



## Photobiomodulation (PBM) for Carpal Tunnel Syndrome: Evidence and Protocols

### What is Photobiomodulation?

Photobiomodulation (PBM), also known as low-level laser therapy or red light therapy, uses specific wavelengths of red and near-infrared light to modulate cellular activity. When applied to tissues affected by compression or inflammation—like in Carpal Tunnel Syndrome (CTS)—PBM helps restore normal function by increasing ATP production, reducing oxidative stress, and alleviating inflammation.

CTS is caused by compression of the median nerve in the wrist and often presents with numbness, tingling, and weakness in the hand. PBM offers a non-invasive, drug-free solution that enhances nerve recovery, reduces swelling within the carpal tunnel, and improves hand function.

### Clinical Benefits for Carpal Tunnel Syndrome

#### 1. Randomized Clinical Trials

- A 2017 RCT with 90 patients showed significant symptom reduction and nerve conduction improvement after PBM treatment for CTS. [Live link](<https://pubmed.ncbi.nlm.nih.gov/29215310/>)
- Another study reported faster recovery and reduced pain scores in mild-to-moderate CTS patients treated with near-infrared light. [Live link](<https://pubmed.ncbi.nlm.nih.gov/27543775/>)

#### 2. Comparative Trials

- PBM was found to be as effective as corticosteroid injections in reducing CTS symptoms, with longer-lasting effects and no injection-related risks. [Live link](<https://pubmed.ncbi.nlm.nih.gov/23328813/>)

### 3. Rehabilitation Settings

- PBM improved motor and sensory nerve conduction in rehabilitation patients when combined with splinting and physiotherapy. [Live link](<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8322183/>)

### Mechanistic Evidence

PBM reduces compression-related inflammation by downregulating IL-6 and TNF- $\alpha$ . It enhances microvascular perfusion within the carpal tunnel and supports remyelination of nerve fibers. Additionally, it reduces edema in the flexor retinaculum, relieving mechanical pressure on the median nerve. [Live link](<https://pubmed.ncbi.nlm.nih.gov/32259889/>)

### Suggested Protocols: SPRB & GRPB

1. SPRB – Local application to wrist and palm
  - Wavelength: 660 nm (red) 50% + 850 nm (near-infrared) 50%
  - Application: Wrap the SPRB around the wrist area or lay it over the carpal tunnel at the palm side and then switch to the dorsal side
  - Duration: 15 minutes per side (30 min total)
  - Frequency: 1–3× per day for acute cases; 3–5× per week for chronic or maintenance care or more frequently as needed
  - Benefit: Reduces pressure in the carpal tunnel, improves nerve conduction, and relieves numbness and tingling



## 2. GRPB – Systemic and multi-point therapy

- Wavelengths: 660 nm (1/3) + 850 nm (2/3)
- Application: Drape the belt over both wrists or wrap around both forearms; can also treat proximal nerve roots at the cervical spine base
- Duration: 15 minutes per session – up to 2x per session and up to 3 sessions per day
- Frequency: 3x daily or as needed for bilateral symptoms
- Benefit: Comprehensive stimulation for inflammation reduction and systemic circulation improvement

\*\*\*For patients with proximal nerve compression or double-crush syndrome, applying GRPB over the cervical spine/ neck area can enhance total median nerve recovery.\*\*\*

### Monitoring & Safety Tips

- Avoid direct application over broken skin or surgical wounds.
- Keep the wrist in a relaxed and neutral position during treatment.
- PBM is safe, painless, and well-tolerated in both clinical and home use settings.

### Conclusion

Photobiomodulation provides a safe, evidence-based, and non-invasive solution for managing Carpal Tunnel Syndrome. By reducing nerve inflammation, enhancing blood flow, and promoting healing at the cellular level, PBM offers lasting symptom relief. SPRB and GRPB protocols allow for versatile, at-home applications that support hand function restoration and long-term pain management.

### Disclaimer

The information provided in this document is for educational and informational purposes only. It is not intended as a substitute for professional medical advice, diagnosis, or treatment. Individuals should always consult with a licensed physician or qualified healthcare provider before beginning any new therapy, including the use of photobiomodulation (PBM) devices.

PBM devices such as the SPRB and GPRB are wellness tools designed to support general health and well-being. They are not medical devices and are not intended to diagnose, treat, cure, or prevent any disease or medical condition. No medical claims are made or implied. Results may vary based on individual factors, and PBM should not be considered a replacement for appropriate medical care.