

Radiation-Induced Soft Tissue Injuries

Dick Clarke, CHT

Radiation-Induced Soft Tissue Injuries

Hyperbaric Oxygen as Standard of Care?

Primary Training in Hyperbaric Medicine
Columbia, South Carolina



Radiation Tissue Injury: "Non-Target" Tissues

- Acute effects:** mucosa, other rapidly proliferating cells
- usually benign +/- RT pause
- Late effects:** chronic oxidative stress
- dose-dependent
- complex wounds/organ loss

Greenwood TW, Gilchrist AG. Brit J Surgery 1973;6(5)

HYPERTERIC OXYGEN AND WOUND HEALING IN POST-RADIATION HEAD AND NECK SURGERY

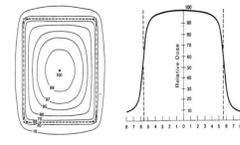
BY T. W. GREENWOOD AND A. G. GILCHRIST

Summary

Seventy-two patients with head and neck cancer who had undergone postoperative irradiation were treated with hyperbaric oxygen (HBO) after surgery. The aim was to improve wound healing and reduce the risk of infection. The results showed that HBO significantly improved wound healing and reduced the risk of infection. The authors conclude that HBO is a valuable adjunct to surgery in the treatment of post-radiation head and neck cancer.

BEAM PROFILE

The dose variation across the field at a specified depth.



Regulation of wound-healing • CO_2-O_2 angiogenesis—Effect of oxygen gradients and inspired oxygen concentration

The healing process is a complex one involving many factors. One of the most important is the availability of oxygen. Oxygen is essential for the synthesis of collagen and other structural proteins. The authors discuss the role of oxygen in wound healing and the effect of inspired oxygen concentration on the healing process. They conclude that increasing inspired oxygen concentration can significantly improve wound healing.

Keynote DR, et al. Surgery 1981;90(2)

Evolution of radiation-induced soft tissue injuries

- Some minor symptoms resolve spontaneously others with conservative care
- Remitting-relapsing characteristics
- Other seemingly minor symptoms prove refractory disease progression despite "standard" care
- New forms of injury may evolve > advanced care leading in some cases to loss of organ or death

Rectal RT injury complex

Microscopic hemorrhage
Macroscopic hemorrhage
Mucosal loss
Pain/tenesmus
Frequency
Loss of sphincter control
Stricture
Ulceration
Death

Trial design

228 screened for eligibility
150 enrolled/randomized (1:1)
66% ratio
120 evaluable
64 HBO 2.0 ATA O2
56 Sham 1.3 x 1.2 ATA air

Objective & subjective criteria

HBO higher response rates
SOM p=0.019
clinical assessment p=0.009
bowel bother
bowel function

All differences abolished at cross-over
Elimination of reinitiating/relapsing sequence
"blowse modification"

Clarke RE, et al. Int. J Rad Oncol Biol Phys 2008;72

RADIATION PROCTITIS EVAL. BY: PRINT NAME: DATE: HORTIS ID:

PT. NAME	SUBJECTIVE				SCORE
	GRADE 1	GRADE 2	GRADE 3	GRADE 4	
Subjective					
Tenesmus	Occasional urgency	Intermittent urgency	Persistent urgency	Refractory	
Mucosal loss	Occasional	Intermittent	Persistent	Refractory	
Sphincter control	Occasional	Intermittent	Persistent	Refractory	
Stool frequency	2-4 per day	4-8 per day	8 per day	Uncontrolled diarrhea	
Objective					
Bleeding	Occasional & minimal	Intermittent & tolerable	Persistent & intense	Refractory & exsanguinating	
Bleeding	Occult	Occasionally >2week	Persistent	Gross hemorrhage	
Ulceration	Superficial < 1 cm ²	Superficial = 1 cm ²	Deep ulcer	Perforation, Fistulae	
Stricture	< 2/3 normal diameter with dilation	1/3-2/3 normal diameter with dilation	> 1/3 normal diameter	Complete obstruction	
Management					
Tenesmus & stool frequency	Occasional < 2 antidiarrheals	Regular > 2 antidiarrheals	Multiple > 2 antidiarrheals	Surgical intervention / Permanent colostomy	
Pain	Occasional non-narcotic	Regular non-narcotic	Regular narcotic	Surgical intervention / Permanent colostomy	
Bleeding	Stool softener, iron therapy	Occasional transfusion	Frequent transfusions	Surgical intervention / Permanent colostomy	
Ulceration	Diet modification, stool softener	Occasional steroids	Steadily per enema, hyperbaric oxygen	Surgical intervention / Permanent colostomy	
Stricture	Diet modification	Occasional dilation	Regular dilation	Surgical intervention	
Sphincter control	Occasional use of biofeedback pads	Intermittent use of biofeedback pads	Persistent use of biofeedback pads	Surgical intervention / Permanent colostomy	
Analytic					
Barium enema	Assessment of lumens and peristalsis				Y/N Date
Proctoscopy	Assessment of lumens and mucosal surface				Y/N Date
CT	Assessment of wall thickness, sinus and fistula formation				Y/N Date
MRI	Assessment of wall thickness, sinus and fistula formation				Y/N Date
Anal manometry	Assessment rectal compliance				Y/N Date
Ultrasound	Assessment of wall thickness, sinus and fistula formation				Y/N Date

RADIATION PROCTITIS EVAL. BY: PRINT NAME: DATE: HORTIS ID:

Time Period	SUBJECTIVE				SCORE
	GRADE 1	GRADE 2	GRADE 3	GRADE 4	
Subjective					
Tenesmus	Occasional urgency	Intermittent urgency	Persistent urgency	Refractory	
Mucosal loss	Occasional	Intermittent	Persistent	Refractory	
Sphincter control	Occasional	Intermittent	Persistent	Refractory	
Stool frequency	2-4 per day	4-8 per day	8 per day	Uncontrolled diarrhea	
Objective					
Bleeding	Occasional & minimal	Intermittent & tolerable	Persistent & intense	Refractory & exsanguinating	
Bleeding	Occult	Occasionally >2week	Persistent	Gross hemorrhage	
Ulceration	Superficial < 1 cm ²	Superficial = 1 cm ²	Deep ulcer	Perforation, Fistulae	
Stricture	< 2/3 normal diameter with dilation	1/3-2/3 normal diameter with dilation	> 1/3 normal diameter	Complete obstruction	
Management					
Tenesmus & stool frequency	Occasional < 2 antidiarrheals	Regular > 2 antidiarrheals	Multiple > 2 antidiarrheals	Surgical intervention / Permanent colostomy	
Pain	Occasional non-narcotic	Regular non-narcotic	Regular narcotic	Surgical intervention / Permanent colostomy	
Bleeding	Stool softener, iron therapy	Occasional transfusion	Frequent transfusions	Surgical intervention / Permanent colostomy	
Ulceration	Diet modification, stool softener	Occasional steroids	Steadily per enema, hyperbaric oxygen	Surgical intervention / Permanent colostomy	
Stricture	Diet modification	Occasional dilation	Regular dilation	Surgical intervention	
Sphincter control	Occasional use of biofeedback pads	Intermittent use of biofeedback pads	Persistent use of biofeedback pads	Surgical intervention / Permanent colostomy	
Analytic					
Barium enema	Assessment of lumens and peristalsis				Y/N Date
Proctoscopy	Assessment of lumens and mucosal surface				Y/N Date
CT	Assessment of wall thickness, sinus and fistula formation				Y/N Date
MRI	Assessment of wall thickness, sinus and fistula formation				Y/N Date
Anal manometry	Assessment rectal compliance				Y/N Date
Ultrasound	Assessment of wall thickness, sinus and fistula formation				Y/N Date

RADIATION PROCTITIS EVAL. BY: PRINT NAME: DATE: HORTIS ID:

Time Period	SUBJECTIVE				SCORE
	GRADE 1	GRADE 2	GRADE 3	GRADE 4	
Subjective					
Tenesmus	Occasional urgency	Intermittent urgency	Persistent urgency	Refractory	
Mucosal loss	Occasional	Intermittent	Persistent	Refractory	
Sphincter control	Occasional	Intermittent	Persistent	Refractory	
Stool frequency	2-4 per day	4-8 per day	8 per day	Uncontrolled diarrhea	
Objective					
Bleeding	Occasional & minimal	Intermittent & tolerable	Persistent & intense	Refractory & exsanguinating	
Bleeding	Occult	Occasionally >2week	Persistent	Gross hemorrhage	
Ulceration	Superficial < 1 cm ²	Superficial = 1 cm ²	Deep ulcer	Perforation, Fistulae	
Stricture	< 2/3 normal diameter with dilation	1/3-2/3 normal diameter with dilation	> 1/3 normal diameter	Complete obstruction	
Management					
Tenesmus & stool frequency	Occasional < 2 antidiarrheals	Regular > 2 antidiarrheals	Multiple > 2 antidiarrheals	Surgical intervention / Permanent colostomy	
Pain	Occasional non-narcotic	Regular non-narcotic	Regular narcotic	Surgical intervention / Permanent colostomy	
Bleeding	Stool softener, iron therapy	Occasional transfusion	Frequent transfusions	Surgical intervention / Permanent colostomy	
Ulceration	Diet modification, stool softener	Occasional steroids	Steadily per enema, hyperbaric oxygen	Surgical intervention / Permanent colostomy	
Stricture	Diet modification	Occasional dilation	Regular dilation	Surgical intervention	
Sphincter control	Occasional use of biofeedback pads	Intermittent use of biofeedback pads	Persistent use of biofeedback pads	Surgical intervention / Permanent colostomy	
Analytic					
Barium enema	Assessment of lumens and peristalsis				Y/N Date
Proctoscopy	Assessment of lumens and mucosal surface				Y/N Date
CT	Assessment of wall thickness, sinus and fistula formation				Y/N Date
MRI	Assessment of wall thickness, sinus and fistula formation				Y/N Date
Anal manometry	Assessment rectal compliance				Y/N Date
Ultrasound	Assessment of wall thickness, sinus and fistula formation				Y/N Date

RADIATION PROCTITIS EVAL. BY: PRINT NAME: DATE: HORTIS ID:

Time Period	SUBJECTIVE				SCORE
	GRADE 1	GRADE 2	GRADE 3	GRADE 4	
Subjective					
Tenesmus	Occasional urgency	Intermittent urgency	Persistent urgency	Refractory	
Mucosal loss	Occasional	Intermittent	Persistent	Refractory	
Sphincter control	Occasional	Intermittent	Persistent	Refractory	
Stool frequency	2-4 per day	4-8 per day	8 per day	Uncontrolled diarrhea	
Objective					
Bleeding	Occasional & minimal	Intermittent & tolerable	Persistent & intense	Refractory & exsanguinating	
Bleeding	Occult	Occasionally >2week	Persistent	Gross hemorrhage	
Ulceration	Superficial < 1 cm ²	Superficial = 1 cm ²	Deep ulcer	Perforation, Fistulae	
Stricture	< 2/3 normal diameter with dilation	1/3-2/3 normal diameter with dilation	> 1/3 normal diameter	Complete obstruction	
Management					
Tenesmus & stool frequency	Occasional < 2 antidiarrheals	Regular > 2 antidiarrheals	Multiple > 2 antidiarrheals	Surgical intervention / Permanent colostomy	
Pain	Occasional non-narcotic	Regular non-narcotic	Regular narcotic	Surgical intervention / Permanent colostomy	
Bleeding	Stool softener, iron therapy	Occasional transfusion	Frequent transfusions	Surgical intervention / Permanent colostomy	
Ulceration	Diet modification, stool softener	Occasional steroids	Steadily per enema, hyperbaric oxygen	Surgical intervention / Permanent colostomy	
Stricture	Diet modification	Occasional dilation	Regular dilation	Surgical intervention	
Sphincter control	Occasional use of biofeedback pads	Intermittent use of biofeedback pads	Persistent use of biofeedback pads	Surgical intervention / Permanent colostomy	
Analytic					
Barium enema	Assessment of lumens and peristalsis				Y/N Date
Proctoscopy	Assessment of lumens and mucosal surface				Y/N Date
CT	Assessment of wall thickness, sinus and fistula formation				Y/N Date
MRI	Assessment of wall thickness, sinus and fistula formation				Y/N Date
Anal manometry	Assessment rectal compliance				Y/N Date
Ultrasound	Assessment of wall thickness, sinus and fistula formation				Y/N Date

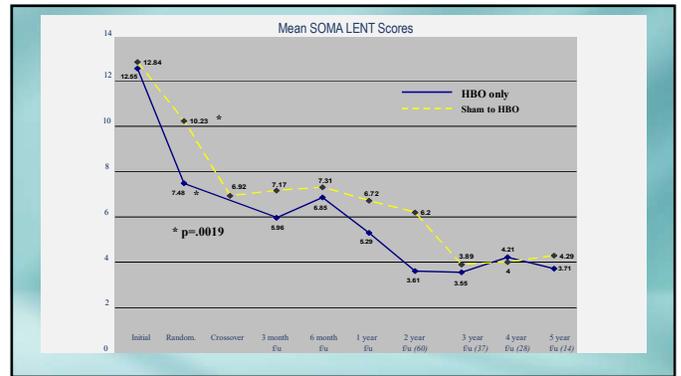
RADIATION PROCTITIS EVAL. BY: PRINT NAME: DATE: HORTIS ID:

Time Period	SUBJECTIVE				SCORE
	GRADE 1	GRADE 2	GRADE 3	GRADE 4	
Subjective					
Tenesmus	Occasional urgency	Intermittent urgency	Persistent urgency	Refractory	
Mucosal loss	Occasional	Intermittent	Persistent	Refractory	
Sphincter control	Occasional	Intermittent	Persistent	Refractory	
Stool frequency	2-4 per day	4-8 per day	8 per day	Uncontrolled diarrhea	
Objective					
Bleeding	Occasional & minimal	Intermittent & tolerable	Persistent & intense	Refractory & exsanguinating	
Bleeding	Occult	Occasionally >2week	Persistent	Gross hemorrhage	
Ulceration	Superficial < 1 cm ²	Superficial = 1 cm ²	Deep ulcer	Perforation, Fistulae	
Stricture	< 2/3 normal diameter with dilation	1/3-2/3 normal diameter with dilation	> 1/3 normal diameter	Complete obstruction	
Management					
Tenesmus & stool frequency	Occasional < 2 antidiarrheals	Regular > 2 antidiarrheals	Multiple > 2 antidiarrheals	Surgical intervention / Permanent colostomy	
Pain	Occasional non-narcotic	Regular non-narcotic	Regular narcotic	Surgical intervention / Permanent colostomy	
Bleeding	Stool softener, iron therapy	Occasional transfusion	Frequent transfusions	Surgical intervention / Permanent colostomy	
Ulceration	Diet modification, stool softener	Occasional steroids	Steadily per enema, hyperbaric oxygen	Surgical intervention / Permanent colostomy	
Stricture	Diet modification	Occasional dilation	Regular dilation	Surgical intervention	
Sphincter control	Occasional use of biofeedback pads	Intermittent use of biofeedback pads	Persistent use of biofeedback pads	Surgical intervention / Permanent colostomy	
Analytic					
Barium enema	Assessment of lumens and peristalsis				Y/N Date
Proctoscopy	Assessment of lumens and mucosal surface				Y/N Date
CT	Assessment of wall thickness, sinus and fistula formation				Y/N Date
MRI	Assessment of wall thickness, sinus and fistula formation				Y/N Date
Anal manometry	Assessment rectal compliance				Y/N Date
Ultrasound	Assessment of wall thickness, sinus and fistula formation				Y/N Date

RADIATION PROCTITIS		EVAL BY: PRINCIPAL NAME: _____		DATE: _____	
Time Point	SCORE	GRADE 1	GRADE 2	GRADE 3	GRADE 4
Subjective					
Tenesmus	Occasional urgency	Intermittent urgency	Persistent urgency	Refractory	
Rectal tenes	Occasional	Intermittent	Persistent	Refractory	
Sphincter control	Occasional	Intermittent	Persistent	Refractory	
Bleed frequency	< 4 per day	4 - 8 per day	> 8 per day	Uncontrolled diarrhea	
Pain	Occasional & minimal	Intermittent & tolerable	Persistent & intense	Refractory & incapacitating	
Objective					
Bleeding	Distal	Occasionally > 2cm	Perianally	Cross hemorrhage	
Ulceration	Superficial < 1 cm ²	Superficial > 1 cm ²	Deep ulcer	Perforation, Fistulae	
Stricture	< 2/3 normal diameter with dilation	1/3 - 2/3 normal diameter with dilation	> 1/3 normal diameter	Complete obstruction	
Management					
Tenesmus & stool frequency	Occasional, < 2 antidiarrheals/week	Regular, > 2 antidiarrheals/week	Multiple, > 2 antidiarrheals/day	Surgical intervention / Permanent colostomy	
Pain	Occasional non-narcotic	Regular non-narcotic	Regular narcotic	Surgical intervention / Permanent colostomy	
Bleeding	Stool softener, iron therapy	Occasional transfusion	Frequent transfusions	Surgical intervention / Permanent colostomy	
Ulceration	Diet modification, stool softener	Occasional steroids	Steroids per anemia, hyperbaric oxygen	Surgical intervention / Permanent colostomy	
Stricture	Diet modification	Occasional dilation	Regular dilation	Surgical intervention / Permanent colostomy	
Sphincter control	Occasional use of incontinence pads	Intermittent use of incontinence pads	Persistent use of incontinence pads	Surgical intervention / Permanent colostomy	
Analysis					
Barium enema	Assessment of lumen and peristalsis				
Proctoscopy	Assessment of lumen and mucosal surface				
CT	Assessment of wall thickness, sinus and fistula formation				
MRI	Assessment of wall thickness, sinus and fistula formation				
Anal manometry	Assessment rectal compliance				
Ultrasound	Assessment of wall thickness, sinus and fistula formation				

RADIATION PROCTITIS		EVAL BY: PRINCIPAL NAME: _____		DATE: _____	
Time Point	SCORE	GRADE 1	GRADE 2	GRADE 3	GRADE 4
Subjective					
Tenesmus	Occasional urgency	Intermittent urgency	Persistent urgency	Refractory	
Rectal tenes	Occasional	Intermittent	Persistent	Refractory	
Sphincter control	Occasional	Intermittent	Persistent	Refractory	
Bleed frequency	< 4 per day	4 - 8 per day	> 8 per day	Uncontrolled diarrhea	
Pain	Occasional & minimal	Intermittent & tolerable	Persistent & intense	Refractory & incapacitating	
Objective					
Bleeding	Distal	Occasionally > 2cm	Perianally	Cross hemorrhage	
Ulceration	Superficial < 1 cm ²	Superficial > 1 cm ²	Deep ulcer	Perforation, Fistulae	
Stricture	< 2/3 normal diameter with dilation	1/3 - 2/3 normal diameter with dilation	> 1/3 normal diameter	Complete obstruction	
Management					
Tenesmus & stool frequency	Occasional, < 2 antidiarrheals/week	Regular, > 2 antidiarrheals/week	Multiple, > 2 antidiarrheals/day	Surgical intervention / Permanent colostomy	
Pain	Occasional non-narcotic	Regular non-narcotic	Regular narcotic	Surgical intervention / Permanent colostomy	
Bleeding	Stool softener, iron therapy	Occasional transfusion	Frequent transfusions	Surgical intervention / Permanent colostomy	
Ulceration	Diet modification, stool softener	Occasional steroids	Steroids per anemia, hyperbaric oxygen	Surgical intervention / Permanent colostomy	
Stricture	Diet modification	Occasional dilation	Regular dilation	Surgical intervention / Permanent colostomy	
Sphincter control	Occasional use of incontinence pads	Intermittent use of incontinence pads	Persistent use of incontinence pads	Surgical intervention / Permanent colostomy	
Analysis					
Barium enema	Assessment of lumen and peristalsis				
Proctoscopy	Assessment of lumen and mucosal surface				
CT	Assessment of wall thickness, sinus and fistula formation				
MRI	Assessment of wall thickness, sinus and fistula formation				
Anal manometry	Assessment rectal compliance				
Ultrasound	Assessment of wall thickness, sinus and fistula formation				

RADIATION PROCTITIS		EVAL BY: PRINCIPAL NAME: _____		DATE: _____	
Time Point	SCORE	GRADE 1	GRADE 2	GRADE 3	GRADE 4
Subjective					
Tenesmus	Occasional urgency	Intermittent urgency	Persistent urgency	Refractory	
Rectal tenes	Occasional	Intermittent	Persistent	Refractory	
Sphincter control	Occasional	Intermittent	Persistent	Refractory	
Bleed frequency	< 4 per day	4 - 8 per day	> 8 per day	Uncontrolled diarrhea	
Pain	Occasional & minimal	Intermittent & tolerable	Persistent & intense	Refractory & incapacitating	
Objective					
Bleeding	Distal	Occasionally > 2cm	Perianally	Cross hemorrhage	
Ulceration	Superficial < 1 cm ²	Superficial > 1 cm ²	Deep ulcer	Perforation, Fistulae	
Stricture	< 2/3 normal diameter with dilation	1/3 - 2/3 normal diameter with dilation	> 1/3 normal diameter	Complete obstruction	
Management					
Tenesmus & stool frequency	Occasional, < 2 antidiarrheals/week	Regular, > 2 antidiarrheals/week	Multiple, > 2 antidiarrheals/day	Surgical intervention / Permanent colostomy	
Pain	Occasional non-narcotic	Regular non-narcotic	Regular narcotic	Surgical intervention / Permanent colostomy	
Bleeding	Stool softener, iron therapy	Occasional transfusion	Frequent transfusions	Surgical intervention / Permanent colostomy	
Ulceration	Diet modification, stool softener	Occasional steroids	Steroids per anemia, hyperbaric oxygen	Surgical intervention / Permanent colostomy	
Stricture	Diet modification	Occasional dilation	Regular dilation	Surgical intervention / Permanent colostomy	
Sphincter control	Occasional use of incontinence pads	Intermittent use of incontinence pads	Persistent use of incontinence pads	Surgical intervention / Permanent colostomy	
Analysis					
Barium enema	Assessment of lumen and peristalsis				
Proctoscopy	Assessment of lumen and mucosal surface				
CT	Assessment of wall thickness, sinus and fistula formation				
MRI	Assessment of wall thickness, sinus and fistula formation				
Anal manometry	Assessment rectal compliance				
Ultrasound	Assessment of wall thickness, sinus and fistula formation				



LENT score reduction; clinical implications

Pre-treatment LENT score of 13

deep ulceration; intermittent pain; bleeding (> 2 weekly); treated with regular non-narcotic, occasional transfusions & steroids

Post-treatment LENT score of 7

occasional pain, occult bleeding; occasional urgency; treated with anti-diarrheals; occasional non-narcotics, stool softeners, diet modification

1 year follow-up LENT score of 5

occasional pain, treated with occasional non-narcotic; stool softener; diet modification & iron therapy

Patient beliefs (blinding)

72 pts. asked what they thought their randomization was

	HBO	Sham	Don't Know
HBO Group (33)	20	1	12
Sham Group (39)	23	2	14

Chi-square test detects no relationship (p = 0.9058)

Ignoring those who did not know, Kappa statistic p = 0.0299

Harms

- Ear barotrauma**
 - 19 pts (15.8%) complained of ear pain/discomfort
 - 11 unremarkable exam
 - 7 TM changes only
 - 1 TM change & middle ear effusion
 - decongestants...8 ventilation tubes...7 no tx...4
- Sinus barotrauma**
 - 1 pt. (0.08%), tx with decongestants
- Transient myopia**
 - 4 pts. (3.3%)
- Confinement anxiety**
 - 2 pts. (1.7%) sedative...1 reassurance...1

Treatment failure

Local recurrence vs. residual tumor as failed clinical response/relapse risk

45% (3) of those who failed to respond per SOMA dx with cancer

SOMA scores in pts who either failed to respond or improved then relapsed > by average of 9 (4-7) at fu when CA dx.

Hyperbaric oxygen for patients with chronic bowel dysfunction after pelvic radiotherapy (HOT2): a randomised, double-blind, sham-controlled phase 3 trial

Glover M, et al. *Cancer Oncology* 2016;17(2):224-233

Trial design

- 241 screened for eligibility
- 84 enrolled/randomized (2:1) 35%
- Reported
 - 40 HBO 2.4 ATA O2 per mask
 - 25 Sham 1.3 ATA air per mask
- Subjective primary endpoint
 - change in IBD questionnaire score
 - IBDQ rectal bleeding score at 1 yr

Hyperbaric oxygen therapy for chronic bowel dysfunction after pelvic radiotherapy

216-087

Hyperbaric oxygen therapy for chronic bowel dysfunction after pelvic radiotherapy

Hyperbaric oxygen therapy for chronic bowel dysfunction after pelvic radiotherapy

"This trial is VERY upsetting!

We have seen such consistently good results in the patients treated off trial, in terms of healing ulceration & treating bleeding - in fact, there is no one in 10 years who has not responded well to HBO.

I must have sent 4 or 5 a year - and it is very difficult to understand our trial results!"

The Effect of Hyperbaric Oxygen Therapy on Rectal Ulcers after Prostate Plasma Coagulation

Laranjo A, et al. *Port J Gastroenterology* 2020;Oct

Radiation proctitis

Post APC

10 mm ulcer at site of APC

Rectal ulcer after HBO x 20

Healed after HBO x 50

Systematic review of agents for the management of gastrointestinal mucositis in cancer patients

Gibson RJ, et al. Supportive Care Cancer 2019;27

Abstract
 Purpose: The aim of this study was to review the evidence for the use of agents for the prevention and treatment of gastrointestinal mucositis in cancer patients. Methods: A systematic review was conducted by searching the literature for randomized controlled trials (RCTs) comparing the use of agents for the prevention and treatment of gastrointestinal mucositis in cancer patients. Results: The use of agents for the prevention and treatment of gastrointestinal mucositis in cancer patients was associated with a reduction in the incidence of mucositis and a reduction in the severity of mucositis. Conclusion: The use of agents for the prevention and treatment of gastrointestinal mucositis in cancer patients is associated with a reduction in the incidence of mucositis and a reduction in the severity of mucositis.

The American Society of Colon and Rectal Surgeons Clinical Practice Guidelines for the Treatment of Chronic Radiation Proctitis

Paquette IM, et al. Diseases Colon & Rectum 2018;61

Abstract
 Purpose: The purpose of this guideline is to provide recommendations for the treatment of chronic radiation proctitis. Methods: A systematic review of the literature was conducted to identify the most effective treatments for chronic radiation proctitis. Results: The use of hyperbaric oxygen (HBO) was found to be the most effective treatment for chronic radiation proctitis. Conclusion: The use of HBO is an effective treatment for chronic radiation proctitis.

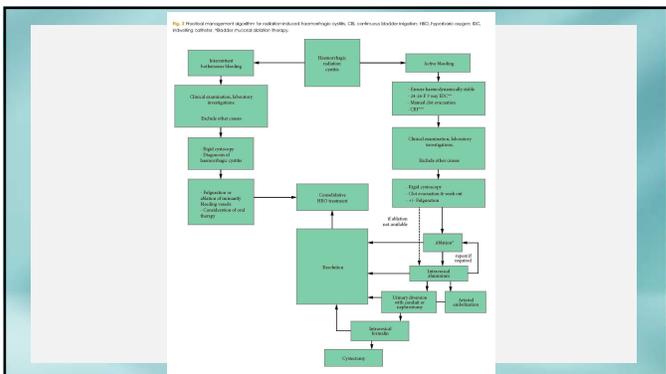
“HBO is an effective tx to reduce bleeding.”
“Grade of Recommendation is Strong.”

Current management of radiation cystitis: a review and practical guide to clinical management

Pascoe G, et al. Brit J Urol Int. 2019;123

Abstract
 Purpose: The aim of this review is to provide an update on the current management of radiation cystitis. Methods: A systematic review of the literature was conducted to identify the most effective treatments for radiation cystitis. Results: The use of hyperbaric oxygen (HBO) was found to be the most effective treatment for radiation cystitis. Conclusion: The use of HBO is an effective treatment for radiation cystitis.

Keywords: Radiation cystitis, management, hyperbaric oxygen.



Trial design

223 screened for eligibility

37% ratio

42 HBO 2.4 ATA + SC

45 SC

No sham or blinding

79 available ITT analysis

Objective & subjective criteria

Treatment effect:

64% HBO vs improved symptom grades vs 18% SC

Oscarsson N, et al. Lancet Oncol 2019;20(11)

Radiation induced cystitis treated with hyperbaric oxygen therapy (RICH-ART): long-term follow-up of a randomised controlled, phase 2-3 trial

Oscarsson N, et al. eClinical Med 2025;8:103214

Abstract
 Purpose: The purpose of this study was to evaluate the long-term effects of hyperbaric oxygen therapy (HBO) in the treatment of radiation-induced cystitis. Methods: A randomised controlled trial was conducted comparing HBO with standard care (SC). Results: HBO was found to be superior to SC in the treatment of radiation-induced cystitis. Conclusion: HBO is an effective treatment for radiation-induced cystitis.

