# Extensive Temporal Bone Pneumatization: Incidental Finding in a Patient with TMJ Dysfunction

MURTUZA HASNAINI AND SUK YEE NG

*Abstract:* An 18-year-old male presented with symptoms of temporomandibular joint dysfunction. A panoramic radiograph revealed slight erosion of the condylar heads, and an incidental finding of multilocular radiolucencies in the zygomatic processes of the right and left temporal bones. CT scans were undertaken to exclude any sinister cause. The radiolucencies were shown to be extensive bilateral pneumatization of the temporal bones. Conservative management relieved the symptoms of TMJ dysfunction.

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*Clinical Relevance:* This case illustrates the importance of knowing the range of normal anatomy on a panoramic radiograph, and of being guided by clinical signs and symptoms in reaching a working diagnosis.

An 18-year-old Afro-Caribbean male was referred by his medical practitioner to the Department of Oral and Maxillofacial Surgery of the Royal London Hospital. He gave a 3-month history of increasing pain from both temporomandibular joints (TMJ) and inability to open his mouth widely. This was affecting his speech and mastication. There was no relevant medical, family or social history. The patient denied parafunctional activity.

Extra-oral examination revealed bilateral tenderness over the preauricular and masseteric regions, but not involving other masticatory muscles. Mouth opening was limited to 27 mm. There was no evidence of any clicking or crepitation of the TMJ. Intra-oral examination showed no occlusal abnormality, tooth wear or faceting. An asymptomatic carious lower left first molar was present.

A dental panoramic tomogram demonstrated multilocular radiolucencies in the zygomatic process of the right and left temporal bones. This was more pronounced on the right side, extending up to the zygomaticotemporal suture (Figure 1) and involving the articular eminence. The condyles showed slight flattening and beaking anteriorly. The lower left first molar contained an inadequate root filling and demonstrated apical rarefying osteitis. The lower right and left third molars were unerupted, impacted and showed incomplete root formation.

Further investigation of the temporal bones using CT revealed extensive pneumatization in all parts of both temporal bones: mastoid, petrous, squamous and zygomatic. The roof of the right glenoid fossa was very thin (<1 mm) medially. The superomedial surfaces of both condyles were showing mild signs of erosion, which was more prominent on the right side (Figures 2 and 3).

A diagnosis was made of TMJ pain dysfunction syndrome, with an incidental finding of extensive pneumatization of the temporal bones.

Conservative management was instituted. A soft acrylic bite-raising appliance was constructed and worn by the patient full-time for 6 weeks. The patient was instructed to carry out jaw exercises and to keep to a soft diet. At review 6 weeks after presentation, the patient reported a reduction in pain and improved mouth opening, with consequent improvement in speech and mastication. At that time, mouth opening was 45 mm. The patient was instructed to continue to wear the appliance part-time until the next review at 4 months.

## DISCUSSION

Pneumatization of the temporal bone is recognized as a normal anatomical variation.[1–4] Tyndall and Matteson[3] coined the phrase 'zygomatic air cell defect' (ZACD) to describe the accessory air cells that occur in the root of the zygomatic arch and in the articular eminence of the temporal bone, and which do not extend anterior to the zygomaticotemporal suture. The prevalence of ZACD was reported to be 1.7% in a meta-analysis[5] based on panoramic radiographs. Pneumatization of the temporal bone starts in the squamo-mastoid part, and spreads to the other parts to varying degrees. The volume of air cells in most temporal bones[6] varies from 2.08 to 20.05 ml. In one study[7] of 100 patients who had no TMJ abnormalities and who had undergone high-resolution CT of the base of the skull, the roof of the glenoid fossa was pneumatized in 51 patients,

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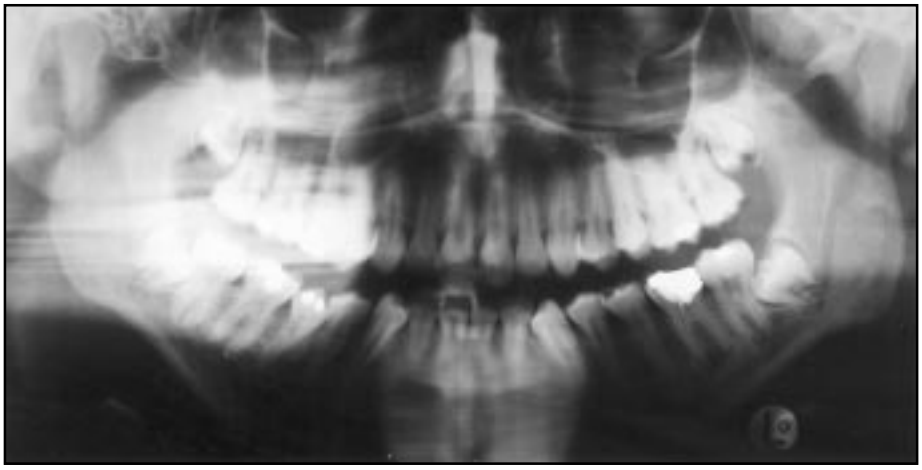

***Figure 1.*** *Dental panoramic tomogram, showing pneumatization of the zygomatic process of the temporal bone on both sides. On the right the pneumatization extends up to the zygomatico-temporal suture. Both condyles show slight flattening and beaking on the anterior aspect.*

the articular eminence contained air spaces in 12 patients and the root of the zygomatic process in five.

Pneumatization is usually symmetrical, but asymmetry is also occasionally observed. The condition is almost always asymptomatic and discovered as a chance radiographic finding, and usually not further investigated. There are no reported cases of the condition presenting as TMJ dysfunction. However, in the case presented here, the symptoms were clearly of concern to the patient because they were having a detrimental effect on his oral function and social interaction.

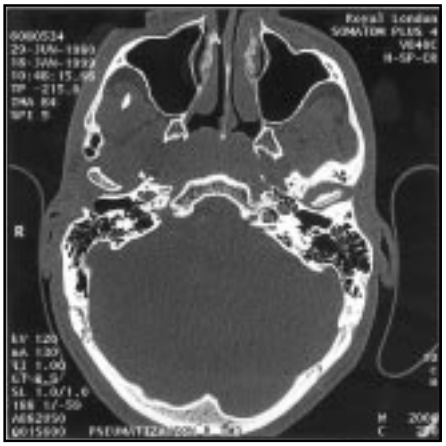

***Figure 2.*** *Axial CT scan at the level of the mandibular condyles. Window width 2000 HU, centre 250 HU. Extensive pneumatization of right and left temporal bones is visible, involving the zygomatic process, articular eminence, squamous part, petrous part and peritubal area around the carotid canal. Note increased width of bone.*

Investigations of TMJ dysfunction are somewhat controversial. Conditions involving only the masticatory muscles are unlikely to be demonstrable on plain films. Bony pathology such as an old fracture, ankylosis and arthritides usually has accompanying radiological signs. Internal derangement of the disc can be demonstrated only on arthrography or MRI. Increased metabolism in the condyles can be shown by a radioisotope scan.

The dental panoramic tomogram, although showing minimal remodelling changes, excluded any obvious bony pathology involving the condyles and the teeth in relation to the patient's symptoms. The well corticated multilocular radiolucencies in the zygomatic process of the temporal bones prompted a differential diagnosis of:

- variation of normal anatomy;
- giant cell lesion;
- central haemangioma;
- traumatic bone cyst;
- aneurysmal bone cyst;
- myxoma; or
- metastasis.

In view of the symptoms and the plain film findings, and in order to exclude a sinister cause, a CT scan was performed to demonstrate the temporal bones in their entirety. This clearly revealed the full extent of the radiolucencies. They were bilateral, symmetrical and causing enlargement of parts of the temporal bones. All these signs are consistent with temporal bone pneumatization and effectively exclude the other differential diagnoses.

Interestingly, the CT scans revealed that, due to the pneumatization, there was approximately less than 1 mm of bone between the glenoid fossa and the middle cranial fossa. This could obviously be an important consideration in the event of maxillofacial injuries or TMJ surgery. Temporal air spaces are potential pathways for spread of infection and other disease processes. The prominent pneumatization may prove to be a caution or even a contraindication[5] to certain types of procedures such as eminectomy or eminoplasty,[2] which is occasionally carried out for patients with chronic recurrent mandibular dislocation. In such procedures, there is a risk of penetration into the middle cranial fossa when using osteotomes or burs.

The management of TMJ dysfunction syndrome has been widely reported in the literature and will not be discussed here.

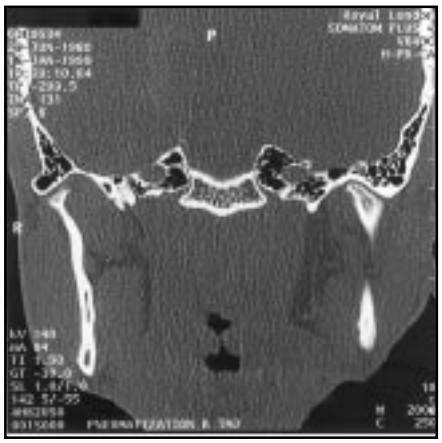

***Figure 3.*** *Coronal CT scan at the level of the posterior border of the mandibular ramus. Extensive pneumatization is visible, as described in Figure 2, and with air spaces in the roof of the glenoid fossa. The articulating surface of the right condyle shows loss of corticated outline and slight erosion. Note thinness of the medial roof of the right glenoid fossa.*

The patient has responded very well to conservative management to date and will be kept under review.

## CONCLUSIONS

This case illustrates the importance of understanding the full range of normal anatomy, not only of the tooth-bearing areas but also of the surrounding tissues as seen on a panoramic (or indeed any) radiograph. The general dental practitioner needs to be aware of the existence of ZACD so that an appropriate differential diagnosis may be formulated.

**ACKNOWLEDGEMENT**

We are grateful to Mr K.M. Coghlan for permission to present this case.

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## ABSTRACTS

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### WORK DISRUPTION AND THIRD MOLARS

Impact of Third Molar Removal on Demands for Post-operative Care and Job Disruption: Does Anaesthetic Choice Make a Difference? D.J. Edwards, J.P. Shepherd, J. Horton, M.R. Brickley. *Annals of the Royal College of Surgeons of England* 1999; **81:** 119-123.

With the recent guidelines issued by the GDC regarding the use of general anaesthesia (GA) this is a timely paper by Edwards *et al*. These workers investigated the differences between patients receiving local anaesthesia (LA) and GA for the removal of third molars with regards to the post-operative problems experienced by patients.

Of a total of 266 patients who returned questionnaires, significantly more patients who had received GA as an inpatient used the primary care services in the week following their operation than did those who had day case GA or LA (including sedation). This was most likely due to the relatively more difficult surgery in such cases rather than an effect of the anaesthetic.

Regarding the differences between LA and GA (day case and inpatient), the study reported that those patients who had received GA took significantly more days off work (mean 5.7 days) than those who had received LA (mean 2.9 days).

The study also showed that patients considerably underestimated the time they needed to recover from third molar surgery.

With the referring dentist now having to explain the risks involved with GA, along with the obvious factors, the patients should be advised that a significant break from work is likely to be needed for recovery.

### ADRENALINE IN CARDIAC PATIENTS

The Effect of Midazolam Sedation on Indicators for Myocardial Ischaemia. R. Middlehurst and P. Coulthard. *Oral Surgery Oral Medicine Oral Pathology Oral Radiology and Endodontics* 1999; **88:** 400-405.

These authors investigated the cardiovascular effects of adrenaline containing local anaesthetic solutions on a group of cardiac patients undergoing oral surgery procedures. An additional group also received intravenous sedation with midazolam.

Significant increases in the mean values for heart rate and blood pressure were recorded in these patients but the effects were minimized in the group of patients also receiving sedation. However, in neither of the groups of patients were the clinical effects of these observed cardiac parameters significant; there were no reports of coincident chest pain.

The authors conclude that the treatment of patients with cardiovascular disease should involve local anaesthesia with a vasoconstrictor such as adrenaline to ensure adequate anaesthesia and in some circumstances this should be coupled with elective conscious sedation. The authors also advocate monitoring of vital signs in this group of patients which means those patients more severely debilitated by their disease (ASA categories III and IV) would be more appropriately treated in a hospital environment.