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# **Endoplasmic reticulum stress is involved in retinal injury induced by repeated transient spikes of intraocular pressure**

**Key words:** ER stress, Spike IOP, retinal injury, neuron apoptosis, glaucoma

# ***Research Summary***

**In this study, to mimic peak IOP that may happen repeatedly during the sleep period in glaucoma patients, we treated mice with a sequence of IOP spikes, then analyzed the effects of repeated IOP spikes on the retina.**

**The main results are as follows:**

- Spike IOP induces time-dependent RGCs loss**
- Retinal cell apoptosis proceeds from the outer nuclear to the ganglion cell layer**
- Spike IOP induction elevates ER stress in retinas**

## Result 1: Spike IOP induces time-dependent RGCs loss

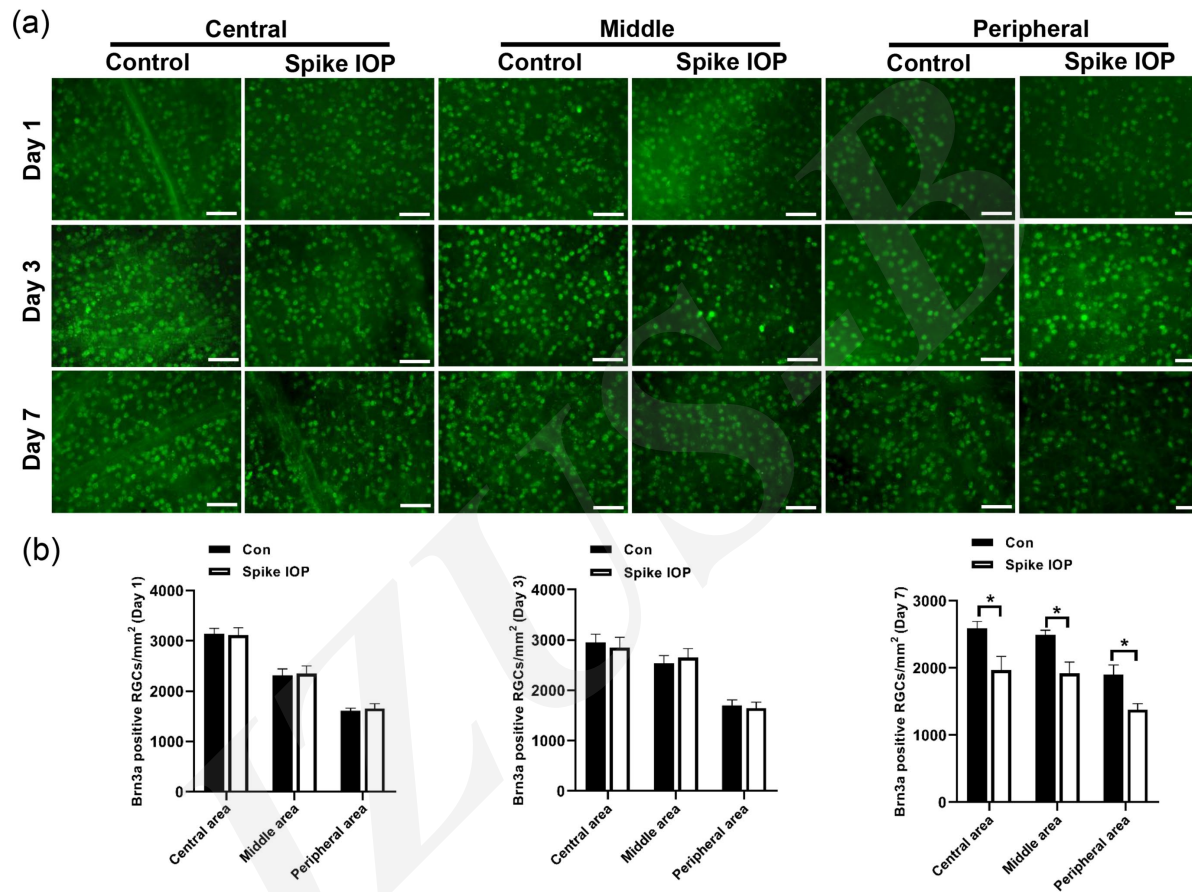


Figure 1. Brn3a immunostaining and quantification of RGC cells in a whole-mount retina.

(a) Representative images were taken from the central, middle, and peripheral areas. (b) RGC in the central, middle, and peripheral areas were counted and averaged.

## Result 2: Retinal cell apoptosis proceeds from the outer nuclear to the ganglion cell layer

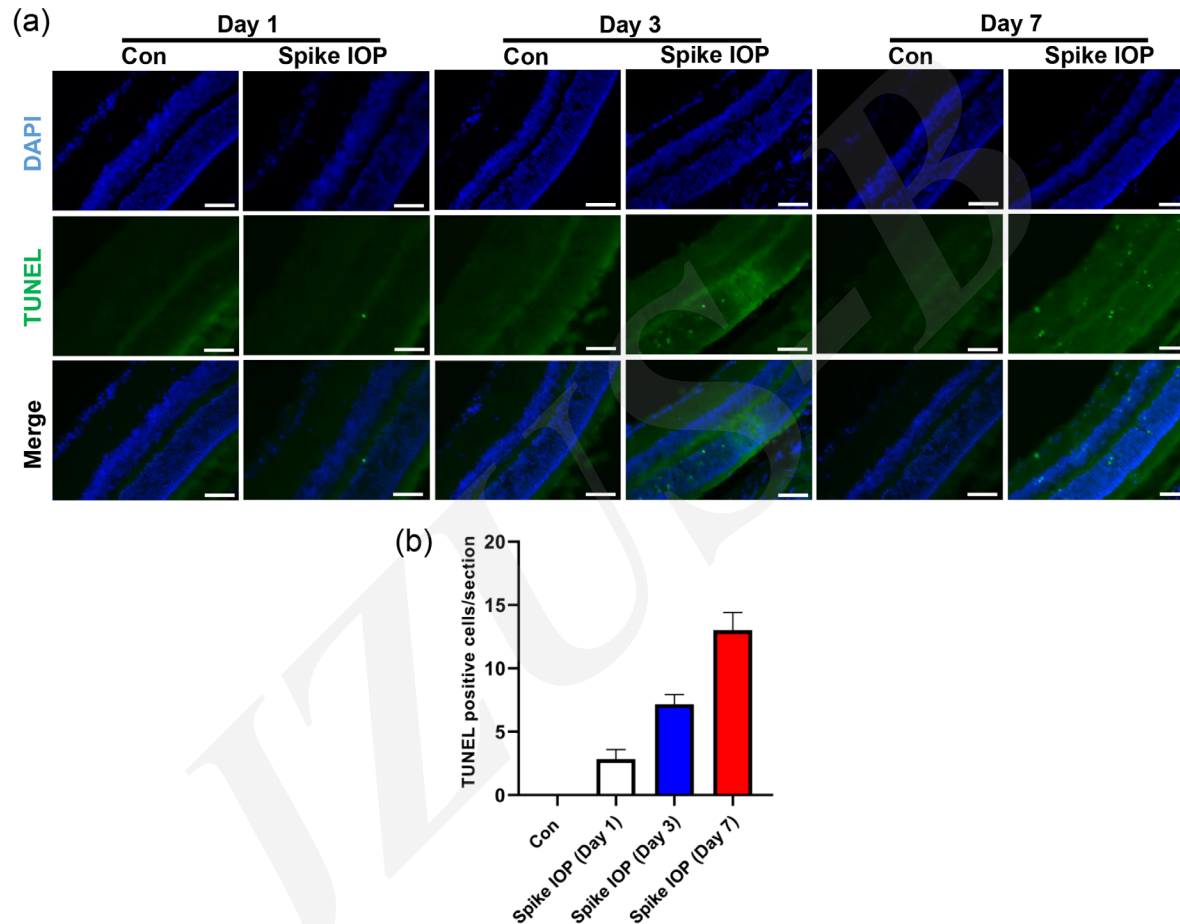


Figure 2. TUNEL staining of retinal sections. (a) Presence of retinal neuronal apoptosis in mice in the Spike IOP group at 1, 3, and 7 days after treatment. (b) TUNEL-positive cells were counted and averaged in 6 sections from 3 mice per group at each time point.

### Result 3: Spike IOP elevates ER stress in retinas

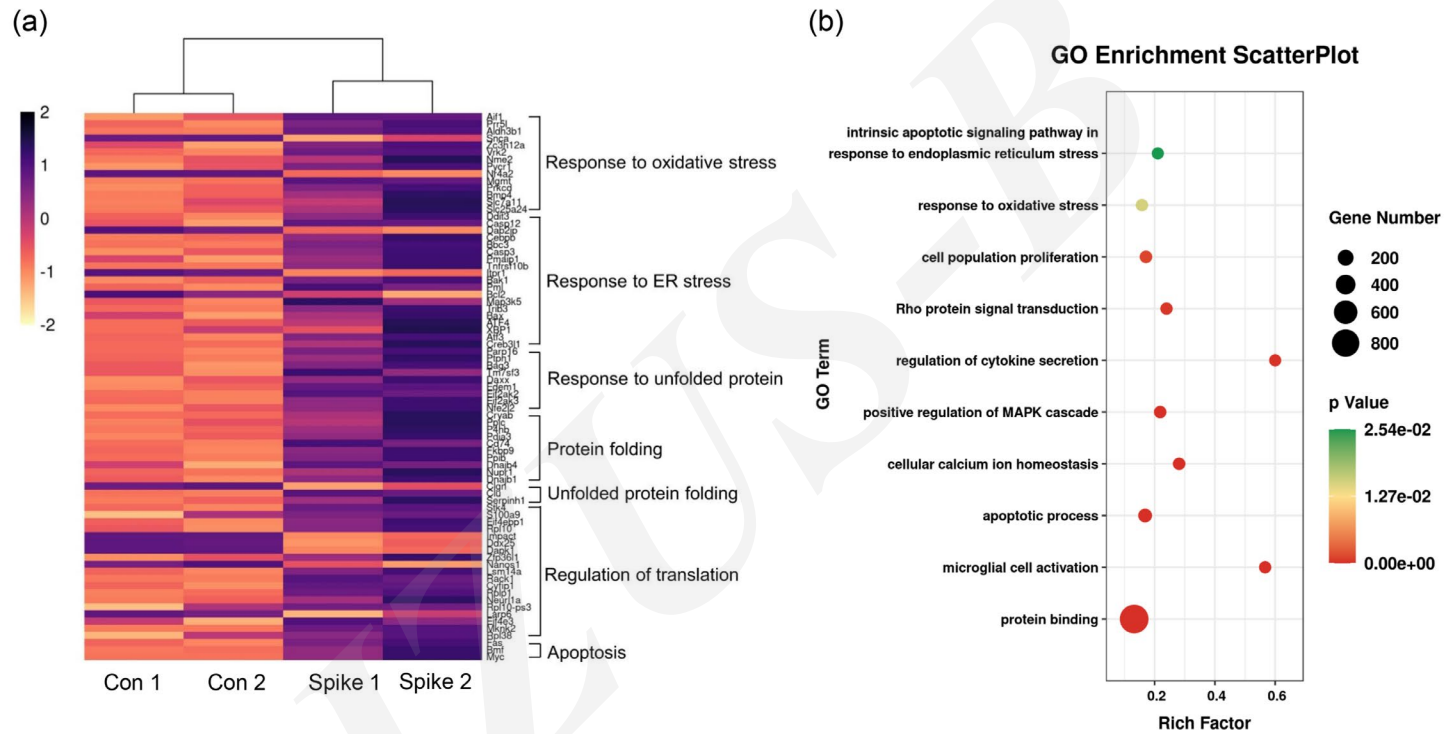


Figure 3. RNA sequence results. (a) Heatmap showing differentially expressed genes associated with ER stress. (b) Gene ontology showing differentially expressed genes enriched in apoptotic and other ER stress-related responses.

### Result 3: Spike IOP elevates ER stress in retinas

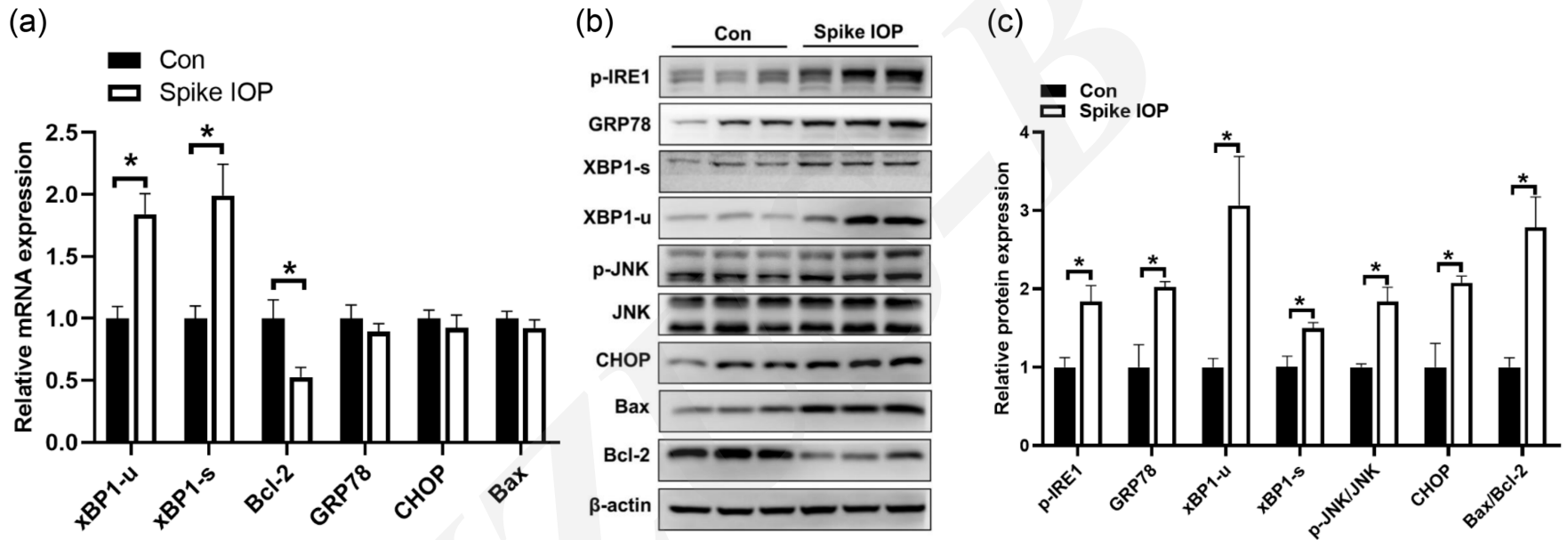


Figure 4. Molecular markers related to ER stress in retinas of mice treated with or without Spike IOP. (a) Expression profile of different molecules in the retinas quantified by qRT-PCR. (b) Representative Western blots showing change in expression of ER stress-related proteins. (c) Quantitative analysis of Western blot of ER stress-related proteins.