Hyperbaric oxygen in cutaneous burn injury: a missing rung on the reconstructive ladder?

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Background

- Hyperbaric oxygen therapy (HBOT) administers 100% oxygen at pressures > 1atm
- Historically used for decompression sickness and carbon monoxide (CO) poisoning, more recently HBOT has been employed to assist healing of complex conditions such as necrotising fasciitis, diabetes and burns
- Proposed mechanisms of action include:
  - Preservation of dermal circulation via inhibition of leukocyte adhesion and preventing micro-thrombi propagation
  - Reduction of oedema by hyperoxic vasoconstriction
  - Enhancement of phagocytic function

Methods

- We performed a literature search of Cochrane, PubMed, Medline, and Google Scholar databases from 1950 to 2017, searching for the terms:
  'burns' AND 'hyperbaric oxygen' OR 'HBOT'
- Abstracts were hand-searched by a single author to assess relevance to use of HBOT in thermal injuries
- Articles were excluded if they were not available in English or only relevant only to the management of airway, CO or cyanide

Results

- 14 relevant articles were found in the literature
- 9 out of 14 studies reported HBOT improved outcomes:
  - Reduced length of stay = 1 RCT and 2 cohorts
  - Reduced number of surgeries = 2 cohorts
  - Reduced wound oedema = 2 RCT (In Vitro)
  - Reduced wound healing time = 1 RCT
- Most studies of small power and issues with methodology

Author	Year	Type	# of patients	Fidnings
Villeneuva	2004	Cochrane Review	N/A	Poor study quality, serious methodological/reporting issues Promising but insufficient results to recommend HBOT as reoutine
Hart	1974	RCT	16	Decreased Healing time Reduced morbidity/mortality rate
Bannen	1997	RCT	126	No significant difference between 2 groups
Niezgoda	1997	RCT	12	Reduction in wound oedema/exudate
Cianci	1991	Cohort	20	Reduction in # surgeries/Cost/LoS
Cianci (2)	1991	Cohort	21	Reduction in LoS/Cost/Mortality
Simsit/Atkas	2005	Case Report	1	Reduced Oedema
Bilic	2005	RCT animal model	70	Reduced oedema Increase in neoangiogenesis and regeneration of follicles
Turkalasan	2009	RCT animal model	20	Reduced oedema Increase in Neoangiogenesis and Cell proliferation
Chong	2013	Cohort	17	Small study size No discernable effects
Jones	2014	Cohort	18	Increase LOS Compared to other study- Reduced Readm/Amputations
Cianci (3)	1988	Cohort	12	Reduced number of surgeries
Shosani	1998	RCT Animal Model	54	Poor wound healing HBOT Small period of monitorring
Chiang	2015	Cohort	53	Reduction in PCT (Marker of sepsis

Discussion

- HBOT appears promising in some areas of wound care and has shown merit in the healing of complex chronic burn injuries in small non-randomised studies and series
- Its mechanism of action is intuitive for assisting the early healing of certain burn injury populations, namely the burns seen in diabetic feet.
- Our unit has reviewed the injuries and healing in diabetic lower limb injuries and is in the process of formulating a RCT incorporating HNOT at an early stage in the treatment algorithm, to assess whether this could assist these difficult injuries.