Gomes S, Cranney G, Bennett M, Li A, Giles R. Twenty-year experience of transvenous lead extraction at a single centre. Europace 19 Feb 2014 (Journal article)


Publications 2013


10. Bennett MH. Hyperbaric oxygen for acute ischemic stroke. Stroke 2013 (Journal article)
Publications 2012


- Bennett MH. Critical appraisal. Hyperbaric oxygen therapy did not improve arm volume or functional scores in post-radiation lymphoedema. Diving and Hyperbaric Medicine 42 (1), pp. 45


1. Prevention of Osteoradionecrosis

What is the rate of ORN among those patients we have treated?

Ethics already done

- Barb

ACTION: This is underway... 48 patients done with 1 ORN. Barb and Gnana Spail on the case
<table>
<thead>
<tr>
<th></th>
<th>ORN</th>
<th>P/ORN</th>
<th>Other not P/ORN/ORN</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of completed records</td>
<td>85</td>
<td>173</td>
<td>46</td>
</tr>
<tr>
<td>Number of incomplete records Total</td>
<td>45</td>
<td>82</td>
<td></td>
</tr>
<tr>
<td>No ORN</td>
<td>66</td>
<td>165</td>
<td></td>
</tr>
<tr>
<td>&lt;12 treatments (between 0 and 12)</td>
<td>18</td>
<td>22</td>
<td></td>
</tr>
<tr>
<td>Not followed up</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ORN post HBOT</td>
<td>19 of 85</td>
<td>8 of 173</td>
<td></td>
</tr>
<tr>
<td>Complications</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
5. PLUHS Study (AG/JL/MB)

- Paper completed and submitted for examination by Jan
  - done

- Draft nearing completion
  - Jan and Mike

- Jan and Michael sending paper back and forth

**ACTION:**
- Plan to submit to DHM
- Jan putting it up for submission Kurt-Jan
13. Eye Changes (SW/MB/NN)

- Mixed reports of hood versus BIBS
- Bryan Hui in charge
- Currently recruiting with some teething troubles
  - Aim for 120 patients
  - Currently 75 patients enrolled
16. PtcO2 and revascularization (RV and MB)

- The Utility of Transcutaneous Oxygen Manometry for surveillance after percutaneous infrapopliteal revascularisation

- Does regular PtcO2 measurement detect failure of balloon angioplasty before clinical changes.

- A comparison with angiography.

- Funding problems are holding this up.
NITROGEN NARCOSIS

Darran Foo Zhiyong/Joel Hissink/Mike B

Ethics done x2

Pictures obtained

Testing procedures went well
  - Comms a bit of a problem
  - Light

Next batch of divers June 14
  - Not confirmed

Use tablet with w’proof housing
Venous ulcers

The effectiveness of hyperbaric oxygen therapy (HBOT) for healing chronic venous leg ulcers: A randomised, double blind, placebo-controlled trial

Outcomes
- Wound healing
- Wound tracings and digital photography
- TCOMs
- Quality of life
- Cost effectiveness
Interim analysis

Chi Square Analysis
There were 20% healed in one group and 60% healed in the other, \( p = 0.17 \) (Fisher’s Exact Test) – see table.

<table>
<thead>
<tr>
<th>Chi-Square Tests</th>
<th>Value</th>
<th>df</th>
<th>Asymp. Sig. (2-sided)</th>
<th>Exact Sig. (2-sided)</th>
<th>Exact Sig. (1-sided)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pearson Chi-Square</td>
<td>3.333</td>
<td>1</td>
<td>.068</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Continuity Correction</td>
<td>1.875</td>
<td>1</td>
<td>.171</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Likelihood Ratio</td>
<td>3.452</td>
<td>1</td>
<td>.063</td>
<td>.170</td>
<td>.085</td>
</tr>
<tr>
<td>Fisher’s Exact Test</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Linear-by-Linear Association</td>
<td>3.167</td>
<td>1</td>
<td>.075</td>
<td></td>
<td></td>
</tr>
<tr>
<td>N of Valid Cases</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

a. 2 cells (50.0%) have expected count less than 5. The minimum expected count is 4.00.
b. Computed only for a 2x2 table

Kaplan Meir Survival Analysis
Mean survival time in one group was 11.1 weeks (SE=.57) (no median provided), and 8.8 weeks (SE=1.05) in the other group (median=7.0).

Log rank = 3.532, \( p = 0.06 \)

Equality of ulcer size and duration at baseline (Mann-Whitney U test analyses):
Duration of current wound: \( p=0.44 \); Baseline area: \( p=0.63 \)
Cont’d….

- Four weeks compression 0 if not 50% size, enter RCT
- 30 treatments 2.4ATA over six weeks versus sham
Cont’d…..

- Ethics approval
- Start recruitment
- 30 treatments 2.4ATA over six weeks versus sham
CATs


Darran. Wet v dry dive bubbles.

Mike – severe periodontitis
Periodonitis

- A set of inflammatory diseases affecting the tissues that surround and support the teeth. Involves progressive loss of the alveolar bone around the teeth, and if left untreated, can lead to the loosening and loss of teeth.

- Caused by anaerobic bacteria that adhere to and grow on the tooth's surfaces, along with an over-aggressive immune response against these microorganisms.

- Common. 10% of population have severe form
Diagnosis by inspecting the soft gum tissues around the teeth with a probe (i.e., a clinical examination) and by evaluating the patient's X-Rays to determine the amount of bone loss around the teeth.

Symptoms may include:
- Redness or bleeding of gums while brushing or flossing
- Gum swelling that recurs
- Spitting out blood after brushing teeth
- Halitosis and a persistent metallic taste in the mouth
- Gingival recession, resulting in apparent lengthening of teeth. (This may also be caused by heavy-handed brushing or with a stiff tooth brush.)
- Deep pockets between the teeth and the gums (sites where the attachment has been gradually destroyed by collagenases)
- Loose teeth, in the later stages
Consequences:

- Linked to increased inflammation in the body, raised levels of C-reactive protein IL-6
- Increased risk of stroke, MI, atherosclerosis.
- Impairments in delayed memory
- Brittle diabetes
- Erectile dysfunction
Management

Prevention – good oral hygiene!

Removal of microbial plaque and calculus to establish periodontal health. Nonsurgical cleaning below the gumline with a procedure called scaling and debridement. [In the past, root planing was used (removal of cemental layer as well as calculus)]
Management

Surgery. Open flap debridement and osseous surgery, as well as guided tissue regeneration and bone grafting. Successful in nearly 85% of patients.

Alternatives:

- Injecting antimicrobial solutions, such as H2O2 into periodontal pockets via slender applicators or oral irrigators. Short-lived benefits
- Doxycycline - inhibition of MMPs (such as collagenase)
The Trial

For patients with severe periodontitis, does the adjunctive use of hyperbaric oxygen compared to standard therapy with scaling and root planing only, result in any improvement in outcome?

Single-blinded concealed randomised controlled trial with intention-to-treat.

- Adult patients with severe, generalised, chronic periodontitis diagnosed with more than 30% of sites affected
- **Control group** (N = 10; 10 analysed): Standard treatment for periodontitis including scaling and root planing at five visits up to three months.
- **Experimental group** (N = 10; 10 analysed): As above, plus twice daily HBOT for five days. Each session 72 minutes at 2.4ATA breathing 100% oxygen.
The trial

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Standard Group</th>
<th>HBO Group</th>
<th>Difference</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>SD</td>
<td>Mean</td>
<td>SD</td>
</tr>
<tr>
<td>Probing depth (mm) at 3 months</td>
<td>5.5</td>
<td>1.1</td>
<td>3.7</td>
<td>1.3</td>
</tr>
<tr>
<td>Clinical attachment level (mm) at 3 months</td>
<td>5.7</td>
<td>1.5</td>
<td>3.8</td>
<td>1.4</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Non-Event Outcomes</th>
<th>Time to outcome/s</th>
<th>Control group</th>
<th>Experimental group</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plaque index (PI)</td>
<td>3 months</td>
<td>45.2%</td>
<td>32.2%</td>
<td>&gt;0.05</td>
</tr>
<tr>
<td>Bleeding on probing (BoP)</td>
<td>3 months</td>
<td>28.3%</td>
<td>18.7%</td>
<td>&gt;0.05</td>
</tr>
</tbody>
</table>
Bottom line and comments

1. No difference at three months in the plaque index or proportion of sites bleeding on probing.
2. Significantly improved mean probing depth and clinical attachment level at three months.

Comments:
1. Pilot study only, no sample size calculations made. Only 20 of 360 patients were eligible - most did not meet the inclusion criteria.
2. The clinical importance of these findings is not clear. The plaque index has not been explained.
3. Improvements in probing depth and clinical attachment level may reflect improved fibroblast activity and bacterial killing.
4. This trial only measured short-term effects and more work is necessary.
**Title:** Biological effects of hyperbaric oxygen on human severe periodontitis.

**Author:** Chen, T; Zhou, Y; Liu, J; Xu, B; Wu, Z; Li, D

This paper reports the effects of Hyperbaric Oxygen (HBO2) in a controlled study of periodontitis in 24 patients. The patients received either HBO2 or no HBO2, and study teeth were divided into 4 groups based on treatment: 1-HBO2 therapy, 2-HBO2 + scaling, 3-scaling, 4-control. We measured indices of periodontal disease and gingival blood flow (GBF). The microorganisms in a periodontal pocket were stained and the percentage of straight rods (Rods), curved rods (Cur), fusiforms (Fusi) and spirochetes (Spiro) were observed. The numbers of anaerobic organisms were measured by routine anaerobic culture. Highly significant differences in Gingival Indices (GI), Sulus Bleeding Indices (SBI), Probing Depth (PD), Attachment Loss (AL), Plaque Index (PLI), and GBF were seen in the HBO2, the HBO2 + Scaling and the Scaling Groups compared to the Control Group (P < 0.01). The number of subgingival anaerobes as well as the number of Rods, Cur, Fusi, and Spiro were reduced markedly in these three treatment groups. Statistically greater differences in clinical indices, GBF, subgingival anaerobe number and number of Rods, Cur. Fusi and Spiro were found by comparison of HBO2 + Scaling and HBO2 Groups, as well as between the HBO2 + Scaling and Scaling Groups. but no significant differences were observed in GI, SBI, PD, or AL between the HBO2 and Scaling Groups. In conclusion, HBO2 had beneficial therapeutic effects on severe periodontitis. HBO2 therapy combined with scaling and root planing was the most beneficial in the treatment of periodontitis. Clinical follow-up suggests that this treatment effect could last more than 1 year.

**Description:** Undersea & Hyperbaric Medicine : Journal of the Undersea and Hyperbaric Medical Society, Inc.

**URI:** http://archive.rubicon-foundation.org/3907

**Date:** 2002
Biological effects of hyperbaric oxygen on human severe periodontitis

T. CHEN¹, Y. ZHOU², J. LIU³, B. XU⁴, Z. WU², D. LI⁵

¹Associate Professor, Department of Periodontology, Stomatological Research Center, Si Chuan Bei Road 2111, Shanghai, P.R. China 200081; ²Department of Periodontology, Stomatological Medical College,Fourth Military Medical University; ³Medical Research Institute of the Navy; ⁴Department of Chemistry, Medical College, Tong Ji University of Shanghai; ⁵Stomatological Medical College Fourth Military Medical University.

Existing literature:

Chen T, Zhou Y, Liu J, Xu B, Wu Z, and Li D, Biological effects of hyperbaric oxygen on severe human periodontitis. Undersea Hyperb Med 2002; 29(3):159-166 - This paper reports the effects of Hyperbaric Oxygen (HBO₂) in a controlled study of periodontitis in 24 patients. The patients received either HBO₂ or no HBO₂, and study teeth were divided into 4 groups based on treatment: 1- HBO₂ therapy, 2- HBO₂ + scaling, 3-scaling, 4-control. We measured indices of periodontal disease and gingival blood flow (GBF). The microorganisms in a periodontal pocket were stained and the percentage of straight rods (Rods), curved rods (Cur), fusiforms (Fusi) and spirochetes (Spiro) were observed. The numbers of anaerobic organisms were measured by routine anaerobic culture. Highly significant differences in Gingival Indices (GI), Sulcus Bleeding Indices (SBI), Probing Depth (PD), Attachment Loss (AL), Plaque Index (PLI), and GBF were seen in the HBO₂, the HBO₂ + Scaling and the Scaling Groups compared to the Control Group (P<0.01). The number of subgingival anaerobes as well as the number of Rods, Cur, Fusi, and Spiro were reduced markedly in these three treatment groups. Statistically greater differences in clinical indices, GBF, subgingival anaerobe number and number of Rods, Cur, Fusi and Spiro were found by comparison of HBO₂ + Scaling and HBO₂ Groups, as well as between the HBO₂ + Scaling and Scaling Groups, but no significant differences were observed in GI, SBI, PD, or AL between the HBO₂ and Scaling Groups. In conclusion, HBO₂ had beneficial therapeutic effects on severe periodontitis. HBO₂ therapy combined with scaling and root planing was the most beneficial in the treatment of periodontitis. Clinical follow-up suggests that this treatment effect could last more than 1 year.

18. Clinical Indicators

No. ONE: Hypoglycaemia in chamber 0/300

No. TWO: Attendant DCI 0/341

No. THREE: Unplanned tymp tubes 3/99

No. FOUR: Seizures

No. FIVE: No show for treatment
<table>
<thead>
<tr>
<th>Clinical Indicators Jan-Dec 2010</th>
<th>Jan</th>
<th>Feb</th>
<th>Mar</th>
<th>Apr</th>
<th>May</th>
<th>Jun</th>
<th>Jul</th>
<th>Aug</th>
<th>Sep</th>
<th>Oct</th>
<th>Nov</th>
<th>Dec</th>
<th>% of incidence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total number of events of hypoglycaemia</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0.46%</td>
</tr>
<tr>
<td>Total number of diabetic patient treatments (per/day)</td>
<td>42</td>
<td>23</td>
<td>41</td>
<td>33</td>
<td>64</td>
<td>25</td>
<td>22</td>
<td>28</td>
<td>28</td>
<td>65</td>
<td>39</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>No of attendants compressed (per/day)</td>
<td>51</td>
<td>59</td>
<td>107</td>
<td>67</td>
<td>68</td>
<td>41</td>
<td>63</td>
<td>73</td>
<td>85</td>
<td>82</td>
<td>73</td>
<td>65</td>
<td>0%</td>
</tr>
<tr>
<td>Total number of episodes where patients have a seizure during or immediately after a compression</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0.07%</td>
</tr>
<tr>
<td>Total number of patient compressions for HBOT</td>
<td>329</td>
<td>204</td>
<td>248</td>
<td>237</td>
<td>248</td>
<td>251</td>
<td>21</td>
<td>4</td>
<td>182</td>
<td>274</td>
<td>286</td>
<td>284</td>
<td>215</td>
</tr>
</tbody>
</table>
1. Clinical in-chamber hypoglycaemic event in diabetic patients

**Topic:** Blood Glucose Level (BGL, measured by whatever means) less than 4 mmol/L in a symptomatic patient* with diabetes during HBOT.

**Rational:** A high proportion of patients undergoing HBOT have diabetes. A BGL of less than 4 mmol/L is low and has potentially serious adverse consequences.

**Numerator:** Total number of episodes where initially conscious patients with diabetes have symptoms or signs suggestive of hypoglycaemia and a BGL of less than 4 mmol/L during a compression*.

**Denominator:** Total number of compressions for conscious patients with diabetes who receive HBO*.

**Type of indicator:** Outcome

**Dimension of Quality:** Effectiveness, Safety

**Desirable level:** Low
2. Attendant decompression illness

- **Topic:** DCI in attendant staff during or following a compression.

- **Rationale:** Attendant staff are at risk of DCI. Knowing the incidence will help in designing risk reduction strategies.

- **Numerator:** Total number of episodes of DCI in attendant staff*.

- **Denominator:** Total number of staff attendant compressions.

- **Type of indicator:** Outcome

- **Dimension of Quality:** Safety

- **Desirable level:** Low
3. Unplanned insertion of tympanostomy tube(s) or performance of myringotomy in patients scheduled for routine HBOT

**Topic:** The number of individuals in whom tympanostomy tube(s)/myringotomy (tt/m) are required in order to continue HBOT where difficulty with middle ear equalisation was not anticipated before therapy commenced.

**Rationale:** This indicator will provide evidence of the frequency with which patients unexpectedly require placement of tt/m in order to complete the planned HBOT course.

**Numerator:** Total number of individual patients presenting for HBOT who unexpectedly require tt/m.

**Denominator:** Total number of HBOT patients.

**Type of indicator:** Outcome

**Dimension of Quality:** Effectiveness, Safety

**Desirable level:** Low
4. Oxygen toxic seizure

Topic: Generalised (grand mal) seizure presumed due to oxygen toxicity seizure during HBOT.

Rational: Some patients undergoing HBOT will have an oxygen toxic seizure. This event has potentially serious consequences.

Numerator: Total number of episodes where patients have a seizure during or immediately after a compression*.

Denominator: Total number of patient compressions for HBOT*.

Type of indicator: Outcome

Dimension of Quality: Adverse outcome, Safety

Desirable level: Low
Failure to arrive for a planned HBOT session

Topic: Number of occasions where a patient fails to arrive for a scheduled hyperbaric treatment session.

Rational: This indicator provides evidence of the appropriateness of the booking system, transport arrangements, communications and assessment of co-morbid medical illness.

Numerator: Total number of booked patient occasions of service where the patient does not arrive without prior notification.

Denominator: Total number of patient occasions of service.

Type of indicator: Outcome

Dimension of Quality: Efficiency

Desirable level: Low
Presence of Responsible Physician

- **Topic:** Number and proportion of individual episodes of hyperbaric oxygen therapy (HBOT) conducted without the responsible physician present in the building and immediately available.

- **Rationale:** The presence of an identified physician during hyperbaric treatment is an important factor in safe patient management.

- **Numerator:** Total number of individual HBOT patient sessions during which the responsible physician is not in the building or is not immediately available.

- **Denominator:** Total number of HBOT patient sessions (each patient treated – not each chamber run)

- **Type of indicator:** Structure

- **Dimension of Quality:** Effectiveness, Safety

- **Desirable level:** Low
Cancellation of planned HBOT due to non-acute co-existing medical condition

Topic: Number of occasions an individual is withdrawn from a scheduled hyperbaric treatment because of a co-existing medical problem that was not foreseen at the time the treatment was booked.

Rationale: This indicator will provide evidence of the frequency with which patients are unexpectedly withdrawn from treatment because of medical problems. It may also provide some evidence of the appropriateness of the booking and assessment process.

Numerator: Total number of individual HBOT patients presenting for treatment who are cancelled due to a medical condition.

Denominator: Total number of HBOT patient sessions (each patient treated – not each chamber run)

Type of indicator: Outcome

Dimension of Quality: Effectiveness, Safety

Desirable level: Low
Unable to have HBOT due to anxiety

- **Topic:** Patients unable to commence or complete one or more HBOT sessions due to anxiety.

- **Rational:** Reporting of patients with anxiety associated with HBOT, may be beneficial for the future management and safety of patients.

- **Numerator:** Total number of patients unable to start or complete one or more HBOT sessions due to anxiety.

- **Denominator:** Total number of patients undergoing HBOT.

- **Type of indicator:** Outcome

- **Dimension of Quality:** Safety

- **Desirable level:** Low
Completion of medical and nursing assessment pre commencement of Hyperbaric treatment

**Topic:** Number and proportion of individual episodes of hyperbaric oxygen therapy (HBOT) conducted without the completion of medical and nursing assessment.

**Rationale:** The medical and nursing assessments should be completed prior to patients commencing hyperbaric treatment. Pre assessment is an important factor in safe patient management.

**Numerator:** Total number of individual HBOT patient sessions during which the medical and nursing assessments are not completed prior to commencing HBOT.

**Denominator:** Total number of HBOT patient sessions (each patient treated – not each chamber run)

**Type of indicator:** Structure

**Dimension of Quality:** Effectiveness, Safety

**Desirable level:** Low
20. Nec fasc

?Long-term follow-up…. ANGELA
Outcomes analysis has some problems and team are discussing best approach
Meta-analysis??

AB will have a go… Chris Anderson now on board

- About 120 patients through unit but ? Limit analysis to Fournier’s presentation
- ALSO: Cochrane review underway.
Possible projects list

- 3D wound camera…?
- Diabetic RCT
  - RBH
- Venous ulcer RCT
  - Wesley
- Chronic wounds case-control study
  - ?RHH
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- Hyperbaric conditions and diving
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