

# Outcomes of Pediatric Macular Hole

BPEI Biostatistics Center

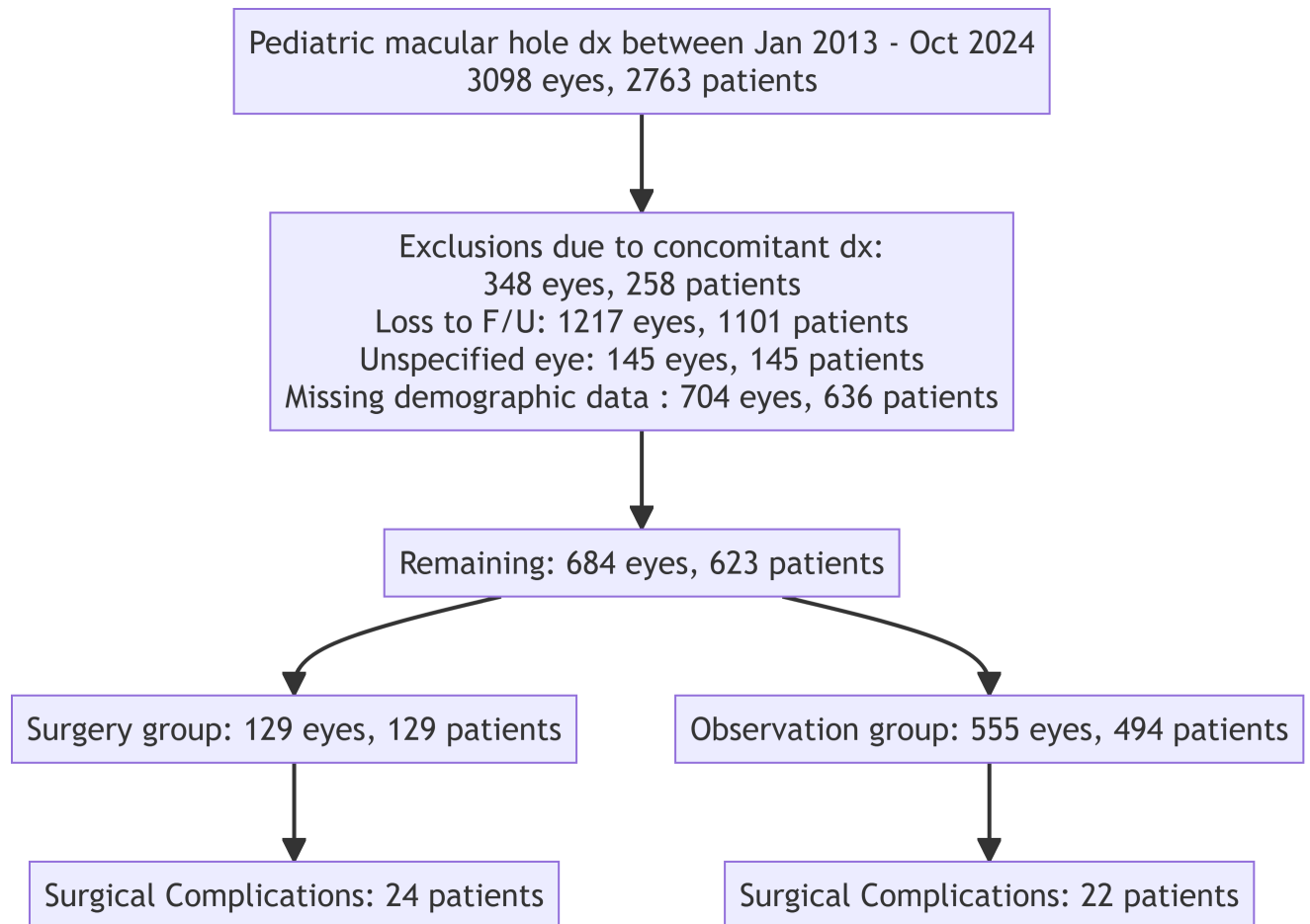
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## Data extraction



## Summary

Table 1: Demographic data of surgical and non-surgical patients

Variable	Overall N = 623 <sup>1</sup>	Observation N = 494 <sup>1</sup>	Surgery N = 129 <sup>1</sup>	p-value <sup>2</sup>
<b>Sex</b>				0.3
Female	219 (35%)	179 (36%)	40 (31%)	
Male	404 (65%)	315 (64%)	89 (69%)	
<b>Both eyes included</b>	61 (9.8%)	58 (12%)	3 (2.3%)	<b>0.001</b>
<b>Age at first macular hole diagnosis</b>	14.00 (11.00, 16.00)	14.00 (11.00, 16.00)	14.00 (11.00, 15.00)	0.8
<b>Age at macular hole diagnosis for fellow eye</b>	13.00 (9.00, 16.00)	13.00 (9.00, 16.00)	13.00 (11.00, 16.00)	0.7
Unknown	562	436	126	
<b>Race</b>				0.5
Asian	20 (3.2%)	18 (3.6%)	2 (1.6%)	
Black Or African American	99 (16%)	74 (15%)	25 (19%)	
Other	108 (17%)	87 (18%)	21 (16%)	
White	396 (64%)	315 (64%)	81 (63%)	
<b>Ethnicity</b>				0.3
Hispanic Or Latino	105 (17%)	79 (16%)	26 (20%)	
Not Hispanic Or Latino	518 (83%)	415 (84%)	103 (80%)	
<b>Region</b>				>0.9
Midwest	143 (23%)	111 (22%)	32 (25%)	
Northeast	122 (20%)	98 (20%)	24 (19%)	
South	267 (43%)	214 (43%)	53 (41%)	
West	91 (15%)	71 (14%)	20 (16%)	

Variable	Overall N = 623 <sup>1</sup>	Observation N = 494 <sup>1</sup>	Surgery N = 129 <sup>1</sup>	p- value <sup>2</sup>
<b>Follow up (months)</b>	35.45 (15.44, 64.16)	38.58 (16.62, 67.64)	24.38 (13.50, 47.14)	<b>&lt;0.001</b>

Note: Three patients are count in both groups as they had one eye in each group

<sup>1</sup>n (%); Median (Q1, Q3)

<sup>2</sup>Pearson's Chi-squared test; Wilcoxon rank sum test; Fisher's exact test

## Observation group

Table 2: Surgical complication for observation group

Variable	No surgical complication N = 475 <sup>1</sup>	Complex RD N = 11 <sup>1</sup>	Photocoagulation N = 8 <sup>1</sup>	Scleral buckling N = 1 <sup>1</sup>	Vitrectomy N = 2 <sup>1</sup>	p-value <sup>2</sup>
<b>Sex</b>						<b>0.8</b>
Female	170 (36%)	4 (36%)	3 (38%)	1 (100%)	1 (50%)	
Male	305 (64%)	7 (64%)	5 (63%)	0 (0%)	1 (50%)	
<b>Both eyes included</b>	54 (11%)	0 (0%)	3 (38%)	1 (100%)	0 (0%)	<b>0.025</b>
<b>Bilateral surgery</b>	0 (NA%)	0 (0%)	2 (25%)	1 (100%)	0 (0%)	0.056
Unknown	475	0	0	0	0	
<b>Age at first macular hole diagnosis</b>	14.00 (11.00, 16.00)	14.00 (12.00, 16.00)	11.00 (10.00, 14.50)	17.00 (17.00, 17.00)	14.00 (11.00, 17.00)	0.4
<b>Age at macular hole diagnosis for fellow eye</b>	13.00 (9.00, 16.00)	NA (NA, NA)	13.00 (10.00, 17.00)	17.00 (17.00, 17.00)	NA (NA, NA)	0.3
Unknown	421	11	5	0	2	
<b>Time to complication (days)</b>	NA (NA, NA)	34.00 (16.00, 893.00)	30.00 (10.00, 1,463.00)	303.00 (303.00, 303.00)	217.00 (22.00, 412.00)	>0.9
Unknown	475	0	1	0	0	
<b>Time to complication, fellow eye(days)</b>	NA (NA, NA)	NA (NA, NA)	702.00 (623.00, 1,161.00)	681.00 (681.00, 681.00)	NA (NA, NA)	0.7
Unknown	475	11	5	0	2	
<b>Race</b>						<b>0.038</b>
Asian	16 (3.4%)	0 (0%)	2 (25%)	0 (0%)	0 (0%)	
Black Or African American	70 (15%)	3 (27%)	1 (13%)	0 (0%)	0 (0%)	

Variable	No surgical complication N = 475 <sup>1</sup>	Complex RD N = 11 <sup>1</sup>	Photocoagulation N = 8 <sup>1</sup>	Scleral buckling N = 1 <sup>1</sup>	Vitrectomy N = 2 <sup>1</sup>	p-value <sup>2</sup>
Other	82 (17%)	5 (45%)	2 (25%)	0 (0%)	0 (0%)	
White	307 (65%)	3 (27%)	3 (38%)	1 (100%)	2 (100%)	
<b>Ethnicity</b>						0.2
Hispanic Or Latino	74 (16%)	3 (27%)	2 (25%)	1 (100%)	0 (0%)	
Not Hispanic Or Latino	401 (84%)	8 (73%)	6 (75%)	0 (0%)	2 (100%)	
<b>Region</b>						0.9
Midwest	108 (23%)	2 (18%)	1 (13%)	0 (0%)	0 (0%)	
Northeast	97 (20%)	1 (9.1%)	2 (25%)	0 (0%)	0 (0%)	
South	202 (43%)	5 (45%)	5 (63%)	1 (100%)	2 (100%)	
West	68 (14%)	3 (27%)	0 (0%)	0 (0%)	0 (0%)	
<b>Follow up (months)</b>	37.42 (16.20, 66.69)	56.31 (35.97, 87.75)	72.62 (37.17, 88.26)	58.05 (58.05, 58.05)	72.60 (34.79, 110.41)	0.2
<sup>1</sup> n (%); Median (Q1, Q3)						
<sup>2</sup> Fisher's exact test; Kruskal-Wallis rank sum test						

## Surgical group

Table 3: Surgical complication for Surgical group

Variable	No surgical complication N = 105 <sup>1</sup>	Cataract Surgery N = 6 <sup>1</sup>	Macular Hole Surgery N = 14 <sup>1</sup>	Retinal Detachment Surgery N = 4 <sup>1</sup>	p-value <sup>2</sup>
<b>Sex</b>					0.5
Female	32 (30%)	2 (33%)	6 (43%)	0 (0%)	
Male	73 (70%)	4 (67%)	8 (57%)	4 (100%)	
<b>Age at first macular hole diagnosis</b>	14.00 (11.00, 15.00)	16.00 (15.00, 17.00)	10.50 (7.00, 13.00)	12.50 (11.50, 13.50)	<b>0.005</b>
<b>Time to complication (days)</b>	NA (NA, NA)	532.00 (268.00, 725.00)	69.00 (21.00, 147.00)	38.00 (20.00, 73.00)	<b>0.001</b>
Unknown	105	0	0	0	
<b>Race</b>					0.4
Asian	1 (1.0%)	0 (0%)	0 (0%)	1 (25%)	
Black Or African American	20 (19%)	1 (17%)	4 (29%)	0 (0%)	
Other	18 (17%)	1 (17%)	2 (14%)	0 (0%)	
White	66 (63%)	4 (67%)	8 (57%)	3 (75%)	
<b>Ethnicity</b>					0.2
Hispanic Or Latino	19 (18%)	2 (33%)	3 (21%)	2 (50%)	
Not Hispanic Or Latino	86 (82%)	4 (67%)	11 (79%)	2 (50%)	
<b>Region</b>					0.9
Midwest	25 (24%)	2 (33%)	4 (29%)	1 (25%)	
Northeast	20 (19%)	0 (0%)	2 (14%)	2 (50%)	

<b>Variable</b>	<b>No surgical complication N = 105<sup>1</sup></b>	<b>Cataract Surgery N = 6<sup>1</sup></b>	<b>Macular Hole Surgery N = 14<sup>1</sup></b>	<b>Retinal Detachment Surgery N = 4<sup>1</sup></b>	<b>p-value<sup>2</sup></b>
South	44 (42%)	3 (50%)	5 (36%)	1 (25%)	
West	16 (15%)	1 (17%)	3 (21%)	0 (0%)	
<b>Follow up (months)</b>	23.46 (13.34, 46.12)	27.45 (19.05, 49.74)	43.64 (11.27, 74.74)	16.06 (12.12, 23.55)	0.5

Note: No one from the surgical group had a Endophthalmitis diagnosis.

One patient had bilateral macular hole diagnosis, both eyes had surgery (133 days apart) but no complication

<sup>1</sup>n (%); Median (Q1, Q3)

<sup>2</sup>Fisher's exact test; Kruskal-Wallis rank sum test



## VA comparison

These results suggest that while surgical patients started with worse VA, both groups experienced comparable gains in vision over time.

Category	Key Findings
<b>Baseline Difference</b>	- Surgical patients had 48% worse VA at baseline compared to the observed group ( $\text{Exp}(\beta) = 1.48$ , p < 0.001)
<b>Time Effects</b>	- Both groups showed significant improvement at all follow-up timepoints (p < 0.01)      - Peak improvement at 3 months

Table 5: GEE model

Variable	Multiplicative Effect p-value		
Variable	$\text{Exp}(\beta)$	95% CI (Lower)	95% CI (Upper) p-value
(Intercept)	0.7944374	0.7350682	0.8586016 <0.001
group_typeSurgical	1.4773713	1.2746061	1.7123925 <0.001
timepoint3MO	0.7976433	0.7383788	0.8616646 <0.001
timepoint6MO	0.7523988	0.6874750	0.8234538 <0.001
timepoint1Y	0.7860029	0.7221201	0.8555372 <0.001
timepoint2Y	0.8157669	0.7274438	0.9148138 <0.001

GEE Forest plot

Vision change across both groups

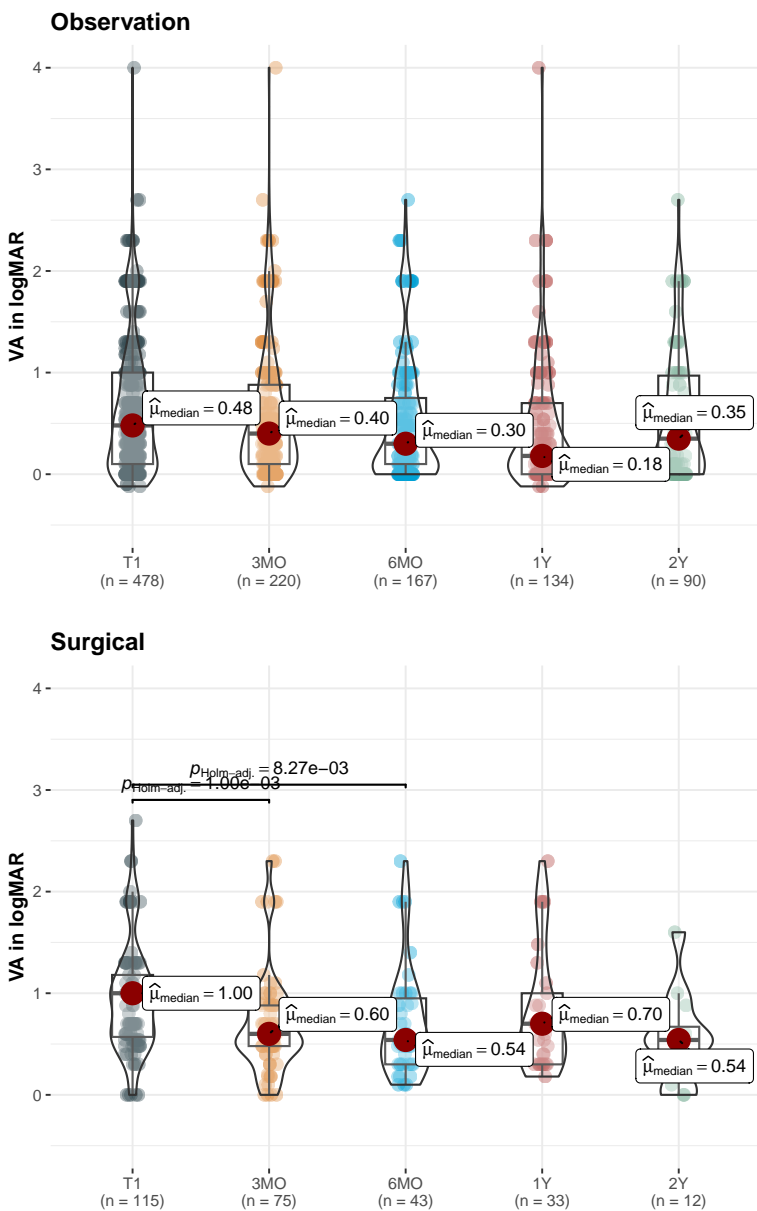


Figure 1: Intra group

Vision change between groups

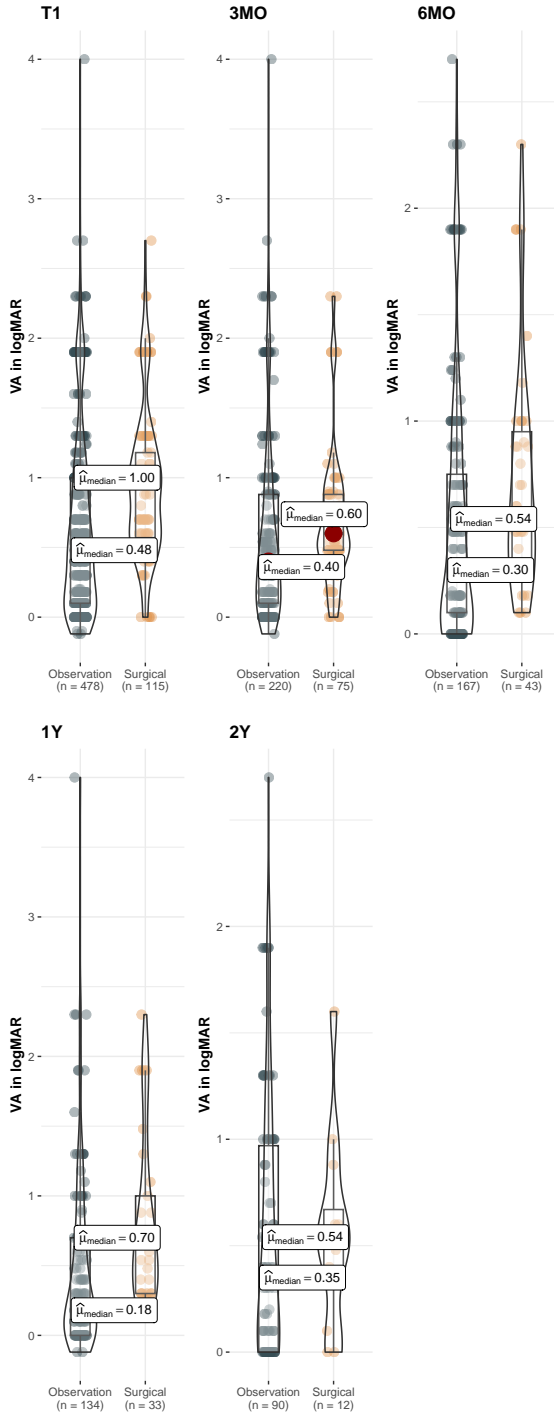


Figure 2: Inter group

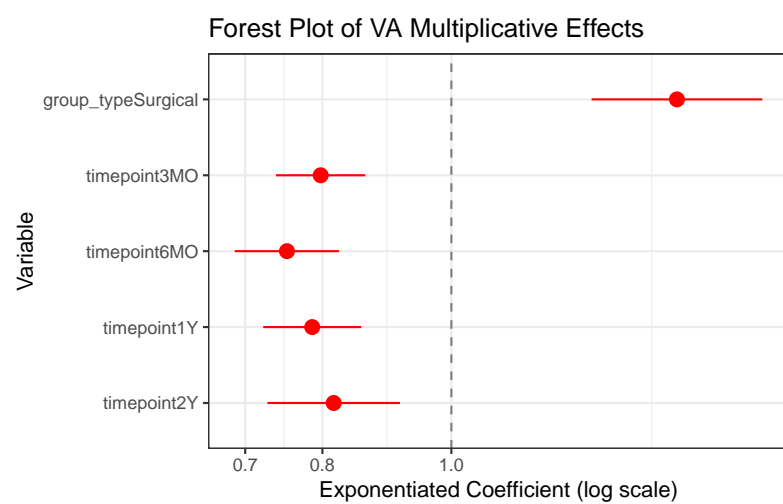


Figure 3: GEE Forest plot

**Time to max BCVA**

### Time to max BCVA

$W_{\text{Mann-Whitney}} = 39808.50$ ,  $p = 4.06\text{e-}05$ ,  $\hat{r}_{\text{biserial}}^{\text{rank}} = 0.24$ ,  $\text{CI}_{95\%} [0.13, 0.34]$ ,  $n_{\text{obs}} = 646$

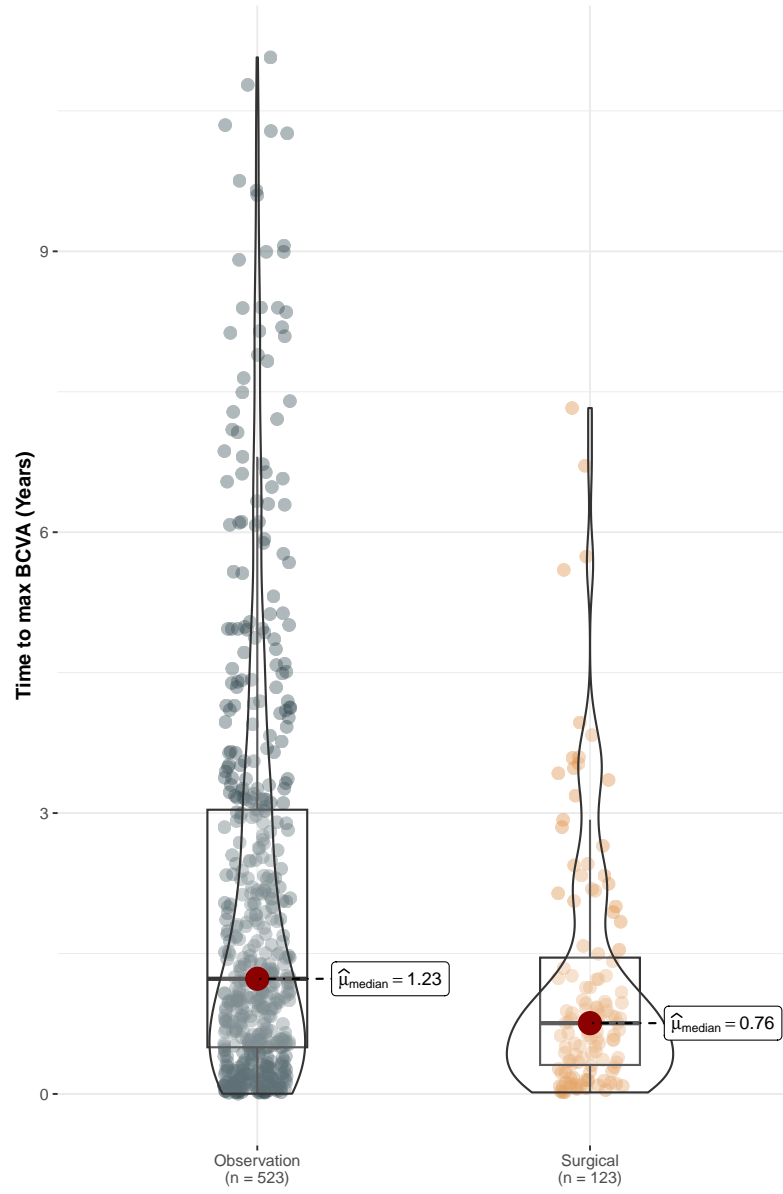


Figure 4: Time to max BCVA

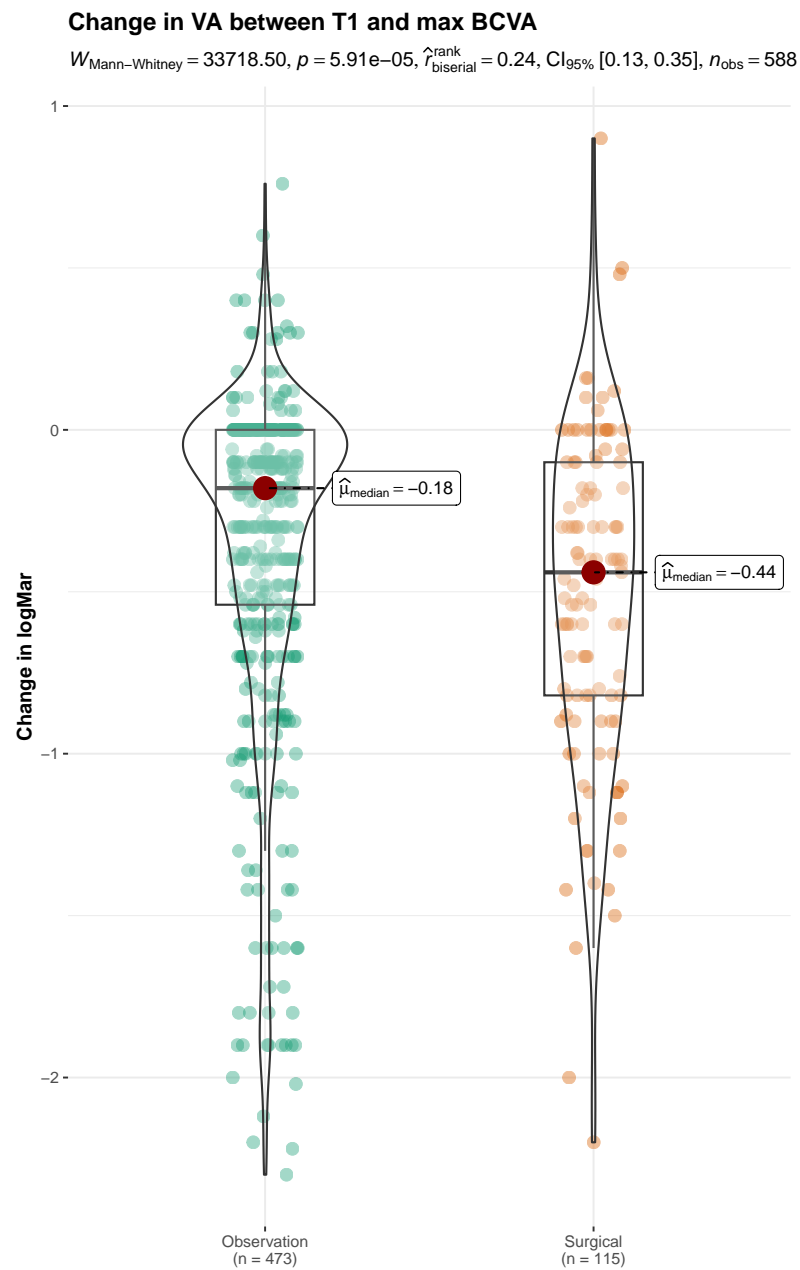


Figure 5: Change in VA from T1 to max BCVA

## Logistic Mixed Effects Model

Table 6: Multivariate data for Logistic mixed effects model

Variable	Overall N = 593 <sup>1</sup>	Observation N = 478 <sup>1</sup>	Surgery N = 115 <sup>1</sup>	p-value <sup>2</sup>
<b>Age at macular hole diagnosis</b>	14 (11, 16)	14 (11, 16)	14 (11, 16)	0.9
<b>Sex</b>				0.2
Female	214 (36%)	178 (37%)	36 (31%)	
Male	379 (64%)	300 (63%)	79 (69%)	
<b>Race</b>				0.4
Black Or African American	100 (17%)	76 (16%)	24 (21%)	
Other	121 (20%)	100 (21%)	21 (18%)	
White	372 (63%)	302 (63%)	70 (61%)	
<b>Ethnicity</b>				0.5
Hispanic Or Latino	95 (16%)	74 (15%)	21 (18%)	
Not Hispanic Or Latino	498 (84%)	404 (85%)	94 (82%)	
<b>Region</b>				0.5
Midwest	135 (23%)	103 (22%)	32 (28%)	
Northeast	126 (21%)	103 (22%)	23 (20%)	
South	246 (41%)	200 (42%)	46 (40%)	
West	86 (15%)	72 (15%)	14 (12%)	
<b>VA (logMAR)</b>	0.54 (0.18, 1.00)	0.48 (0.10, 1.00)	1.00 (0.54, 1.18)	<b>&lt;0.001</b>
<b>VA groups</b>				<b>&lt;0.001</b>
Normal	204 (34%)	195 (41%)	9 (7.8%)	
Mild	128 (22%)	100 (21%)	28 (24%)	
Moderate	138 (23%)	93 (19%)	45 (39%)	
Severe	123 (21%)	90 (19%)	33 (29%)	



Variable	Overall N = 593 <sup>1</sup>	Observation N = 478 <sup>1</sup>	Surgery N = 115 <sup>1</sup>	p-value <sup>2</sup>
<sup>1</sup> Median (Q1, Q3); n (%)				
<sup>2</sup> Wilcoxon rank sum test; Pearson's Chi-squared test				

**Vision impairment** (as classified by the `vision_group` variable) is a **strong predictor** of surgery, with those in the “Mild,” “Moderate,” and “Severe” vision groups having much higher odds of surgery compared to those with “Normal” vision. The severity of vision impairment increases the odds of surgery.

Other variables such as **age**, **sex**, and **ethnicity** do not significantly predict whether a patient has surgery.

Overall, these results provide evidence that patients with worse vision are more likely to undergo surgery, supporting the notion that visual acuity at baseline plays a crucial role in surgical decisions.

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Characteristic	OR <sup>1</sup>	95% CI <sup>1</sup>	p-value	OR <sup>1</sup>	95% CI <sup>1</sup>	p-value	OR <sup>1</sup>	95%
ageatdx	1.01	0.76, 1.36	>0.9					
sex								
Female				—	—			
Male				1.30	0.16, 10.8	0.8		
race								
Black Or African American							—	—
Other							0.60	0.02,
White							0.70	0.06,
ethnicity								
Hispanic Or Latino								
Not Hispanic Or Latino								
region								
Midwest								
Northeast								
South								
West								
vision_group								
Normal								
Mild								
Moderate								
Severe								

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<sup>1</sup>OR = Odds Ratio, CI = Confidence Interval