

A randomised control prospective study to investigate the efficacy of Tomography-orientated versus Standard axial Riboflavin/Ultraviolet A Corneal Collagen Cross-Linking. ISRCTN52187987

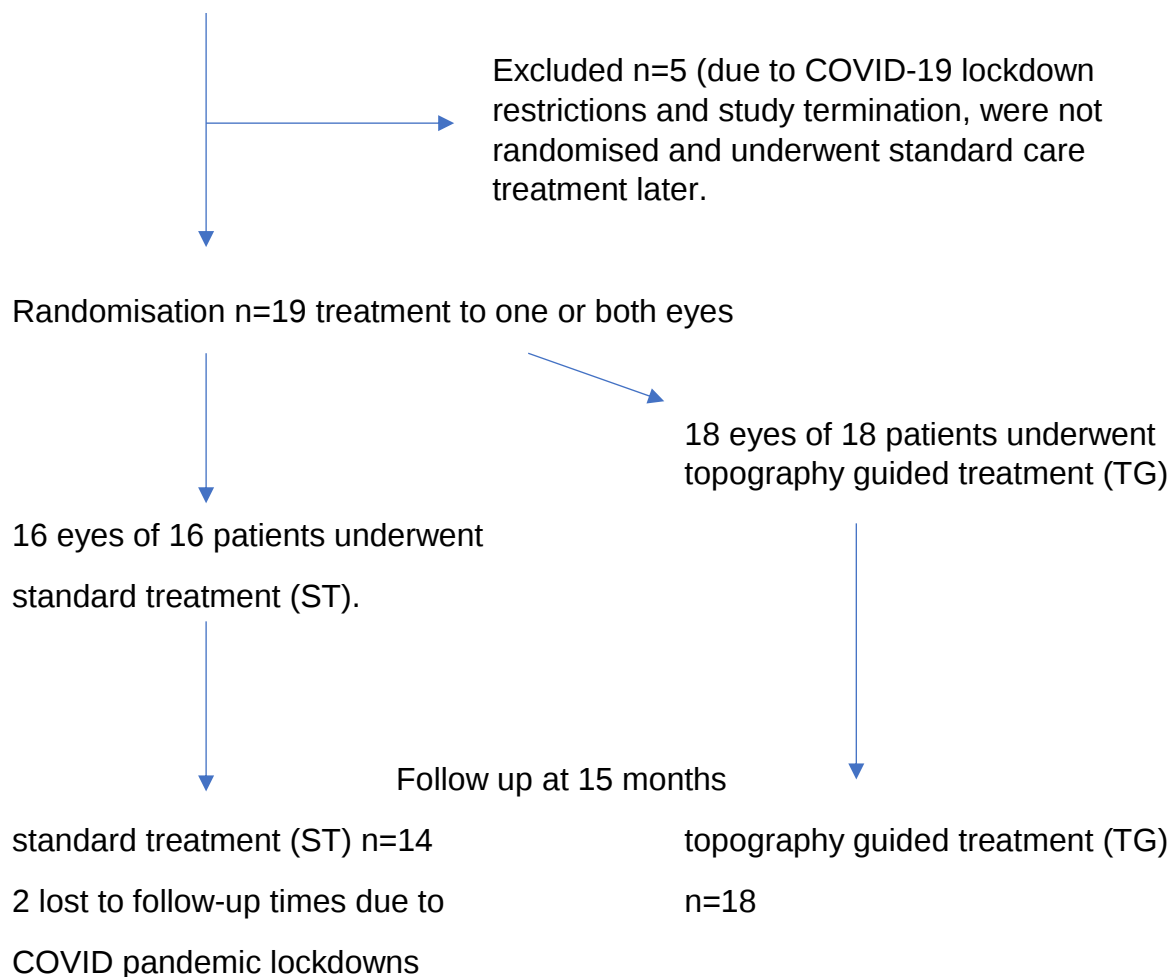
Participant Flow

24 Patients recruited

19 patients underwent randomisation and underwent cross linking treatment to one or both eyes. 18 eyes of 18 patients underwent topography guided treatment (TG) and 16 eyes of 16 patients underwent standard treatment (ST).

5 recruited patients, due to COVID-19 lockdown restrictions and study termination, were not randomised and underwent standard care treatment later.

Assessed for eligibility n=24



Baseline Characteristics

Age:

TG Mean=27.61 years (standard deviation = 7.23 years)

ST Mean=26.88 years (standard deviation = 6.48 years)

Unpaired t-test $p=0.76$, CI=-4.08 to 5.56

Gender:

TG M:F 13:5

ST M:F 11:5

Fisher's Test: $p=1.0$

Right: Left Eye:

TG R:L 9:9

ST R:L 7:9

Fisher's test: $p=0.74$

Outcome measures

Topo-guided Treatment (TG) (Paired T Test compared to base line values)

	Baseline Mean (SD)	3/12 Mean (SD) p-value	6/12 Mean (SD) p-value	9/12 Mean (SD) p-value	12/12 Mean (SD) p-value	15/15 Mean (SD) p-value
Best corrected visual acuity	Mean=0.24 SD=0.20 N=16	Mean=0.099 SD=0.13 P=0.38 CI=-0.087 to 0.21 N=9	Mean=0.11 SD=0.12 P=0.008 CI=0.042 to 0.22 N=13	Mean=0.11 SD=0.094 P=0.39 CI=-0.090 to 0.20 N=8	Mean=0.069 SD=0.071 P=0.092 CI=-0.035 to 0.35 N=7	Mean=0.17 SD=0.18 P=0.39 CI=-0.089 to 0.21
Pinhole CVA	Mean=0.23 SD=0.17 N=18	Mean=0.21 SD=0.15 P=0.87 CI=-0.13 to 0.15 N=14	Mean=0.16 SD=0.15 P=0.048 CI=0.0007 to 0.17 N=17	Mean=0.13 SD=0.11 P=0.065 CI=-0.0059 to 0.17 N=12	Mean=0.17 SD=0.19 P=0.11 CI=-0.034 to 0.27 N=7	Mean=0.15 SD=0.12 P=0.21 CI=-0.041 to 0.17
Corneal (Pentacam) Astigmatism (diopters)	Mean=3.51 SD=1.96 N=18	Mean=4.19 SD=3.72 P=0.15 CI=-1.82 to 0.32 N=14	Mean=3.44 SD=1.99 P=0.63 CI=-0.46 to 0.75 N=17	Mean=3.83 SD=2.23 P=0.58 CI=-0.61 to 0.36 N=14	Mean=3.78 SD=1.94 P=0.96 CI=-0.41 to 0.43 N=11	Mean=3.90 SD=2.60 P=0.33 CI=-0.73 to 0.26
Endothelial cell count	Mean=2598.43 SD=231.25 N=14	Mean=2792.60 SD=374.24 P=0.44 CI=-509.11 to 270.31 N=5	Mean=2466.38 SD=405.32 P=0.26 CI=-138.26 to 436.51 N=8	Mean=2458 SD=108.53 P=0.14 CI=-173.83 to 595.17 N=3	Mean=2482.50 SD=186.67 P=0.40 CI=-370.20 to 698.70 N=4	Mean=2675.83 SD=325.82 P=0.87 CI=-419.17 to 366.50
Mean Keratometry (diopters)	Mean=47.19 SD=3.61 N=18	Mean=48.27 SD=4.58 P=0.15 CI=-0.207 to 0.44 N=14	Mean=47.48 SD=3.60 P=0.64 CI=-1.55 to 0.97 N=17	Mean=48.38 SD=4.11 P=0.38 CI=-2.43 to 1.0 N=14	Mean=47.50 SD=3.32 P=0.43 CI=-2.54 to 1.18 N=11	Mean=48.41 SD=4.13 P=0.30 CI=-2.42 to 0.80
Maximum Keratometry (diopters)	Mean=57.0 SD=7.10 N=18	Mean=57.99 SD=8.80 P=0.34 CI=-2.06 to 0.76 N=14	Mean=56.81 SD=7.46 P=0.82 CI=-1.12 to 1.41 N=17	Mean=59.47 SD=7.40 P=0.29 CI=-3.08 to 0.99 N=14	Mean=58.29 SD=8.07 P=0.30 CI=-3.58 to 1.24 N=11	Mean=57.39 SD=8.05 P=0.80 CI=-2.22 to 2.82
Back Curvature (diopters)	Mean=-6.94 SD=0.72 N=18	Mean=-7.21 SD=0.82 P=0.10 CI=-0.070 to 0.71 N=14	Mean=-7.17 SD=0.67 P=0.18 CI=-0.11 to 0.54 N=17	Mean=-7.30 SD=0.72 P=0.12 CI=-0.098 to 0.73 N=14	Mean=-7.16 SD=0.64 P=0.20 CI=-0.19 to 0.81 N=11	Mean=-7.29 SD=0.74 P=0.094 CI=-0.06 to 0.69
Central corneal thickness (um)	Mean=476 SD=40.12 N=18	Mean=465.50 SD=41.92 P= 0.0085 CI=3.91 to 21.94 N=14	Mean=459.47 SD=29.34 P= 0.0008 CI=5.01 to 15.70 N=17	Mean=450.64 SD=32.42 P= 0.014 CI=4.21 to 31.07 N=14	Mean=450.0 SD=29.53 P= 0.040 CI=0.91 to 30.19 N=11	Mean=470.73 SD=41.48 P=0.083 CI=-1.34 to 19.47

Standard Treatment (ST) (Paired T Test)

	Baseline Mean (SD)	3/12 Mean (SD) p-value	6/12 Mean (SD) p-value	9/12 Mean (SD) p-value	12/12 Mean (SD) p-value	15/15 Mean (SD) p-value
Best corrected visual acuity	Mean=0.26 SD=0.33 N=14	Mean=0.19 SD=0.19 P=0.36 CI=-0.15 to 0.38 N=9	Mean=0.14 SD=0.20 P=-0.29 CI=-0.13 to 0.39 N=10	Mean=0.19 SD=0.20 P=0.28 CI=-0.13 to 0.38 N=8	Mean=0.39 SD=0.21 P=0.57 CI=-0.48 to 0.75 N=5	Mean=0.30 SD=0.46 P=-0.98 CI=-0.41 to 0.42 N=10
Pinhole CVA	Mean=0.33 SD=0.32 N=16	Mean=0.21 SD=0.28 P=0.31 CI=-0.11 to 0.33 N=13	Mean=0.22 SD=0.24 P=0.71 CI=-0.14 to 0.20 N=11	Mean=0.26 SD=0.21 P=0.27 CI=-0.17 to 0.53 N=8	Mean=0.34 SD=0.38 P=0.22 CI=-0.064 to 0.22 N=7	Mean=0.24 SD=0.27 P=0.83 CI=-0.19 to 0.23 N=12
Corneal (Pentacam) Astigmatism (diopters)	Mean=2.94 SD=2.27 N=16	Mean=3.00 SD=1.92 P=0.22 CI=-0.90 to 0.24 N=12	Mean=3.17 SD=2.20 P=0.58 CI=-0.86 to 0.51 N=13	Mean=3.09 SD=2.58 P=0.27 CI=-1.43 to 0.45 N=10	Mean=3.61 SD=2.91 P=0.50 CI=-2.06 to 1.12 N=7	Mean=2.91 SD=1.97 P=0.88 CI=-0.77 to 0.67 N=14
Endothelial cell count	Mean=2726.9 SD=257.85 N=10	Mean=2545.4 SD=166.57 P=0.90 CI=-356.38 to 394.38 N=5	Mean=2547.75 SD=100.54 P=0.11 CI=-42.21 to 244.71 N=4	Mean=2485.75 SD=301.55 P=0.29 CI=-475.99 to 1104.65 N=4	Mean=2590 SD=437.97 P=0.77 CI=-9.73.98 to 1140.65 N=5	Mean=2633 SD=274.60 P=0.78 CI=-339 to 419.68 N=6
Mean Keratometry (diopters)	Mean=48.74 SD=4.78 N=16	Mean=50.11 SD=5.51 P= 0.017 CI=-1.017 to -0.12 N=12	Mean=48.73 SD=5.34 P=0.12 CI=-1.06 to 0.14 N=13	Mean=49.83 SD=3.27 P= 0.048 CI=-1.45 to -0.007 N=10	Mean=51.19 SD=6.33 P=0.33 CI=-7.51 to 2.62 N=7	Mean=49.29 SD=5.37 P=0.13 CI=-0.71 to -0.10 N=14
Maximum Keratometry (diopters)	Mean=58.44 SD=7.82 N=16	Mean=59.53 SD=7.55 P=0.74 CI=-0.92 to 1.24 N=12	Mean=57.99 SD=7.90 P=0.91 CI=-1.78 to 1.98 N=13	Mean=60.92 SD=7.41 P=0.12 CI=-3.55 to 0.49 N=10	Mean=63.36 SD=9.74 P=0.40 CI=-4.37 to 2.0 N=7	Mean=58.53 SD=7.95 P=0.72 CI=-0.63 to 0.88 N=14
Back Curvature (diopters)	Mean=-7.29 SD=0.94 N=16	Mean=-7.53 SD=1.15 P= 0.013 CI=-0.041 to 0.27 N=12	Mean=-7.35 SD=1.12 P= 0.030 CI=0.016 to 0.26 N=13	Mean=-7.50 SD=0.72 P= 0.019 CI=0.033 to 0.29 N=10	Mean=-7.96 SD=1.18 P= 0.026 CI=-0.038 to 0.42 N=7	Mean=-7.42 SD=1.08 P=0.063 CI=-0.007 to 0.22 N=14
Central corneal thickness (um)	Mean=474.5 SD=33.87 N=16	Mean=472.42 SD=42.90 P=0.054 CI=-019 to 19.53 N=12	Mean=476.54 SD=37.14 P=0.92 CI=-12.93 to 11.70 N=13	Mean=460.90 SD=20.77 P=0.073 CI=-0.70 to 12.90 N=10	Mean=466.29 SD=46.07 P=0.95 CI=-25.77 to 27.20 N=7	Mean=473.93 SD=40.32 P=0.34 CI=-5.53 to 14.95 N=14

TG vs ST (unpaired t-test)

	Baseline Mean (SD)	3/12 Mean (SD) p-value	6/12 Mean (SD) p-value	9/12 Mean (SD) p-value	12/12 Mean (SD) p-value	15/15 Mean (SD) p-value
BCVA	TG M=0.24 TG SD=0.21 ST M=0.26 ST SD=0.34 P=0.84 CI=-0.23 to 0.19 N (SD/TG)=14/16	TG M=0.12 TG SD=0.13 ST M=0.21 ST SD=0.19 P=0.23 CI=-0.23 to 0.058 N (SD/TG)=11/11	TG M=0.071 TG SD=0.17 ST M=0.17 ST SD=0.21 P=0.21 CI=-0.27 to 0.061 N (SD/TG)=14/10	TG M=0.11 TG SD=0.084 ST M=0.22 ST SD=0.22 P=0.16 CI=-0.25 to 0.043 N (SD/TG)=11/11	TG M=0.075 TG SD=0.068 ST M=0.38 ST SD=0.17 P=0.0005 CI=-0.45 to -0.16 N (SD/TG)=8/7	TG M=0.17 TG SD=0.17 ST M=0.31 ST SD=0.44 P=0.31 CI=-0.43 to 0.14 N (SD/TG)=12/10
phCVA	TG M=0.23 TG SD=0.18 ST M=0.33 ST SD=0.33 P=0.27 CI=-0.28 to 0.083 N (SD/TG)=16/18	TG M=0.21 TG SD=0.15 ST M=0.21 ST SD=0.28 P=1.0 CI=-0.18 to 0.18 N (SD/TG)=13/14	TG M=0.16 TG SD=0.15 ST M=0.23 ST SD=0.25 P=0.33 CI=-0.23 to 0.081 N (SD/TG)=17/10	TG M=0.13 TG SD=0.11 ST M=0.24 ST SD=0.20 P=0.12 CI=-0.26 to 0.031 N (SD/TG)=12/9	TG M=0.17 TG SD=0.19 ST M=0.34 ST SD=0.38 P=0.29 CI=-0.52 to 0.17 N (SD/TG)=7/7	TG M=0.15 TG SD=0.12 ST M=0.24 ST SD=0.27 P=0.25 CI=-0.26 to 0.069 N (SD/TG)=14/12
Pent Astig	TG M=3.51 TG SD=2.02 ST M=2.94 ST SD=2.34 P=0.45 CI=-0.96 to 2.09 N (SD/TG)=16/18	TG M=4.19 TG SD=3.72 ST M=2.88 ST SD=1.97 P=0.30 CI=-1.27 to 3.87 N (SD/TG)=12/14	TG M=3.44 TG SD=1.99 ST M=3.27 ST SD=2.27 P=0.83 CI=-1.46 and 1.80 N (SD/TG)=17/12	TG M=3.83 TG SD=2.21 ST M=2.99 ST SD=2.47 P=0.38 CI=-1.11 to 2.78 N (SD/TG)=14/11	TG M=3.78 TG SD=1.94 ST M=3.61 ST SD=2.91 P=0.88 CI=-2.25 to 2.58 N (SD/TG)=11/7	TG M=3.90 TG SD=2.60 ST M=2.91 ST SD=1.97 P=0.26 CI=-0.77 to 2.76 N (SD/TG)=15/14
ECC	TG M=2598.43 TG SD=239.98 ST M=2726.90 ST SD=271.80 P=0.23 CI=-346.12 to 89.18 N (SD/TG)=10/14	TG M=2693.25 TG SD=314.93 ST M=2582.75 ST SD=139.10 P=0.38 CI=-150.57 to 371.57 N (SD/TG)=8/8	TG M=2512.64 TG SD=358.51 ST M=2730 ST SD=205.04 P=0.20 CI=-558.93 to 124.20 N (SD/TG)=11/7	TG M=2514 TG SD=127.23 ST M=2473.25 ST SD=218.6 P=0.71 CI=-198.29 to 279.79 N (SD/TG)=5/8	TG M=2524.57 TG SD=204.39 ST M=2639.80 ST SD=359.5 P=0.49 CI=-476.70 to 246.24 N (SD/TG)=7/5	TG M=2675.83 TG SD=325.82 ST M=2690.67 ST SD=283.33 P=0.93 CI=-407.60 to 377.93 N (SD/TG)=6/6
Mean K	TG M=47.19 TG SD=3.72 ST M=48.74 ST SD=4.94 P=0.31 CI=-4.58 to 1.49 N (SD/TG)=16/18	TG M=48.27 TG SD=4.58 ST M=49.34 ST SD=5.74 P=0.43 CI=-5.93 to 2.60 N (SD/TG)=12/14	TG M=47.48 TG SD=3.60 ST M=49 ST SD=5.49 P=0.37 CI=-4.98 to 1.93 N (SD/TG)=17/12	TG M=48.38 TG SD=4.11 ST M=49.44 ST SD=3.34 P=0.50 CI=-4.23 to 2.12 N (SD/TG)=14/11	TG M=47.5 TG SD=3.32 ST M=5.19 ST SD=6.33 P=0.12 CI=-8.48 to 1.11 N (SD/TG)=11/7	TG M=48.41 TG SD=4.13 ST M=49.29 ST SD=5.37 P=0.62 CI=-4.52 to 2.75 N (SD/TG)=15/14
Max K	TG M=57.0 TG SD=7.30 ST M=58.44 ST SD=8.08 P=0.59 CI=-6.81 to 3.93 N (SD/TG)=16/18	TG M=58.24 TG SD=8.51 ST M=59.65 ST SD=7.91 P=0.68 CI=-8.28 to 5.47 N (SD/TG)=12/14	TG M=56.81 TG SD=7.46 ST M=58.58 ST SD=7.95 P=0.55 CI=-7.69 to 4.16 N (SD/TG)=17/12	TG M=59.47 TG SD=7.40 ST M=60.00 ST SD=7.65 P=0.86 CI=-6.80 to 5.72 N (SD/TG)=14/11	TG M=58.29 TG SD=8.07 ST M=63.36 ST SD=9.74 P=0.25 CI=-14.01 to 3.88 N (SD/TG)=11/7	TG M=57.39 TG SD=8.05 ST M=58.53 ST SD=7.95 P=0.71 CI=-7.24 to 4.97 N (SD/TG)=15/14
Back Curv	TG M=-6.94 TG SD=0.74 ST M=-7.29 ST SD=0.97 P=0.24 CI=-0.24 to 0.95 N (SD/TG)=16/18	TG M=-7.21 TG SD=0.82 ST M=-7.55 ST SD=1.19 P=0.42 CI=-0.50 to 1.16 N (SD/TG)=12/14	TG M=-7.17 TG SD=0.67 ST M=-7.41 ST SD=1.16 P=0.49 CI=-0.46 to 0.94 N (SD/TG)=17/12	TG M=-7.3 TG SD=0.72 ST M=-7.43 ST SD=0.73 P=0.67 CI=-0.48 to 0.73 N (SD/TG)=14/11	TG M=-7.16 TG SD=0.64 ST M=-7.96 ST SD=1.18 P=0.081 CI=-0.11 to 1.70 N (SD/TG)=11/7	TG M=-7.29 TG SD=0.74 ST M=-7.42 ST SD=1.08 P=0.70 CI=-0.57 to 0.85 N (SD/TG)=15/14
CCT	TG M=476 TG SD=41.28 ST M=474.5 ST SD=34.98 P=0.91 CI=-25.42 to 28.42 N (SD/TG)=16/18	TG M=465.50 TG SD=41.92 ST M=475.82 ST SD=43.26 P=0.55 CI=-45.75 to 25.11 N (SD/TG)=12/14	TG M=459.47 TG SD=29.34 ST M=481.75 ST SD=33.46 P=0.068 CI=-46.33 to 1.77 N (SD/TG)=17/12	TG M=450.64 TG SD=32.42 ST M=456.64 ST SD=24.25 P=0.61 CI=-30.29 to 18.30 N (SD/TG)=14/11	TG M=450 TG SD=29.53 ST M=466.29 ST SD=46.07 P=0.37 CI=-53.82 to 21.24 N (SD/TG)=11/7	TG M=470.73 TG SD=41.48 ST M=473.93 ST SD=40.32 P=0.84 CI=-34.40 to 28.01 N (SD/TG)=15/14

Adverse Events

There were no adverse events associated with this trial