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The Efficacy of Low-Power Lasers in Tissue Repair and Pain Control: A Meta-Analysis Study

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Objective: We used **statistical meta-analysis** to determine the overall treatment effects of **laser phototherapy** on tissue **repair** and **pain** relief.

Background Data: **Low-power laser** devices were first used as a form of therapy more than **30 years** ago. However, their efficacy in reducing pain or promoting tissue repair remains questionable.

Methods: Following a literature search, studies meeting our inclusion criteria were identified and coded. Then, the effect size of laser treatment, that is, Cohen's d, was calculated from each study using standard meta-analysis procedures.

Results: Thirty-four peer-reviewed papers on tissue repair met our inclusion criteria and were used to calculate 46 treatment effect sizes. Nine peer-reviewed papers on pain control met the inclusion criteria and were used to calculate nine effect sizes. Meta-analysis revealed a **positive effect** of laser phototherapy on tissue **repair** (d = +1.81; n = 46) and **pain** control (d = +1.11; n = 9). The positive effect of treatment on specific indices of tissue repair was evident in the treatment effect sizes determined as follows: **collagen** formation (d = +2.78), **rate of healing** (d = +1.57), tensile **strength** (d = +2.13), time **needed** for **wound closure** (d = +0.76), **tensile stress** (d = +2.65), number and rate of **degranulation of mast cells** (d = +1.87), and **flap survival** (d = +1.95). Further, analysis revealed the **positive** effects of various wavelengths of laser light on tissue repair, with 632.8 nm having the **highest treatment effect** (d = +2.44) and 780 nm the least (d = 0.60). The overall treatment effect for **pain** control was **positive** as well (d = +1.11). The fail-safe number—that is, the number of studies in which laser phototherapy has negative or no effect—needed to nullify the overall outcome of this analysis was 370 for tissue repair and 41 for pain control.

Conclusions: These findings mandate the conclusion that laser phototherapy is a highly effective therapeutic armamentarium for tissue repair and pain relief.

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