# Light therapy for radiation dermatitis: a WHAM evidence summary

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## CLINICAL QUESTION

What is the best available evidence for light therapy for preventing and treating radiation dermatitis and associated skin pain in people undergoing radiation therapy for cancer?

## SUMMARY

Radiation dermatitis (RD) is skin reaction that occurs as a result of radiotherapy used to treat a range of different cancers. Severity of symptoms ranges from erythema to dry desquamation (dry flaky skin with itching) to moist desquamation (serous exudate, oedema and blistering). Light therapy (also called phototherapy, low-level light therapy, light emitting diode [LED] therapy, near infrared therapy or photobiomodulation therapy) is sometimes used to prevent or treat RD, although the mechanisms by which it may have an effect are not clearly understood[1]. *Level 1* evidence[1-3] showed light therapy is not superior to placebo treatment or standard skin care alone for preventing grade[4] 1 or 2 RD. *Level 1* evidence[1, 3] provided evidence of low certainty that light therapy was associated with statistically significantly lower rates of grade 3 RD, but this was based on a very low number of events. There was no evidence on effectiveness of light therapy for healing RD. *Level 1* evidence[5-7] showed mixed findings on the impact of light therapy on skin pain in people undergoing radiation therapy; the effect does not appear to be clinically significant.

## CLINICAL PRACTICE RECOMMENDATIONS

All recommendations should be applied with consideration to the wound, the person, the health professional and the clinical context.

**There is no strong evidence to support the use of light therapy for preventing *or* healing radiation dermatitis or for managing skin pain associated with radiation dermatitis.**

## SOURCES OF EVIDENCE

This summary was conducted using methods published by the Joanna Briggs Institute[8-10]. The summary is based on a systematic literature search combining search terms related to radiation dermatitis/radiodermatitis and light therapy/phototherapy. Searches were conducted in Embase, Medline, Pubmed and Google Scholar for evidence published up to January 2022 in English. Levels of evidence for intervention studies are reported in the table below.

## BACKGROUND

Radiation dermatitis is a common side effect of radiotherapy, which is a type of therapy delivered in the management of cancer. Radiation causes damage to epithelial cells and underlying structures of the skin, usually commencing early during radiotherapy and persisting up to six months following radiotherapy[18, 19]. The severity of RD is related to the dose and regimen of radiation and the area of skin over which radiotherapy is administered[18-20], increasing when cell destruction occurs faster than normal cell reproduction. In early stages of RD the skin becomes warmer, itchy and erythema may present. As cumulative exposure to radiation increases, old skin becomes dry and flaky (referred to as dry desquamation). When the rate of new skin cell production cannot replace shedding cells the epidermis breaks down, becomes oedematous and exudate is present (referred to

| Level 1 Evidence | Level 2 Evidence | Level 3 Evidence | Level 4 Evidence | Level 5 Evidence |
|---|---|---|---|---|
| **Experimental Designs** | **Quasi-experimental Designs** | **Observational – Analytic Designs** | **Observational – Descriptive Studies** | **Expert Opinion/ Bench Research** |
| 1.a Systematic review of RCTs[1]<br>1.b Systematic reviews of RCTs and other designs[11-14]<br>1.c RCT[2, 3, 5-7] | None | 3.e Observational study without a control group[15] | None | 5.b Expert consensus[16, 17] |

as moist desquamation).[19] Pain, skin warmth, pruritus and burning sensations are reported by people experiencing RD.[21] Consistent with outcome measures reported in the evidence, when referring to 'grade' of RD this evidence summary uses the Radiation Therapy Oncology Group (RTOG) scale for categorising the severity of acute of RD (grade 3 is more severe than grade 1)[4].

Light therapy is the use of visible red or infrared spectrum light (600 – 1,000 nanometres [nm]) to prevent and treat wounds, reduce inflammation and relieve discomfort. There has also been some limited research on blue and green light therapy (although not for RD)[22]. Light therapy is also called phototherapy, LED therapy, near infrared therapy, low-level light therapy or photobiomodulation therapy. Light therapy differs from low level laser therapy (LLLT); light therapy emits light in a small band of wavelengths, reducing the ability to target specific tissues, which might be possible with single bandwidth laser therapy[23]. Light therapy is also delivered at a lower wattage than LLLT, reducing the depth of tissue that can be targeted[15, 23]. Influence of light therapy in changing the diversity and quantity of skin and wound microbes has also been reported[24]. Based on laboratory and animal studies, light therapy is used to enhance angiogenesis, increase proliferation of keratinocytes and fibroblasts, increase collagen synthesis, increase granulation and epithelialisation[3, 16, 25, 26], and to reduce inflammation[22]. However, the way in which light therapy achieves these outcomes is not clearly understood[1, 15].

## CLINICAL EVIDENCE

The best evidence on effectiveness of light therapy for preventing RD comes from a meta-analysis[1] that showed negligible clinical benefits. Recent guidelines and narrative reviews[11-13, 17] reported the same evidence included in the meta-analysis[1]. No studies reported the effectiveness of light therapy for healing RD. Some studies[5-7] reported the efficacy of light therapy in reducing skin pain, but the findings were mixed. All the evidence described light therapy used for acute and/or sub-acute RD delivered in the timeframe over which radiotherapy was delivered (i.e., not to manage chronic/persistent RD).

### Light therapy for preventing radiation dermatitis

- A meta-analysis[1] at low risk of bias investigated efficacy of light therapy in healing RD in people who had received radiation treatment for breast, head or neck cancer. The review included six studies[5-7, 27-29], generally at high risk of bias, and four of these studies[5, 7, 28, 29] were combined in the meta-analysis. There was low certainty evidence that people receiving light therapy were more likely to experience grade 1 RD (risk ratio than people who did not receive light therapy [RR] 1.55, 95% confidence interval [CI] 1.14 to 2.10, p = 0.005). There was very low certainty evidence that people receiving light therapy were less likely than people who did not receive light therapy to experience grade 2 RD, but the difference was not statistically significant (n = 81, RR 0.33, 95% CI 0.09 to 1.23, p = 0.10). With light therapy, there was a statistically significant lower risk of developing grade 3 RD, based on low certainty evidence (RR 0.21, 95% CI 0.05 to 0.94, p = 0.39). However, there were only 11 events in the pooled analysis for preventing grade 3 RD[1] (*Level 1*).
- An RCT[2] (n = 71) at moderate risk of bias explored light therapy in conjunction with standard skin care (gentle washing plus either a topical hydroactive gel dressing or foam silicone dressing) for people receiving radiation therapy for breast cancer. Light therapy was delivered twice per week for four weeks, commencing in the second week of radiation therapy. The comparator group received standard skin care and placebo therapy. By the end of treatment, fewer people receiving light therapy developed grade 2 RD compared to the control group and the difference was not statistically significant (10% versus 28%, p = 0.053). However, the study was inadequately powered. No people in the trial developed grade 3 RD[2] (*Level 1*).
- In an RCT[3] (n = 46) at moderate risk of bias, people with head and neck cancer undergoing radiation therapy received light therapy or sham therapy, in conjunction with standard skin care. Most people developed grade 1 or 2 RD (over 70% in both groups, p > 0.05) regardless of whether they received light therapy. There was a statistically significant (p = 0.01) increase in people in the placebo therapy group developing grade 3 RD in the last weeks of the 7-week study, resulting in the light therapy group achieving less grade 2-3 RD overall (28.6% versus 77.8%, p = 0.002)[3]. However, this study was inadequately powered (*Level 1*).
- In an observational study at high risk of bias (n = 33), people with lung, head or neck cancer receiving radiation therapy received light therapy three times per week during the six-week radiation therapy course. By week 7 (one week after ceasing treatment), 9% developed grade 3 RD, 33% developed grade 2 RD and 58% developed grade 1 RD[15]. Without a control group, efficacy could not be estimated (*Level 3*).

### Light therapy for treating skin pain associated with radiation dermatitis

- One RCT[5] (n = 33) at moderate risk of bias reported that there was no statistically significant difference in the ratings that people with breast cancer who received light therapy while undergoing radiation therapy gave for pain and discomfort compared to people who received sham therapy (p > 0.05)[5] (*Level 1*).
- One RCT[6] (n = 60) at high risk of bias showed that that people undergoing radiation therapy for neck and head cancer experienced mild pain and discomfort at an increasing rate over six weeks of treatment. People who received light therapy were statistically less likely to experience pain at weeks 2, 3 and 4 (p < 0.05) compared to no light treatment, but there was no difference by weeks 5 and 6 (*Level 1*).
- One RCT[7] (n = 70) at high risk of bias reported that people receiving radiation therapy for breast cancer

experienced pain intensity rated at 1 to 5 on a 10-point visual analogue scale, with those receiving concurrent light therapy showing statistically significantly less severe pain compared to control ($p < 0.05$)[7] (*Level 1*).

## CONSIDERATIONS FOR PATIENTS WHO CHOOSE TO USE LIGHT THERAPY

- No adverse outcomes are reported from people undergoing radiation therapy using light therapies[14, 16].
- Participating in two sessions per week of light therapy while undergoing radiation therapy neither negatively or positively influenced quality of life over seven weeks for people with neck and head cancer[3].
- In one trial evaluating feasibility of light therapy for people undergoing radiation therapy, the treatment was considered acceptable, with high adherence when delivered up to three times per week[15]. Light therapy devices (e.g. LED) can be self-administered[16], in comparison to LLLT that is delivered by a trained clinician[16]. However, in the trials reported above, the treatment was always delivered by clinicians.
- Access to light therapy is likely to be limited in many clinical settings.


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## CONFLICTS OF INTEREST

The author declares no conflicts of interest in accordance with International Committee of Medical Journal Editors (ICMJE) standards.

## ABOUT WHAM EVIDENCE SUMMARIES

WHAM evidence summaries are consistent with methodology published in Munn Z, Lockwood C, Moola S. The development and use of evidence summaries for point of care information systems: A streamlined rapid review approach, Worldviews Evid Based Nurs, 2015;12(3):131-8. Methods are provided in detail in resources published by the Joanna Briggs Institute as cited in this evidence summary. WHAM evidence summaries undergo peer-review by an international Expert Reference Group. More information: www.WHAMwounds.com

WHAM evidence summaries provide a summary of the best available evidence on specific topics and make suggestions that can be used to inform clinical practice. Evidence contained within this summary should be evaluated by appropriately trained professionals with expertise in wound prevention and management, and the evidence should be considered in the context of the individual, the professional, the clinical setting and other relevant clinical information.



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