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Hyperbaric oxygen therapy for late radiation tissue injury

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Abstract

Background: This is the third update of the original Cochrane Review published in July 2005 and updated previously in 2012 and 2016. Cancer is a significant global health issue. Radiotherapy is a treatment modality for many malignancies, and about 50% of people having radiotherapy will be long-term survivors. Some will experience late radiation tissue injury (LRTI), developing months or years following radiotherapy. Hyperbaric oxygen therapy (HBOT) has been suggested as a treatment for LRTI based on the ability to improve the blood supply to these tissues. It is postulated that HBOT

may result in both healing of tissues and the prevention of complications following surgery and radiotherapy.

Objectives: To evaluate the benefits and harms of hyperbaric oxygen therapy (HBOT) for treating or preventing late radiation tissue injury (LRTI) compared to regimens that excluded HBOT.

Search methods: We used standard, extensive Cochrane search methods. The latest search date was 24 January 2022.

Selection criteria: We included randomised controlled trials (RCTs) comparing the effect of HBOT versus no HBOT on LRTI prevention or healing.

Data collection and analysis: We used standard Cochrane methods. Our primary outcomes were 1. survival from time of randomisation to death from any cause; 2. complete or substantial resolution of clinical problem; 3. site-specific outcomes; and 4.

Adverse events: Our secondary outcomes were 5. resolution of pain; 6. improvement in quality of life, function, or both; and 7. site-specific outcomes. We used GRADE to assess certainty of evidence.

Main results: Eighteen studies contributed to this review (1071 participants) with publications ranging from 1985 to 2022. We added four new studies to this updated review and evidence for the treatment of radiation proctitis, radiation cystitis, and the prevention and treatment of osteoradionecrosis (ORN). HBOT may not prevent death at one year (risk ratio (RR) 0.93, 95% confidence interval (CI) 0.47 to 1.83; I^2 = 0%; 3 RCTs, 166 participants; low-certainty evidence). There is some evidence that HBOT may result in complete resolution or provide significant improvement of LRTI (RR 1.39, 95% CI 1.02 to 1.89; I^2 = 64%; 5 RCTs, 468 participants; low-certainty evidence) and HBOT may result in a large reduction in wound dehiscence following head and neck soft tissue surgery (RR 0.24, 95% CI 0.06 to 0.94; I^2 = 70%; 2 RCTs, 264 participants; low-certainty evidence). In addition, pain scores in ORN improve slightly after HBOT at 12 months (mean difference (MD) -10.72, 95% CI -18.97 to -2.47; I^2 = 40%; 2 RCTs, 157 participants; moderate-certainty evidence). Regarding adverse events, HBOT results in a higher risk of a reduction in visual acuity (RR 4.03, 95% CI 1.65 to 9.84; 5 RCTs, 438 participants; high-certainty evidence). There was a risk of ear barotrauma in people

receiving HBOT when no sham pressurisation was used for the control group (RR 9.08, 95% CI 2.21 to 37.26; I^2 = 0%; 4 RCTs, 357 participants; high-certainty evidence), but no such increase when a sham pressurisation was employed (RR 1.07, 95% CI 0.52 to 2.21; I^2 = 74%; 2 RCTs, 158 participants; high-certainty evidence).

Authors' conclusions: These small studies suggest that for people with LRTI affecting tissues of the head, neck, bladder and rectum, HBOT may be associated with improved outcomes (low- to moderate-certainty evidence). HBOT may also result in a reduced risk of wound dehiscence and a modest reduction in pain following head and neck irradiation. However, HBOT is unlikely to influence the risk of death in the short term. HBOT also carries a risk of adverse events, including an increased risk of a reduction in visual acuity (usually temporary) and of ear barotrauma on compression. Hence, the application of HBOT to selected participants may be justified. The small number of studies and participants, and the methodological and reporting inadequacies of some of the primary studies included in this review demand a cautious interpretation. More information is required on the subset of disease severity and tissue type affected that is most likely to benefit from this therapy, the time for which we can expect any benefits to persist and the most appropriate oxygen dose. Further research is required to establish the optimum participant selection and timing of any therapy. An economic evaluation should also be undertaken.

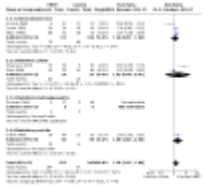
Figures

1 Study flow diagram.

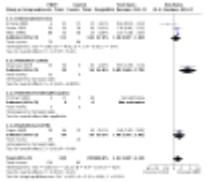
2 Summary of risk of bias in...

3

1.1. Analysis Comparison 1: Death, Outcome 1:...



2.1. Analysis Comparison 2: Complete resolution or...



2.2. Analysis Comparison 2: Complete resolution or...

All figures (14)

Update of

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Bennett MH, Feldmeier J, Hampson NB, Smee R, Milross C.

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