Hyperbaric oxygen in the treatment of perichondritis of the pinna

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Abstract

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Perichondritis is a condition characterized by pain, swelling and purulent discharge from the external ear, which may progress to a deformity of the pinna. The presence of co-morbidities such as diabetes mellitus may aggravate the situation. The main aetiological agent is *Pseudomonas aeruginosa* and treatment consists of antibiotics combined with surgical drainage of the ear. We present the case of a diabetic patient with recurrent perichondritis of the pinna treated with hyperbaric oxygen therapy, with successful healing. Hyperbaric oxygen therapy has proved beneficial as adjunctive therapy of lesions in diabetic patients with foot ulcers, acting in the regeneration of intracellular free radicals and promotion of wound-healing factors. Thus, owing to its mechanisms of action, its effect on other injuries such as perichondritis in diabetic patients may be beneficial and lead to improvement.

Key words

Ear, infection, wound healing, hyperbaric oxygen therapy, case reports

Introduction

Auricular perichondritis is a disease of the pinna that may cause severe deformity.[1] The commonest predisposing factors for this condition are trauma, burns, insect bites, post-operative infections of the skin, bruising or seromas.[1] Diabetes mellitus contributes to the worsening of symptoms.[1,2] The clinical picture of auricular perichondritis includes pain, swelling, deformity and purulent discharge, with *Pseudomonas aeruginosa* as the most common aetiologic agent. Treatment usually consists of incision and drainage and local and systemic antibiotic therapy. In some cases, auricular debridement is also necessary. Other bacteria commonly causing the disease include *Staphylococcus aureus*, *Escherichia coli* and *Proteus sp*.[1,3]

We report the case of a patient with Type 2 diabetes mellitus and recurrent auricular perichondritis treated successfully with hyperbaric oxygen therapy (HBOT) and antibiotics.

Case report

A 55-year-old male presented with signs of perichondritis of the left ear with spontaneous drainage of secretions in the region of the anterior helix. He denied any history of trauma, fever, dizziness, tinnitus, hearing loss, or other co-morbidities. Otoscopy showed intact tympanic membranes bilaterally, without abnormalities.

Ambulatory drainage with placement of a Penrose drain was performed and he remained hospitalized for 10 days for treatment with intravenous oxacillin (1000 mg three times a day) and ciprofloxacin (400 mg twice a day), and daily pressure dressing changes. On admission, his fasting glucose was 18.1 mmol L^{-1} (reference value 2.2–5.5 mmol L^{-1}), and he was commenced on subcutaneous soluble insulin according to pre-prandial blood glucose levels and a low-glycaemic diet. He was discharged in good condition on oral ciprofloxacin (500 mg daily), pressure dressings and insulin (NPH plus regular insulin before breakfast, regular insulin before lunch and dinner, and NPH insulin at bedtime)

Forty days after discharge he represented with intense swelling of the left pinna, with areas of fluctuation and signs of inflammation. The abscess was drained and he was commenced on IV ciprofloxacin (400 mg 8 hourly) and hydrocortisone (100 mg 6 hrly). Microbiology was positive for *E. coli* ESBL+ (Extended-spectrum beta-lactamase), and a search for fungi and acid-fast bacilli was negative. On the fourth day of antibiotic therapy, the culture results indicated a need to change to imipenem IV (500 mg 6 hrly). After 15 days of antibiotic treatment the patient was discharged without oedema or erythema in the pinna, and no auricular discharge.

One week after hospital discharge, the patient relapsed again and imipenem (500 mg, 6 hrly) and daily compressive dressings were restarted. CT scan of the neck revealed perichondritis of the left external ear, a left intra-parotid lymph node and enlarged lymph nodes in the cervical chains bilaterally.

Again, the patient improved and he was discharged on the eighth day. Hyperglycaemia was well controlled. However, this improvement was not sustained and a month later the use of HBOT was considered. He underwent 10 daily, 2 h HBOT at a pressure of 304 kPa, which resulted in complete remission of erythema and oedema of the ear, without purulent discharge (Figure 1). At a three-month follow up, otoscopy was normal and he was asymptomatic.

Figure 1
Left ear of patient after 10 HBOT at 304 kPa (with permission)

Concomitantly, the hyperglycaemia was investigated and, on fundoscopy, severe diabetic retinopathy and neovascular glaucoma were confirmed and glibenclamide 5 mg daily was commenced.

Discussion

Because of their vulnerability, any lesions of the pinna, if handled improperly or ignored, can lead to evident deformity. Treatments that have been proposed include: repeated incision and drainage with local instillation of antibiotics; excision of affected cartilage, anterior overlying skin and perichondrium; through-drainage tube method, and ultraviolet rays.[1–4]

HBOT may be beneficial as a complementary therapy for soft-tissue injuries in patients with diabetes, compromised skin flaps, osteoradionecrosis, soft tissue necrosis and gangrene.[5] With particular relevance to this case report, HBOT has proved beneficial in healing problem wounds in patients with diabetes mellitus.[6,7] The main mechanisms of action of HBOT are based on the regeneration of intracellular free radicals of oxygen and nitrogen.[8] Breathing oxygen at greater than 101.3 kPa increases production of reactive oxygen species (ROS). This is critically important as it is the molecular basis for a number of therapeutic mechanisms. In association with reactive nitrogen species (RNS), they serve as signalling molecules in transduction cascades, or pathways, for a variety of growth factors, cytokines and hormones. RNS include nitric oxide and agents generated by reactions between nitric oxide or its oxidation products, and ROS.[8] ROS are generated intracellularly as part of normal metabolism, acting in conjunction with several redox systems, and play central roles in coordinating cell signalling and also anti-oxidant, protective pathways. HBOT has been shown to improve diabetic wound healing by increasing circulating stem cells.[9]

HBOT is a relatively safe procedure. The risk of central nervous system oxygen toxicity is approximately 1 to 4 in 10,000 patient treatments, depending on both the pressure and duration of exposure.[8] The difficulties of treatment by HBOT include the cost and availability of hyperbaric facilities. Furthermore, patients require multiple sessions so it is demanding on their time. However, the number of HBOT chambers has increased, allowing greater access to this intervention.

This case of auricular perichondritis in a diabetic patient with multiple relapses which resolved with HBOT suggests this is a useful treatment option in this condition.

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