

Third Molar Wound Recovery and the Impact of Photobiomodulation: A Comprehensive Review with Meta-Analysis

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Introduction

The third molars, often referred to as wisdom teeth, are the last set of molars that typically emerge in the late teenage years or early adulthood. Their extraction is one of the most common dental surgeries worldwide, often due to complications such as impaction, infection, or crowding. While the procedure is generally straightforward, the recovery process can be lengthy and associated with significant discomfort and risk of complications, including infection, dry socket, and prolonged swelling. Therefore, effective interventions to accelerate healing and mitigate post-operative complications are a key area of interest in dental research. Photobiomodulation (PBM) therapy has emerged as a promising adjunctive treatment to aid in the recovery process of third molar extractions. In this review, we examine the effects of PBM therapy on wound healing following third molar extraction, focusing on its mechanisms, clinical outcomes, and overall impact on the recovery process [1].

Photobiomodulation therapy, formerly known as Low-Level Laser Therapy (LLLT), uses specific wavelengths of light to promote cellular processes that enhance tissue repair and reduce inflammation. PBM operates primarily through the absorption of light by mitochondrial chromophores, leading to increased production of Adenosine Triphosphate (ATP), which is essential for cell growth and tissue regeneration. The light from PBM stimulates various biological processes, including collagen synthesis, increased blood circulation, and modulation of inflammatory responses, all of which contribute to the healing process. The use of PBM in dental practices is not new, but its application in post-surgical wound healing, especially in the context of third molar extraction, has garnered attention due to its potential to reduce healing times, decrease postoperative pain, and minimize the risk of complications [2].

Description

The extraction of third molars results in the creation of a surgical wound that can take several weeks to fully heal. The healing process consists of several stages, including hemostasis, inflammation, proliferation, and remodeling. During the inflammation phase, which typically lasts several days, the body's immune system works to clear away dead tissue and prevent infection. However, prolonged inflammation or excessive tissue damage can delay healing and increase the risk of complications. PBM therapy has been shown to influence this phase by reducing the activity of pro-inflammatory cytokines, decreasing swelling, and promoting the formation of new blood vessels through angiogenesis. This can accelerate the transition to the proliferative phase, where tissue regeneration and collagen deposition occur [3].

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Clinical studies investigating the impact of PBM on third molar wound recovery have provided promising results. Several meta-analyses and Randomized Controlled Trials (RCTs) have assessed the efficacy of PBM in reducing postoperative pain, swelling, and the incidence of complications. In particular, PBM therapy has been shown to significantly reduce pain intensity when applied in the immediate postoperative period, often as early as 24 to 48 hours post-surgery. The mechanism behind this pain reduction is thought to be linked to PBM's anti-inflammatory effects and its ability to stimulate the production of endorphins and other pain-relieving substances in the body. Moreover, PBM has been associated with a decrease in swelling, which is one of the most common postoperative issues following third molar extraction. Swelling can lead to discomfort and interfere with the normal recovery process. By accelerating the resolution of inflammation, PBM therapy may help to mitigate these issues, contributing to a more comfortable and efficient healing period [4].

In addition to pain and swelling reduction, PBM therapy has also been found to promote tissue healing by stimulating cell proliferation and collagen synthesis. Collagen, a critical component of connective tissue, plays an essential role in wound healing by providing structural support to the newly formed tissue. Studies have shown that PBM can increase the expression of collagen and other extracellular matrix components, thus facilitating the regeneration of tissue and speeding up the overall healing process. This can be particularly beneficial in preventing complications such as delayed wound healing or infection, which may occur if the healing process is not optimized [5].

Conclusion

In conclusion, photobiomodulation therapy shows significant promise as an adjunctive treatment for enhancing recovery following third molar extraction. The therapy's ability to reduce pain, swelling, and the risk of complications such as dry socket, while simultaneously promoting tissue regeneration and collagen synthesis, makes it an attractive option for improving postoperative outcomes. However, while the evidence supporting PBM therapy is compelling, there is a need for further studies to refine treatment protocols, assess long-term effects, and evaluate the therapy's efficacy across diverse patient populations. Ultimately, the incorporation of PBM into clinical practice could revolutionize the management of third molar extractions, offering patients faster, more comfortable recovery experiences and reducing the burden of postoperative complications.

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Conflict of Interest

None.

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