

Delayed Radiation Injury — Soft Tissue

ELECTIVE — but earlier within the refractory phase appears better

An adjunct for refractory late radiation soft-tissue and mucosal injury: positive and durable for cystitis, genuinely contested for proctitis, and negative for neural tissue.

TREATMENT PROTOCOL

Pressure	2.0–2.5 ATA. 2.4 ATA is the manual's preferred pressure; at 2.0 ATA extend the exposure to 120 min
Duration	90–120 min (80–90 min in RICH-ART)
Frequency	Daily, 5 days per week
Sessions	40–60 typical (RICH-ART gave 30–40)
Review	After 60 treatments

PATIENT SELECTION

Who to treat	Established, refractory soft-tissue or mucosal late radiation injury, at least 6 months after radiotherapy and symptomatic despite standard management — radiation cystitis, proctitis, or soft-tissue radionecrosis.
Who not to treat, or when to stop	Reserve for refractory disease. Practical exclusions from the anchor trial: heavy bleeding needing large transfusion, permanent catheter, very small bladder capacity, urinary fistula, prior hyperbaric treatment. Neural tissue (brain, brachial plexus) and arm lymphoedema are negative — do not motivate on an efficacy basis. Confirm necrosis, not active tumour, before treating: in three intracranial glioma animal models HBO alone enlarged a live tumour (survival shorter in one, unchanged in one); a latent-cancer model showed no acceleration.
Mechanism	Progressive endarteritis leaves tissue hypovascular, hypocellular and hypoxic. Intermittent hyperoxia drives an oxygen gradient that stimulates angiogenesis and fibroblast activity — confirmed in irradiated human tissue by a durable oximetry rise and increased microvessel density.
Outcome measure	EPIC urinary score for cystitis; SOMA-LENT fibrosis grading; haematuria resolution; IBDQ bowel score.

WHAT THE NUMBERS SHOW

- Clarke 2008 proctitis RCT** (double-blind sham-controlled crossover, 120 evaluable; RoB 2 some concerns — retrospective registration, undisclosed interim stop): responders **88.9% vs 62.5% (p=0.0009)** — a difference of **26 percentage points, NNT 4** (the paper prints ARR 32%, NNT 3, which its own counts do not reproduce).
- Oscarsson 2019 RICH-ART RCT**: EPIC urinary score improved **10.1 points more (95% CI 2.2–18.1, p=0.013)**; at 5 years, in all treated patients (single-arm, 44% missing), the rise from baseline held at **19.1 points (95% CI 13.3–24.9)**.
- Glover 2016 HOT2 RCT** (double-blind, sham-controlled): **negative** — bowel score p=0.50, rectal bleeding p=0.092.
- Chong 2005** (uncontrolled haemorrhagic-cystitis series, n=60): response **96% (27/28) when treated within 6 months of haematuria onset against 66% (21/32) after, one-sided P=0.003**; the late group is self-selected, a timing signal, not an effect size.
- Cochrane 2023** (18 studies, 1,071 patients): complete resolution or significant improvement **RR 1.39 (1.02–1.89)**, low certainty (I² 64%).
- Thomas 2026 Ontario cohort** (707 HBOT users with haemorrhagic radiation cystitis vs 3:1 matched non-users): fewer procedures, emergency visits and admissions after HBOT, but users started with 2–5 times the utilisation, matched non-users also fell 34–47%, and transfusions did not differ at 3 years — confounded, not an effect size.

EVIDENCE BASE

Shape and certainty	Large — 20 or more records with multiple randomised trials. Cystitis evidence is positive and durable; the bowel evidence is genuinely split between a positive sham-controlled crossover trial and a negative parallel sham-controlled one.	
Study	Design	Result and risk of bias
Clarke 2008, IJROBP — PMID 18342453	Double-blind crossover RCT, 120 evaluable	Positive ; RoB 2 some concerns
Oscarsson 2019 RICH-ART — PMID 31537473	Open-label phase 2–3 RCT, 5 centres	Positive
Oscarsson 2025, 5-year follow-up — PMID 40291346	Single-arm 5-year follow-up	Positive and durable; no control arm
Glover 2016 HOT2 — PMID 26703894	Double-blind sham-controlled RCT	Negative
Mink van der Molen 2024 HONEY — PMID 38329746	Pragmatic breast RCT, n=189; RoB 2 high	Mixed — pain null, fibrosis positive

WHAT THE EVIDENCE DOES NOT SUPPORT

Cautions	HOT2 found no benefit for chronic radiation bowel dysfunction, contradicting the evidence used to justify current practice. Brain radionecrosis has no positive randomised trial. Brachial plexopathy and arm lymphoedema both have negative randomised trials.
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STATUS AND SOCIETY POSITIONS

Status	Partial and site-specific. Radiation colitis maps a PMB pair only with life-threatening haemorrhage or dehydration. Cystitis, proctitis and soft-tissue radionecrosis are not PMB-listed and rely on the SAUHMA Level B argument.
ICD-10 (SA)	N30.4, K62.7, K52.0, L59.9, L59.8, J37.0, J70.1, L58.1, K13.5
ECHM 2017 (Type, Level)	Cystitis 1B; proctitis 1A; other soft tissue 2C

Compiled from the **UHMS Hyperbaric Oxygen Therapy Indications Manual, 15th edition (2023)** and the appraised trial evidence held in an HBOT evidence library. All treatments are 100% oxygen. US Navy Treatment Table profiles are named, not reproduced — the US Navy Diving Manual is the operative document at the chamber. Session counts are largely guideline convention rather than dose-finding evidence. This card summarises published parameters and does not replace those source documents or clinical judgement for the individual patient. Generated 28 October 2026. Not a SAUHMA publication and carries no society endorsement.