%
- Moderate myopia (-6.00D <SE ≤ -3.00D): 50.77%
- High myopia (-10.00D < SE ≤ -6.00D): 29.62%
- Extreme myopia (SE ≥ -10.00D) : 6.69%



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MYOPIA SURGERY BY TYPE

- LASIK most commonly performed • refractive procedure at 51.87%
- Followed by SMILE at 31.99% ightarrow
- ICL 3rd most common procedure at 10.95%
- **Corneal surface refractive surgery at 5.19%**

Corneal Surface Refractive Surgery 53,176 | 5.19%

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CUSTOMIZED CORNEAL REFRACTIVE SURGERY

- A total of 584,370 eyes underwent LASIK and corneal surface refractive surgery
- Of these 133,242 (22.5%) were customized surgeries (topography guided, wave front guided, Q-value 0 adjusted)
- A significant proportion of patients were not merely hoping for better vision, but also an improvement in the overall quality of vision





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TYPE OF SURGERY AND REFRACTIVE ERROR

- Low myopia: LASIK, SMILE
- Moderate myopia: LASIK, SMILE \bullet
- High myopia: LASIK, ICL •
- **Extreme myopia: ICL, LASIK** \bullet
- Of 89,987 eyes undergoing ICL, 55.75% • had high myopia, 29.95% had extreme myopia



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TYPE OF SURGERY BY PATIENT AGE

•	Patients between 20-24 years of	>=50	
	corneal surgery (LASIK, SMILE)	45-49	
		40-44	
•	ICL was more commonly	35-39	
	performed in patients over the age of 25	30-34	
		25-39	
•	With increasing age, the number of SMILE procedures decreased	20-24	
	accordingly	<20	

0%



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TYPE OF SURGERY BY PATIENT OCCUPATION

 Students make up the majority of patients undergoing refractive surgery

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ICL uptake is low amongst students

SURGERY VOLUME 2018-2020

	In 2018- 126 5/0 (2/ 3%)	Cases	(k)
	111 2010.120,340 (24.370)	500	
		450	
•	In 2019: 172,430 (33.2%) In 2020: 221,038 (42.5%)	400	
		350	
		300	
		250	
•	Incremental trend over time	200	
		150	
		100	
		50	
		0	

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PATIENT DEMOGRAPHIC TREND 2018-2020

- Increasing number of patients below the age of 24 years, and \bullet between age 20 to 24 from Year 2018 to 2020
- Increasing proportion of Professionals and Technical Personnel \bullet
- **Distribution of pre-operative refractive error relatively** unchanged

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≥50

POST-OP VISUAL ACUITY

@ 1st Post-operative Day

Post-operative Uncorrected Distance Visual Acuity (UDVA)

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Pre-operative Best Corrected Distance Visual Acuity (CDVA)

POST-OP VISUAL ACUITY

Measured at 1 Week, 1 Month, 3 Months, 6 Months and 12 Months after Surgery

- Post-operative UDVA equal to or better than pre-operative CDVA in more than 90% of cases
- Marked improvement in visual acuity 1 week following surgery

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POST-OP VISUAL ACUITY

Mean UDVA	1.15
• Before surgery: 0.08	1.1
• 1 day post-operatively: 0.99	1.05
• 1 week post-operatively: 1.09	1
• 1 year post-operatively: 1.11	0.95
	0.9

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POST-OP VISUAL ACUITY BY SURGERY TYPE

ICL

- Post-operative UDVA equal to or better than pre-operative CDVA @ Day 1: 86.67% of patients
- Mean visual acuity 1 day post-operatively: 0.99 (BCVA 0.92)
- Mean visual acuity 1 year post-operatively: 1.05

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POST-OP VISUAL ACUITY BY SURGERY TYPE

LASIK

- Post-operative UDVA equal to or better than pre-operative CDVA at Day 1: 84.65%
- Mean visual acuity 1 day post-operatively: 1.02 (BCVA 0.99)
- Mean visual acuity 1 year post-operatively: 1.12

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POST-OP VISUAL ACUITY BY SURGERY TYPE

SMILE

- Post-operative UDVA equal to or better than pre-operative CDVA at Day 1: 76.81%
- Mean visual acuity 1 day post-operatively: 0.98(BCVA: 0.99)
- Mean visual acuity 1 year post-operatively: 1.12

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Post-operative UDVA < BCVA</p>

■ Post-operative UDVA ≥ BCVA

All Surgery Types

- Mean pre-operative refractive error -5.72D
- Mean refractive error 1 month post-operatively -0.02D
- Mean refractive error 1 year post-operatively -0.19D
- **Post-operative refraction remained stable 1** year after refractive surgery

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ICL

- Mean pre-operative refractive error -9.29D
- Mean refractive error 1 month post-operatively -0.06D
- D Mean refractive error 1 year post-operatively -0.28D
- **Post-operative refraction remained stable 1** year after ICL surgery

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LASIK

- Mean pre-operative refractive error -5.50D •
- Mean refractive error 1 month post-operatively 0 -0.06D
- Mean refractive error 1 year post-operatively • -0.18D
- **Post-operative refraction remained stable 1** year after LASIK procedures

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SMILE

- Mean pre-operative refractive error -5.06D
- Mean refractive error 1 month post-operatively -0.11D
- Mean refractive error 1 year post-operatively -0.25D
- **Post-operative refraction remained stable 1** year after SMILE procedures

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SUMMARY

Analysis of AIER's database of over one million eyes undergoing surgery shows that:

- 1. Myopia surgery volumes are *increasing year on year* at a rapid rate;
- 2. Myopia surgery is extremely popular amongst the younger and middle-aged populations;
- **3.** Refractive Surgery is suitable for all myopia types ranging from low to extreme myopia;
- 4. There is great variety in the choice of procedures, with *customized surgery* forming a significant proportion;
- 5. Myopia surgery is safe and achieves excellent visual outcomes with a great degree of stability and predictability.

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FUTURE DEVELOPMENT

- 1. Assimilation of technological advances and innovation with clinical application with the aim of delivering the best possible surgical outcomes and thus fulfilling the increasing expectations of refractive surgery patients;
- 2. Embracing a *patient-centered* approach to refractive surgery by adapting to evolving trends within this field and placing emphasis on customization and personalization of the surgical process;
- 3. Improving *international academic collaboration* and data collection by leveraging AIER EYE HOSPITAL GROUP's considerable global network, paving the way for future multi-center refractive surgery studies on a large scale.

All efforts have been made to ensure the contents and data for "Big Data Analysis of Myopia Surgery in China" are accurate and reliable. However, we do not assume any responsibility or obligation or give any representation or warranty for the accuracy, authenticity, completeness, legality or reliability of the information contained and shared in the report, nor will we be liable for any potential use or application of such information by anyone.

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