AIM OF THE WORK

This work aimed at evaluating the relationship between the corneal topographic parameters and the rigid gas permeable contact lens fitting parameters in patients with keratoconus.

SUBJECTS

This prospective study included 40 eyes suffering from keratoconus.

Inclusion criteria:

1- Age: any age.
2- Sex: both sexes.
3- Keratoconus was diagnosed based on clinical findings and topographic findings.
   - Clinical findings (such as corneal thinning, cone-like shape deformity, Vogt's striae, Munson's sign, Fleischer's ring)
   - Topographic diagnosis:
     - (a) Placido – based topography: diagnosis of keratoconus was made if the topographic pattern revealed abnormal localized steepening or an asymmetric bow-tie with or without skewing of the radial axis.
     - (b) Scheimpflug Camera – based topography (Pentacam). Diagnosis of keratoconus was made if the elevation of the corneal front surface at the thinnest location was greater than 15μ or greater than 20μ for the back surface at the same thinnest point.[154]

Exclusion criteria:

- Patients who had a history of other ocular co-morbidity, amblyopia, or previous surgery or trauma.
- Patients whose topographical plots yielded insufficient useful data after 5 attempts.
- Contraindications for RGP contact lenses:
  - Severe dry eye
  - Meibomian gland dysfunction.
  - Mental retardation.
  - Poor hygiene.
  - Unsuitable environment, e.g., farmers, soldiers, working in dusty environment.
- Patients who could not be fitted with our trial lens set (based on assessment of centration, movement and fluorescein pattern)

METHODS

All patients underwent complete ophthalmologic examination including:

- Visual acuity (UCVA & BCVA) was measured using the decimal visual acuity charts. Visual acuity was recorded as the smallest line where at least half of the of letters were read correctly.
- Slit-lamp biomicroscopy.
- Corneal topography analysis (Wavelight® Topolyzer™ *VARIO™)*(Fig.11)

Fig.11 : The Allegro topolyzer [154]

The ALLEGRO TOPOLYZER (WaveLight Laser Technologie, AG, Erlangen, Germany), features a built-in keratometer and a high resolution Placido-ring corneal topographer detecting 22,000 points of measurement from 22 ring edges, with an interactive elevation map. The measurements are aligned to the line of sight that passes through the pupil center. To ensure this, the patients are instructed to maintain fixation on the target light, while the TOPOLYZER software automatically release the measurements only when the corneal apex was correctly focused in x, y and z axes.[155]

Topography image acquisition procedure:

After patients' personal data are entered, the program changes to imaging mode. Patients were seated with his or her chin on a chin rest and forehead against the forehead strap and were asked to fixate ahead on a target. The operator manually focuses and aligns the image. Arrows are displayed on the screen that guides the operator's alignment of the instrument in the horizontal, vertical, and antero-posterior axes. The instrument

automatically determines when correct focus and alignment with the corneal apex had been achieved and then performs a scan.

The image was then examined immediately by the operator to make certain that it is complete, aligned, and focused. If the image was unacceptable, it was discarded and the procedure repeated until an acceptable image is achieved. The best video keratography image was selected based on the quality of the keratoscope mires (the best mire coverage of the cornea).

The tangential radius maps were used to define the exact size and location of the cone (indication of cone type)

The cones were subdivided into two categories:

- Nipple or centered cones (if the highest power was located in the central 3 mm) (Fig. 12)
- Oval cones (if the highest power was located outside the central 3 mm) (Fig. 13)

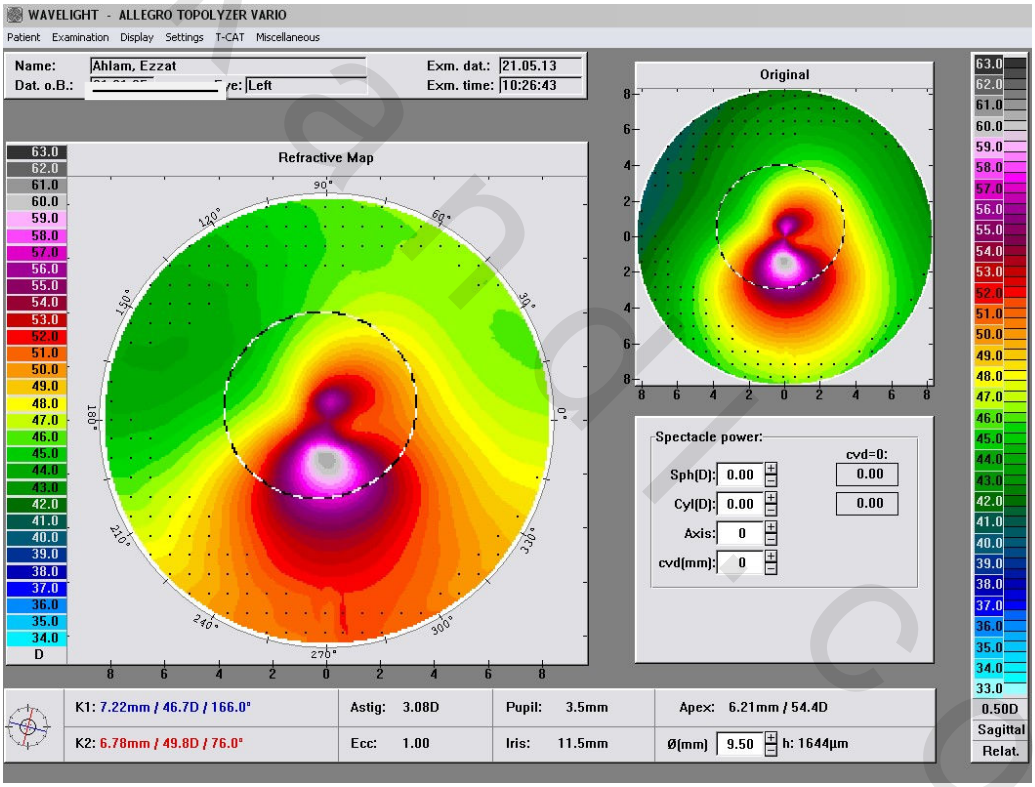


Fig. 12: Nipple cone

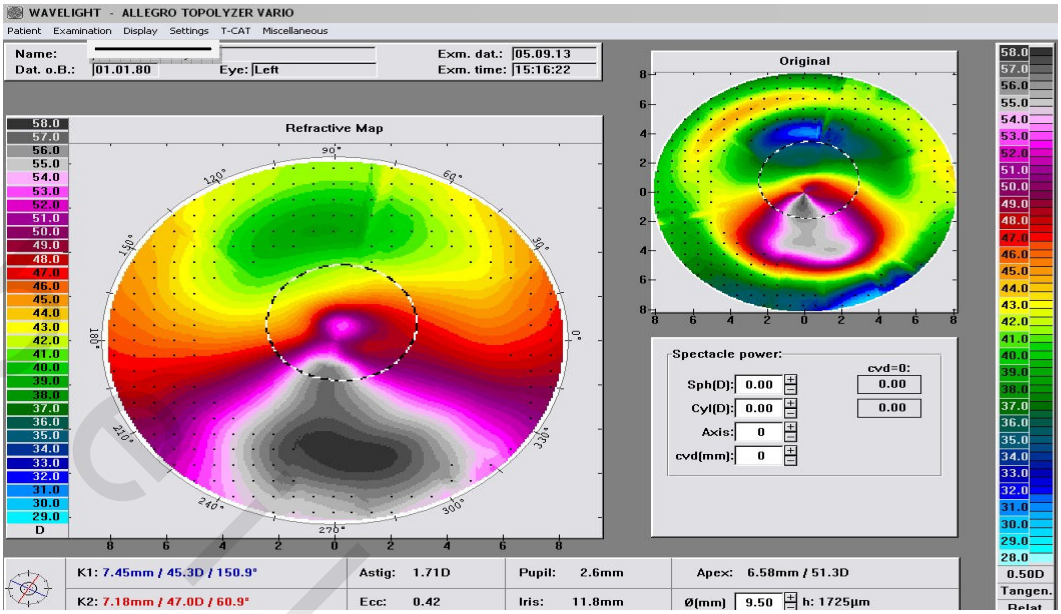


Fig. 13: Oval cone

Based on the mean keratometry reading on corneal topography, the patients were classified into three stages according to the guidelines of the Contact Lens Association of Ophthalmologists.(156)

- Mild keratoconus: mean 'K' ≤45.00 Dioptres (D)
- Moderate: mean 'K' 45.00–52.00 D
- Advanced: mean 'K' ≥52.00 D

Measurement of the Cone Diameter

To measure the size of the cone, a screen caliper was placed over the topographic map. (Fig.14) The horizontal diameter of the cone was measured to one tenth of a centimeter. Two measurements were obtained: the cone peak diameter and the overall cone diameter. (Fig.15&16) Cone peak is the maximum keratometry power inside the cone area.(157)

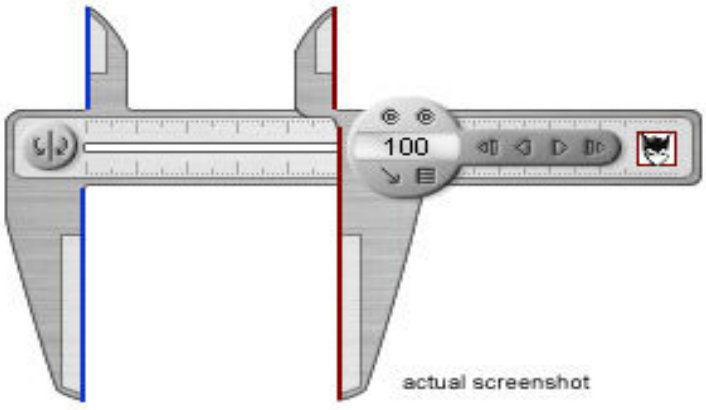


Fig. 14: shows the screen caliper [158]

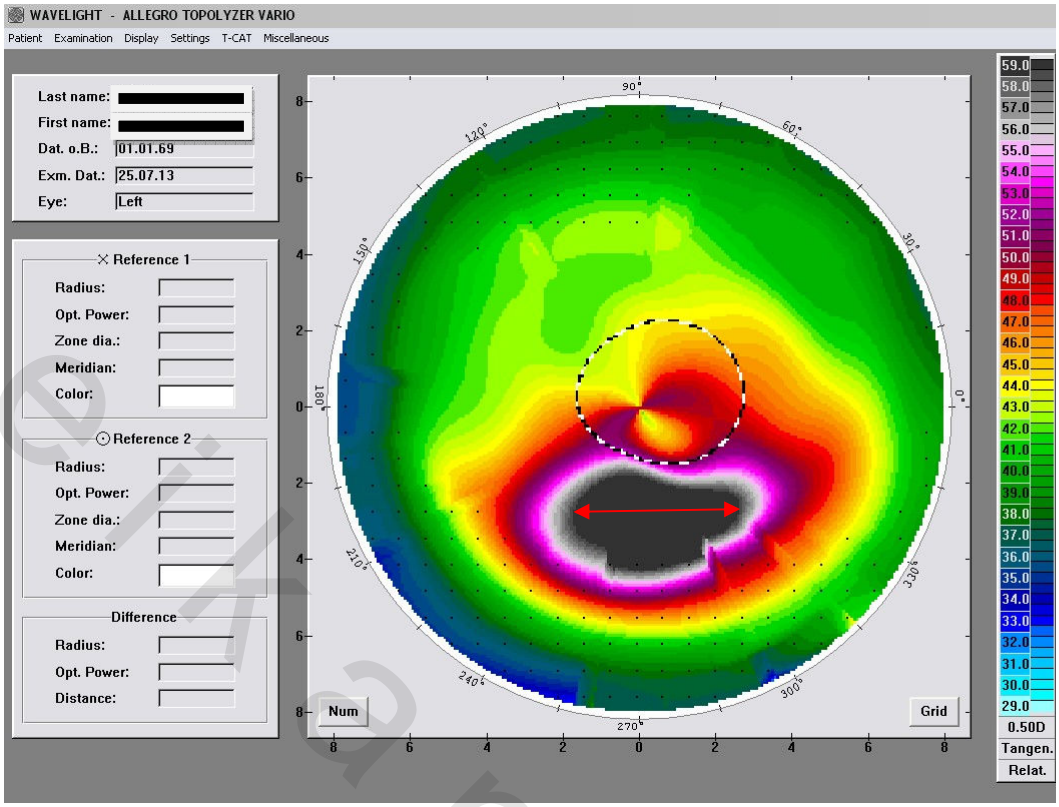


Fig. 15: Shows measurement of cone peak diameter

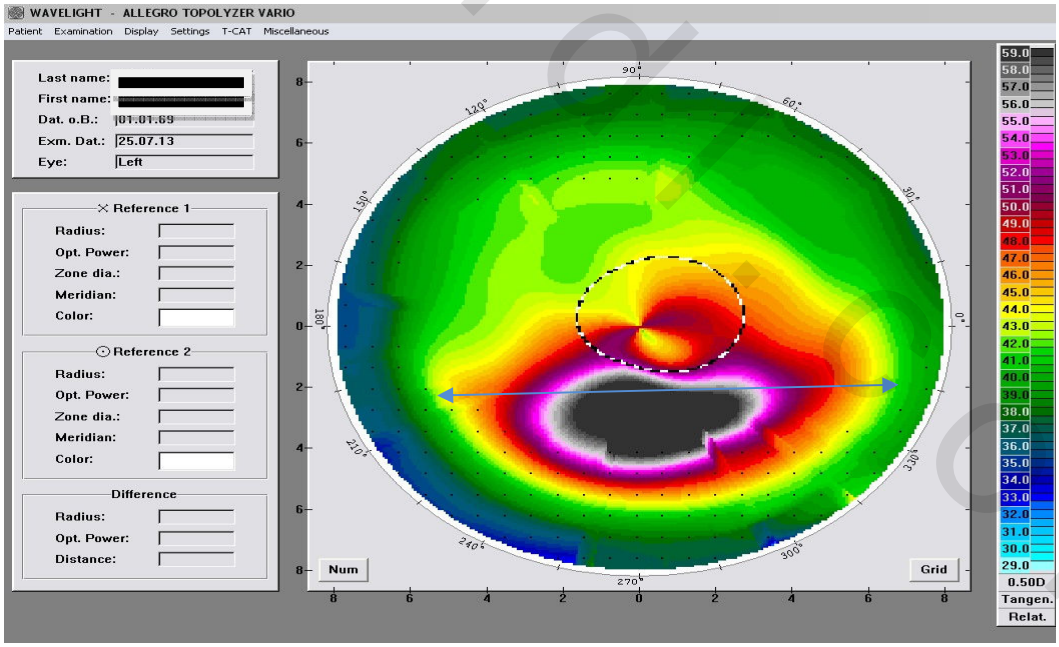


Fig. 16: Shows measurement of overall cone diameter

Contact lens fitting:

The initial trial lens was selected based on the flat sim K reading on corneal topography. For proper lens fit assessment, patients were required to wear each lens for 30 minutes to allow for lens stabilization. Lens fitting was then assessed on the slit-lamp, utilizing white light and the cobalt blue filter after instillation of fluorescein.

In our fitting protocol, we attempted to have a 'three-point touch' approach. (Fig.17) If a three-point touch was not achievable, apical bearing pattern with a moderate amount of touch on the corneal apex was accepted. Maximum accepted touch at the apex of the cone was 2–3 mm.

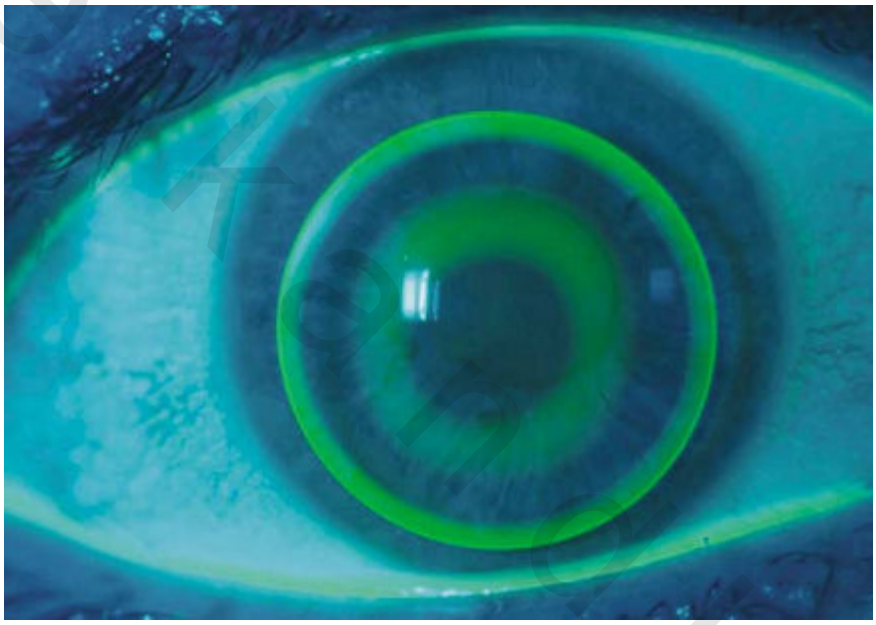


Fig. 17: Fluorescein pattern with 3 point touch

A specially designed set of rigid gas permeable trial lenses (manufactured by CANTOR+NISSEL, Brackley, United Kingdom) was used. These are spherical lenses with variable back optic zone diameter (BOZD), where steeper lenses in the trial set have smaller BOZD.

The trial lens parameters ranged as follows: the base curves (BC) ranged from 5.9 to 7.30 mm (in 0.1 mm steps), the diameters ranged from 8.2 to 9 mm (in 0.2 mm steps) and the back optic zone diameter ranged from 6.4 to 7.2 (in 0.2 mm steps) . Table (1)

Table. 1: The trial lenses parameters (each lens has three specification)

Base curve radius	Optic zone diameter	Overall lens diameter
7.7	7.4	9.2
7.6	7.4	9.2
7.5	7.3	9.1
7.4	7.3	9.1
7.3	7.2	9.0
7.2	7.2	9.0
7.1	7.2	9.0
7.0	7.0	8.8
6.9	7.0	8.8
6.8	7.0	8.8
6.7	6.8	8.6
6.6	6.8	8.6
6.5	6.8	8.6
6.4	6.6	8.4
6.3	6.6	8.4
6.2	6.6	8.4
6.1	6.4	8.2
6.0	6.4	8.2
5.9	6.4	8.2

Over contact lens refraction was performed using auto refractometer (Topcon) then subjective refraction was performed.

RGP visual acuity (RGPVA) was recorded by using the decimal visual acuity chart at 6 m distance.

The following correlations were evaluated:

- The correlation between the steepest K (K2), base curve and cone diameters.
- The correlation between lens diameter, back optic zone diameter and cone diameters.

Statistical analysis of the data

Data were fed to the computer and analyzed using IBM SPSS software package version 20.0. Qualitative data were described using number and percent. Quantitative data

were described using Range (minimum and maximum), mean, standard deviation and median. Distribution of oval and nipple cases regarding categorical variables was tested using Chi-square test. When more than 20% of the cells have expected count less than 5, correction for chi-square was conducted using Fisher's Exact test or Monte Carlo correction. The distributions of quantitative variables were tested for normality using Kolmogorov-Smirnov *test,* Shapiro-Wilk test and D'Agstino test, also Histogram and QQ plot were used for vision test. If it reveals normal data distribution, parametric tests was applied. If the data were abnormally distributed, non-parametric tests were used. For normally distributed data, Independent t-test was used to reveal any difference between oval and nipple cases. Correlations between two quantitative variables were assessed using Pearson coefficient. For abnormally distributed data, Mann Whitney test was used to determine any difference between oval and nipple cases. Correlations between two quantitative variables were assessed using Spearman coefficient. Significance test results are quoted as two-tailed probabilities. Significance of the obtained results was judged at the 5% level.[159, 160]

RESULTS

Forty eyes (22 right eyes and 18 left eyes) from 25 patients were enrolled in this study. Ten patients (40%) were male and 15 patients (60%) were female.

The mean age (±SD) was 27.93 ± 10.75 years. Ages ranged from 15 to 56 years.

According to the cone type, the patients were divided into nipple and oval cone groups. Twenty eyes (50%) had nipple cone and 20 eyes (50%) had oval cone (Table 2).

Table. 2: Age distribution in the two groups.

	Oval (n = 20)	**Nipple (n = 20)**	**Total (n = 40)**
Age (years)			
Min. – Max.	16.0 – 45.0	15.0 – 56.0	15.0 – 56.0
Mean ± SD	28.43 ± 9.54	27.40 ± 12.13	27.93 ± 10.75
p	0.565		

p: p value for comparing between the two studied groups

Visual acuity:

- The mean logMAR UCVA in the oval cone group was 0.75 ± 0.42**,** while in the nipple cone group was 0.81 ± 0.44.
- The mean logMAR BSCVA in the oval cone group was 0.38 ± 0.33, while in the nipple cone group was 0.43 ± 0.32.
- The mean logMAR RGP VA in the oval cone group was 0.12 ± 0.09, while in the nipple cone group was 0.19 ± 0.20.
- There was no statistically significant difference between both groups regarding logMAR UCVA, BSCVA and RGPVA.
- Table (3) illustrates LogMAR visual acuities in the studied groups.

Table. 3: LogMAR visual acuities in the studied groups

LogMAR	**Oval (n = 20)**	**Nipple (n = 20)**	**Total (n = 40)**
UCVA			
Min. – Max.	0.10 – 1.30	0.05 – 1.30	0.05 – 1.30
Mean ± SD	0.75 ± 0.42	0.87 ± 0.46	0.81 ± 0.44
p	0.364		
BSCVA			
Min. – Max.	0.05 – 1.30	0.05 – 1.0	0.05 – 1.30
Mean ± SD	0.38 ± 0.33	0.47 ± 0.30	0.43 ± 0.32
p	0.253		
RGP VA			
Min. – Max.	0.0 – 0.30	0.0 – 0.70	0.0 – 0.70
Mean ± SD	0.12 ± 0.09	0.19 ± 0.20	0.16 ± 0.15
p	0.157		

- The number of eyes with RGP VA 0.5 or better were 19 eyes (95%) in the oval cone group and 15 eyes (75.0 %) in the nipple cone group.
- 18 eyes (90%) in the oval cone group showed RGP VA better than BSCVA while 17 eyes in the nipple cone group (85%) showed RGP VA better than BSCVA.
- Table (4&5) show the decimal visual acuities in both groups.

Table. 4: Shows the decimal visual acuity in the nipple cone group

Patient number	BSCVA	RGP VA
1	0.2	0.2
2	0.3	0.8
3	0.9	0.9
4	0.6	0.8
5	0.3	0.6
6	0.3	0.6
7	0.1	0.3
8	0.05	0.7
9	0.4	0.8
10	0.8	0.8
11	0.3	0.4
12	0.4	1.0
13	0.9	1.0
14	0.4	0.7
15	0.1	0.3
16	0.5	0.9
17	0.1	0.9
18	0.4	0.8
19	0.05	0.5
20	0.1	0.3

Table .5: Shows the decimal visual acuity in the oval cone group.

Patient number	BSCVA	RGP VA
1	0.6	0.8
2	0.7	0.9
3	0.2	0.6
4	0.6	1.0
5	0.7	0.7
6	0.1	0.6
7	0.3	0.7
8	0.5	0.7
9	0.4	0.7
10	0.4	0.6
11	0.8	0.9
12	0.15	0.8
13	0.3	0.5
14	0.4	0.6
15	0.9	1.0
16	0.05	0.7
17	0.7	0.9
18	0.7	0.7
19	0.6	0.9
20	0.7	1.0

Topographic keratometry readings:

- The mean K1 in the oval cone group was 47.60 ± 3.75 D, while in the nipple cone group was 46.44 ± 3.65 D.
- The mean K2 in the oval cone group was 50.47 ± 4.69 D, while in the nipple cone group was 50.28 ± 3.41D.
- The mean average K in the oval cone group was 48.39 ± 4.12 D, while in the nipple cone group was 47.88 ± 3.81 D.
- There was no statistically significant difference between the two groups regarding keratometry readings.
- Table (6) illustrates keratometry readings in the studied groups.

Table. 6: Keratometry readings in the studied groups.

	Oval (n = 20)	Nipple (n = 20)	Total (n = 40)
K1(D)			
Min. – Max.	43.2 – 55.5	43.2 – 55.8	43.2 – 55.8
Mean ± SD	47.6 ± 3.75	46.44 ± 3.65	47.08 ± 3.46
p	0.391		
K2 (D)			
Min. – Max.	44 – 58.7	45.6 – 60.8	44 – 60.8
Mean ± SD	50.47 ± 4.69	50.28 ± 3.41	50.18 ± 4.11
p	0.995		
Mean K (D)			
Min. – Max.	43.70 – 57.10	41.40 – 58.20	41.40 – 58.20
Mean ± SD	48.39 ± 4.12	47.88 ± 3.81	48.14 ± 3.93
p	0.682		

Astigmatism:

1. Subjective refraction astigmatism:

- The mean refractive astigmatism in oval cone group was -3.05 ± 2.12 D, while in the nipple cone group was -4.39 ± 2.50 D.
- There was no statistically significant difference between the two groups.

2. Topographic astigmatism:

- The mean topographic astigmatism in oval cone group was 2.68 ± 2.03 D, while in the nipple cone group was 3.45 ± 1.55 D.
- There was no statistically significant difference between the two groups.
- Table (7) illustrates distribution of the studied groups according to refractive and topographic astigmatism

Table.7: Distribution of the studied groups according to refractive and topographic astigmatism.

	Oval (n = 20)	Nipple (n = 20)	Total (n = 40)
Refractive astigmatism (D)			
Min. – Max.	-6.0 – 0.0	-10.0 – 0.0	-10.0 – 0.0
Mean ± SD	-3.05 ± 2.12	-4.39 ± 2.50	-3.70 ± 2.38
p	0.093		
Topographic astigmatism (D)			
Min. – Max.	0.62 – 9.35	0.54 – 6.22	0.54 – 9.35
Mean ± SD	2.68 ± 2.03	3.45 ± 1.55	3.06 ± 1.83
p	0.066		

Stage of the disease:

- The stage of the disease was determined according to the mean K values (the average of flat and steep simulated K) following the guidelines of the Contact Lens Association of Ophthalmologists.[156]
- In the oval cone group, 3 eyes (15%) had mild keratoconus, 13 eyes (65%) had moderate keratoconus, while 4 eyes (20 %) had severe keratoconus.
- In the nipple cone group, 4 eyes (20%) had mild keratoconus, 14 eyes (70%) had keratoconus, while 2 eyes (10 %) had severe keratoconus.
- Table (8) illustrates each of the cone types and their severity according to the mean K.

Table. 8: Cone types and their severity according to the mean K.

	Oval (n = 20)		Nipple (n = 20)		Total (n = 40)	
	No	**%**	**No**	**%**	**No**	**%**
Stage						
Mild	3	15	4	20.0	7	17.5
Moderate	13	65	14	70.0	27	67.5
Advanced	4	20	2	10.0	6	15
p	0.409					

Cone diameter:

- The mean cone peak diameter in the oval cone group was 2.89 ± 1.24 cm and in the nipple cone group was 2.44 ± 0.89 cm.
- The mean overall cone diameter in the oval cone group was 8.13 ± 1.21 cm and in the nipple cone group was 7.75 ± 1.25 cm.
- There was no statistically significant difference between both groups regarding the cone peak diameter and the overall cone diameter.
- Table (9) illustrates cone peak diameter and overall cone diameter in the studied groups.

Table.9: Cone peak diameter and overall cone diameter in the studied groups.

	Oval (n = 20)	Nipple (n = 20)	Total (n = 40)
Cone peak diameter (cm)			
Min. – Max.	1.30 – 4.34	1.32 – 4.0	1.30 – 4.34
Mean ± SD	2.89 ± 1.24	2.44 ± 0.89	2.67 ± 1.10
p	0.240		
Overall cone diameter (cm)			
Min. – Max.	6.51 – 10.56	5.13 – 10.0	5.13 – 10.56
Mean ± SD	8.13 ± 1.21	7.75 ± 1.25	7.94 ± 1.23
p	0.331		

Cone diameter and K2 readings

- There was a negative correlation between K2 and the cone peak diameter and a positive correlation between the K2 and overall cone diameter. In other words, a steeper cornea has a larger cone peak diameter and a smaller overall cone diameter.
- The only statistically significant correlation was between K2 and the overall cone diameter in the oval cone group (r=0.515, P=0.017).
- Table (10): illustrate the correlation between K2 readings and the cone diameters.
- Figure (18): shows the correlation between K2 with overall cone diameter in the oval cone group.

Table.10: The correlation between K2 readings and the cone diameters.

	K2			
	Oval		Nipple	
	coeff.	P	coeff.	P
Cone peak diameter	r_s = -0.280	0.219	r_s = -0.261	0.267
Overall cone diameter	r = 0.515*	0.017	r = 0.305	0.192

r: Pearson coefficient
r_s: Spearman coefficient
*: Statistically significant at $p \leq 0.05$

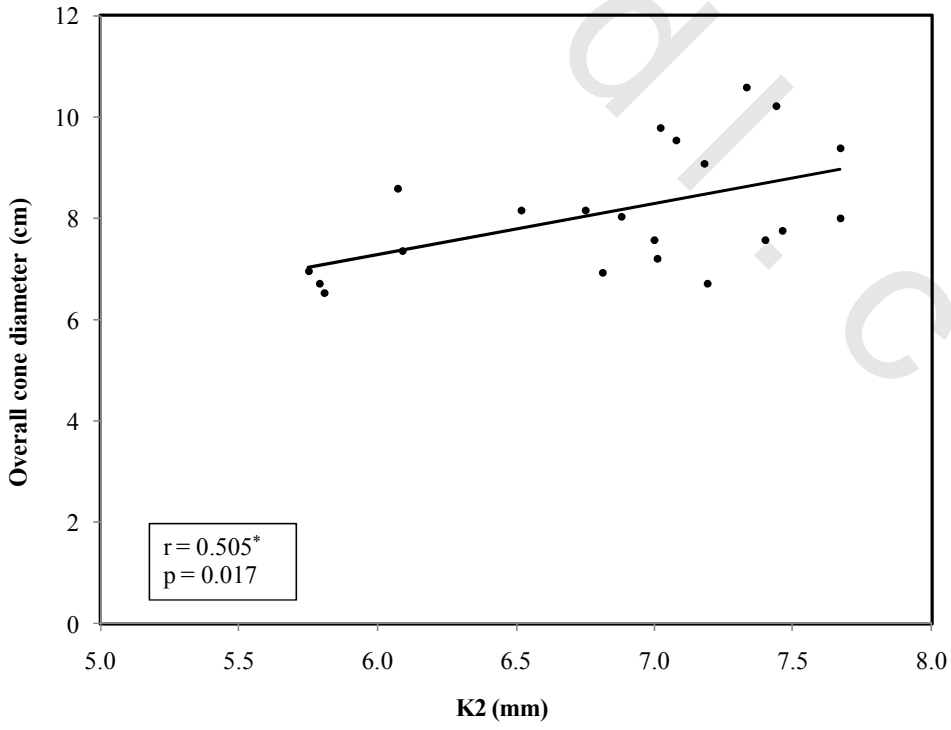


Fig. 18: Correlation between K2 with overall cone diameter in the oval cone group**.**

Contact Lens Parameters:

a) Base curve (BC) :

- The mean BC in the oval cone group was 7.02 ± 0.50 mm with the minimum BC used was 5.9 and the maximum BC was 7.7mm.
- The mean BC in the nipple cone group was 7.03 ± 0.48 mm with the minimum BC used was 6.1 mm and the maximum BC 7.6 mm.
- There was no statistically significant difference between the nipple and oval cones regarding the BC.

b) Back optic zone diameter (BOZD):

- The mean BOZD in the oval cone group was 7.10 ± 0.28 mm with the minimum BOZD was 6.40 mm and the maximum BOZD 7.40 mm.
- The mean BOZD in the nipple cone group was 7.05 ± 0.31 mm with the minimum BOZD was 6.40 and the maximum BOZD was 7.40 mm.
- There was no statistically significant difference between the nipple and oval cones regarding BOZD.

c) Lens diameter (LD) :

- The mean LD in the oval cone group was 8.90 ± 0.28 mm with the minimum LD was 8.20 mm and the maximum LD 9.20 mm.
- The mean LD in the nipple cone group was 8.85 ± 0.31 mm with the minimum LD was 8.20 mm and the maximum LD was 9.20 mm.
- There was no statistically significant difference between the nipple and oval cones regarding LD.
- Table (11) illustrates the BC, BOZD, Lens diameter in the studied groups.

Table .11: Base curve, back optic zone diameter and Lens diameter in the studied groups.

	Oval (n = 20)	Nipple (n = 20)	Total (n = 40)
Base curve			
Min. – Max.	6.10 – 7.60	5.90 – 7.70	5.90 – 7.70
Mean ± SD	7.03 ± 0.48	7.02 ± 0.50	7.03 ± 0.49
^{t}p	0.931		
Back optic zone diameter			
Min. – Max.	6.40 – 7.40	6.40 – 7.40	6.40 – 7.40
Mean ± SD	7.10 ± 0.28	7.05 ± 0.31	7.07 ± 0.29
Lens diameter			
Min. – Max.	8.20 – 9.20	8.20 – 9.20	8.20 – 9.20
Mean ± SD	8.90 ± 0.28	8.85 ± 0.31	8.87 ± 0.29
^{t}p	0.622		

Correlation between contact lens parameters and topographic parameters:

1. Base curve and flat K (K)

- In the oval cone group, 10 % of eyes were fitted on K, 35% of eyes were fitted flatter than K, while 55% of eyes were fitted steeper than K.
- In the nipple cone group, 20% of eyes were fitted on K, 20% were fitted flatter than K, while 60 % of eyes fitted steeper than K.
- Table (12) illustrates fitting of eyes according to flat K in the studied groups.

Table. 12: Fitting of eyes according to flat K in the studied groups.

Matching between K1 and BC	Oval (n = 20)		Nipple (n = 20)		Total (n = 40)	
	No	%	No	%	No	%
Fitted steeper	11	55	12	60.0	23	57.5
Fitted on K	2	10	4	20.0	6	15
Fitted flatter	7	35	4	20.0	11	27.5

2. Base curve and cone type/diameter:

- Cone diameter was correlated with the base curve of the lens.
- There was a negative correlation between the cone peak diameter and the base curve. This correlation was statistically significant only in the nipple cone group (r=-0.481&P=0.032). Figure (19) shows the correlation between BC and cone peak diameter in nipple cone group.
- There was a positive correlation between the base curve and the overall cone diameter but it was statistically significant in the oval cone group (r=0.621&P=0.003). Figure (20) shows the correlation between BC and overall cone diameter in oval cone group
- Table (13): illustrates the correlation between base curve and the cone diameter in both groups.

Table. 13: The correlation between base curve and the cone diameter in both groups.

	Base curve			
	Oval		Nipple	
	Coeff.	P	Coeff.	p
Cone peak	r_s = -0.376	0.093	r_s = -0.481*	0.032
Overall cone	r = 0.621*	0.003	r = 0.065	0.785

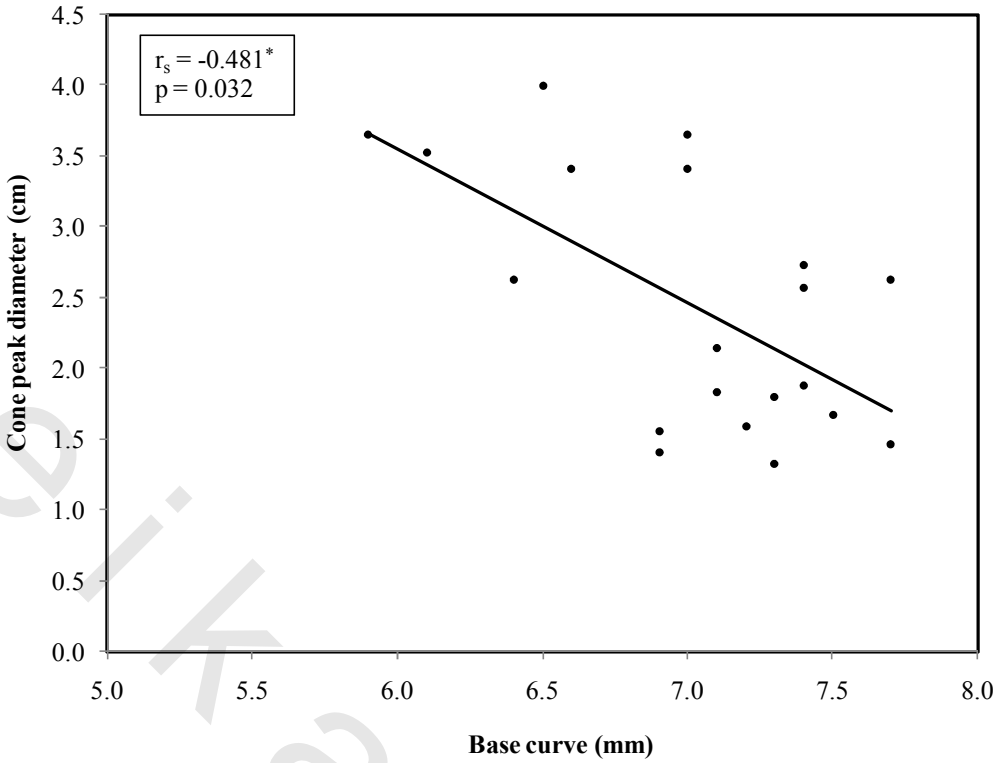


Fig .19: Correlation between BC and cone peak diameter in nipple cone group**.**

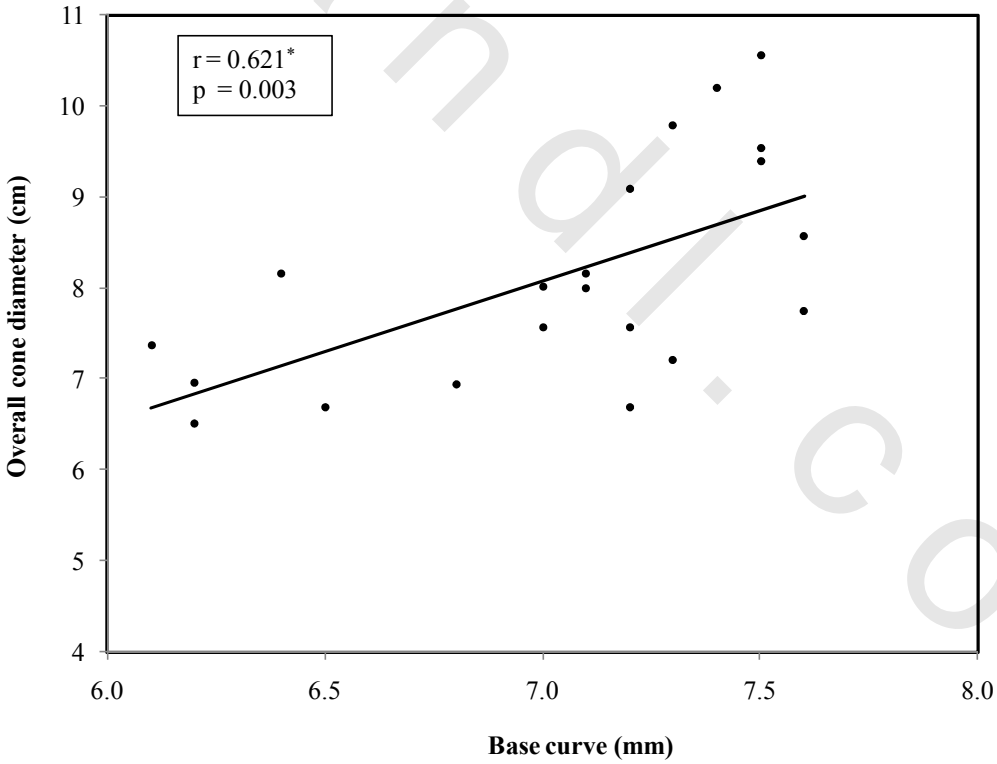


Fig .20: Correlation between BC and overall cone diameter in oval cone group.

3. Cone type/diameter and back optic zone diameter:

- Cone diameter was correlated with the back optic zone diameter (BOZD) of the lenses.
- There was a negative correlation between the cone peak diameter and BOZD. This correlation was statistically significant only in the nipple cone group (r= -0.624 &P=0.003). Figure (21) shows the correlation between BOZD and cone peak diameter in the nipple cone group.
- There was a positive correlation between the overall cone diameter and BOZD but it was statistically significant in the oval cone group (r= 0.484 &P=0.026). Figure (22) shows the correlation between BOZD with overall cone in oval cone group.
- Table (14): illustrates the Correlation between BOZD with Cone peak and overall cone diameters in each group.

Table. 14: Correlation between BOZD with Cone peak and overall cone diameter in each group.

	BOZD			
	Oval		Nipple	
	r	p	r	P
Cone peak diameter	-0.322	0.154	-0.624*	0.003*
Overall cone diameter	0.484*	0.026	0.093	0.698

r: Pearson coefficient
*: Statistically significant at $p \leq 0.05$

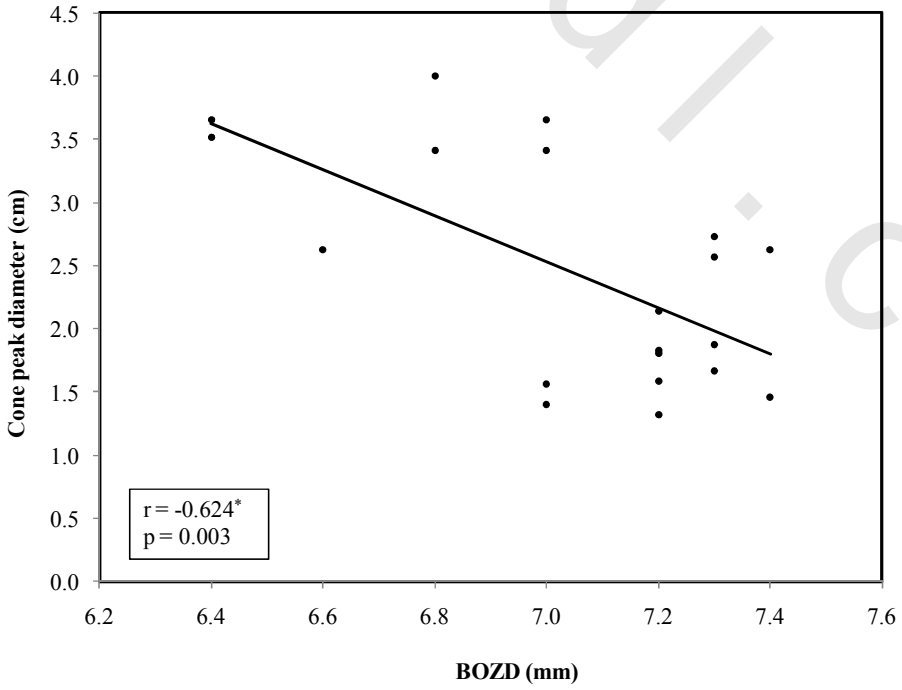


Fig. 21: Correlation between BOZD and cone peak diameter in the nipple cone group.

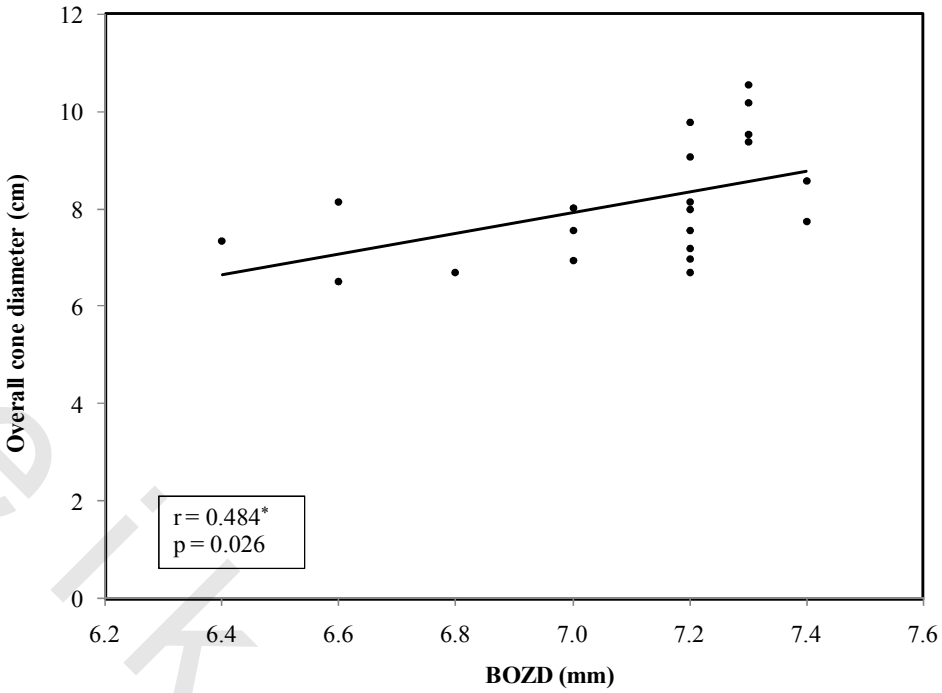


Fig. 22: Correlation between BOZD with overall cone diameter in the oval cone group.

4. Cone type/diameter and lens diameter :

- Cone diameter was correlated with the fitted lens diameter.
- There was negative correlation between the cone peak diameter and lens diameter, this correlation was statistically significant only in the nipple cone group (r=-0.490*&P=0.028). Figure (23) shows the correlation between overall lens diameter with cone peak in nipple cone group.
- There was positive correlation between the overall cone diameter and lens diameter but it was statistically significant in the oval cone group (r= 0.484&P=0.026). Figure (24) shows the correlation between BOZD with overall cone in oval cone group.
- Table (15): illustrates the Correlation between lens diameter with Cone peak and overall cone diameters in each group.

Table. 15: Correlation between lens diameter with Cone peak and Overall cone diameter in each group.

	Lens diameter			
	Oval		Nipple	
	coeff.	P	coeff.	p
Cone peak	r = -0.216	0.347	r = -0.490*	0.028
Overall cone	r = 0.484*	0.026	r = 0.093	0.698

r: Pearson coefficient

*: Statistically significant at $p \leq 0.05$

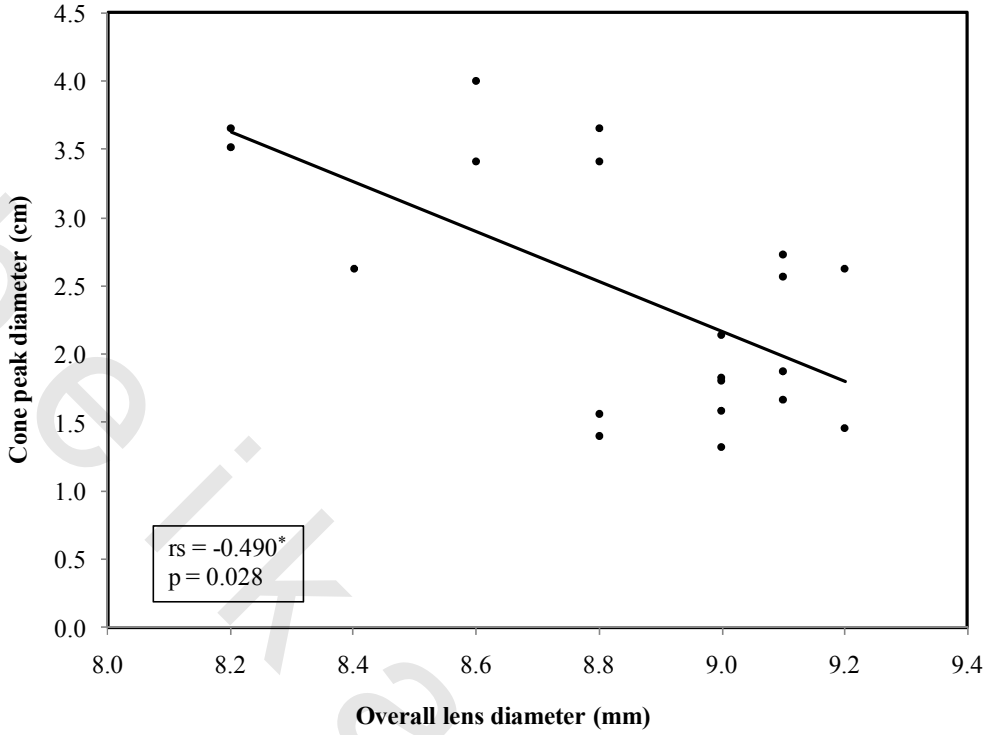


Fig. 23: Correlation between lens diameter with cone peak diameter in nipple cone group.

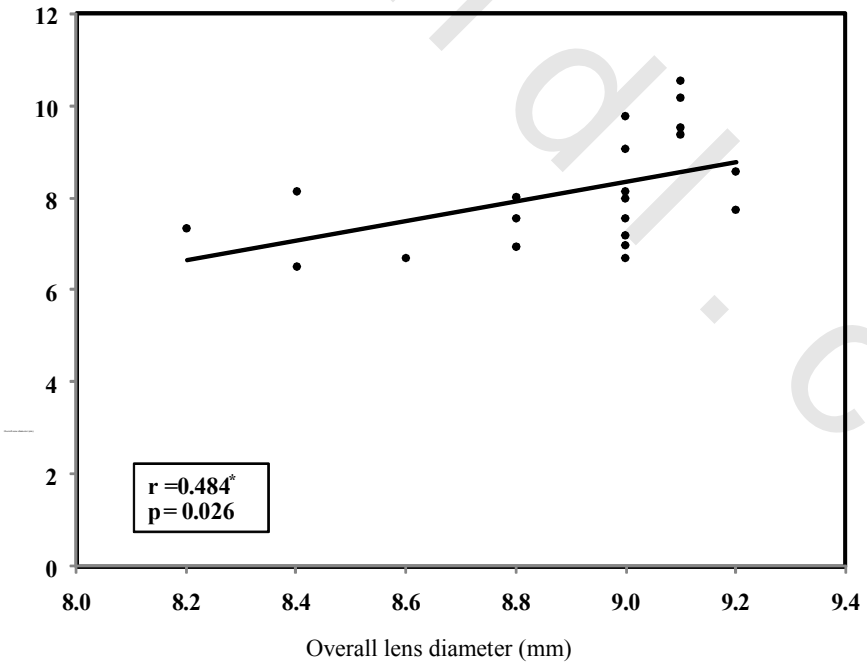


Fig.24: Correlation between lens diameter with overall cone diameter in oval cone group.

Case presentation:

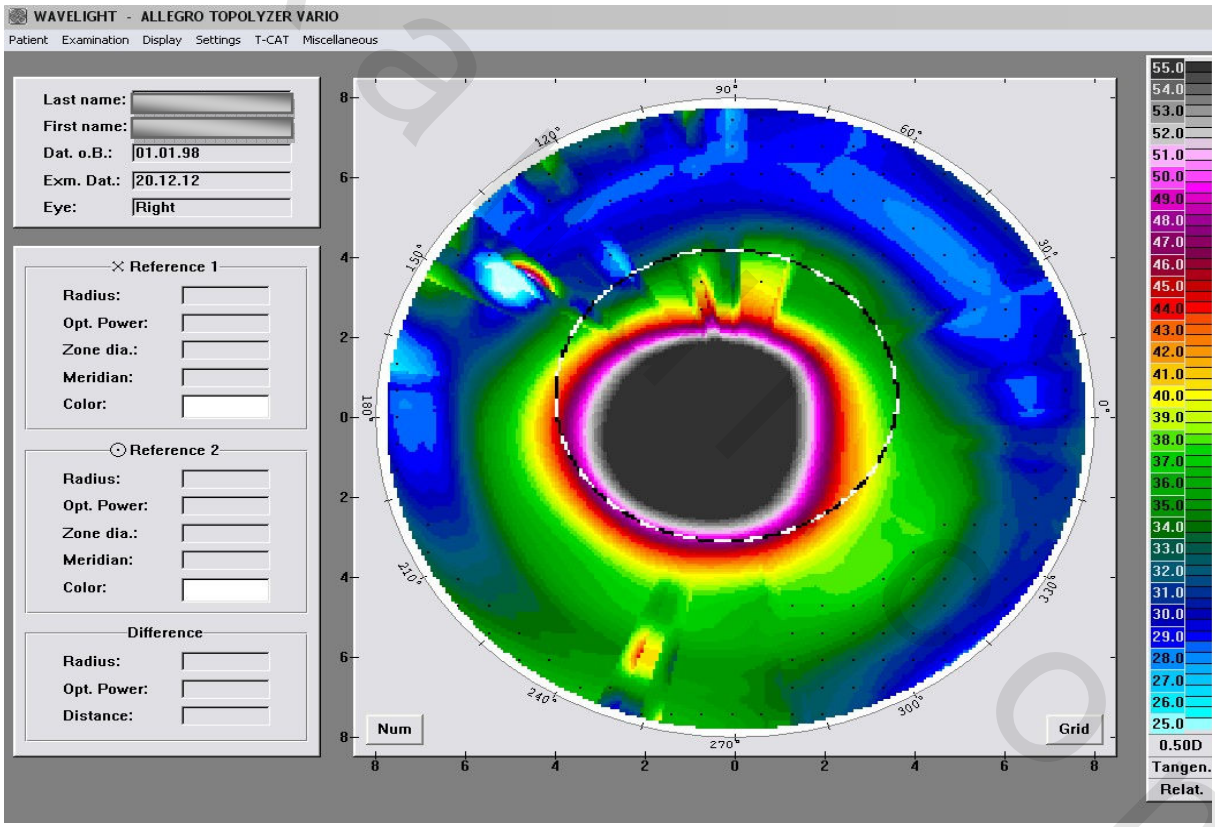
Nipple cone:

Case 1:

A 16 years old female patient.

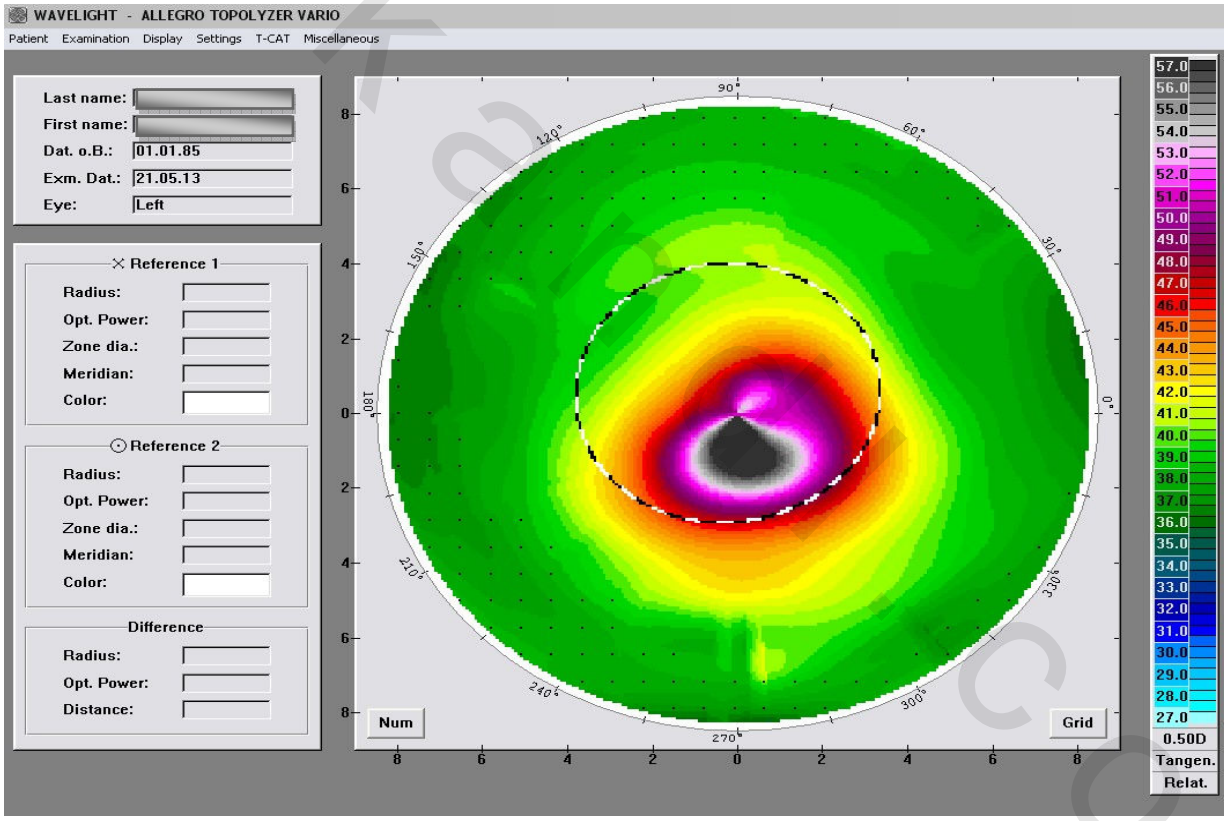
OD:

- UCVA: 0.05
- Manifest refraction: -3 -6 x 165
- BSCVA: 0.1
- RGP VA: 0.5
- K1: 6.08 mm (55.5 D)
- K2: 5.75 mm (58.7 D)
- BC: 6.2 mm
- BOZD: 6.6 mm
- LD : 8.4 mm
- Lens power: -10 D
- Cone peak diameter: 4.31 cm
- Overall cone diameter: 6.96 cm



Case 1:
A 29 years old female patient.
OS:

- UCVA: 0.05
- Manifest refraction: -8.5 -5.5 x 165
- BSCVA: 0.1
- RGP VA: 0.7
- K1: 7.22 mm (46.7 D)
- K2: 6.78 mm(49.8 D)
- BC: 7.1 mm
- BOZD: 7.2 mm
- OAD: 9 mm
- Lens power : -2.5 D
- Cone peak diameter: 1.32 cm
- Overall cone diameter: 6.69 cm



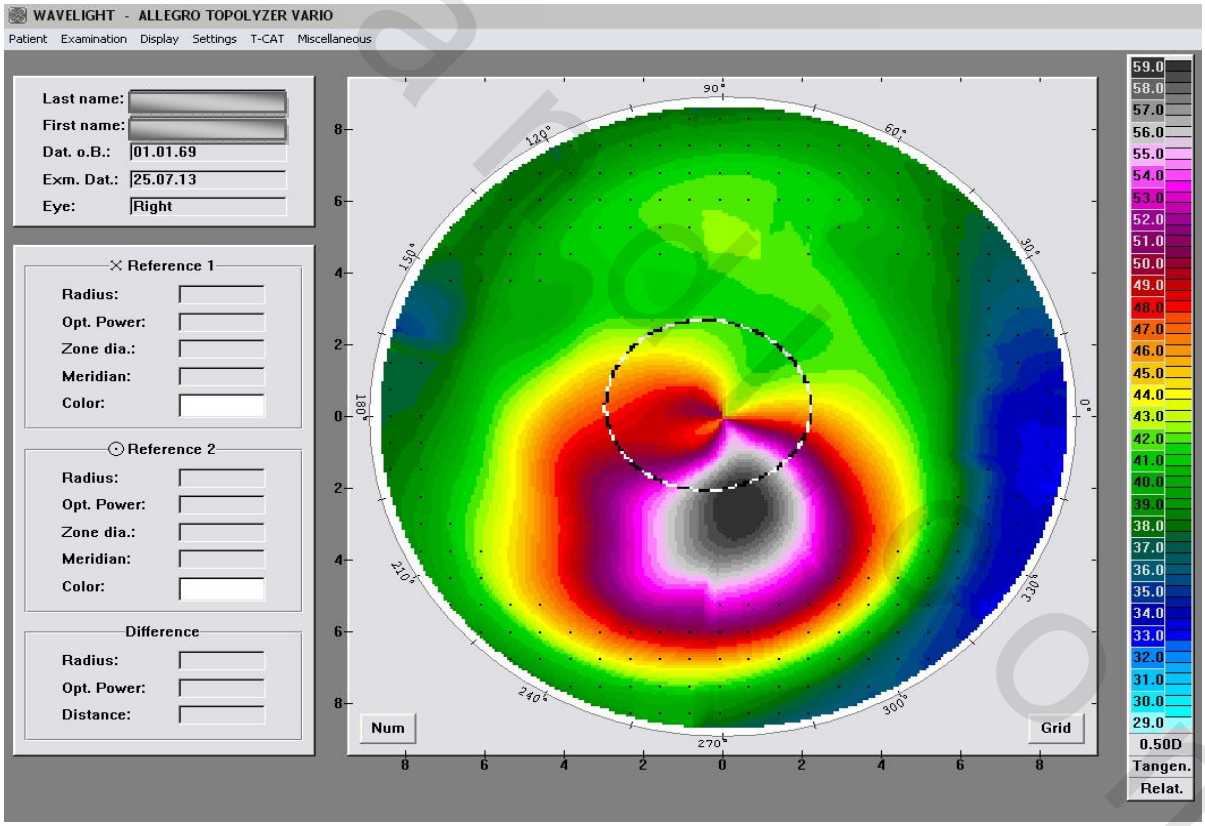
Oval cone:

Case 1:

A 45 years old female patient.

OD:

- UCVA: 0.4
- Manifest refraction: +0.5 -5 x 45
- BSCVA: 0.7
- RGP VA: 0.9
- K1: 7.36 mm (45.8 D)
- K2: 6.75 mm (50 D)
- BC: 7.1 mm
- BOZD: 7.2 mm
- OAD: 9 mm
- Lens power: -0.5 D
- Cone peak diameter: 1.91 cm
- Overall cone diameter: 8.15 cm



Case 2:

OD:

- UCVA: 0.3
- Manifest refraction: -10 -5.5 x 180
- BSCVA: 0.6
- RGP VA: 0.9
- K1: 7.67 mm (44.0 D)
- K2: 7.08 mm(47.7 D)
- BC: 7.5 mm
- BOZD: 7.3 mm
- OAD: 9.1 mm
- Lens power: -4.50 D
- Cone peak diameter: 2.12 cm
- Overall cone diameter: 9.53 cm