

## **An Algorithm to Convert Optical Coherence Tomography Central Corneal Thickness Values to Ultrasound Central Corneal Thickness Values and its Corresponding Correction Factor**

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**Background:** Measuring Central Corneal Thickness (CCT) using Optical Coherence Tomography (OCT) is more convenient for the doctor and patient as compared to the Ultrasound (USS) measurement. OCT is a non-contact test, anesthetic drops are not used, there is no risk of abrasion or infection and the exact position of the central cornea is measured as OCT maps out the center. Nevertheless, OCT values have been found to be statistically significantly lower than the USS measures, <sup>1-8</sup> so both measures cannot be interchanged. Hence an algorithm is needed to convert OCT values to USS values after which the relevant intraocular pressure (IOP) correction factor can be applied in patient management.

**Aim:** To develop an algorithm to convert OCT CCT values to USS CCT values and apply the corresponding correction factor.

**Materials and Methods:** A cross sectional comparative study carried in 100 eyes of 50 patients attending Rachel Eye Center in Abuja from January to March 2021. CCT was first measured using the Pachscan ultrasound and then, using the Optovue OCT machine, at 10 minutes interval to both eyes. Measurements were taken between nine and eleven am, in a sitting position and by one examiner and using same instrument. The average of two successive readings was taken for all instruments. Data was analyzed using SPSS version 20 using the linear regression analysis. The linear regression formula was then applied to develop an algorithm to convert OCT CCT values to USS CCT values and apply the corresponding correction factor.

**Results:** A linear regression formula  $OCT = -2.184 + (0.955 \times USS)$   $p < 0.001$  was derived. The linear regression formula was then imputed into Microsoft excel to derive the OCT CCT values of preset USS CCT values alongside their corresponding correction factors, which was obtained from the modified Ehler's scale (Table 1).

**Discussion:** Algorithms to derive the correction factor of IOP from CCT have been in use since

**Table 1:** Modified Ehlers scale showing the CCT with its corresponding correction value (Ehlers et al)<sup>9,10</sup>

Central corneal thickness (um)	Correction value (mmHg)
410	10
415	10
420	9
425	9
430	8
435	8
440	7
445	7
455	6
465	6
475	5
485	4
495	4
505	3
515	2
525	1
535	1
545	0
555	-1
565	-1
575	-2
585	-3
595	-4
605	-4
615	-5
625	-6
635	-6
645	-7

**Table 2:** Modified Ehlers scale for OCT

USS Central corneal thickness (um)	Corresponding OCT value [i.e. -2.184+ (0.955 x USS)]	Correction value/ Adjustment in IOP (mmHg)
410	389.4	10.0
415	394.1	10.0
420	398.9	9.0
425	403.7	9.0
430	408.5	8.0
435	413.2	8.0
440	418.0	7.0
445	422.8	7
455	432.3	6
465	441.9	6
475	451.4	5
485	461.0	4
495	470.5	4
505	480.1	3
515	489.6	2
525	499.2	1
535	508.7	1
545	518.3	0
555	527.8	-1
565	537.4	-1
575	546.9	-2
585	556.5	-3
595	566.0	-4
605	575.6	-4
615	585.1	-5
625	594.7	-6
635	604.2	-6
645	613.8	-7

1975.<sup>9,10</sup> Various algorithms exist such as Ehler's conversion scale(1975),<sup>9,10</sup> Dresdner correction scale by Kohlass et al (2006),<sup>11</sup> Doughty (meta analysis in 2000),<sup>12</sup> Whitacre (1993)<sup>13</sup> and Orssengo and Pye (1999)<sup>14</sup> but the short fall of these algorithms is they were derived from USS or HAAG-Streit Pachometer and not OCT CCT values.

We have used the modified Ehlers conversion scale in our practice for years. The scale is the most popular algorithm in use and incorporated in most USS machines. Ehlers conversion scale has been modified for a population with average thickness of 545mmhg<sup>10</sup> (which fits into our Nigerian average CCT value of  $547 \pm 29.5\mu\text{m}$ ,  $550 \pm 36.3$ ,  $548 \pm 34.28/$ )<sup>15-19</sup>

**Conclusion and Recommendation:** The algorithm enables us to convert OCT CCT values to USS CCT values and apply the corresponding correction factor in managing our patients. There is a need for manufacturers of OCT machine to incorporate OCT designed algorithms for conversion scale in their machine as USS derived algorithms cannot be used interchangeably with OCT values.

**Keywords:** Algorithm; Convert; Central Corneal Thickness; Ultrasound Pachymetry; Optical Coherent Tomography

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