

HYPERBARIC OXYGEN THERAPY AND NON HEALING ULCERS (Case Report)

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Summary

3 cases of non healing ulcers refractory to conventional therapy were treated with hyperbaric oxygenation (HBO) at 2.5 atmospheric pressure (ATA) for 90 minutes daily 6 days per week to a total of 30 to 36 exposures. HBO when given as an adjunct to conventional treatment was found effective in quick healing and obtaining sterile culture.

KEY WORDS : Hyperbaric oxygen; Nonhealing ulcers.

Introduction

Hyperbaric oxygenation is a method of treatment by which oxygen is delivered under high pressure. Effect of hyperbaric oxygen (HBO) has been studied in man and animals for centuries. It was originally introduced in clinical practice with the contention that a large amount of oxygen made available deep into tissues help in their survival in pathological states and prior to circulatory arrest. There are encouraging reports of its therapeutic efficacy in the fields of radiotherapy¹ and cardiac surgery². Hyperbaric oxygen has been extensively used also in other conditions like carbon monoxide poisoning³, decompression sickness⁴, peripheral vascular diseases⁵, anaerobic

infections⁶ and burns⁷ and found to have beneficial effect.

Indications for hyperbaric oxygen therapy and its scope in dermatological practice are steadily increasing. It had been tried in a number of infective disorders^{8,9} when usual forms of therapy had failed. The reported beneficial effect of hyperbaric oxygenation in quick healing has been utilised in treating chronic and refractory cases of varicose ulcers¹⁰, osteomyelitis¹¹ and various forms of sepsis¹².

The rationale of HBO treatment is based on the increased oxygen tension in the plasma, tissue fluids and metabolising cells which can be obtained. This oxygenation in the arterial blood is the primary factor which governs the volume of oxygen carried to the tissues. On breathing 100% oxygen a rapid rise in alveolar oxygen pressure results, reaching 673 mm Hg in about 7 minutes at one atmospheric pressure (ATA). This oxygen tension further increases with the rise of atmospheric pressure reaching 1433 mm Hg and 2193 mm Hg

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at 2 ATA and 3 ATA respectively. Because of limitation in oxygen dissociation curve, volume of oxygen can hardly increase as oxyhaemoglobin, but the amount of dissolved oxygen rises linearly with increasing pressure. Actual oxygen tension in any particular organ depends on the tissue activity, blood flow and oxygen consumption. Greater discrepancies may occur in pathological states between one region and another.

Because of easy availability of hyperbaric chamber at the Institute of Aviation Medicine at Bangalore, 3 cases of non-healing ulcers which were recalcitrant to conventional therapy were treated with HBO.

Case reports

Case 1

A 39 years old male patient was admitted at Command Hospital, Air Force, Bangalore, with multiple abscesses, discharging sinuses and extensive ulcerations on front of left leg and dorsum of left foot of 1 month's duration. The lesions had developed after a thorn prick. The floor of the ulcers showed unhealthy granulation tissues and there was cellulitis of surrounding skin. Routine blood, urine and stool examinations were normal. No acid fast bacilli could be detected on smear from the ulcer or culture. β Haemolytic streptococci sensitive to gentamycin, septran and chloromycetin were isolated repeatedly on cultures. KOH preparation failed to demonstrate any fungus and culture on Sabouraud's media was negative. No bony changes were seen on X-ray. Skin histology showed non-specific abscesses in dermis which showed chronic and acute inflammatory cells including a fair number of eosinophils. Patient was treated with gentamycin-80 mg twice daily for 15 days, Septran 2 tabs twice daily for 15 days, local dressing and supportive measures without any appreciable improvement. He

was then subjected to hyperbaric oxygen (HBO) therapy while continuing with Septran and local therapy. After two weeks of therapy, ulcers showed signs of healing and culture became sterile. Ulcers completely healed after 36 exposures of HBO (Fig. 1).

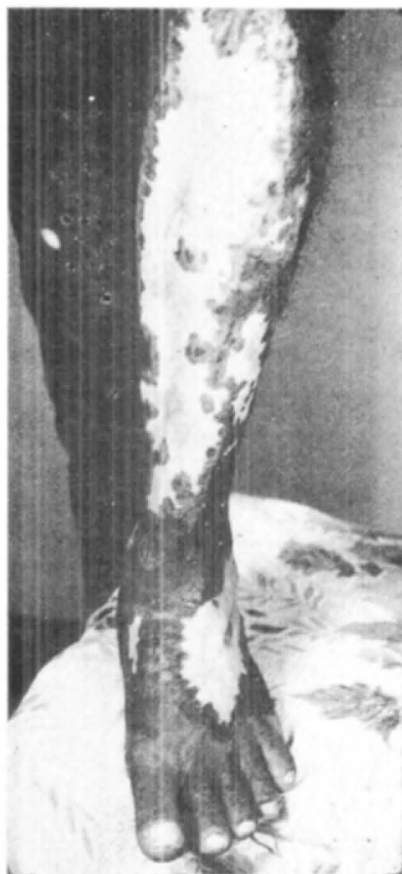


Fig. 1

Healed ulcers on front of left leg and dorsum of left foot after 36 exposures of H.B.O.

Case 2

A 33 years old gunner was admitted with multiple tender fluctuant swellings and punched out ulcers with profuse sero-purulent discharge, on the extremities, of 5 weeks duration (Fig 2). Tender abscesses continued to appear in crops over the extremities which on



Fig. 2

Multiple tender fluctuant swellings and punched out ulcers.

bursting left punched out ulcers. A similar nodular swelling had appeared at 11 O' clock position in the left eye-producing a scleral perforation through which uveal tissue could be seen. Routine investigations were normal. No fungi or acid fast organism could be seen demonstrated in scrapings by smears or cultures. VDRL, Kahn and Wasserman tests were repeatedly negative. Staphylococci pyogens sensitive to gentamycin was grown in culture from the pus.

The patient was treated with gentamycin 80 mg twice daily for 10 days without any improvement. Staphylococci pyogens could be isolated again on culture, this time sensitive to both septran and gentamycin. At this stage he was exposed to hyperbaric oxygen therapy along with septran and supportive therapy. Both skin and eye lesions healed after 36 exposures of HBO and culture became sterile.

Case 3

A 40 years old female patient reported to Command Hospital, Air Force,

Bangalore, with multiple trophic ulcers on the pressure areas of the right sole. She was a case of neuritic leprosy on DDS therapy for 3 years. An area of sensory loss to all modalities of superficial sensation was present on the lateral aspect of the right leg and extending downwards to involve the whole of the right foot. The right peroneal and anterior tibial nerves were thickened. Since there was very slow response to usual antiseptic dressings, the patient was put on HBO as an adjunct to the local treatment. The ulcers started showing improvement after 20 exposures and healed completely with 30 exposures of hyperbaric oxygen (Fig. 3).



Fig. 3

Trophic ulcers healed up after 30 exposures of H B.O.

The treatment with HBO was accomplished in a cylindrical multiplace decompression chamber. The patients were given HBO for 90 minutes daily for 6 days a week to a total of 36 exposures at 2.5 ATA for case No.1 and 2 and 30 exposures in case No.3. Hyperbaric oxygen at 2.5 ATA was

selected since it can meet the oxygen needs of skin while avoiding any possible side effects of HBO or oxygen toxicity which are frequently observed with therapy above 3 ATA. The therapy was simple and acceptable to the patients. None of the patients developed any side effect or oxygen toxicity. Lung pathology favouring air trapping is an absolute contra indication to HBO. During the course of the treatment weekly culture and antibiotic sensitivity tests were carried out.

Discussion

Tropical ulcers and trophic ulcers due to leprosy are well known for their chronicity and refractiveness to treatment. Antibiotics and local dressing often fail to produce satisfactory therapeutic response. In the absence of quick healing of the ulcer, tissue necrosis goes on unabated. During normal wound healing, oxygen tension is a critical rate-limiting factor. Though epidermis can survive under anaerobic conditions, adequate oxygen supply is needed for mitosis and cell movements.

Hyperbaric oxygen drenching not only increases oxygen tension locally but also in the neighbouring migrating cells by diffusion. Beneficial effect of HBO on wound healing is attributed to enhanced fibroblastic and osteoblastic activities, neo-vascularisation, formation of granulation tissue and epithelialisation. 3 cases of non-healing chronic ulcers which were refractory to antibiotic therapy showed good response clinically and bacteriologically when HBO was administered as an adjunct; bacteriological response being evident after 2 weeks of therapy. Recent study at the Institute of Aviation Medicine demonstrated definite bacteriostatic and bactericidal effect of hyperbaric oxygen on aerobic organisms¹³.

At present there is no standard treatment schedule with HBO for various cutaneous disorders, though certain regimes are available for the treatment of anaerobic infections, decompression sickness and peripheral vascular disorders.

Conclusion

Preliminary observation on the use of HBO in certain chronic bacterial infections of the skin has given encouraging results.

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