

# Malignant Otitis Externa and Temporal Bone Osteomyelitis: Complete Recovery Following the Adjunctive use of Hyperbaric Oxygen and Antibiotics

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## استخدام الأوكسجين تحت ضغط عال لعلاج التهاب الأذن الداخلية والعظم الصدغي

ديبا بهارجافا ، وكريس وايت ، وسمير حسين ، ودليلب سنخال ، وحسين خاتم ، ونيكولاس ودهاوس

خلاصة : إن التهاب الأذن الداخلية الخبيث من الحالات غير الشائعة ولكنه قد يكون مميتاً . وتسبب هذا الالتهاب الخمجي بكتيريا تسمى «سيودوموناس ايروجينوسا» . يصاب بهذا الالتهاب عادة المسنون المصابون بداء السكري ويتبع عادة بالتهاب الأنسجة الرخوة العميقة والعظم مؤدياً إلى التهاب نخاع العظم . نعرض في هذه المقالة مريضاً استمر مرضه على الرغم من علاجه بالمضاد الحيوي لمدة شهرين ، وعندما تم استخدام علاج الأوكسجين تحت الضغط العالي لمدة أربعة أسابيع شفي تماماً .

**ABSTRACT:** Malignant otitis externa is an uncommon potentially fatal infection of the external ear caused by *Pseudomonas aeruginosa*. It occurs usually in elderly diabetics and is followed by rapid invasion of the deep periauricular tissue and bone leading to osteomyelitis. We present such a patient whose disease persisted inspite of two months antibiotic therapy until the concomitant use of hyperbaric oxygen therapy was given over a period of four weeks. Complete recovery followed.

Malignant external otitis was first reported by Chandler in 1968, who described the triad of diabetes mellitus, granulomas and infection with *Pseudomonas aeruginosa*. Cases were described as "malignant" as they were usually "doomed to die in great agony" (Chandler, 1968). Review of literature of past ten years reveals a steady decline in mortality due to early diagnosis and treatment with cephalosporins. Hyperbaric oxygen (HBO) is also reportedly of value in chronic cases (Davis, 1992).

### Case Report

A 45-year-old Omani man presented to our department with a history of pain and discharge from the right ear of four weeks duration. He gave a history of diabetes mellitus treated with glibenclamide for the last 7 years. He had received some unknown antibiotic

treatment from a private clinic prior to presentation.

On examination there was obvious protrusion of the affected pinna due to swelling of the peri- and post-auricular tissues. Examination of the external canal was difficult due to severe tenderness, canal oedema and purulent discharge. The tympanic membrane could not be visualized. He was initially diagnosed as having a simple external otitis. Cultures were obtained and treatment was started with cefuroxime 500 mg twice daily, antihistamine and gentamicin ear drops.

Two weeks later, he was symptomatically better but there was a persistent purulent discharge. Re-examination revealed a large granulation at the junction of the cartilage and bony canal (Figure 1). The cultures had grown *Pseudomonas aeruginosa* and x-rays revealed sclerosis and clouding of mastoid air cells. He was diagnosed as "malignant otitis externa" and the treatment was changed to oral ciprofloxacin 750 mg twice daily (Levenson et al.,

1991). Two weeks later he was clinically unchanged. CT scanning revealed a soft tissue mass encroaching the external canal, with erosion and osteomyelitis of skull base (Figure 2a). He was admitted and given IV ciprofloxacin 750 mg twice daily, ceftazidime 1 gm thrice daily (Kimmelman and Lucente, 1989), glibenclamide 5 mg and metformin 500 mg twice daily. Seven days later a gallium scan revealed accumulation of activity in the affected area (Figure 3a).

In view of the extensive osteomyelitis, discharge and previous reports of the use of HBO in this disorder, the patient was referred to Oman Navy Base, at Wudham, for adjunctive treatment. There he received HBO at 1.8 bars for 90 minutes for 30 days. He continued the antibiotics and other medications as before. During treatment, the ear pain gradually diminished and stopped completely over 30 days.

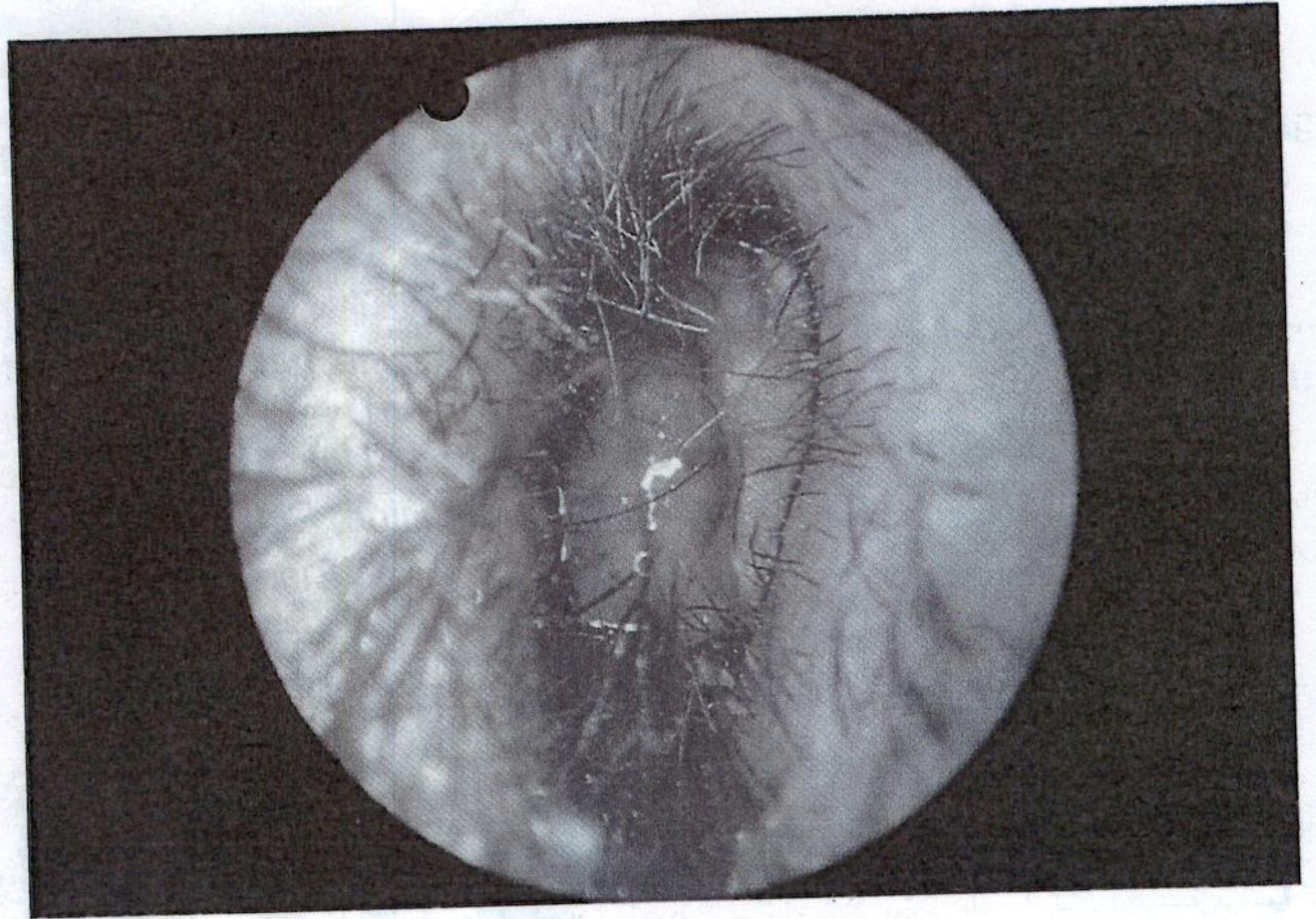


Figure 1. Granulation tissue is seen at the junction of the cartilage and bony external canal.

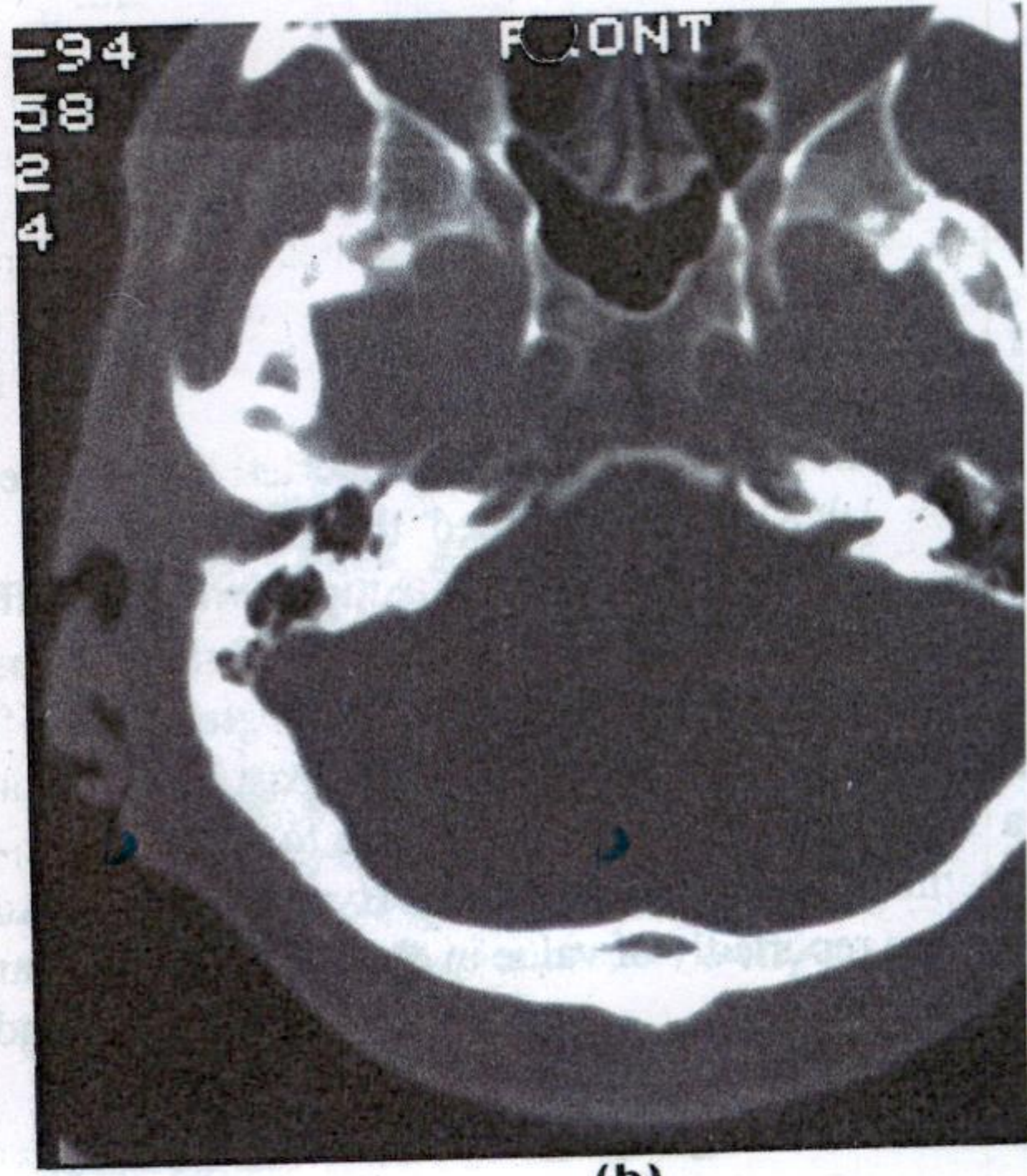
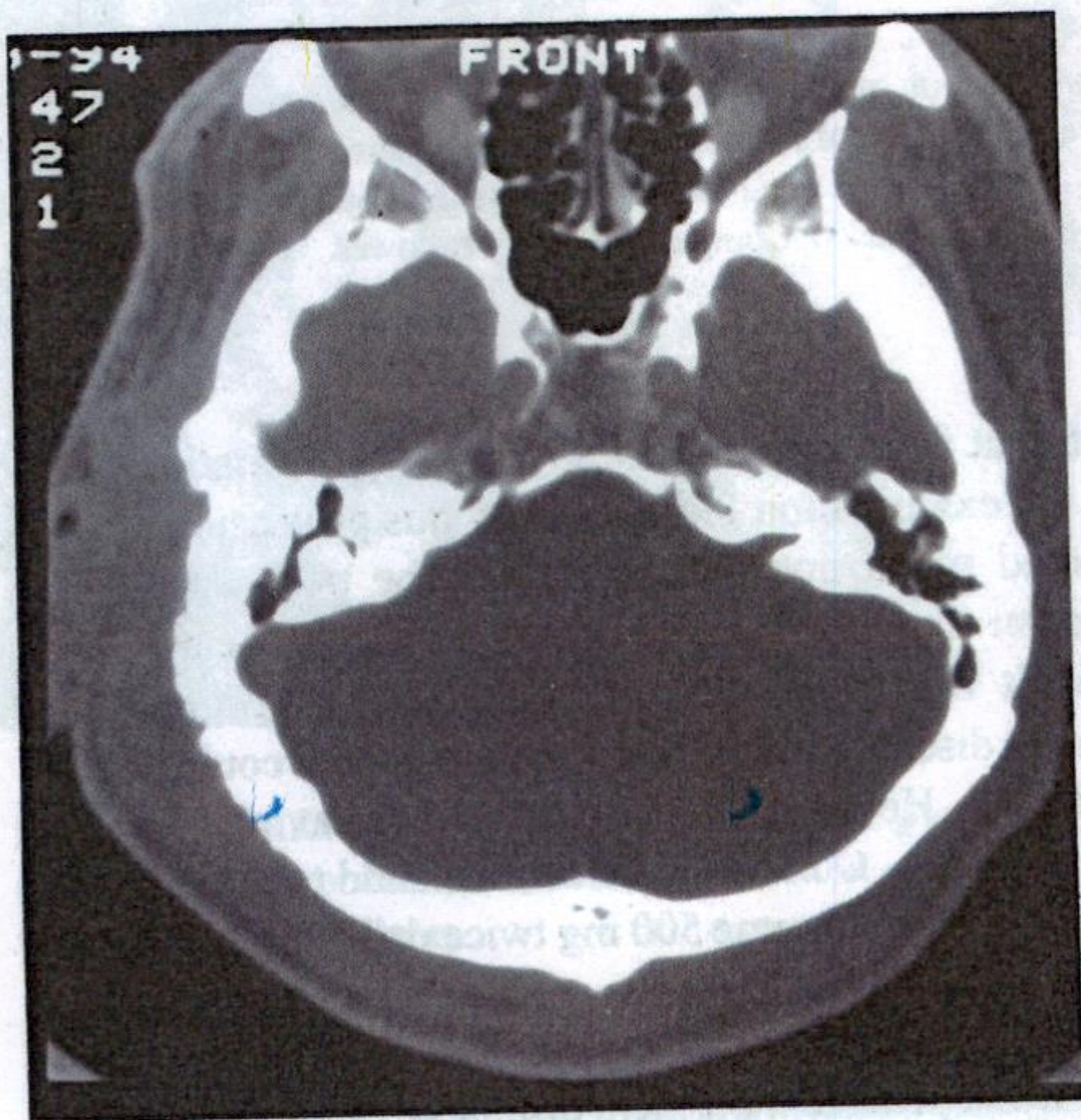


Figure 2(a) and 2(b). CT scans showing (a) soft tissue swelling with underlying osteomyelitis of the right petrous before treatment; (b) Five months after completion of the hyperbaric oxygen therapy there was complete resolution of abnormalities and marked improvement of the underlying bone.

## MALIGNANT OTITIS EXTERNA AND TEMPORAL BONE OSTEOMYELITIS

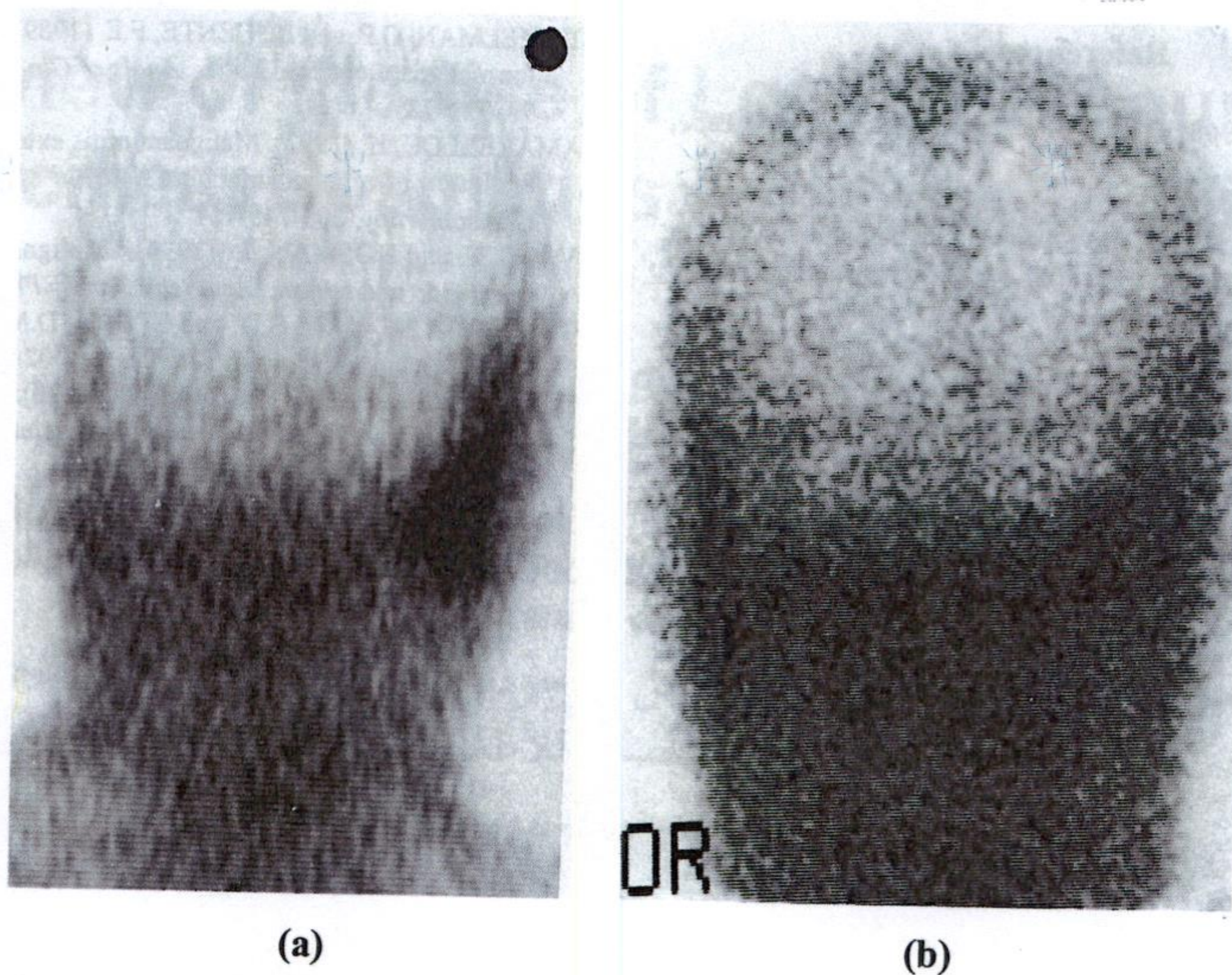


Figure 3. Gallium scan posterior view: (a) before treatment showing localised uptake on the right; (b) Eight weeks after completing his treatment no localised accumulation is seen.

On completion, he was asymptomatic without evidence of discharge, swelling or granulation tissue. Antibiotics were stopped two weeks later. Repeat CT and gallium scans showed healing of the osteomyelitis (Figures. 2b and 3b). He remains asymptomatic two years after completion of treatment.

### Discussion

The diagnostic criteria for malignant otitis externa are diabetes mellitus with external otitis, granulation tissue at the junction of cartilage and bone and *Pseudomonas aeruginosa*. All were present in our patient.

Invasive disease in malignant external otitis usually begins at the junction of cartilage and bone in the external canal. The infection spreads into the temporal bone along the Santorini's fissure. The infection may spread towards the skull base involving the jugular foramen causing multiple cranial nerve involvement, cavernous sinus thrombus and meningitis. The pattern of spread is usually rapid and progressive. Invasion of the central nervous system often leads to death (Samarellou, 1992; Evans and Hofman, 1994). In our patient the granulation tissue had caused bone erosion and osteomyelitis of temporal bone, mastoids and part of the skull base (Figure 2a). It was interesting to note that in spite of impending fatal complications, the patient's general condition was surprisingly good, he was ambulatory and initially refusing admission.

Why diabetics are more susceptible to this particular infection is unclear. Possibilities include diminished polymorphonuclear chemotaxis and phagocytosis and attenuation of neutrophil antimicrobial polypeptides by high levels of advanced glycation end products (Schmidt, Yan and Stern, 1995).

HBO was given as an adjunctive therapy to our patient in view of his extensive and life threatening osteomyelitis. The response was dramatic with rapid reduction of the soft tissue swelling and gradual disappearance of the purulent ear discharge. Complete resolution of the infection was subsequently confirmed by repeated gallium and CT scanning. We cannot however exclude the possibility that high doses of antibiotics would have had the same beneficial effect on their own but we followed the advice of Davies et al. (1992) who advocate HBO therapy in recurring or advanced cases of malignant external otitis. Experimentally HBO is bacteriostatic for *pseudomonas* and in addition it may improve neutrophil function by reversing local hypoxia thus increasing free radical production and the rate of killing of some bacteria by phagocytosis (Timbles and Edelsberg, 1996).

Whatever the mechanism the introduction of HBO treatment was apparently beneficial in this clinical setting. We would advocate its adjunctive use in patients with resistant osteomyelitis. Furthermore diabetic patients with an apparently simple external otitis should be treated aggressively with antibiotics particularly if granulations are present until culture results are available.

## References

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