Headache Medicine 2026, Supplement ▪ p-ISSN 2178-7468, e-ISSN 2763-6178

Headache Medicine

ID: 137

Photophobia in migraine: pathophysiological mechanisms at the neuro-ophtalmological interface

Carla Braga Monteiro, Ana Maria Ávila Dória, Giovanna de Oliveira Sá Costa, Jonas Oliveira Santana Neto, Laryssa Byanca Cruz Santos

Federal University of Sergipe, Aracaju, Sergipe, Brazil

Carla Braga Monteiro
carlabragamonteiro7@gmail.com

Introduction
Migraine is a neurological condition characterized by recurrent episodes of pulsatile headache, frequently accompanied by nausea, vomiting, phonophobia, and photophobia, with approximately 25% of patients experiencing aura. Among associated symptoms, photophobia stands out as one of the most prevalent and disabling manifestations of primary headaches, occurring in up to 80–90% of migraineurs. Its pathophysiology involves retinal, trigeminovascular, and cortical mechanisms, with evidence pointing to the involvement of intrinsically photosensitive retinal ganglion cells (ipRGCs) containing melanopsin, activation of the trigeminovascular pathway, and cortical hyperexcitability.

Objective
To analyze the pathophysiological mechanisms involved in photophobia in primary headaches, with emphasis on the interaction between retinal light capture and central pain pathways, especially in migraine.

Methods
A systematic literature review was conducted following PRISMA guidelines, searching PubMed, SciELO, and LILACS. Eligibility criteria included reviews and clinical trials from the last 10 years, available in free full text, in English or Portuguese. Screening was performed by the study team with disagreements resolved by consensus. Studies not addressing photophobia pathophysiology in primary headaches, unavailable in full text, or published in other languages were excluded. Eight studies were identified; one was excluded after eligibility screening, and seven were fully analyzed.

Results
The studies demonstrated a multimechanistic pathophysiology for photophobia in primary headaches. At the retinal level, ipRGCs proved central, directly responding to light and triggering discomfort, with greater sensitivity to blue light and connections to nociceptive structures. At the central level, convergence between photic signals and the trigeminovascular pathway was observed in pain-related thalamic neurons. CGRP and PACAP showed important roles in pain modulation and light aversion. Cortical hyperexcitability was also identified as a mechanism underlying light intolerance.

Conclusion
Photophobia in primary headaches represents a complex neuro-ophthalmological manifestation resulting from the interaction between the retina, trigeminovascular pathway, and visual cortex. The involvement of ipRGCs, modulation by CGRP and PACAP, and cortical hyperexcitability support an integrated pathophysiological model. These findings reinforce the importance of early clinical recognition and broaden therapeutic perspectives targeting light and pain processing.

Keywords:
Migraine
Photophobia
Neuro-ophthalmology

© Copyright 2025