

A Multi-Method Approach Investigating Incudo-Malleolar Joint Fusion Arising From A Possible Traumatic Injury

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CONTEXT

An adult skeleton was excavated from the site of a former chapel and cemetery, Tywyn y Capel (Anglesey), North Wales [1]

Radiocarbon dating estimated this to be an early medieval cemetery dating from 7th – 12th century AD [1]

Individual buried in a simple, earth dug grave in keeping with burial practices for this period / region [1]

Macroscopic observations were accompanied by radiologic and scanning electron microscope imaging to assess pathological changes and assist with developing differential diagnoses

INDIVIDUAL SK30 – PATHOLOGY PROFILE

- Age Estimation:
 - Brothwell Tooth Wear: mid-30s to mid-40s [2]
- Sex Estimation:
 - Cranium: Indeterminate / likely male [3,4]
 - Mandible: Indeterminate / likely male [3,4]
- Complete fusion of the left incus and malleus at the incudo-malleolar joint with a lack of erosive lesions [A]
- Well-healed fracture of the left mastoid process running supero-inferiorly [B]
- X-ray of mastoid process showed no signs of chronic mastoiditis / otitis media [5] [C]
- More pronounced digastric groove on left temporal bone [D]
- Fractured left styloid process in line with the vaginal process showing evidence of healing over time [E]
- Narrowing of the left ear canal supero-inferiorly [F], and pathological changes along the tympanic part [G]
- Changes to mandible:
 - Masseter muscle attachment site on the lateral surface of the mandible is more robust on the right side compared to the left
 - Ascending ramus breadth is more robust on the right side (8.2mm vs 7.4mm)
 - Condylar neck is thicker on the right side (6.3mm vs 5.6mm)

DISCUSSION

Ear ossicles are connected to each other through synovial joints and serve to transmit sound to the inner ear [6,7]

Fusion of ear ossicles is a rare occurrence with either a congenital or an acquired aetiology (e.g. traumatic injury to the skull) [8]

Our findings suggest the fusion of the individual's incudo-malleolar joint was due to a traumatic injury rather than chronic infection or congenital causes

Trauma resulting in middle ear ossicular chain disruption is likely to result in conductive hearing loss [7,9,10]

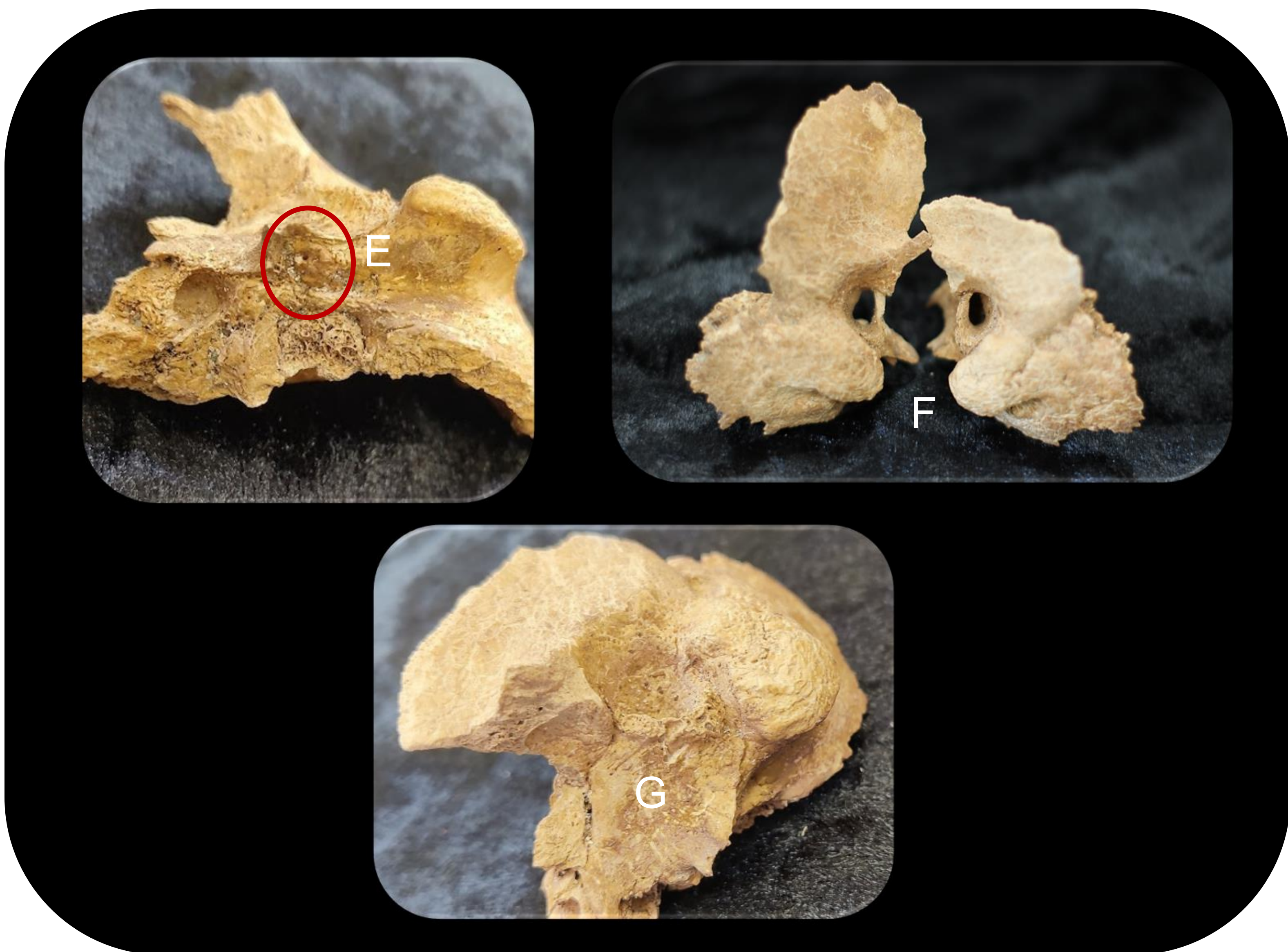
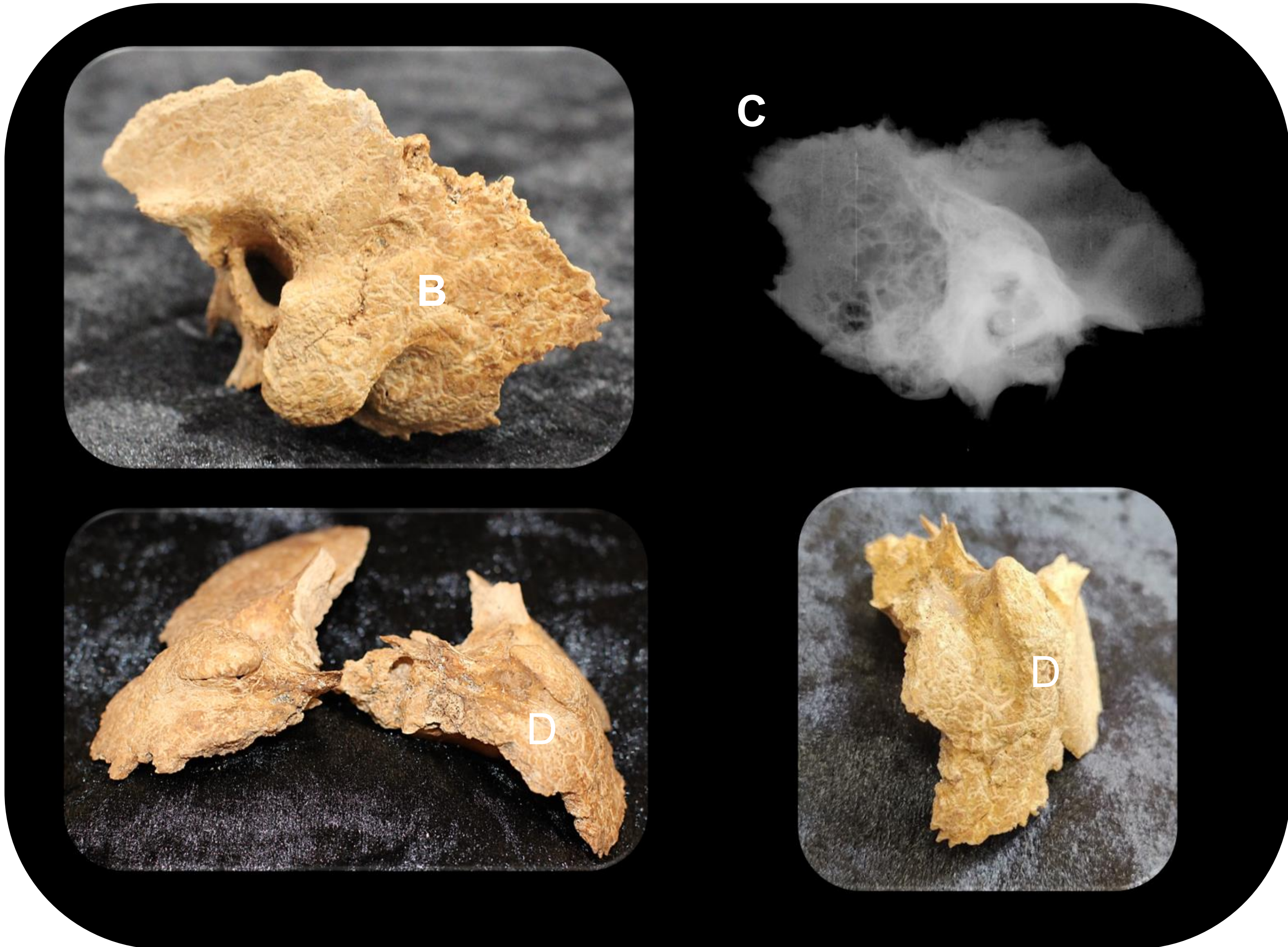
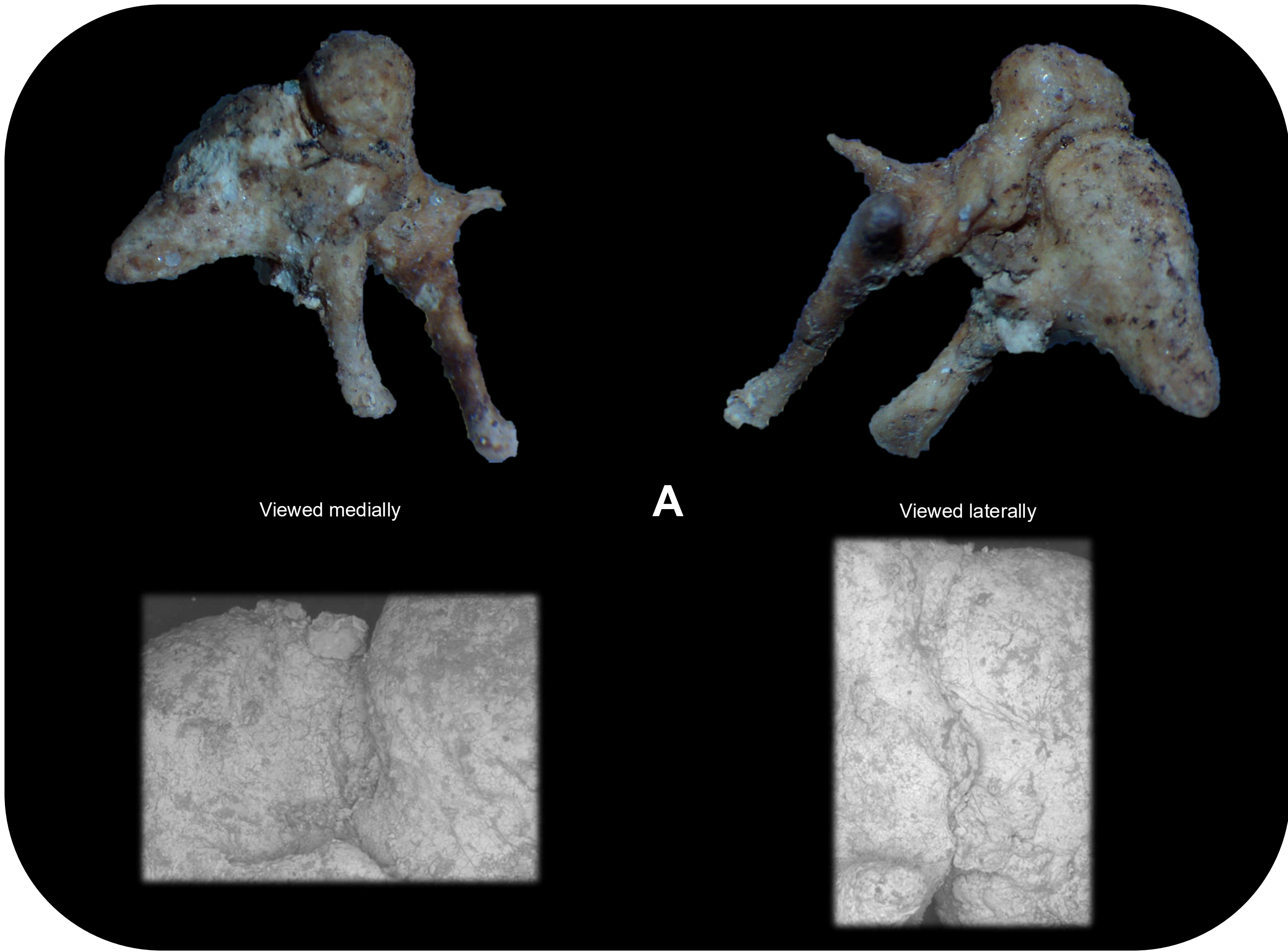
A supero-inferior fracture along the left mastoid process indicates trauma occurred to the left side of the head [9]

Fracture of the left styloid process likely impacted the stylo-mandibular ligament resulting in restricted mandibular movements on that side

Pronounced muscle attachments on the right mandibular ramus suggest muscle compensation following the trauma [11]

Presence of well-healed fractures suggests the trauma occurred at least 10-15 years before death [12 – 16]

Trauma likely resulted in partial or complete hearing loss on the left side which may have had significant consequences for this individual during later life



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Acknowledgements
Thanks to all the individuals who participated in the archaeological excavation and those who have supported all other aspects of the analysis to date. Thanks to Andrew Davidson and Gwynedd Archaeological Trust for providing access to the collection. Equipment was funded through an AHRC 'CapCo' grant awarded to K.A. Hemer (Ref: AH/V011529/1).
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