

Why photobiomodulation is relevant in multimorphic cancer pain management?

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What is photobiomodulation?

- Photobiomodulation (PBM) is a form of light therapy that utilizes non-ionizing forms of light sources, including laser diodes (LD), light-emitting diodes (LEDs), and broadband light, in the visible and infrared spectrum.
- PBM provokes a nonthermal process whereby endogenous chromophores elicit photophysical and photochemical events at diverse biological levels.
- This process results in positive therapeutic outcomes including the stimulation of tissue regeneration and wound healing, the reduction of inflammation and pain, and immunomodulation

Cancer pain has changed : multimorphism at the heart of the global analgesic strategy

- From an etymological point of view, the term multimorphic refers to the possibility of adopting several forms at the same time and of changing form.
- This term seems to us to be adapted to the dynamic definition that we have sought to give to cancer pain: this type of pain can effectively evolve in how it presents, in relation to the different factors, whether or not they are linked to cancer and its management.
- In short, cancer pain is not a fixed entity in itself or over time. It changes, alters, evolves, or devolves, presenting in different forms at any time, from the diagnosis until after the cure or in palliative situations when applicable.
- These modifications depend on a series of intrinsic or extrinsic factors generally associated with each other, which play a part in initiating an imbalance at the level of pain management and thus create disruptions

Conclusion

- Cancer pain has changed : multimorphism is at the heart of the global analgesic strategy
- Supportive care is the cornerstone of modern cancerology
- Photobiomodulation is one of the most exciting technology to improve our patient's quality of life

01 PBM has no side effect and enables treatments optimization

- No side effect when professionally used
- No interaction
- PBM makes it possible to avoid initiating medications with potential side effects
- PBM can help us decrementing medications such as opioids, antineuropathic, or psychoactive drugs with potential side effects including addiction/misuse

02 PBM can reverse mechanisms responsible for pain and... prevent it!

- PBM can prevent cancer treatments side-effects (mucositis, radiodermatitis, etc.): early implementation is required!
- PBM can directly reverse/act on mechanisms responsible for pain and more (Chemotherapy Induced Peripheral Neurobathy)
- PBM can treat symptoms that medications can't (chemobrain, dysgueusia, voice changes etc.)
- PBM can accelerate recovery, treating pain in the meantime (wounds healing)

03 PBM is useful along the whole cancer care pathway

- Pain management is one of the major supportive care in cancer
- PBM is (probably) the best available technology to literally "support" side effects of cancer treatments to date
- Including prevention...
- ... and useful indications in palliative care (ex: visceral pain, complex pain syndromes)

04 PBM can be effective on most painful syndromes

- PBM alone as a first line treatment, or in association with medication and/or more invasive interventions and/or complementary approaches
 - Within a multimodal approach to target nociceptive, neuropathic, nociplastic components of pain
- Which means (mandatory):**
- exhaustive analysis of multimorphic pain, evaluations and re-evaluations of patients, defining objectives of an optimal analgesic balance throughout the care pathway

05 PBM is a multimodal approach on its own

- Treating pain with PBM implies peripheral (receptors) and central (medullar and cortical) targets, and allows neuromodulation
- Mechanisms : metabolism, Reactive Oxygen Species, nitric oxide, blood flow, ion-channels (Ca, TRPV), anti-inflammatory effects, neuroprotection, neuroplasticity...

06 PBM is science-based

- Publications
- Guidelines (3,4,5)
- Dosimetry/protocols standardisation
- Teaching

We need more real-life data to implement international pain guidelines with PBM



07 PBM is cost-effective

- Considering :**
- the global cost of an entire cancer care pathway
 - the cost of non-quality
 - the cost of avoidable side effects or complications

PBM is probably one of the most cost-effective technologies in regard to its possibilities

But we need medico-economic studies to prove it

Photobiomodulation in supportive care: pain as a major symptom to manage global analgesic strategy

WALT 2022 and MASCC/ISOO 2020 recommendations for PBM treatments in prevention and/or management of cancer therapy-related complications	Therapeutic prospects to the use of photobiomodulation in supportive care
Oral mucositis	Pain Chemotherapy-induced Cognitive Impairment
Acute radiodermatitis	Pain Anxiety and depression
Lymphoedema	Pain Opioids addiction
Radiation fibrosis	Pain Ototoxicity
Palmar-plantar erythrodysesthesia	Cancer-fatigue
Graft versus host disease	Pain Cancer treatment acne and skin changes Pain
Dysphagia	Pain Focal neuropathies Pain
Dysgueusia	Myofascial pain syndromes Pain
Xerostomia and hyposalivation	Pain Visceral pain Pain
Osteonecrosis and musocal necrosis	Pain Musculoskeletal pain syndromes Pain
Voice and/or speech alterations	Tendinitis Pain
Chemotherapy-induced peripheral neuropathy	Pain Complex multimorphic pain syndromes requiring central and peripheral neuromodulation Pain
Chemotherapy-induced alopecia	Wound healing Pain
Periodontal lesions after chemotherapy and radiotherapy	Pain Erectile dysfunction
Trismus	Pain Vaginal dryness Pain Pain Radiation cystitis Pain
	Xerophthalmia

1. WALT/NAALT (2014) Photobiomodulation: mainstream medicine and beyond. WALT Biennial Congress and NAALT Annual Conference, Arlington, VA, (September 2014). [Google Scholar]
 2. Lemaire A. Multimorphic cancer pain management: why photobiomodulation is relevant. WALT Photobiomodulation World Congress, Manipal, India, sept. 2023. DOI: 10.13140/RG.2.2.32676.86404
 3. Robijns J, Nair RG, Lodewijckx J, Arany P, Barasch A, Bjordal JM, Bossi P, Chilles A, Corby PM, Epstein JB, Elad S, Fekrazad R, Fregiani ER, Genot MeT, Ibarra AMC, Hamblin MR, Heiskanen V, Hu K, Klasterky J, Lalla R, Latifian S, Maizy A, Mebis J, Migliorati CA, Milstein DMJ, Murphy B, Raber-Durlacher JE, Roseboom HJ, Sontis S, Trester N, Zadik Y and Bensadoun R-J (2022). Photobiomodulation therapy in management of cancer therapy-induced side effects: WALT position paper 2022. Front. Oncol. 12:927685. doi: 10.3389/fonc.2022.927685
 4. Elad S, Cheng KKF, Lalla RV, Yarom N, Hong C, Logan RM, Bowen J, Gibson R, Saunders DP, Zadik Y, Ariawardana A, Correa ME, Ranna V, Bossi P. Mucositis Guidelines Leadership Group of the Multinational Association of Supportive Care in Cancer and International Society of Oral Oncology (MASCC/ISOO). MASCC/ISOO clinical practice guidelines for the management of mucositis secondary to cancer therapy. Cancer. 2020 Oct 1;126(19):4423-4431. doi: 10.1002/cncr.33100. Epub 2020 Jul 28. Erratum in: Cancer. 2021 Oct 1;127(19):3700. PMID: 32786044; PMCID: PMC7540329.
 5. Behroozian T, Boromo P, Patel P, Kanee I, Finkelstein S, van den Hurk C, Chow E, Wolf JR; Multinational Association of Supportive Care in Cancer (MASCC) Oncodermatology Study Group Radiation Dermatitis Guidelines Working Group. Multinational Association of Supportive Care in Cancer (MASCC) clinical practice guidelines for the prevention and management of acute radiation dermatitis: international Delphi consensus-based recommendations. Lancet Oncol. 2023 Apr;24(4):e172-e185. doi: 10.1016/S1470-2045(23)00067-0. PMID: 36990615.