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Original article

Telemedicine correlation in retinopathy of prematurity between experts and non-expert observers[☆]



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ABSTRACT

Objective: To study the correlation between expert and non-expert observers in the reporting images for the diagnosis of retinopathy of prematurity (ROP) in a telemedicine setting.

Methods: A cross-sectional, multicenter study, consisting of 25 sets of images of patients screened for ROP. They were evaluated by two experts in ROP and 1 non-expert and classified according to telemedicine classification, zone, stage, plus disease and Ells referral criteria. The telemedicine classification was: no ROP, mild ROP, type 2 ROP, or ROP that requires treatment. Ells referral criteria are defined as the presence at least one of the following: ROP in zone I, Stage 3 in zone I or II, or plus+. For statistical analysis, SPSS 16.0 was used. For correlation, Kappa value was performed.

Results: There was a high correlation between observers for the assessment of ROP stage (0.75; 0.54–0.88) plus disease (0.85; 0.71–0.92), and Ells criteria (0.89; 0.83–1.0). However, inter-observer values were low for zone (0.41; 0.27–0.54) and telemedicine classification (0.43; 0.33–0.6).

Conclusions: When evaluating telemedicine images by examiners with different levels of expertise in ROP, the Ells criteria gave the best correlation. In addition, stage of disease and plus disease have good correlation among observers. In contrast, the correlation between observers was low for zone and telemedicine classification.

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Correlación en telemedicina de retinopatía del prematuro entre observadores expertos y no expertos

R E S U M E N

Palabras clave:

Telemedicina
Retinopatía del prematuro
Correlación en RetCam

Objetivo: Estudiar la correlación de observadores expertos y no expertos en la evaluación de imágenes para el diagnóstico de retinopatía del prematuro (ROP) en un sistema de telemedicina.

Métodos: Estudio transversal y multicéntrico. Veinticinco sets de imágenes de pacientes con *screening* para ROP evaluadas por 2 expertos en ROP y uno no experto. Se clasificaron según esquema de telemedicina: zona, estadio, enfermedad plus y según criterios derivación de Ells. El esquema de telemedicina era: no ROP, ROP leve, ROP tipo 2 o ROP que requiere tratamiento. Criterios de derivación según Ells son la presencia de al menos uno de los siguientes: ROP en zona I, estadio 3 en zona I o II, o plus+. Para el análisis estadístico se utilizó SPSS® v.16.0. Para la correlación se usó el índice de Kappa.

Resultados: Hubo una alta correlación entre observadores para la evaluación del estadio ROP (0,75; 0,54–0,88), enfermedad plus (0,85; 0,71–0,92) y los criterios de derivación de Ells (0,89; 0,83–1,0). Sin embargo, los valores interobservadores fueron bajos para zona (0,41; 0,27–0,54) y esquema de telemedicina (0,43; 0,33–0,6).

Conclusiones: Al evaluar imágenes de telemedicina por examinadores con distinto grado de especialización en ROP, la clasificación de Ells tiene la mejor correlación, junto con estadio y enfermedad plus. En cambio, la correlación entre los observadores fue baja para zona de ROP y esquema de telemedicina.

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Introduction

Retinopathy of prematurity (ROP) is a vasoproliferative disorder that affects low weight premature babies. Several multicenter studies have developed criteria for the classification^{1,2} and treatment^{3,4} of ROP. This disorder continues to be the first cause of childhood blindness in developed countries.⁵ A survey carried out by the American Ophthalmology Academy revealed that 54% of ophthalmologists are willing to carry out screening and 20% of those who do are considering discontinuing said screening,⁶ one of the reasons being the possibility of medical-legal problems.⁶ Telemedicine is a strategy to resolve the limitations of ROP screening,⁶⁻¹² i.e., lack of specialist time, shortage of specialists in charge of screening and lack of clinical documentation in images. This is particularly important for the moderate to severe grade of the disorder. In addition, telemedicine has demonstrated a better cost-effectiveness ratio than ophthalmoscopy.^{13,14} The primary objective of this study is to analyze the correlation of expert and non-expert observers for diagnosing ROP in a system of image analysis via telemedicine.

Methods

A transversal and multicenter study in which an independent ophthalmologist selected 25 sets of ocular fundus images of patients screened for ROP obtained with RetCam equipment (Clarity Medical System; 2011) (Figs. 1 and 2) by trained nonmedical staff (Fig. 3). The images were assessed by 2 ROP experts and one non-expert (resident with previous training).

The images were classified according to the telemedicine scheme¹⁵ as zone, stage, plus and according to the Ells referral system.¹⁶ The statistical analysis was performed with SPSS® v.16.0 (SPSS Inc; 2007. Mac version, Chicago, USA). The correlation was assessed with the Kappa index. The study was approved by the ethics committee. The reporting scheme for telemedicine was¹: no ROP,² slight ROP,³ ROP without indication for treatment or type II (stage I or 2 in zone 1 without plus; stage III in zone 2 without plus),¹⁷ ROP which requires treatment or type I (stage III in zone 1 without plus, stage II or 3 with plus)⁴ unclassifiable. The composite referral criteria according to Ells require one of the following criteria for positive rating: presence of ROP in zone 1, stage III in

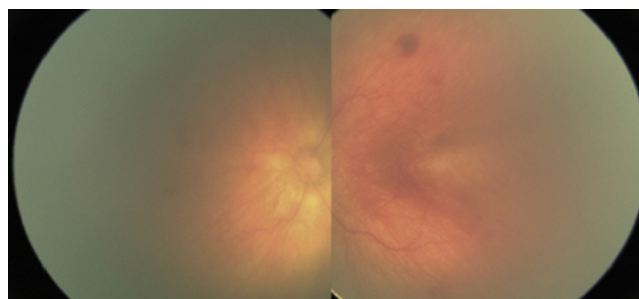


Fig. 1 – Image taken by neonatology nurse utilizing the RetCam system at week 37 of gestation in premature 27-week newborn with natal weight of 750 g. The image is compatible with ROP 2 due to the presence of stage II in zone 2 without the presence of plus. Note ridge hemorrhage toward temporal without visible neovessels.

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