



Australasian Hyperbaric & Diving Medicine Research Trust

Final Report: The effect of hyperbaric oxygen treatment on large bone defect healing using tissue engineered bone substitutes

Grant Agency: AHD MRT

Total support: \$10,000

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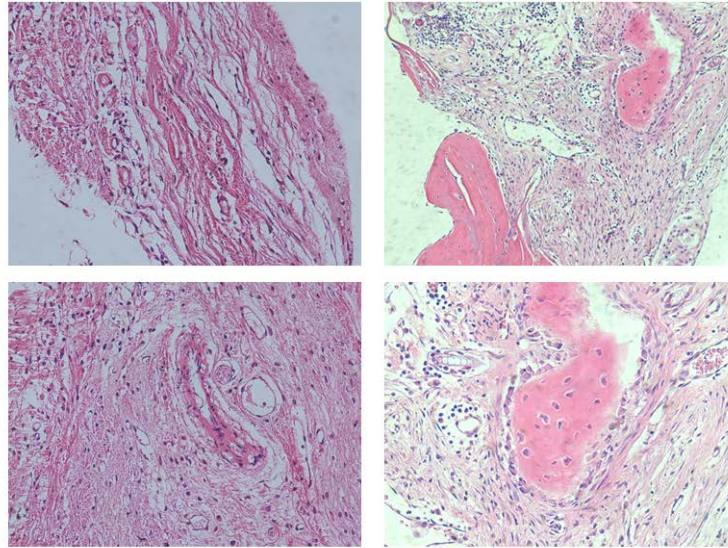
Research aims:

- 1) To optimize the conditions of HBO treatment on stem cell/scaffold complexes for osteogenesis and avoid possible cytotoxic effects of HBO;
- 2) To use a calvarial defect model in rat to evaluate the effects of HBO on bone defect healing after the BMSCs/scaffold complex transplantation.

Progress and results:

1. Human bone marrow stem cells (hBMSCs) have been successfully isolated and characterized.
2. 3-dimensional culture of hBMSCs in collagen scaffolds was established and the osteogenic property of hBMSCs in collagen scaffolds was characterized using the osteogenic cell culture media.
3. Animal models for the bone defect repair have been created and tested under HBO treatments.

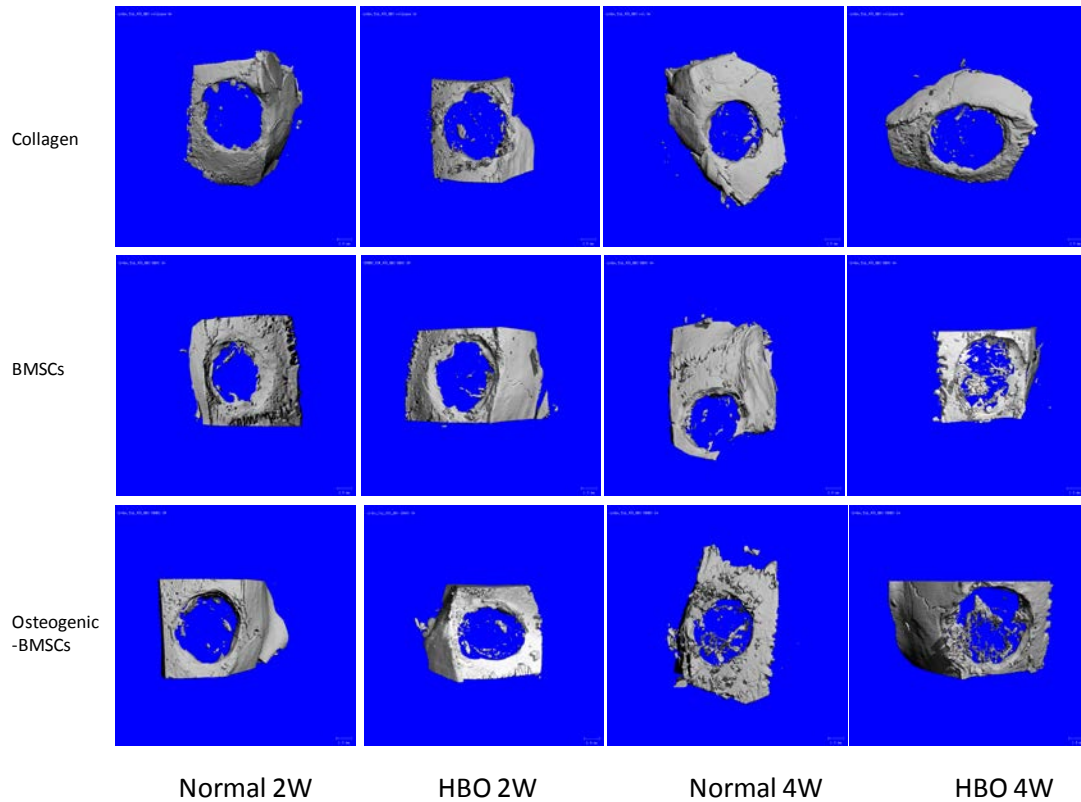
4. Tissue samples for the histology assessment have been processed and stained to observe new bone formation and cell activities under the treatment of HBO.
5. Results: Increased bone formation was detected in the HBO treatment compared with the normal oxygen treatment controls in histology and micro-CT studies.



Normal Control 4w

HBO Treatment 4w

Newly formed bone islands were detectable in the bone defected treated by HBO after 4 weeks (4w).



Micro-CT results showed that no new bone formation could be detected in rat skull defect in the normal oxygen condition in 2 weeks (2w), however, slightly increased ossification could be found in the HBO treatment. In the 4 weeks after the surgery, some ossification could be found in the group treated with osteogenic differentiated hBMSCs in the normal oxygen environment. Interestingly significantly increased ossification was found in the HBO treatment groups in both un-differentiated hBMSC and osteogenic-differentiated hBMSC delivery groups

Research data has been collected for publication.

Budget:

A total of \$10,000 has been used for the cell cultures, animal experiments, micro-CT, and histology.

A research paper will be submitted and the AHD MRT foundation will be informed and acknowledged.