Independent Risk Factor Analysis for Poor Visual Outcomes in the Primary Retinal Detachment Outcomes (PRO) Study

Retina Society Abstract

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Louis Cai, Matthew Starr, Michael Ammar, Jeffrey Lin, Luv G. Patel, Anthony Obeid, Edwin H. Ryan, Claire Ryan, Nora J. Forbes, Antonio Capone Jr., Geoffrey G. Emerson, Daniel P. Joseph, Dean Eliott, Omesh P. Gupta, Carl D. Regillo, Jason Hsu, Yoshihiro Yonekawa, For the Primary Retinal Detachment Outcomes (PRO) Study Group.

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- None

Summary Slide

- This study evaluated 1178 patients who underwent primary RRD repair to determine factors contributing to poor visual outcomes.
- The most important prognostic variables identified were
    1. Preoperative visual acuity
    2. Proliferative vitreoretinopathy
    3. History of AMD/intravitreal injections
    4. Choroidal detachment
    5. Anterior segment pathology
    6. Surgery performed within one week of vision loss.
- Multiple regression performed similarly to machine learning models
- A simplified clinical model was created for use in patient counseling.

Introduction and Purpose

- Primary rhegmatogenous retinal detachment still remains one of the leading causes of visual morbidity.
- The purpose of this study was to assess the impact of preoperative, intraoperative, and postoperative variables on final visual acuity (VA) in patients undergoing primary rhegmatogenous retinal detachment (RRD) repair.
- The secondary purpose was to develop a clinical model that can help with patient counseling prior to RRD repair.

Methods

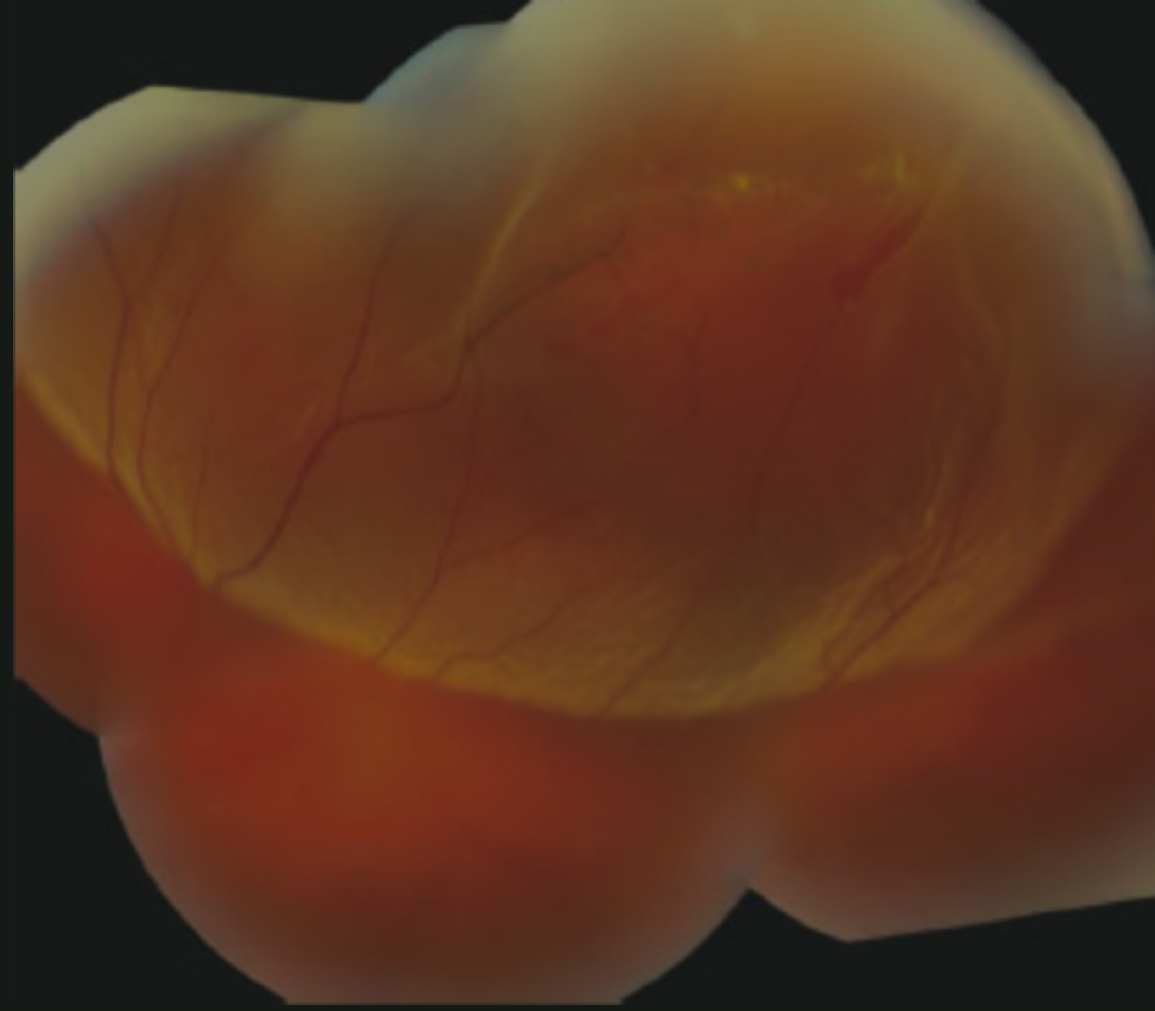
- The Primary Retinal Detachment Outcomes (PRO) Study
  - Large Multicenter Database of 2729 consecutive patients who underwent primary RRD repair in 2015

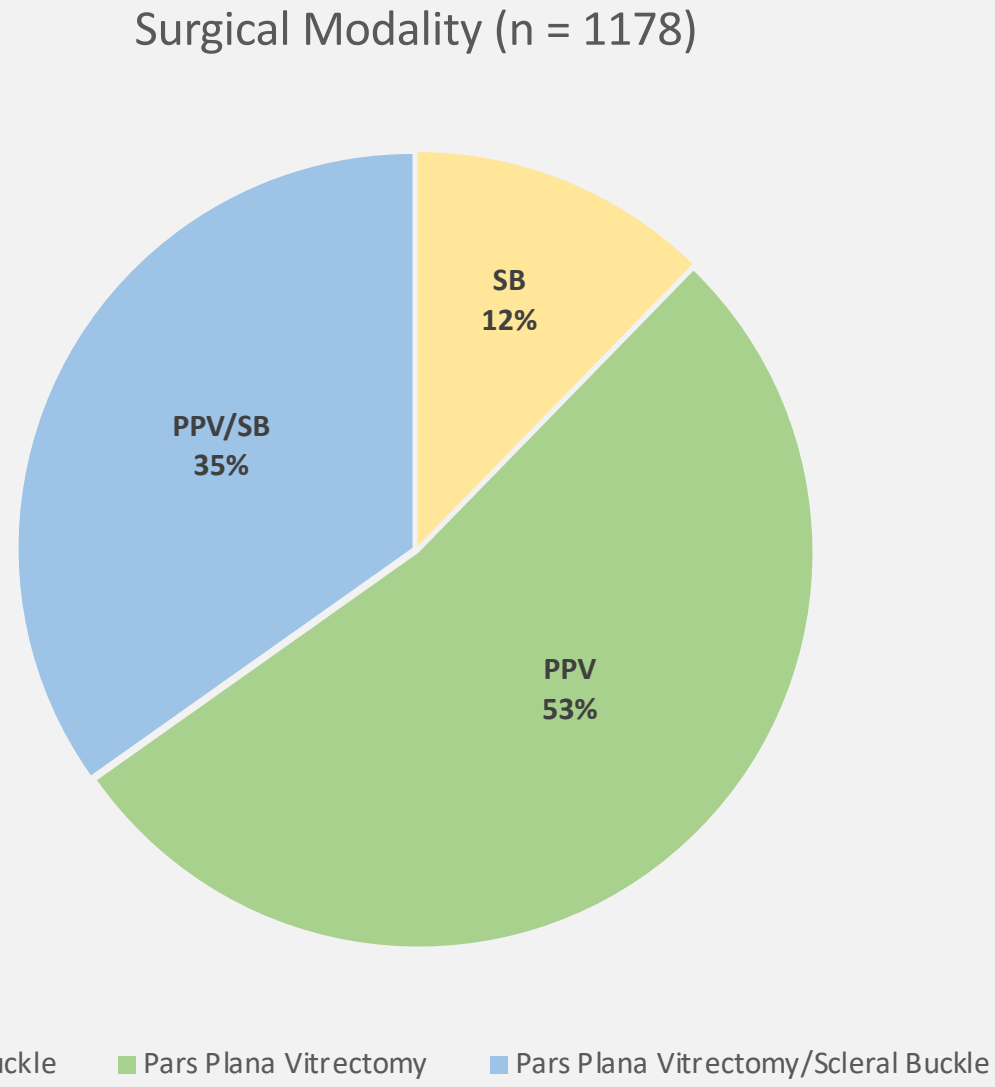
Methods

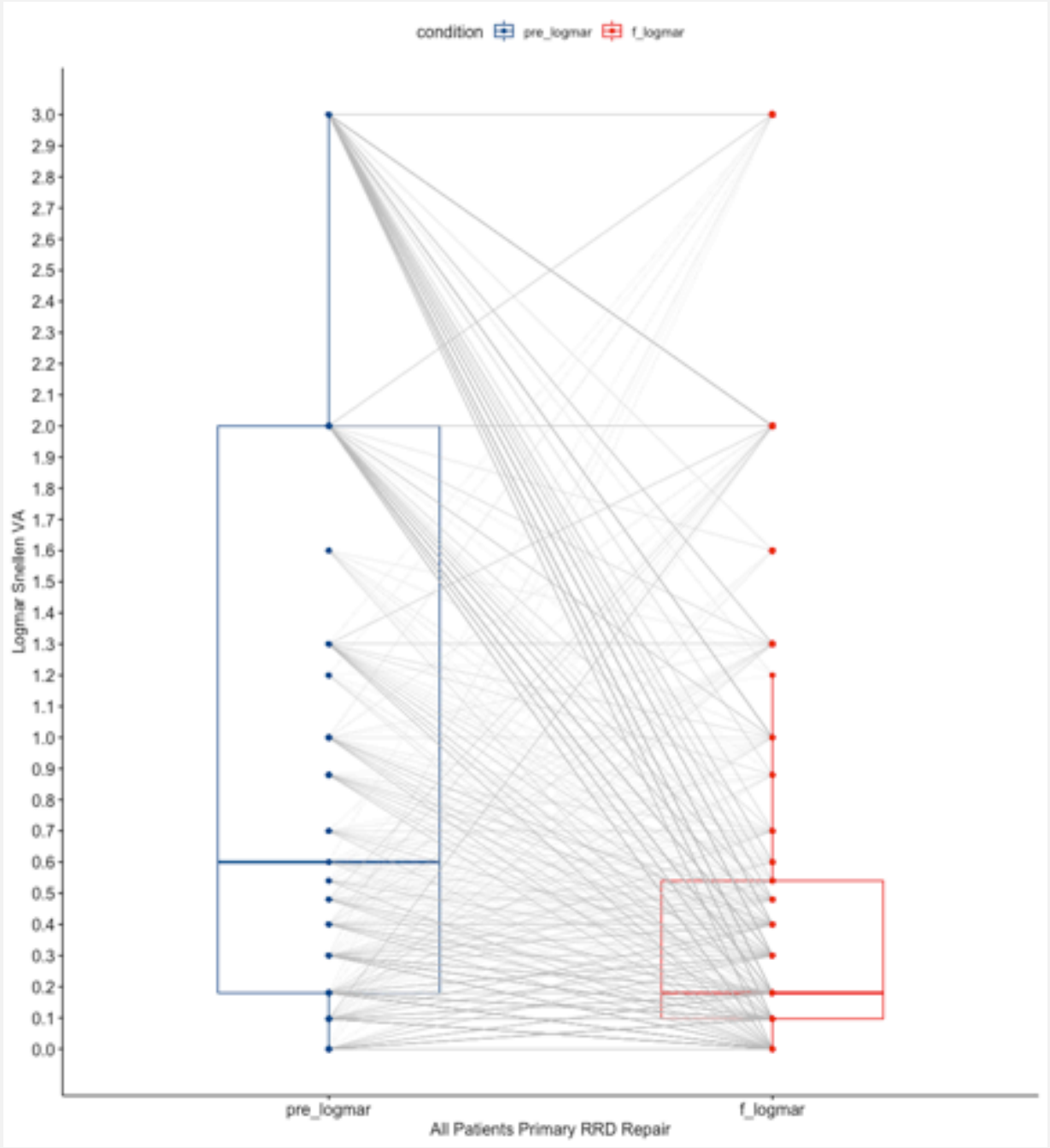
- Primary Outcome: Final Visual Acuity
- Inclusion criteria: Patients who underwent SB, PPV, PPV/SB and followed at least one year after surgery
- Modeling
  - Univariate linear regression was used for variable selection, using a threshold of $P < 0.001$
  - Afterwards, modeling was performed using multivariate linear regression and various machine learning algorithms.
  - Finally, a simplified clinical model was created for practical application

Results

- Number of Patients : 1178
- Mean follow up length: 504 days
- Mean Age: 60
- 61% Female
- 58% Phakic
- 55% Macula Detached
- 75% Surgery within 1W of vision loss

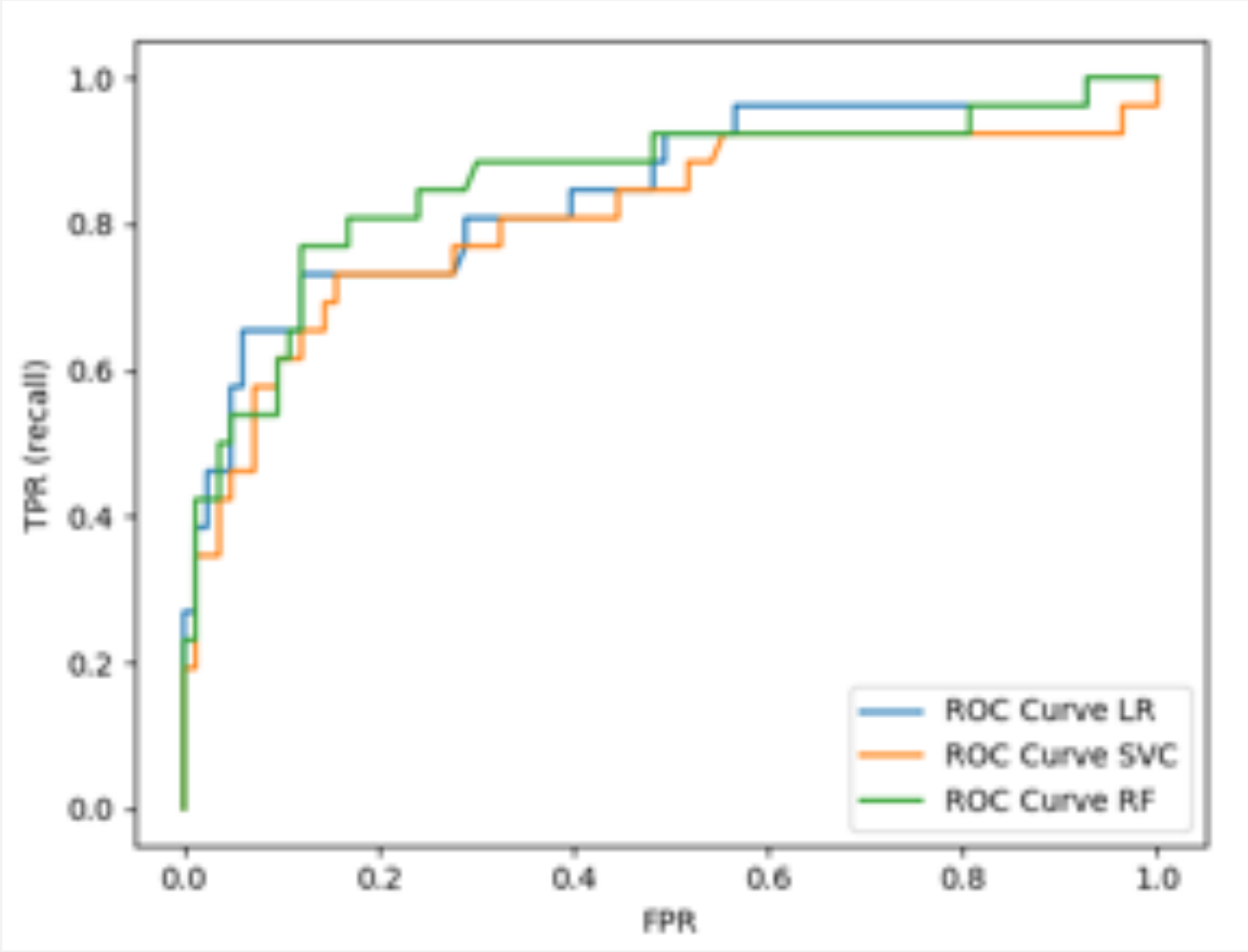



Surgical Modality (n = 1178)
SB
12%
PPV
53%
PPV/SB
35%
Scleral Buckle
Pars Plana Vitrectomy
Pars Plana Vitrectomy/Scleral Buckle


condition
pre_logmar
f_logmar
Logmar Snellen VA
3.0
2.9
2.8
2.7
2.6
2.5
2.4
2.3
2.2
2.1
2.0
1.9
1.8
1.7
1.6
1.5
1.4
1.3
1.2
1.1
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
pre_logmar
f_logmar
All Patients Primary RRD Repair

Variable	EDTRS Lines	Std. Error	P value
Intercept	-1.5	1.6	0.342
Postoperative Silicone Oil	8.3	1.2	P < 0.001
Number of subsequent retina operations (per op)	1.9*	0.3	P < 0.001
PVR	3.6	0.8	P < 0.001
Recurrent detachment	5.5	1.4	P < 0.001
Initial LogMAR Snellen (per LogMAR unit)	1.0*	0.3	0.001
History of intra-ocular injection in study eye	5.1	1.7	0.004
Postoperative Cataract Presence	2.7	0.9	0.005
Visually significant anterior pathology	4.2	1.8	0.020
Choroidal detachment	5.7	2.5	0.021
Surgery after 1 week of visual symptoms	1.4	0.6	0.029
Postoperative CME	1.3	0.8	0.088
PPV, compared to SB	1.9	1.1	0.104
Retained PFO	4.1	3.1	0.189
PPVSB, compared to SB	1.4	1.1	0.218
History of AMD	3.4	2.9	0.234
Inferior Extent of the Detachment (per clockhour)	0.1*	0.1	0.665
Preoperative Macula Detachment	0.3	0.8	0.724
Age	0.0	0.0	0.851
History of Amblyopia	-0.9	5.6	0.866

PREOPERATIVE	INTRAOPERATIVE	POSTOPERATIVE


1.0
0.8
0.6
0.4
0.2
0.0
TPR (recall)
0.0
0.2
0.4
0.6
0.8
1.0
FPR
ROC Curve LR
ROC Curve SVC
ROC Curve RF

Variable	Score
Initial VA	
Better than 20/40	0
20/40 or Worse	0.5
20/100 or Worse	1
20/400 or Worse	1.5
HM or CF	2
LP	3
Surgery After 1 week of Severe Vision Loss	1
History of AMD	3
Presence of visually significant anterior abnormality	3
Presence of PVR	4
History of intra-ocular injections (in study eye)	4.5
Presence of Choroidal Detachments	5.5

Variable	Score
Postoperative Cataract Presence*	2
Presence of Postoperative Oil*	14

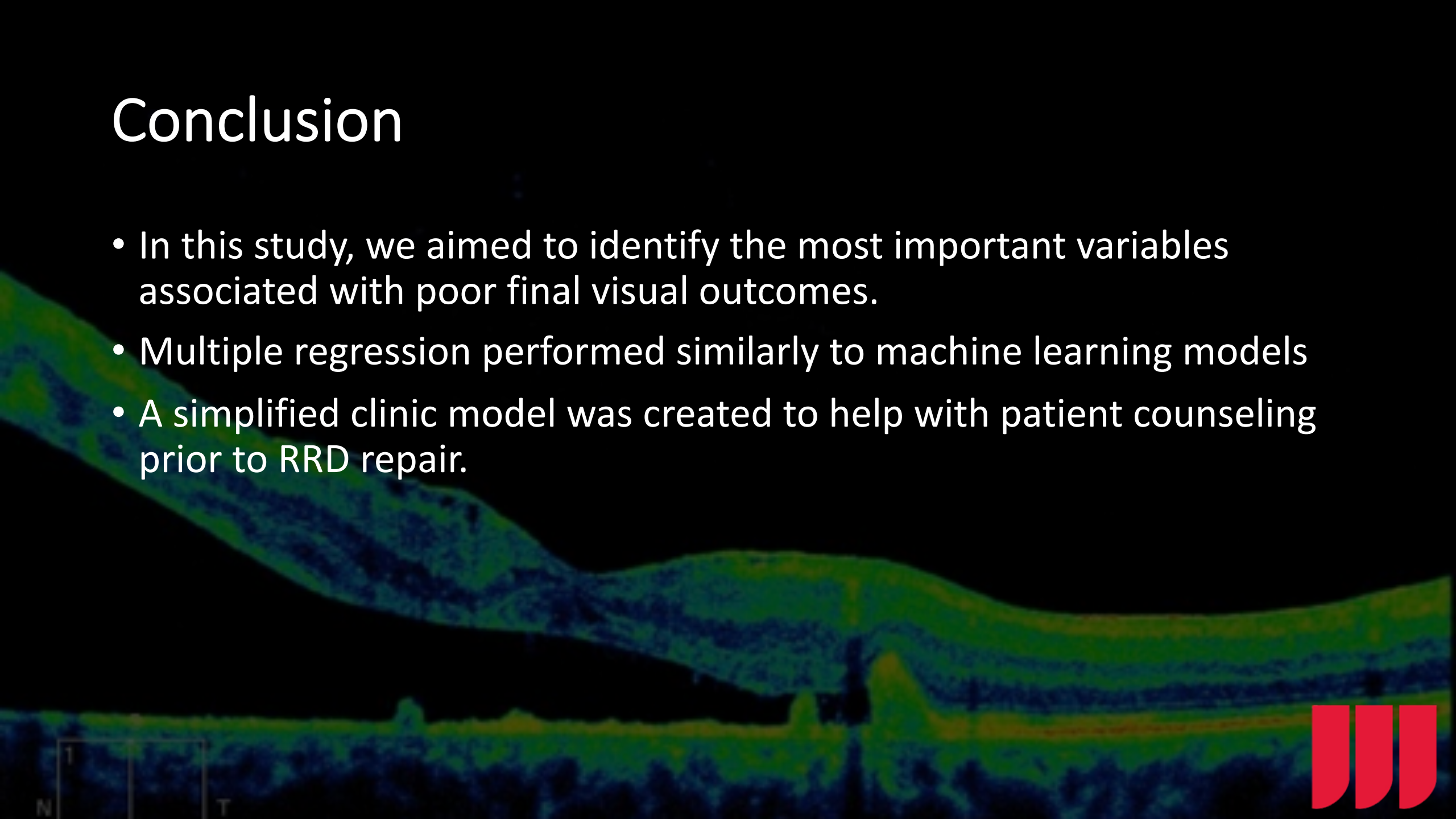
*Indicates postoperative variable, Score = EDTRS lines lost

Total	Risk of Poor Visual Outcome
3 or less	Low
Between 3 and 10	Medium
10 or more	High

		Final LogMAR		
		≤ 0.3 (20/40)	0.3 > x < 1.0	≥ 1.0 (20/200)
Predicted Risk	Low	64.54%	24.28%	11.18%
	Med	39.29%	27.68%	33.04%
	High	2.22%	6.67%	91.11%

Conclusion

- In this study, we aimed to identify the most important variables associated with poor final visual outcomes.
- Multiple regression performed similarly to machine learning models
- A simplified clinic model was created to help with patient counseling prior to RRD repair.



Limitations

- Our best linear regression model still only accounted for 51% of the total variability.
- Future studies should incorporate more prognostic variables by using OCT and other imaging modalities.
- Machine learning is not magic. Study design and variable selection are paramount.

References

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5. Pictures courtesy of Wills Eye Manual

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