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Application of NATROX® topical oxygen therapy in post-radiotherapy neck wounds

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A 75 year-old Asian male presented with Notani Grade 3 osteoradionecrosis of the right mandible with an orocutaneous fistula. He underwent ablative resection with fibula free flap and pectoralis major myocutaneous flap reconstruction. Unfortunately, the neck wound dehiscenced with purulent discharge from the mandible. Initial

management involved antibiotic therapy, debridement and wound dressings. Further breakdown ensued, exposing the bone and mandibular reconstruction plate (Figure 1). We debrided the wound, sectioned the exposed plate at the wound edges and covered with an Integra® dermal regeneration template and a sponge bolster dressing; this was unsuccessful.

Given these setbacks, a novel treatment alternative NATROX®, a topical oxygen delivery device, was sought. NATROX® consists of a portable oxygen generator (rechargeable battery-operated) and an oxygen delivery system (single-use 'web' device). We drilled small holes into the exposed bone and secured the delivery web onto the wound with adhesive tapes (Figure 2). An Aquacel® dressing covered the web to absorb exudate, with a protective dressing on top. The dressing and single-use web were renewed twice weekly in the first month, then once weekly for four months. Though the COVID-19 lockdown restricted his appointments, the patient changed the dressings at home without additional training or adverse effects. In six weeks, we noted partial coverage of defect (Figure 3) with substantial coverage of the bone and reconstruction plate occurring in five months (Figure 4).

Managing wound breakdown is difficult and prolonged in patients with history of radiotherapy. Radiation therapy depletes growth factors and damages microvasculature at its target, leading to poor healing.¹ Management strategies including dressings, skin grafts, pedicled and free flaps, platelet-derived growth factor, dermal regeneration templates and hyperbaric oxygen therapy, have been used with variable success.

NATROX® delivers 98% humidified oxygen to wounds at 13 ml/hour (£300-£500 per 12-week treatment) and has been successfully used to manage chronic diabetic foot ulcers where it has been shown to outperform standard dressings.^{2,3} Oxygen plays many key roles in wound repair: it facilitates collagen deposition by driving collagen synthesis, inhibits infection by catalysing reactive oxygen species production, and encourages angiogenesis by increasing VEGF expression.⁴ While hyperbaric oxygen therapy is famously used, topical oxygen therapy is a newer method for treating chronic wounds where oxygen is delivered locally without patients needing to sit inside a chamber. This reduces the risk of oxygen toxicity, barotrauma and ocular disturbances. As topical oxygen therapy is not reliant on local microvasculature its use on irradiated wounds could prove promising.⁴

NICE has recently supported the use of NATROX® therapy in chronic wounds.³ Based on our literature review (PubMed, Medline, EMBASE) this is the first paper to present use of NATROX® in the head and neck region. A recent case series highlighted successful management of early mandibular osteoradionecrosis using topical ozone gel.⁵ We recognise the limitation of a single report, however research is sparse and our success with NATROX® highlights scope for further studies on this simple cost-effective therapy for challenging wounds in the head and neck.

Conflict of Interest

No

Ethics statement/confirmation of patient permission

Ethics approval not required. Patient permission obtained

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Figures



Figure 1. Post-operative neck breakdown



Figure 2. NATROX® secured onto the wound bed with adhesive tapes



Figure 3. Wound healing after 6 weeks of regular NATROX® use



Figure 4. Wound coverage after 5 months of regular NATROX® use