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Evaluation of Artificial Intelligence-Based Retinopathy of Prematurity Screening in South India

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Keywords

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Abstract

Background

Artificial Intelligence (AI) algorithms have demonstrated efficacy in detecting severe ROP. Recent work using the Imaging and Informatics in ROP (i-ROP) deep learning (DL) system demonstrated high diagnostic accuracy compared to a reference standard diagnosis of plus disease in an Indian ROP telemedicine program. There remains a gap in knowledge as to how the i-ROP DL algorithm would work as an **autonomous** screening device against the clinical diagnosis of treatment-requiring (TR) ROP. The purpose of our study is to evaluate the i-ROP DL algorithm as an autonomous screening device in an Indian ROP telemedicine program at Aravind Eye Hospital (AEH).

Methods

We reviewed the results of telemedicine eye examinations from 2,728 consecutive patients seen in the AEH ROP telemedicine program in 2019–2020. The screening criteria included gestational age (GA) \leq 34 weeks or birth weight (BW) \leq 2,000 g. None were excluded. Images from each eye exam that included an optic nerve were analyzed by the i-ROP DL algorithm retrospectively in an automated fashion. Each eye was labeled "Possible TR-ROP" or "No TR-ROP" based on the presence or absence of pre-plus or worse disease as determined by the i-ROP DL system. Analysis was performed on the subject level (baby screened "+" for that exam if either eye had pre-plus or plus).

Results

Over a two-year period, simulated autonomous ROP screening using the i-ROP DL algorithm yielded a 99% sensitivity and 62% specificity for TR-ROP. Implementation of this system would have reduced the number of required tele-readings by 61%. 1 case of "TR-ROP" would have been missed during the 2-year period at this cut-off (although in retrospect this patient may have been treated without type 1 ROP- Fig 1).

Discussion

Future work may evaluate optimal cut- points to ensure high sensitivity in autonomous implementation, integration of risk models, and other potential indications for use for AI.

References

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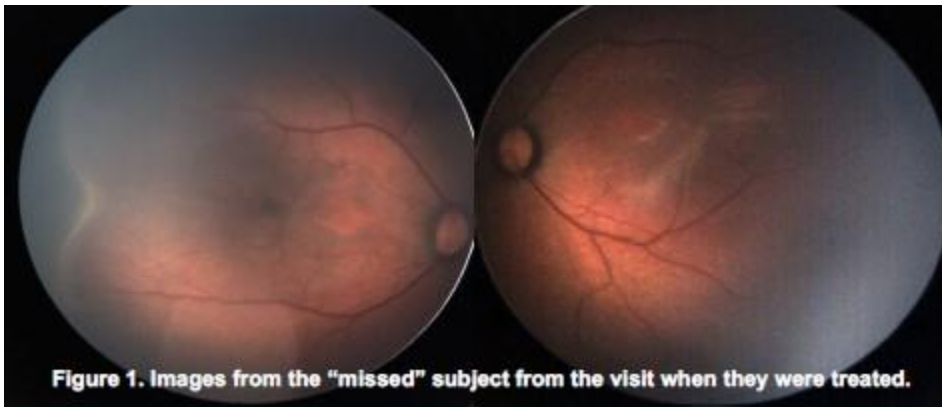


Figure 1. Images from the "missed" subject from the visit when they were treated.