

## REVIEW ARTICLE



# Clinical Characteristics of Patients Undergoing Examination Under Anesthesia in A Referral Hospital

Yordan R. Miranda-Cepeda<sup>1</sup>, Indumathi Krishnan-Sivadoss<sup>1</sup>, Pablo A. Juárez-Vargas<sup>1</sup>, Anya Dorairaj<sup>2</sup>, Mauricio Cedillo-Ley<sup>1</sup>

<sup>1</sup>Asociación Para Evitar la Ceguera en México, Hospital Dr. Luis Sánchez Bulnes. Ciudad de México, México.

<sup>2</sup>Mayo Clinic, Jacksonville, Florida, United States

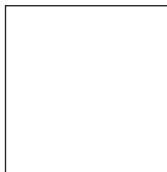
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**Address for correspondence:**

Yordan R. Miranda-Cepeda,  
Asociación Para Evitar la Ceguera en  
México, Hospital Dr. Luis Sánchez  
Bulnes. Ciudad de México, México.  
E-mail: yordan.rmc@gmail.com

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**Abstract**

Pediatric eye health is a global challenge. The lack of specialists and equipment poses a barrier for the pediatric ophthalmologic evaluation. Retinopathy of prematurity (ROP) is one of the principal causes of visual disability in our country and around the world. To address this issue, hospitals have implemented screening programs to improve early detection. Still, in distant regions of the capital many pediatric patients fail to undergo a complete evaluation. This retrospective study reviewed 150 pediatric patients that underwent examination under anesthesia (EUA) in a reference center between January 2023 and April 2023. ROP (42%) was the most common diagnosis identified, followed by strabismus (32%). Among the 63 patients diagnosed with ROP, 40.8% were classified as having stage 5. This study highlights the utility of EUA as a complementary assessment and treatment of pediatric eye diseases. Most patients came from the capital and surrounding areas, where third-level hospitals are more accessible, which is concerning for distant regions of our country. Implementing appropriate ophthalmologic evaluation and ROP screening in pediatric patients is key to improving visual health in our country and EUA can be a great tool for this purpose.

**Introduction**

Ensuring healthy vision in children is a major global challenge. Many of the childhood eye diseases are included in the Vision 2020 plan - the right to sight - of the World Health Organization.<sup>1</sup> However, the lack of specialists, centers with adequate equipment and the difficulty in performing a complete ophthalmological examination in pediatric patients continue to be some of the limiting factors.<sup>1-3</sup>

To emphasize the importance of screening in the pediatric population, pathologies such as retinopathy of prematurity (ROP) continue to generate visual disability in premature patients up to 10.7%.<sup>4</sup> In Mexico, it is estimated that up to 34.7% of premature patients have this disease or sequelae due to ROP.<sup>5</sup>

To address this lack of correct screening and evaluation of pediatric patients, hospitals around the world have implemented various screening programs to detect diseases such as congenital glaucoma, congenital cataract, strabismus, anisometropia, retinoblastoma, tear duct occlusions, among others. In reference

centers, an ocular pathology is detected in up to 13.4% of pediatric patients.<sup>1</sup> A study conducted by Ali, SMA et al. (2021), reported that 10.2% of healthy newborns examined in the Middle East had some form of ocular pathology.<sup>1</sup>

We present the findings of EUA performed in a national reference center in pediatric patients to learn about the common indications, procedures carried out in combination and different pathologies diagnosed, for which ophthalmologists rely on this tool as a complement in clinical practice.

**Materials and Methods**

For this retrospective study, we reviewed medical records of pediatric patients undergoing EUA in Asociación Para Evitar la Ceguera Hospital "Dr. Luis Sánchez Bulnes" in Mexico City from January to April 2023. In premature patients with ROP, to establish standard nomenclature, the international classification of retinopathy of prematurity (ICROP) was utilized. Demographic data, past medical history, diagnosis and motive of examination

were analyzed. For the analysis of quantitative and qualitative variables, descriptive statistics were utilized. This study was approved by the hospital's ethical and research committee.

### Results

A total of 150 patients were included, 84 (56%) male and 66 (44%) female with a mean age of 53.42 months (table 1). The most common procedure performed was EUA combined with fluorescein angiography with 53 (35.3%) patients, followed by botulinum toxin application for strabismus with 25 (16.7%) patients and suture removal with 25 (16.7%) patients (table 2). The most common diagnosis was ROP in 63 (42%) patients, followed by strabismus with 48 (32%) patients.

**Table 1:** Demographic information

Demographics	No (%)
Total of patients	150
<b>Gender</b>	
Male	84 (56)
Female	66 (44)
Mean age at EUA (months); mean (range)	53.42 (2-432)
<b>Origin</b>	
Capital	39 (26)
Surrounding states	49 (32.7)
Non-surrounding states	62 (41.3)
<b>Perinatal history</b>	
Premature patients	84 (56)
Full-term patients	66 (44)
Perinatal history of premature patients	No (%)
Total of patients	84 (55)
Patients with ROP	63 (42)
Supplemental oxygen use in premature patients	57 (90.5)
Intubation	26 (41.3)
CPAP	28 (44.4)
Neonatal oxygen hood	22 (34.9)
Nasal prongs	33 (52.4)
Indirect oxygen	14 (22.2)
Mean duration of supplemental oxygen in days	47.3
Blood transfused patients	29 (46)

We encountered 84 (56%) premature patients with a mean gestational age of 30.4 weeks and a mean weight at birth of 1526.7 grams. The most frequent cause of premature birth was premature rupture of membranes with 25 (16.7%) patients, followed by preeclampsia in 9 (6%) patients. A total of 63 of the 84 premature patients had ROP (table 1). Of those, 57 (90.5%) required oxygen supplementation for a mean duration of 47.4 days in the postnatal

period. The mechanisms of oxygen delivery are demonstrated in table 1. Of the 63 patients with ROP, 4 eyes (3.2%) had stage 1, 12 eyes (9.6%) had stage 2, 17 eyes (13.6%) had stage 3, 18 eyes (14.4%) had stage 4 and 51 eyes (40.8%) had stage 5 ROP. In 23 eyes (18.4%) ROP sequelae was found (table 4).

A total of 48 (32%) patients had strabismus including 4 patients with nystagmus. The most common presentation of strabismus was congenital esotropia in 20 (41.7%) patients followed by variable-angle esotropia in 6 (12.5%) patients (table 5). Of the 48 patients with strabismus, 26 (54.1%) patients received botulinum toxin as part of their treatment during the EUA (table 2).

Some of our patients had neurological disorders. A total of 25 (16.7%) of patients had psychomotor impairment, 4 (2.7%) had cerebral palsy and 10 presented other neurological disorders such as epilepsy (2%), microcephaly (1.3%) and corpus callosum hypoplasia (1.3%) (Table 3).

**Table 2:** Departments performing EUA and common procedures performed

Departments performing EUA	No (%)
Pediatric retinal unit	104 (69.3)
Strabismus and pediatric ophthalmology	29 (19.3)
Uveitis	9 (6)
Cornea	3 (2)
Glaucoma	3 (2)
Oculoplastics`	1 (0.7)
Anterior segment	1 (0.7)
<b>Most common procedures</b>	
Fluorescein Angiography	53 (35.3)
Suture removal	25 (16.7)
Botulin toxin injection	25 (16.7)
EUA	15 ( 10)
Ocular ultrasound	9 (6)
Laser photocoagulation	7 (4.6)

**Table 3:** Common neurological disorders found

Neurological disorders	No (%)
Psychomotor impairment	25 (16.7)
Cerebral palsy	4 (2.7)
Epilepsy	3 (2)
ADHD	1 (0.7)
Periventricular leukomalacia	1 (0.7)
Hemiparesia	1 (0.7)
Microcephaly	2 (1.3)
Corpus callosum hypoplasia	2 (1.3)

**Table 4:** ROP classification

Stage	ROP Classification						Total	
	Zone							
	I		II		III		n	%
1	n	%	n	%	n	%	n	%
2	3	2.4	0	0	1	0.8	4	3.2
3	1	0.8	6	4.8	5	4	12	9.6
4	5	4	12	9.6	0	0	17	13.6
5	a		b					
	n	%	n	%				
ROP sequelae	8	6.4	10	8			18	14.4
	n	%					51	40.8
	51	40.8					23	18.4
	23	18.4					125	100

**Table 5:** Strabismus findings

Strabismus	No (%)
Congenital esotropia	20 (41.7)
Variable-angle esotropia	6 (12.5)
Sensory esotropia	5 (10.4)
Intermittent exotropia	4 (8.3)
Nystagmus	4 (8.3)
Accommodative esotropia	2 (4.2)
Basic exotropia	2 (4.2)
Dissociated vertical deviation	2 (4.2)
Variable-angle exotropia	1 (2.1)
Sensory exotropia	1 (2.1)
Hypertropia	1 (2.1)

**Discussion**

Our study highlights the utility of EUA as a complement for assessment and treatment of pediatric patients. In a study conducted by Abdurhaem et al in Nigeria, the most common indication for performing EUA was congenital glaucoma in 20 patients in a period of time of 17 years<sup>6</sup>. In our institution, we have a specialized pediatric retina unit with a dedicated room for these procedures. This designation makes us more likely to receive a higher volume of cases and more severe presentations of ROP in children unlike the study mentioned above. In another study by Mohamed and Yassen in Libya, in a period of 6 years, they performed EUA in 265 children and the most common diagnosis was strabismus in 235 patients<sup>7</sup>. In our study, we found that most patients that underwent EUA have stage 5 ROP, highlighting the lack of early detection and screening of this disease. Regarding the origin of our patients, the majority came from the capital and surrounding states. Still, our patients had more severe stages of ROP on initial presentation although a specialized pediatric unit is available on hand. This raises concern due to the unavailability of specialized centers and trained

ophthalmologists outside the capital. It raises the question whether in distant states and regions of the country where EUA facilities are not present, pediatric and premature patients are obtaining a complete ophthalmologic evaluation and ROP screening.

Our center performed EUA in 150 children over a period of 4 months, meanwhile most of the reports mentioned, did so in a longer period. A wide variety of diseases have been diagnosed and treated, and multiple procedures have been performed in combination. This calls attention to the great utility and importance of performing EUA as an additional tool that aids the pediatric ophthalmological evaluation, which is challenging on its own in uncooperative patients.

**Conclusion**

These findings highlight the importance of implementing pediatric ophthalmology screening programs, improve accessibility to specialized centers and to ensure the appropriate evaluation in the pediatric population. The use of EUA is a tool that the ophthalmologist world-wide can use to overcome the challenges associated with pediatric eye examinations for the correct treatment of ocular pathologies.

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