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THE PREFERENCES AND PRACTICES OF OPHTHALMOLOGISTS REGARDING REFRACTIVE SURGERIES IN MIDDLE EAST COUNTRIES

Abdullhamid AL- Ghamdi [1], Rahma A.Algethami [2], Yousef Alharbi [3], Nada Almalki [2], lama Aljohani [4], Abdulrahman Al-Amri [5], Ma'an Al-Barry [6]

[1] Professor of Ophthalmology, College of Medicine, Taif University, Saudi Arabia.
[2] Medical Intern, College of Medicine, Taif University, Taif, Saudi Arabia.
[3] Medical Intern, College of Medicine, Qassim University, Unaizah, Saudi Arabia.
[4] Medical Intern, College of Medicine, King Abdulaziz University, Jeddah, Saudi Arabia.
[5] Professor of Ophthalmology, College of Medicine, King Khalid University, Saudi Arabia.
[6] Assistant Professor of Ophthalmology, College of Medicine, Taibah University, Saudi Arabia.

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Abstract:

Background and Objectives*: Refractive errors are the leading cause of impairments visual impairments in the Kingdom of Saudi Arabia. Laser refractive eye surgeries are getting huge popularity for correcting these visual impairments in KSA and other gulf countries. The study assessed the preferences and practices of ophthalmologists regarding refractive surgeries in Middle East countries.*

Materials and Methods*: A cross-sectional study was conducted using an online questionnaire among the Saudi Ophthalmology Society (SOS) members. The questionnaire was pilot tested and had 28 items that included sociodemographic details and practices related to refractive eye surgery of participating ophthalmologists. The data collected were subjected to statistical analysis, and Pearson's chi-square test was used to find the relationship between categorical variables.*

Results*: Excimer laser platform EX 500 (Alcon) was the most commonly used Refractive surgery system. There were region-wide differences observed in the type of Refractive surgery system where surgeons from central KSA used AMARIS 1050 RS (SCHWIND) (83.4%) and AMARIS 500 (SCHWIND) (68.4%) comparatively more than other regions ($p<0.05$). The majority of the eye surgeons (84.4%) used Pentacam Comprehensive Eye Scanner preoperative screening, and Corneal Topography was the most commonly used preoperative examination method. Only 9.1% of the surgeons had refractive eye surgery on 75-100% of their patients, and the most commonly preferred RES by the surgeons in our study was Photorefractive Keratectomy [PRK].*

Conclusion*: The findings showed that refractive eye surgery trends are changing, and surgeons are shifting to more reliable techniques with fewer post-surgical complications.*

Keywords: Refractive errors, Refractive surgeries, Ophthalmologists, Saudi Arabia

Corresponding author:
Dr. Rahma A.Algethami,
Medical Intern, College of Medicine,
Taif University, Taif, Saudi Arabia.
Email: drrahmh@gmail.com,

QR code

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INTRODUCTION:

Vision defects due to corneal shape changes are known as refractive errors (RE), and this makes up the second cause of blindness globally [1]. Refractive eye surgeries are commonly performed to correct these errors. In 1970, Radial keratotomy was the first refractive eye surgery performed to correct such eye errors [2]. Since then, many improvements in refractive error corrections have been employed, and laser surgery techniques are used widely to correct errors such as myopia, hyperopia, or astigmatism. In myopia, light rays from an object are concentrated anteriorly to the retina leading to nearsightedness. In astigmatism, light rays do not focus at a single point due to the abnormal curvature of the cornea or lens at various meridians, causing uneven focusing, while in hyperopia, the rays are focused posterior to the retina, causing farsightedness [2-4].

In the Kingdom of Saudi Arabia (KSA), studies are limited that assessed the prevalence of refractive errors in the adult population. A study done in Arar city had reported a prevalence of REs was 45.8%, in which myopia was the most common type of RE (24.4%), followed by hyperopia (11.9%) and astigmatism (9.5%) [5]. Epidemiological studies conducted in other parts of KSA show that RE is the leading cause of visual impairments [6-8]. The quality of life in people suffering from visual impairments is compromised where they experience difficulties in physical function, emotional distress, and poor social life. Refractive surgery improves the quality of patients' life and daily work in addition to spectacle independence [9]. Furthermore, corneal surgery remains the mainstay of refractive correction since the cornea is the most accessible part of the eye and provides two-thirds of the eye's refractive power [10]. Photorefractive keratectomy (PRK) and laser in situ keratomileuses (LASIK) are still used among these refractive eye surgery techniques. Laser refractive surgery is now generally accepted as effective and safe, providing the most predictable outcomes for patients diagnosed with low to moderate amounts of refractive error [11]. However, LASIK has got some drawbacks, such as epithelial ingrowth, corneal ectasia, corneal flap complications [12]. To compensate for these drawbacks, Laser-Assisted Sub-Epithelial Keratomileusis (LASEK) was first introduced in 1990 [13]. Laser eye surgeries are rapidly evolving, and many promising surgical options have been tried, such as Phakic intraocular lenses (IOLs), Epithelial Laser Keratomileusis (Epi-LASIK), Femtosecond Lenticule Extraction (FLEX), and customized Transepithelial No-touch (C-TEN), and SMILE (small incision lenticule extraction) [14,15]. It is thus important to identify the needs for treatment and rehabilitation services by gathering essential data on the frequency of REs from the population.

Studies show that the preferences of eye surgeons are changing with the development and availability of new and reliable eye surgery techniques [14,16]. Some eye surgeons have the impression that the clinical characteristics of patients have changed over time and new technology needs to be adopted to overcome these changes [15]. Shreds of evidence show that most of the patients are satisfied with the outcomes of laser eye surgeries, and the factors that determine the satisfaction and dissatisfaction are largely unpredictable and subjective [17,18]. The choice of type of refractive eye surgery is shared decision-making between the patient and the doctor. These surgeries are not usually covered by health insurance, and the cost varies according to the country's market, the technology used, and the surgeon's preferences. A study shows that the majority of the patients seek refractive eye surgery based on their preferences and suggestion from experts such as family physicians or ophthalmologists [19]. There is a need to identify current practices in refractive surgery and compare them with past practices in the KSA. This is crucial for predicting future challenges and changes in eye surgery and health care policy. The popularity of refractive eye surgeries is showing an upward trend, and there is a lack of studies in our region about the trends in these surgeries. Our aim in this study is to assess the preferences and practices of

ophthalmologists regarding refractive surgeries trends in Middle East countries.

METHODOLOGY:

A cross-sectional study was conducted using a pretested questionnaire among ophthalmologists in the KSA. The questionnaire was applied during the Saudi Ophthalmology Congress, 2020, after identifying the email id of all the registered member ophthalmologists of the Saudi Ophthalmology Society (SOS). Only members of the SOS who gave consent to participate after understanding the need and benefits of the study were included. Ophthalmologists who were not members of SOS and who didn't give consent were excluded. The questionnaire was sent using a link to an online survey form (Google Form) to collect the required data. A mixture of convenience and snowball sampling was done to collect the data. Responses from 77 ophthalmologists who fulfilled the above eligibility criteria were thus included for our analysis.

The questionnaire consisted of two parts. The first part collected information related to sociodemographic characteristics of ophthalmologists (6 items), and the second part included items related to refractive eye surgery practices (18 items). The questionnaire was pretested and piloted among ten ophthalmologists before sending for final data collection.

Statistical analysis

All the collected information was first cleaned and then tabulated on a Microsoft Excel sheet and transferred to IBM Statistical Package for Social Sciences, Version 23 (SPSS Inc., Chicago, IL, USA) for analysis. Descriptive statistics in the form of frequencies and percentages using suitable tables and figures were used to represent categorical data. Pearson's Chi-square test was used to find the relationship between categorical variables. A p-value less than 0.05 is considered statistically significant

RESULTS:

The analysis showed that the majority of the surgeons belonged to the age of 40-49 years (49.4%) and were Saudi citizens (90.9%). The type of work setting where refractive surgeons showed that 59.7% worked in private surgery hospitals or clinics, 9.1% worked in government hospitals, whereas 23.4% worked in both private and government hospitals. The majority of the surgeons practiced in Saudi Arabia (96.1%), and 41.6% had experience of 10-19 years in refractory surgery. It was found the 46.8% had done 16-25 refractive surgeries per month [Table 1].

Refractive surgery systems

The most commonly used Excimer laser platform is EX 500 (Alcon) (27.3%) followed by AMARIS 500 (SCHWIND) (24.7%). The usage of EX 500 (Alcon) was found to be comparatively more used by surgeons of the age group <40 years (42.1%), whereas AMARIS 500 (SCHWIND) was used more commonly by surgeons of age group 40-49 years (52.4%) ($p<0.05$) [Table 2]. It was also observed that surgeons from central KSA used AMARIS 1050 RS (SCHWIND) (83.4%) and AMARIS 500 (SCHWIND) (68.4%) comparatively more than other regions, whereas those from western KSA used MEL 90 (Carl Zeiss Meditec AG) more than others (71.4%), which showed a statistically significant association ($p=0.005$) [Table 3].

The most commonly used Femtosecond laser was Intralase 150 HZ (28.5%), followed by WaveLight FS200 femtosecond laser system (20.8%), which was found to be more used by surgeons from central KSA and Western KSA compared to others ($p=0.006$). It was found that the majority of the surgeons didn't use any manual Microkeratome [Table 2]

Preoperative diagnostics and examination

The most preferred preoperative topographic diagnostic device used for preoperative screening was Pentacam Comprehensive Eye Scanner (84.4%), and the preoperative wavefront diagnostic device for treatment planning was Alcons Contoura Vision (22.1%). For preoperative examination, Corneal Topography was the most commonly performed method (89.6%) of the surgeons, followed by Thinnest corneal Pachymetery (87%), Corneal Tomography (70.1%), and the less commonly done was Continuity of Placido mires (16.9%) [Table 4].

It was found that 72.7% reported that all factors such cylindrical power, high order abrasion, spherical equivalent, spherical power, post-operative expected keratometry, and post-operative expected residual stromal bed were influencing factors for undertaking RES. It was reported by 79.2% of the surgeons that only <25% of their patients underwent RES, whereas 9.1% mentioned that they RES on 75-100% of their patients [Figure 1].

When we assessed the treatment chosen for Presbyopia, 59.7% and 26% of the surgeons reported it as 'reading glasses' and 'Refractive Lens Exchange (RLE) with presbyopia IOL, respectively.' It was found that 96.1% and 92.2% of the surgeons didn't undergo any Corneal Surface Excimer procedure and Intracorneal Inlay for their patients. The most commonly performed multifocal intraocular lenses for

Presbyopia was 'the Panoptix' (33.8%), followed by 'the AT LISA tri 839 MP' (26%). It was reported by 98.7% of the surgeons that they didn't use any Accommodating intraocular lenses for Presbyopia [Figure 2].

The assessment of technique for myopia showed that Photorefractive Keratectomy [PRK] was the most preferred for myopia <4.00 D (68.8%) and 4.00-8.00 D (53.2%). At the same time, it was Phakic intraocular lens implants [p-IOLs] for Myopia 8.00 to 12.00 D (80.5%) and >12.00 D (92.2%). When we asked the preferable p-IOLs, it was found that the majority (90.9%) of the surgeons preferred Visian ICL PCIOL [Table 5].

The most commonly preferred RES by the surgeons in our study was Photorefractive Keratectomy [PRK], which was more reported by surgeons with 9 years or less experience (p=0.020). Laser in situ Keratomileusis [LASIK] and Intrastromal corneal rings [ICRs] were more preferred by non-Saudi surgeons than Saudi Surgeons (p<0.05) [Table 6].

LASIK surgery-related factors

For LASIK surgery, the most used corneal flap creation was Femtosecond laser (94.8%), which was comparatively more used by surgeons of age less than 49 years (> 40 and 41-49 years) (p<0.001). The most commonly preferred Corneal flap thickness was 110 um (66.2%), which was significantly more used by surgeons who had an experience of 10 years and more (p<0.001). The most commonly used Corneal flap diameter for myopia was 8.50 mm (45.5%), which was significantly higher in surgeons who had an experience of 10-19 years (51.4%) (p=0.015). Whereas the commonly used Corneal flap diameter for Hyperopia was 9.00 mm (84.4%), and this was comparatively more in surgeons who worked in private hospitals or clinics (61.5%) (p=0.010). The most preferred Residual Stromal Bed thickness limitation for LASIK surgery was 351-400 um (40.3%), which was comparatively more seen in surgeons of age group 50-59 years (48.4%) (p=0.020) [Table 7].

It was reported by 88.3% of surgeons that the percentage of post-refractive surgery enhancement performed was <2%, and this was significantly higher in surgeons aged 40-49 years (52.9%), Saudi surgeons (94.1%), and those who had experience in RES of <5 years (28%) (p<0.05). It was found that 81.8% of the surgeons <25% of their cataract patients received premium IOL implant, and 68.8% of them preferred PRK procedure Mitomycin application for all cases. 74% of surgeons reported that they don't apply Mitomycin during a PRK [Table 7].

Table 1: Baseline characteristics of refractive surgeons (n=77)

		Frequency	Percent
Age	<40 years	23	29.9
	40-49 years	38	49.4
	50-59 years	11	14.3
	>60 years	5	6.5
Nationality	Saudi	70	90.9
	Non-Saudi	7	9.1
Type of practice	Government	7	9.1
	Private	46	59.7
	Both Government and Private	18	23.4
	University Hospital	6	7.8
Location of practice	Eastern KSA (including Bahrain)	12	15.6
	Western KSA	19	24.7
	Central KSA	41	53.2
	Others	5	6.5
Experience in refractive eye surgery (years)	<5	20	26.0
	5-9	14	18.2
	10-19	32	41.6
	>20	11	14.3
Average refractive surgeries done/ month	1-5	11	14.3
	6-15	36	46.8
	16-25	7	9.1
	26-50	12	15.6
	>51	11	14.3

Table 2: Refractive surgery equipment and their relationship with **characteristics of surgeons**

Commonly used systems		N	%	Age	Nationality	Type of practice	Location of practice	Experience in refractive surgery	Average refractive surgeries done/ month
Excimer laser platform	Allegretto Wave Eye-Q (Alcon).	10	13.0	0.012	0.074	0.221	0.005	0.055	0.155
	AMARIS 1050RS(SCHWIND).	6	7.8						
	AMARIS 500 (SCHWIND)	19	24.7						
	AMARIS 750 s (SCHWIND).	3	3.9						
	EX 500 (Alcon)	21	27.3						
	MEL 90 (Carl Zeiss Meditec AG)	7	9.1						
	Nidek EC 5000 Navex Quest.	9	11.7						
	VISX STAR S4 IR	2	2.6						
Femtosecond laser	Femto LVD	7	9.1	0.747	0.621	0.070	0.006	0.527	0.094
	Intralase 150 HZ	22	28.6						
	Intralase 60 HZ	13	16.9						
	Visμmax	8	10.4						
	WaveLight FS200 femtosecond laser system	16	20.8						
	Don't use	11	14.3						
Manual Microkeratome	M2 110 Moria	6	7.8	0.049	0.015	0.029	0.488	0.111	0.552
	M2 90 Moria	8	10.4						
	SBK Moria	2	2.6						
	SBK Moria	7	9.1						
	None	54	70.1						

Table 3: Usage of Excimer laser platform based on regions								
			Regions				Total	***P value***
			Eastern KSA including Bahrain	Western KSA	Central KSA	Others		
	Allegretto Wave Eye-Q (Alcon).	N	2	1	7	0	10	0.005
		%	20.0%	10.0%	70.0%	0.0%	100.0%	
	AMARIS 1050RS(SCHWIND)	N	0	1	5	0	6	
		%	0.0%	16.7%	83.3%	0.0%	100.0%	
	AMARIS 500 (SCHWIND)	N	3	2	13	1	19	
		%	15.8%	10.5%	68.4%	5.3%	100.0%	
	AMARIS 750 s (SCHWIND).	N	1	0	2	0	3	
		%	33.3%	0.0%	66.7%	0.0%	100.0%	
	EX 500 (Alcon)	N	4	5	9	3	21	
		%	19.0%	23.8%	42.9%	14.3%	100.0%	
	MEL 90 (Carl Zeiss Meditec AG)	N	2	5	0	0	7	
		%	28.6%	71.4%	0.0%	0.0%	100.0%	
	Nidek EC 5000 Navex Quest	N	0	3	5	1	9	
		%	0.0%	33.3%	55.6%	11.1%	100.0%	
	VISX STAR S4 IR	N	0	2	0	0	2	
		%	0.0%	100.0%	0.0%	0.0%	100.0%	

Table 4: Preoperative diagnostics and examination			
		N	%
Preoperative topography diagnostic device preferred in pre-operative screening	CSO Sirius topographic system	5	6.5
	Galilei dual Scheimpflug system	5	6.5
	OPD-Scan III topographer.	1	1.3
	Orbscan II	1	1.3
	Pentacam Comprehensive Eye Scanner	65	84.4
Preoperative wavefront diagnostic device used for treatment-planning	Alcons Contoura Vision	17	22.1
	CSO Sirius Aberrometric analysis system	6	7.8
	iDESIGN Refractive Studio	2	2.6
	NAVEX	4	5.2
	OPD-Scan III Wavefront Aberrometer	4	5.2
	The Combi Wavefront Analyzer	16	20.8
	ZEISS CRS-Master	5	6.5
	None	23	29.9
Preoperative examination	Central Corneal Tachymetry	50	64.9
	Thinnest corneal Pachymetery	67	87.0
	Anterior Chamber Depth	33	42.9
	Corneal Topography	69	89.6
	Corneal Tomography (belin/ambrosio if available),	54	70.1
	Corneal Keratometry	50	64.9
	Fundus Status	53	68.8
	Pupil size in dim light	51	66.2
	Intraocular Pressure	46	59.7
	Schirmers test or Tear film Break-up time	35	45.5
	Continuity of placido mires	13	16.9
	Infrared pupillometry	14	18.2
	Axial length	14	18.2
	Peripheral corneal thickness	16	20.8

Table 5: Preferred methods for RES in Myopia patients			
		N	**%**
RES Technique for <4.00 D Myopia	Laser assisted subepithelial keratectomy [LASEK]	10	13.0
	Laser in situ Keratomileusis [LASIK]	14	18.2
	Photorefractive Keratectomy [PRK]	53	68.8
RES Technique for 4.00 - 8.00 D Myopia	Laser assisted subepithelial keratectomy [LASEK]	8	10.4
	Laser in situ Keratomileusis [LASIK]	23	29.9
	Phakic intraocular lense implants [p-IOLs]	3	3.9
	Photorefractive Keratectomy [PRK]	41	53.2
	Small incision lenticule extraction (SMILE)	2	2.6
RES Technique for 8.00 to to 12.00 D Myopia	Phakic intraocular lense implants [p-IOLs]	62	80.5
	Photorefractive Keratectomy [PRK]	8	10.4
	Small incision lenticule extraction (SMILE)	3	3.9
	No Surgery	4	5.2
RES Technique for >12.00 D Myopia	Phakic intraocular lense implants [p-IOLs]	71	92.2
	No Surgery	6	7.8
Preferred Phakic intraocular lense implants [p-IOLs	Artisan Iris-claw ACIOL	3	3.9
	Verisyse Iris-claw ACIOL	1	1.3
	Visian ICL PCIOL	3	3.9
	Visian ICL PCIOL	70	90.9

Table 6: Refractive eye surgery and its relationship with characteristics of surgeons									
		N		P value*					
		N	%	Age	Nationality	Type of practice	Location of practice	Experience in RES	Average RES done/ month
RES performed	Laser in situ Keratomileusis [LASIK]	21	27.3	0.013	<0.001	0.262	0.118	0.142	0.193
	Photorefractive Keratectomy [PRK]	63	81.8	0.134	0.455	0.646	0.488	0.020	0.306
	Phakic intraocular lens implants [p-IOLs]	26	33.8	0.038	0.170	0.008	0.987	0.301	0.442
	Epithelial laser in situ Keratomileusis [epiLASIK]	1	1.3	0.498	0.001	0.877	<0.001	0.409	0.886
	Intrastromal corneal rings [ICRs]	10	13.0	0.262	0.014	0.987	0.285	0.867	0.366

* P value for Pearson chi-square test (*$p<0.05$ is considered statistically significant)*

Table 7: LASIK surgery related factors and its relationship with characteristics of surgeons

		N	%	P value*					
				Age	Nationality	Type of practice	Location of practice	Experience in RES	Average RES done/ month
Corneal flap creation used in LASIK	Femtosecond laser	73	94.8	0.001	0.936	0.803	0.982	0.319	0.660
	M2 110 Moria microkeratome	1	1.3						
	M2 90 Moria microkeratome	1	1.3						
	SBK Moria microkeratome	2	2.6						
Corneal flap thickness used in LASIK	90 µm	12	15.6	0.338	0.978	0.321	0.089	0.191	<0.001
	110 µm	51	66.2						
	120 µm	10	13.0						
	130 µm	2	2.6						
	140 µm	2	2.6						
Corneal flap Diameter in Myopia used in LASIK	8.00 mm	20	26.0	0.186	0.671	0.225	0.909	0.015	0.239
	8.50 mm	35	45.5						
	9.00 mm	22	28.6						
Corneal flap Diameter in Hyperopia used in LASIK	8.00 mm	1	1.3	0.836	0.950	0.010	0.622	0.212	0.352
	8.50 mm	11	14.3						
	9.00 mm	65	84.4						
Residual Stromal Bed thickness limitation for LASIK	250 to 300 µm	15	19.5	0.020	0.269	0.145	0.504	0.369	0.209
	301-350 µm	29	37.7						
	351-400 µm	31	40.3						
	>400 µm	2	2.6						
Percentage of post refractive surgery enhancement performed	< 2%	68	88.3	0.001	0.013	0.812	0.813	0.005	0.476
	3 to 5%	8	10.4						
	> 5%	1	1.3						
Percentage of your cataract patients received premiµm IOL implant	< 25%	63	81.8	0.104	0.198	0.866	0.707	0.101	0.132
	26 to 50%	10	13.0						
	>51%	4	5.2						
PRK procedure Mitomycin application preferred	>2.00 shere	7	9.1	0.001	0.723	0.523	0.879	0.001	<0.001
	>= 4.00 shere	15	19.5						
	All cases	53	68.8						
	None	2	2.6						
Percentage of Mitomycin applied during a PRK procedure	0%	57	74.0	0.069	0.841	0.388	0.361	0.096	0.688
	1-10%	10	13.0						
	11-15%	6	7.8						
	25-30%	4	5.2						

* P value for Pearson chi-square test (*p<0.05 is considered statistically significant)*

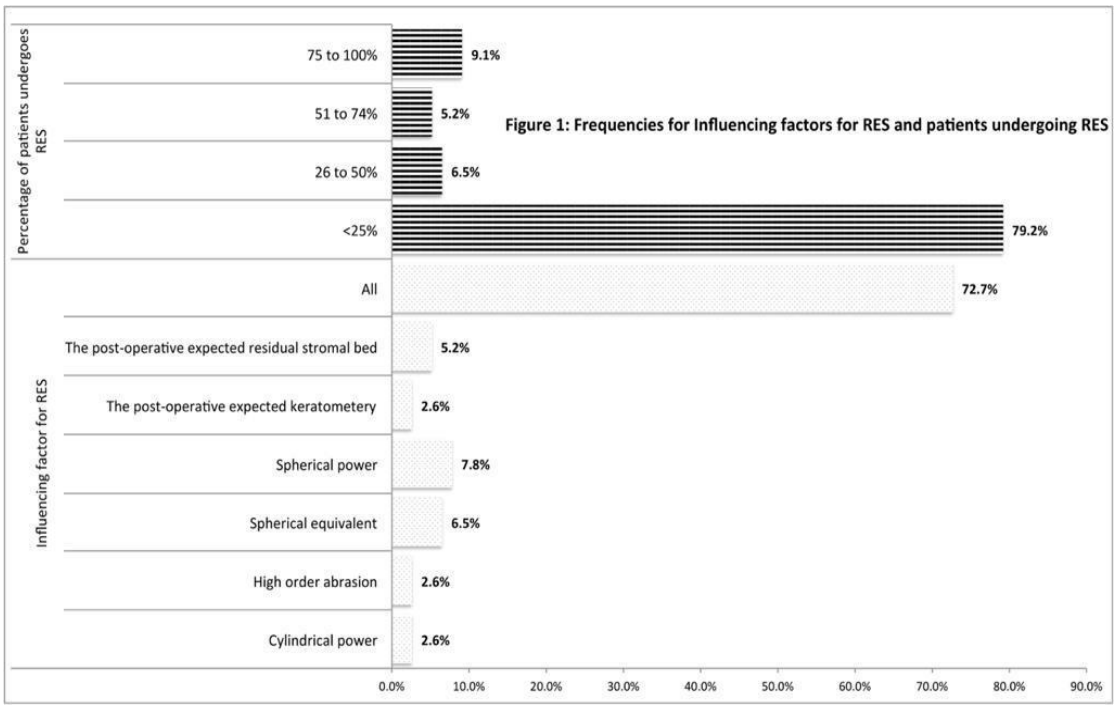

Figure 1: Frequencies for influencing factors for RES and patients underwent RES.

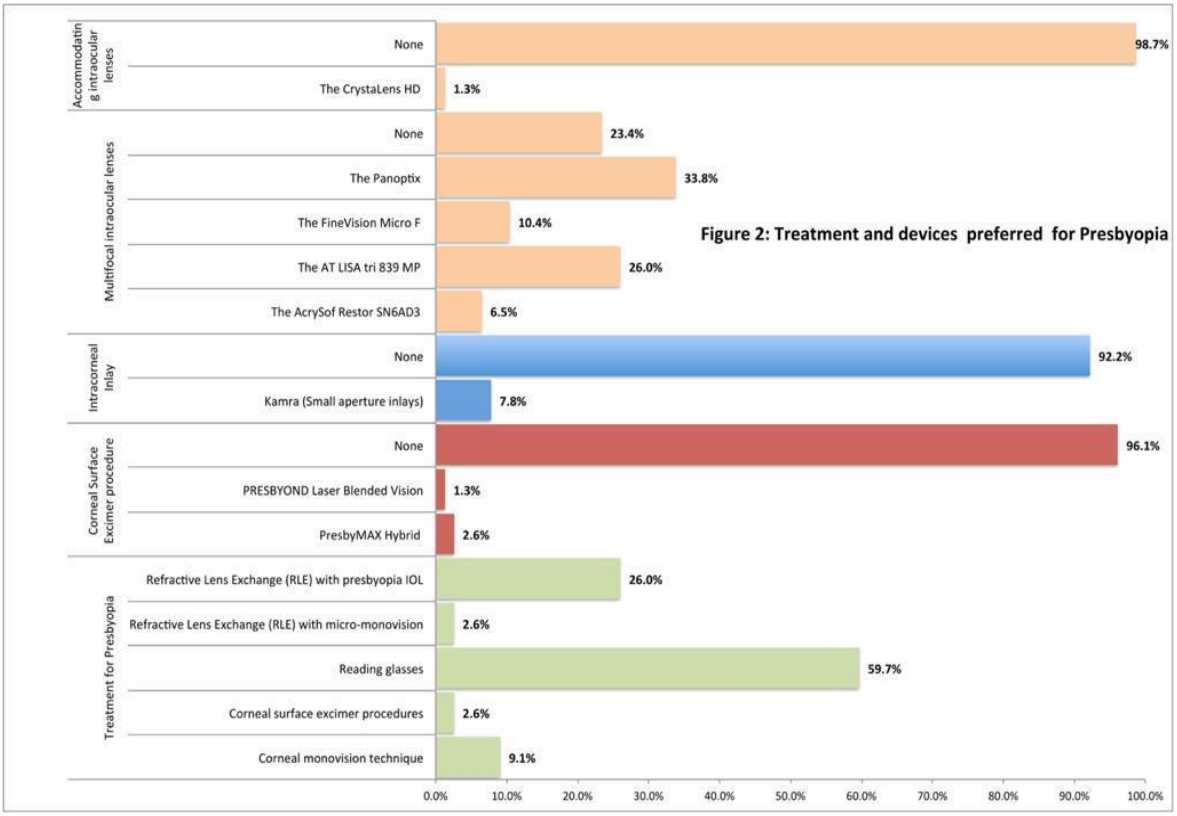

Figure 2: Treatment and devices preferred for Presbyopia

DISCUSSION:

This study assessed the current practices related to n refractive surgery among ophthalmologists in and around KSA. The findings showed that Photorefractive Keratectomy [PRK] surgery was the most commonly performed surgery for myopia -8 D reported by the participants. This is in contrast to a recent study conducted by Alsabaani et al. in KSA, which said that 50% and 45% of the ophthalmologists preferred LASIK and PRK, respectively [20]. Laser in situ Keratomileusis (LASIK) is one of the commonly preferred procedures for refractive eye surgery worldwide as it has the advantage of maintaining central corneal epithelium compared to PRK [21,22]. One of the reasons to avoid LASIK by our study participants could be minimizing the corneal flap-related complications during surgery that are difficult to treat. However, Phakic intraocular lens implants [p-IOLs] were the most preferred technique for myopia -8 to -12 D by our study participants, and this may be to minimize the incidence of corneal ectasia, postoperative refractive error, and myopic regression [23]. This is similar to the findings of Ahn et al., which reported that 92% of the surgeon preferred p-IOLs for myopia more than -8 D [14]. The most commonly used Excimer laser platform was EX 500 (Alcon) (27.3%), followed by AMARIS 500 (SCHWIND) (24.7%). The excimer laser system had been in use since 1987, and now there are various commercially available systems depending on the country. In our study, there were variations observed in the usage of Excimer laser systems between different regions. A study done in Riyadh had reported that 30% and 15% of eye surgeons used Alcon and Nidek laser systems and 50% didn't remember what systems they used for refractive surgery [20]. EX500 systems are one of the latest systems that many surgeons prefer due to their advantages, such as maintaining a more natural corneal shape surgery, decreased aberration induced during the procedure, topography-guided customized treatment using a 6D tracking system [24]. Schwind Amaris has a super-Gaussian ablative spot profile and has major advantages such as short treatment time (<2 seconds) and has the ability to maintain the preoperative levels of ocular higher-order aberrations due to its aspheric ablation algorithm [25].

In our study, the majority of the surgeon used Pentacam Comprehensive Eye Scanner (CES) for preoperative screening. Evidence shows that refractive indices on the Pentacam system are reliable preoperative topography diagnostic devices [26]. A study done by Uçakhan and colleagues reported that Pentacam CES showed better reproducibility in measuring central corneal thickness (CCT) compared to ultrasound pachymetry (UP) among moderately keratoconic eyes [27]. The most commonly used Preoperative wavefront diagnostic device by our participants were Alcons Contoura Vision and The Combi Wavefront Analyzer. It was demonstrated by Heidari et al. that Corneal wavefront indices from Scheimpflug, Scheimpflug/Placido, and Hartmann–Shack devices have better validity and higher diagnostic ability for keratoconus (KCN) patients when compared to subclinical keratoconus (SKCN) [28]. The majority of the surgeons used Corneal Topography and Thinnest corneal Pachymetery for preoperative examination. Corneal topography is used to evaluate the anterior curvature of the cornea, whereas tomography is used to measure posterior curvature [29]. Pachymetry imaging is often preferred by eye surgeons for Central cornea thickness (CCT) measurement due to its easiness to use, reproducibility, and acceptable cost [30].

Femtosecond laser (FSL) was used for corneal flap creations by the majority of the surgeons in our study. FSL is rapidly gaining popularity due to the superior consistency and predictability for corneal incisions and anterior capsulorhexis [31]. Our study observed that the majority of the surgeon preferred 110 µm thickness for corneal flap in LASIK, whereas only minimum participants preferred 130 µm. These findings are in contrast to findings from Korea, where the preferred thickness was 130 µm [14]. Some surgeons preferred thinner flaps, which might be because a thin flap can be created more easily using an FSL. The less use of Mechanical microkeratomes by the refractive surgeons could be because they tend to create uneven thickness for meniscus-shaped corneal flaps compared to FSL, which gives a more uniform planar flap [32]. The most commonly preferred flap diameter for myopia using LASIK was 8.5 µm. It is very crucial to consider flap size to the corneal diameter when opting for a LASIK as a larger corneal diameter may give tear deficiency after the surgery [33]. The commonly used Residual Stromal Bed thickness (RSBT) for LASIK in our study was 351-400 µm (40.3%) followed by 301-350 µm (37.7%). A study done in the USA reported that the commonly preferred RSBT was 300 µm (43%) and 250 µm (39%) [34]. The Korean study showed that 66.7% was preferred 300 to 350 µm as the minimum RSBT for LASIK [14], which is more than our study findings. Our study participants preferred a thicker RSBT, which could be related to avoiding corneal ectasia related to refractive surgery.

Refractive errors (REs) such as under-correction, overcorrection, regression, and surgically induced

astigmatism could happen after refractive surgeries. In our study, the percentage of post-refractive surgery enhancement performed was minimal (<2%) as reported by the majority of the surgeons. This indicates the incidence of refractive errors was less reported by our study participants, which could not be completely related to the technique and devices used for surgery as REs depend on many other factors [35]. It was reported by <25% of the surgeons that they gave premiμm IOL (p-IOLs) implants for cataract patients. The p-IOLs have special refractive properties, aspheric design, and are biocompatible, would provide clear vision at near and distant focal points without additional spectacle correction compared to Traditional intraocular lenses [36]. In our study, only 26% did Refractive Lens Exchange (RLE) with IOLs for presbyopia, and the majority of the surgeons prescribed reading glasses for such patients. Surgical procedures are expensive when compared to other non-surgical methods such as Spectacles and contact lenses, and this could be the reason why the majority of surgeons prescribed spectacles for presbyopia patients.

Our study has some limitations; firstly, we used a self-reported online questionnaire with multiple choices, resulting in response bias and social desirability bias. Secondly, our sample size was not big enough, and we used a mixture of convincing and snowball sampling methods that would have resulted in sampling bias. Thirdly, we had a very limited response rate as this was an anonymous survey.

CONCLUSION:

In conclusion, the current study showed that the most commonly preferred refractive surgery was Photorefractive Keratectomy [PRK], which shows that trends are shifting from LASIK to other newer methods. The use of surgical procedures for correcting presbyopia was less among our study participants. Eye surgeons need to be updated with newer technologies and devices that deliver higher accuracy, repeatability, consistency, and also patient safety. We suggest conducting a larger prospective study involving a bigger sample of eye surgeons to truly assess the latest trends in refractive surgery in KSA.

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