Original Article

# Comparison of Corneal Epithelial Thickness Mapping using Two Different Optical Coherence Tomography

PJO – Official Journal of Ophthalmological Society of Pakistan



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## ABSTRACT

**Purpose:** To assess agreement between corneal epithelial thickness maps obtained with MS-39 and Optovue Avanti OCT devices in healthy eyes, and to ascertain if their measures are interchangeable.

**Study Design:** Descriptive comparative study.

**Place and Duration of Study:** Amanat Eye Hospital, Rawalpindi from May 2025 to July 2025.

**Methods:** In this study, 23-eyes were scanned with MS-39 and Optovue. Central (0-2mm), paracentral (2-5mm) and mid-peripheral (5-7mm) epithelial thickness measurements were taken. The Shapiro-Wilk test was used to evaluate the normality of data. The pair measurements were compared using Wilcoxon signed-rank test. Reliability was determined with intraclass correlation coefficient (ICC) and agreement with Bland-Altman analysis. A $p<0.05$ value was considered statistically significant.

**Results:** Majority of variables were not normal. The Wilcoxon analysis revealed systematic differences between the devices. MS-39 recorded greater readings in paracentral and peripheral sectors, while Optovue reported higher central values. The overall agreement was good when averaging several measurements [ICC (3, K) = 0.823] and moderate for a single measurement [ICC (3,1) = 0.699]. Zone and sector-based analysis revealed highest agreement in the paracentral region, moderate agreement in the central zone, and the lowest in the mid-peripheral region.

**Conclusion:** Both MS-39 and Optovue provide reliable epithelial thickness measurements, but their results are not interchangeable. Optovue tends to overestimate central thickness compared to MS-39, while MS-39 yields higher peripheral values. Device-specific reference data should therefore be used in clinical practice, and switching between devices is not recommended in longitudinal follow-up or surgical planning.

**Keywords:** Corneal Epithelial Thickness Mapping, M-39, Optovue, Avanti OCT devices, Optical Coherence Tomography.

**How to Cite this Article:** Bibi A, Asrar U, Akhtar M, Ali W, Zahid A. Comparison of Corneal Epithelial Thickness Mapping using Two Different Optical Coherence Tomography. 2026;42(3):260-268. **Doi:10.36351/pjo.v42i3.2241**

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*Received: September 26, 2025*
*Revised: February 15, 2026*
*Accepted: May 20, 2026*

## INTRODUCTION

The corneal epithelium is crucial for preserving the integrity of the cornea. It is composed of five to seven cell layers and has an optimal central thickness (CT) of approximately 50-52 µm.[1] In addition to its protective function, it also contributes to the refractive power of the eye. Thickness of corneal epithelium (CE) is not evenly distributed and tends to change its profile to compensate for curvatures and stromal irregularities to ensure a regular and smooth ocular surface.[2]

Changes in the corneal epithelial thickness (CET) have been observed after refractive surgery, contact lens (CL) wear, and various conditions like keratoconus (KC) and dry eyes. Epithelial thickness also varies by age and sex.[3,4,5] Medications like antiglaucoma eye drops also affect corneal epithelialthickness.[6]

Reinstein et al, were the first to measure and map the CE throughout the entire cornea, thus establishing ETM (Epithelial thickness mapping).[7] The CE is recognized for its significant influence on corneal net power and consequently overall ocular refraction. The average epithelial refractive power alone is 0.85D (range 0.29-1.60) at 3.6 mm diameter zone and 1.03D (range 0.55-1.85) over the central 2 mm diameter zone.[8] When assessing patients with suspicious corneal topographies, it is crucial to comprehend the pattern of ET because it can affect the decision to proceed with surgery or not. This is because the Bowman's layer irregularly distributed and frequently exhibits nonuniform thinning, which might mask underlying stromal abnormalities. To smooth out the stromal surface, CE responds by thickening over depressed areas and thinning over high areas. Thus, accurate and reliable CE can provide important information for measuring remodeling for corneal refractive surgery and for identifying iatrogenic ectasia.[8]

In KC, epithelium tends to thin in the regions where the corneal curvature is increased and thicken in flatter areas, often observed in the inferior paracentral zone.[9]These early changes typically begin in the basal layer of epithelium. Changes in ET cannot only affect total corneal power and cause unwanted refractive shift but also indicate structural or functional alteration in a variety of conditions. Therefore, precise measurement of corneal and limbal ET is useful for monitoring corneal remodeling, identifying early changes in ectatic corneal disorders, planning refractive surgery, and determining whether additional therapies are appropriate.[9]

Several methods and tools are available to measure CET including SD-OCT.[10] Accurate CET mapping can be obtained with SD-OCT, with good reliability and repeatability. However, anterior segment SD-OCT has emerged as a crucial instrument for characterizing the morphological alteration associated with several corneal disorders.[10]

The Optovue RT-100 (Optovue, Inc.) was the first commercially marketed OCT-based device, having SD-OCT technology, providing 6-mm diameter epithelial thickness mapping (ETM), later replaced by the Optovue Avanti ETM device measuring 9 mm of corneal epithelium.[11] The MS-39 (CSO) uses hybrid technology, which combines SD-OCT with Placido disk imaging. It was first used for anterior segment imaging, such as ETM in 2018.[12,13]

There are few direct comparative studies assessing the measurement consistency among devices in healthy corneas, despite the growing use of sophisticated anterior segment imaging technology.[2,3] The current study compares the ETM obtained from MS-39 and Optovue, to ascertain if they can be used interchangeably in standard clinical procedures and patient monitoring.

## METHODS

This descriptive comparative study was conducted at Amanat Eye Hospital, Rawalpindi from May 2025 to July 2025 and approved by ethical review committee **(Reference number:26/03-001).** All the participants were included after taking verbal consent from them or their guardian. The research followed the principles of the Declaration of Helsinki, ensuring the protection of participant rights, safety, and well-being throughout the study. Participant's confidentiality and anonymity were strictly maintained. The data collected was only used for academic purposes. The study included 123 patients through consecutive sampling. Patients between 10-40 years of age, having refractive error and no evidence of corneal pathology on slit-lamp examination were included in this study. Participant with previous ocular surgeries, trauma or corneal pathologies (KC, dystrophies or degeneration), ptosis that could cause measurement errors and use of hard or rigid contact lenses two weeks before the examination were excluded. Only one eye from each participant was included based on eligibility and imaging quality, to ensure they fulfill all inclusion criteria. Before measuring ET, every patient underwent a thorough ocular examination. Demographic data including age and sex of each participant were recorded. spherical equivalent of the selected eye was calculated using manifest refraction and slit lamp examination was performed for anterior segment. Advance anterior segment OCT (MS-39 and Avanti Optovue) were used. To minimize inter-observer variability, all measurements were made by a single skilled examiner under good lighting conditions. Patients were instructed to fixate on the internal target to ensure proper alignment. CET mapping was performed using RTVue Fourier domain OCT (Optovue INC, Fremont, CA). The epithelial mapping protocol involved eight high-definition meridional scans obtained in 0.31 seconds, thus minimizing the risk of motion artifacts. The ET map is segmented into 25 regions within a 9 mm corneal diameter, with the mean ET measured and displayed at each point shown in Figure 1.

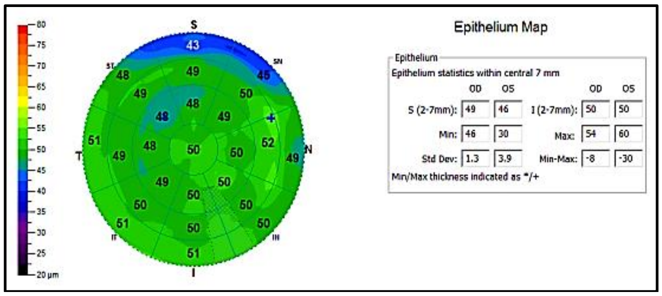


**Figure 1:** Corneal epithelial thickness map illustration of Optovue.

MS-39 (Costruzione Strumenti Oftalmici Florence, Italy) combines Placido disc corneal topography with high-resolution SD OCT-based tomography. It employs an infrared light source with a wavelength of 845 nm with a 3.6 µm transverse resolution; it can perform 102,400 scans per second. Approximately one second is needed for acquisition of an 8 nm epithelial map.[14] In order to compare the two devices, the mean value from the same 17 regions, including the central 2 mm zone, the 2-5 mm zone, and the 5-7 mm zone, was computed show in Figure 2.

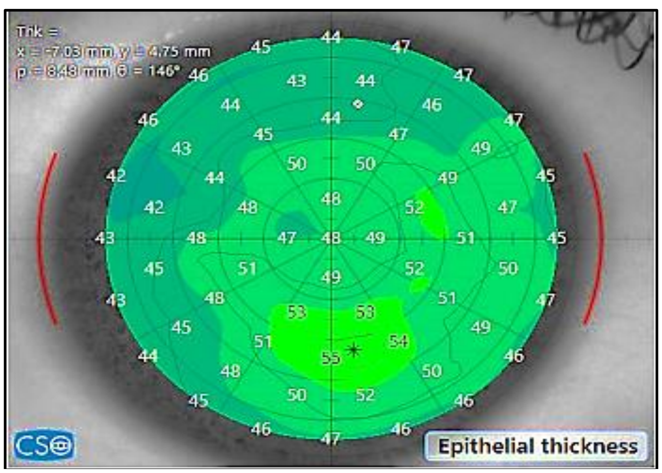


**Figure 2:** Corneal epithelial thickness map illustration of MS-39.

Statistical analyses were performed using both R software (version R 4.5.0) and Stata. Paired t-tests (or Wilcox on signed-rank tests if data were not normally distributed) were conducted in Stata to compare the mean values between the devices. Intraclass correlation coefficient (ICC) was calculated in R to assess the reliability, and Bland-Altman plots were generated in R and used to assess the agreement. A *p*-value of < 0.05 was considered statistically significant.

# RESULTS

Shapiro-Wilk test was used for accessing Normality of data. Separate analyses were conducted for the central zone (0-2 mm), the paracentral ring (2-5 mm), and the peripheral ring (5-7 mm). Table 2 shows that most of the variables had statistically significant deviations from normality ($p < 0.05$). Central zone (0-2 mm) showed a pronounced deviation from normality (w= 0.8803, p< 0.001). W values ranged from 0.8828 to 0.9628 for all parameters within the paracentral ring, except for DIT (2-5 mm)(p=0.0662).Most values in the peripheral ring were also non-normally distributed, except for DN – 57 mm($p = 0.0685$), which was not statistically significant at the 5% level. Given the above results, the Wilcoxon signed-rank test, a non-parametric substitute of the paired t-test, was used.

Using the Wilcoxon signed-rank test, the measurements from the Optovue and MS-39 were compared across all the corneal zones in the Table 1. Positive ranks indicate instances where Optovue measurements were higher than the MS-39, while negative ranks indicated the reverse; ties were denoted by zero values.

The test indicated a highly significant difference in the central CET [c (0-2mm)] between the devices ($z = 7.8170,\ p < 0.0001$), with Optovue having high readings in most cases (93 positive vs 13 negative differences).

Significant differences were observed for (2-5 mm), superonasal (SN, 2-5 mm), and inferonasal (IN 2-5 mm) (p<0.05), with MS-39 typically producing higher values in these sectors. Significance levels ($0.05 \leq p \leq 0.10$) were seen for both inferotemporal (IT, 2-5 mm) and superotemporal (ST, 2-5 mm). The remaining paracentral (PC) sectors showed no statistically significant differences, thus indicating a strong agreement in those areas.

In the peripheral regions, superior (S, 5-7 mm), SN (5-7 mm), nasal (N, 5-7 mm), IN (5-7 mm), temporal (T, 5-7 mm) and ST (5-7 mm) all showed significant differences in the peripheral region (p<0.05), with MS-39 often producing greater values. Inferior (I, 5-7 mm) exhibited marginal significance, although variation in other sectors was not statistically significant.

Inter-device agreement (intraclass correlation coefficient) ICC was used to measure overall agreement between Optovue and MS-39. We computed two types of ICC.

**Table 1:** *Wilcoxon signed-ranked tests comparing Optovue vs. MS-39 across corneal zones (n = 123).*

| Zone | Variable | Positive | Negative | Zero | Z | *p*-value |
|---|---|---|---|---|---|---|
| **Central Zone** | C (0-2 mm) | 93.0000 | 13.0000 | 17.0000 | 7.3770 | 0.0000 |
| **Paracentral ring** | S(2-5mm) | 30.0000 | 61.0000 | 32.0000 | -3.4270 | 0.0005 |
| **Paracentral ring** | SN(2-5mm) | 39.0000 | 62.0000 | 22.0000 | -2.2520 | 0.0240 |
| **Paracentral ring** | N(2-5mm) | 41.0000 | 52.0000 | 30.0000 | -0.5980 | 0.5523 |
| **Paracentral ring** | IN(2-5mm) | 46.0000 | 56.0000 | 21.0000 | -0.5230 | 0.6039 |
| **Paracentral ring** | I(2-5mm) | 46.0000 | 52.0000 | 25.0000 | -0.0770 | 0.9399 |
| **Paracentral ring** | IT(2-5mm) | 39.0000 | 62.0000 | 22.0000 | -1.7010 | 0.0890 |
| **Paracentral ring** | T(2-5mm) | 45.0000 | 62.0000 | 16.0000 | -1.3530 | 0.1769 |
| **Paracentral ring** | ST(2-5mm) | 39.0000 | 63.0000 | 21.0000 | -2.2290 | 0.0255 |
| **Peripheral ring** | S(5-7mm) | 23.0000 | 77.0000 | 23.0000 | -5.7110 | 0.0000 |
| **Peripheral ring** | SN(5-7mm) | 30.0000 | 72.0000 | 21.0000 | -4.7390 | 0.0000 |
| **Peripheral ring** | N(5-7mm) | 44.0000 | 65.0000 | 14.0000 | -2.6530 | 0.0077 |
| **Peripheral ring** | IN(5-7mm) | 41.0000 | 59.0000 | 23.0000 | -2.2360 | 0.0251 |
| **Peripheral ring** | I(5-7mm) | 45.0000 | 57.0000 | 21.0000 | -1.8660 | 0.0620 |
| **Peripheral ring** | IT(5-7mm) | 41.0000 | 62.0000 | 20.0000 | -2.1420 | 0.0319 |
| **Peripheral ring** | T(5-7mm) | 42.0000 | 63.0000 | 18.0000 | -2.2300 | 0.0255 |
| **Peripheral ring** | ST(5-7mm) | 32.0000 | 70.0000 | 21.0000 | -4.4800 | 0.0000 |

*Notes:* Positive/Negative = number of cases where Optovue> or < MS-39, respectively; zero = ties. Bold *p* values indicate $p < 0.05$ (exact). Marginal significance ($0.05 \leq p \leq 0.10$).

- ICC (3,1) indicated the degree of agreement between devices for individual measurements.
- ICC (3, k) measures the absolute agreement for the mean of k measurements and offers a more stable estimate of reliability.

For individual measurement, the coefficient of ICC (3,1) was 0.699 (95% CI: 0.669–0.726, P<0.001), suggesting a moderate degree of agreement between devices. In line with sector-specific variation seen in the Wilcoxon signed-rank test results, this implies that there was significant variability even while there was some regularity. However, when considering the mean of numerous measurements, the ICC (3, k) was higher at 0.823 (95% CI: 0.801-0.842, P< 0.001) indicating good agreement. This enhancement was the result of averaging, which reduced the random measurement error and improved the dependency of the device. The zone-specific ICC study showed different corneal regions had different levels of inter-device agreement. The paracentral zone (2-5 mm) showed the highest consistency, with ICC (3,1) showing strong agreement (0.752) and ICC (3, k) improving further to 0.859, consistent with Wilcoxon results, which showed less significant variations in the zone. According to these findings, device agreement improved with averaging across all regions, with the paracentral region having the highest agreement, the central zone having moderate agreement, and the mid-peripheral zone having the lowest agreement shown in Table 2.

**Table 2:** *ICC by Zone: Optovue vs. MS-39.*

| Zone | Central (0-2 mm) | Paracentral (2-5 mm) | Mid-Peripheral(5-7 mm) |
|---|---|---|---|
| **N** | 123.0000 | 984.0000 | 984.0000 |
| **ICC (3,1)** | 0.7300 | 0.7520 | 0.6550 |
| **LCI** | 0.4070 | 0.7230 | 0.5730 |
| **UCI** | 0.8590 | 0.7790 | 0.7180 |
| **P** | 0.0000 | 0.0000 | 0.0000 |
| **Qual.** | Moderate | Good | Moderate |
| **ICC (3,k)** | 0.8440 | 0.8590 | 0.7910 |
| **LCI2** | 0.5510 | 0.8390 | 0.7220 |
| **UCI3** | 0.9260 | 0.8760 | 0.8390 |
| **p4** | 0.0000 | 0.0000 | 0.0000 |
| **Qual** | Good | Good | Good |

ICC = Intraclass Correlation Coefficient; LCI = Lower Confidence Interval; UCI = Upper Confidence Interval; P = p-value; Qual. = Qualitative interpretation of agreement/reliability; N = Number of samples/measurements

For single measurements, the ICC (3,1) score was 0.738, which improved to 0.844 (excellent) when results were averaged. This was consistent with the previous observation that the devices were very consistent in the center, despite some systematic variances. The highest level of overall devices was very often seen in the paracentral zone (2-5 mm). While certain sectors, like the temporal and superonasal sectors, were moderate but still improved to good with averaging, many already attained good single-measurement agreement [ICC (3,1) = 0.794 – 0.803 for the inferior, inferonasal, and nasal sectors]. ICC (3, k) scores in this region were consistently high

(0.835-0.887), indicating a strong reliability in this zone. In the mid-peripheral zone (5-7 mm), the agreement varied notably by sector. The moderate range of ICC values goes from 0.5219 (superior, lowest agreement) to 0.703 (inferotemporal, highest in this zone). Agreement in all sectors was improved to good levels through averaging [ICC (3, k) between 0.785 and 0.842]. The Wilcoxon results indicated more significant differences in the periphery, particularly in superior superotemporal areas, supported by the generally lower ICC (3,1) scores (Table 3,4,5).

**Table 3:** *ICC by Area (Central): Optovue vs MS-39*

| Area | Central (0-2mm) |
|---|---|
| N | 123 |
| ICC (3,1) | 0.7300 |
| LCI | 0.4070 |
| UCI | 0.8590 |
| P | 0.0000 |
| Qual | Moderate |
| ICC (3,k) | 0.8440 |
| LCI | 0.5510 |
| UCI | 0.9260 |
| P | 0.0000 |
| Qual | Good |

**Table 4:** *ICC by Area (Paracentral 2-5mm): Optovue vs MS-39*

| Area | PC-I | PC-IN | PC-IT | PC-N | PC-S | PC-SN | PC-ST | PC-T |
|---|---|---|---|---|---|---|---|---|
| N | 123 | 123 | 123 | 123 | 123 | 123 | 123 | 123 |
| ICC (3,1) | 0.7850 | 0.7980 | 0.7500 | 0.7970 | 0.6660 | 0.6990 | 0.7700 | 0.7260 |
| LCI | 0.7070 | 0.7230 | 0.6610 | 0.7230 | 0.5400 | 0.5950 | 0.6850 | 0.6310 |
| UCI | 0.8450 | 0.8540 | 0.8180 | 0.8540 | 0.7600 | 0.7800 | 0.8340 | 0.8000 |
| P | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Qual | Good | Good | Good | Good | Moderate | Moderate | Moderate | Moderate |
| ICC (3,k) | 0.8800 | 0.8880 | 0.8570 | 0.8870 | 0.7990 | 0.8230 | 0.8700 | 0.8410 |
| LCI | 0.8280 | 0.8390 | 0.7960 | 0.8390 | 0.6970 | 0.7460 | 0.8130 | 0.7730 |
| UCI | 0.9160 | 0.9210 | 0.9000 | 0.9210 | 0.8650 | 0.8770 | 0.9090 | 0.8890 |
| P | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Qual | Good | Good | Good | Good | Good | Good | Good | Good |

Note: PC-I= Paracentral (Inferior), PC-IN= Paracentral (Inferonasal), PC-IT (Inferotemporal), PC-N= Paracentral (Nasal), PC-S= Paracentral (Superior), PC-SN= Paracentral (Superonasal), PC-ST= Paracentral (Superotemporal), PC-T= Paracentral (Temporal)

**Table 5:** *ICC by Area (Mid-Peripheral 5-7mm): Optovue vs MS-39.*

| Area | MP-I | MP-IN | MP-IT | MP-N | MP-S | MP-SN | MP-ST | MP-T |
|---|---|---|---|---|---|---|---|---|
| N | 123 | 123 | 123 | 123 | 123 | 123 | 123 | 123 |
| ICC (3,1) | 0.6880 | 0.6680 | 0.7030 | 0.6270 | 0.5210 | 0.5400 | 0.5360 | 0.6350 |
| LCI | 0.5820 | 0.5550 | 0.5990 | 0.4980 | 0.2730 | 0.3350 | 0.3430 | 0.5120 |
| UCI | 0.7710 | 0.7570 | 0.7830 | 0.7270 | 0.6830 | 0.6820 | 0.6750 | 0.7320 |
| P | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Qual | Moderate | Moderate | Moderate | Moderate | Moderate | Moderate | Moderate | Moderate |
| ICC (3,k) | 0.8150 | 0.8010 | 0.8260 | 0.7710 | 0.6850 | 0.7010 | 0.6980 | 0.7770 |
| LCI | 0.7350 | 0.7130 | 0.7490 | 0.6620 | 0.3860 | 0.4760 | 0.4890 | 0.6750 |
| UCI | 0.8710 | 0.8620 | 0.8790 | 0.8430 | 0.8190 | 0.8170 | 0.8110 | 0.8460 |
| P | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Qual | Good | Good | Good | Moderate | Moderate | Moderate | Good | Good |

Note: MP-I=Mid-peripheral (Inferior), MP-IN= Mid-peripheral (Inferonasal), MP-IT=Mid-peripheral (Inferotemporal), MP-N=Mid-peripheral (Nasal), MP-S=Mid-peripheral (Superior), MP-SN= Mid-peripheral (Superonasal), MP-ST=Mid-peripheral (Superotemporal), MP-T=Mid-peripheral (Temporal).

Overall epithelial thickness measurements from Optovue and MS-39 devices showed a small mean bias in the Bland-Altman plot, suggesting that the two instruments gave similar values. Since most data points fell within the 95% limits of agreement, which were roughly 10, there was no indication of proportionate bias throughout the measurement range, indicating acceptable agreement. Both devices had limited variability and little bias in the central (0-2 mm) and paracentral (2-5 mm) regions, according to the analysis. On the other hand, the mid-peripheral zone (5-7 mm) showed larger margins of agreement, indicating more measurement variability between the two devices in this area. These findings imply that

Optovue and MS-39 show good agreement in central and paracentral measurements, but care should be taken when interpreting mid-peripheral data.

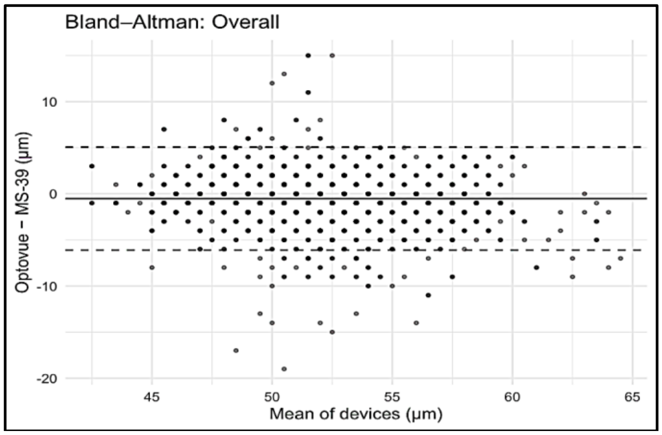


**Figure 3:** Bland-Altman figure demonstrating the overall corneal epithelial thickness measurements between the Optovue and MS-39 instrument.

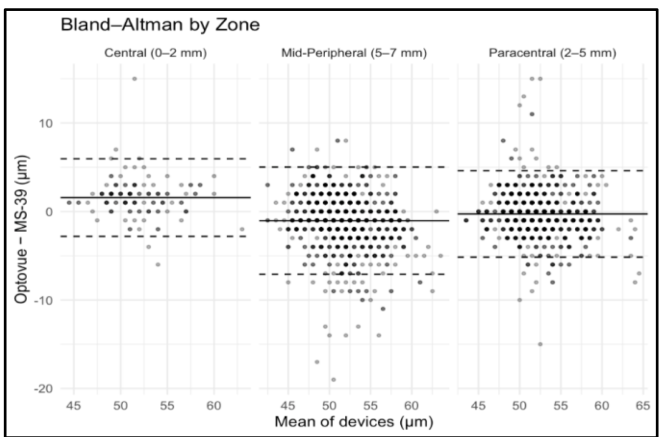


**Figure 4:** The agreement between Optovue and MS-39 devices across several corneal zones is displayed in a Bland-Altman plot.

## DISCUSSION

The agreement between Optovue and MS-39 in measuring CET across different zones and sectors was evaluated in this study. Systematic difference across devices was found by Wilcoxon analysis. MS-39 typically produced greater readings in the number of paracentral and mid-peripheral sectors, while Optovue tended to report higher values in the central zone. Inter-class correlation coefficients were used to further quantify inter-class agreement (ICC). Overall analysis revealed a good agreement when averaging several readings [ICC (3, k) = 0.823] and moderate agreement for single measures [ICC (3,1) = 0.699]. Agreement was found to be lowest in the mid-peripheral zone, moderate in the central region, and highest in the paracentral region, according to zone-specific research. The paracentral inferior, inferonasal, and nasal sectors demonstrated the most dependability, whereas the mid-peripheral superior and supratemporal sectors demonstrated the lowest, according to a more thorough area-based assessment. Crucially, averaging continuously increased the agreement in every sector zone. These results align with other studies which compared several anterior segment imaging modalities and found systematic biases because of variations in measuring methods and segmentation algorithms. While Optovue uses spectral domain OCT, and MS-39 uses a Scheimpflug-Placido method, which could account for MS-39's propensity to produce thickness values that are higher toward the periphery. These disparities are probably caused by the technique utilized for epithelial boundary recognition as well as device-specific scan resolution. Our findings imply that Optovue and MS-39 are not interchangeable in all corneal regions from clinical perspective. Single measurements should be regarded cautiously, especially in the central and mid-peripheral zones where systematic variations were more apparent, even if there is strong agreement in the paracentral zone and it gets better on average. This is especially important for keratoconus diagnosis, screening for refractive surgery, and postoperative monitoring, where accurate mapping of epithelial thickness is crucial.[15]

Our results are in line with a prior study that compared three OCT devices (MS-39, Anterion and Avanti) in keratoconus eyes.[16] Significant variations in MS-39 epithelial thickness mapping were discovered by the investigation, yielding the thickest results. The repeatability value of Anterion was the highest. The results show that there are constant differences between devices in both healthy and disease corneas, which restricts the interchangeability of these devices. Additionally, the Anterion showed the best repeatability, followed by MS-39 and Avanti, suggesting that systematic biases are present in both healthy and diseased corneas.

Similar findings were seen in a study comparing the repeatability and agreement of the Anterior (SS-OCT) and Avanti (SD-OCT) in virgin, post-laser refractive surgery and KC eyes.[17] Higher repeatability was shown by the Anterion (Sw: 0.60-1.36µm) compared to the Avanti (Sw: 0.75-1.96µm), indicating that swept-source technology provides more accurate measurements. With mean discrepancies of 3-4µm between groups, Bland-Altman analysis demonstrated that the Anterion consistently measured thinner epithelial values than the Avanti, indicating that the two devices cannot be used interchangeably without correction. When two Fourier-domain OCT systems (Cirrus 5000 and Avanti RTVue 100) were compared, it was found that while some metrics (minimum pachymetry and maximum epithelial thickness) varied significantly, others showed remarkable correlations.[18] Device comparability is further impacted by surgical modifications, as seen by the increased agreement in normal eyes compared to post-smile eyes. The author concluded that while anterior segment OCT is a dependable technique for assessing pachymetry and epithelial thickness, equipment variations restrict its interchangeable application. Similar trends were also seen when SS-OCT and SD-OCT were compared in healthy eyes.[19] Corneal thickness (r=0.99) and central minimum epithelial thickness (r=0.86 and 0.72, respectively) showed substantial relationships. Both instruments provided reproducible measurements of corneal and epithelial thickness. Unlike SD-OCT, SS-OCT has systematic biases, overestimating corneal thickness by 11-144µm and underestimating epithelial thickness by 1.4-1.9 µm. Both instruments demonstrated acceptable repeatability; however, SS-OCT showed slightly greater inter-operator variability in epithelial thickness. The author concluded that, despite the strong association, SS-OCT and SD-OCT cannot be used interchangeably when utilizing central or minimum thickness criteria, especially when diagnosing keratoconus and planning refractive surgery.

According to a recent study, MS-39 and HS-100 demonstrated good reliability for mapping corneal epithelial thickness in both keratoconic and healthy eyes, with the central zone exhibiting the best repeatability.[20] MS-39, however showed marginally superior consistency, particularly in keratonic eyes.

Another study of 119 KC eyes, divided into form fruste, mild, moderate, and severe stages, epithelial thickness was measured using RTVue and MS-39.[21] The study revealed 95% agreement, varying from roughly -6 to +8 µm depending on the location evaluated. Reliability declined gradually from the center toward the periphery and with increasing illness severity, even though repeatability indicators, such as within-subject standard deviation, test-reset variability, coefficient variation, and ICC, showed adequate reliability. These results validate that severity grading should be considered prior to clinical interpretation to reduce diagnostic errors and that device comparability becomes much more difficult in keratoconus. Crucially, both devices were found to not be used interchangeably without adjustment.[21]

Our study has some limitations. Because it was done at one setup, the result may not be as applicable. Furthermore, the investigation did not assess longitudinal changes in corneal epithelial thickness and was restricted to cross-sectional data. To confirm these results and more accurately the clinical interchangeability of these devices, more multicenter trials with bigger sample sizes and longer follow-up are advised.

## CONCLUSION

The agreement between MS-39 and Optovue in mapping of CET in healthy eyes was assessed in this study. Although both devices demonstrated good reliability, systematic differences were noted. Optovue tends to provide higher central measurements, while MS-39 yields higher values in the paracentral and peripheral regions. Agreement, as determined by ICC, was the lowest in the mid-peripheral zone, moderate in the central region, and strongest in the paracentral zone. These results show that although both instruments are appropriate for measuring epithelial thickness, they cannot be used interchangeably. Therefore, it is crucial to use device-specific reference values and exercise caution when interpreting results across different platforms, especially in surgery planning and longitudinal follow-up.

**Funding:** This study was not funded by any organization.

**Patient's Consent:** Researchers followed the guidelines set forth in the Declaration of Helsinki.

**Conflict of Interest:** Authors declared no conflict of interest.

**Ethical Approval:** The study was approved by the Institutional review board/Ethical review board **(IRB#26/03-001)**.

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