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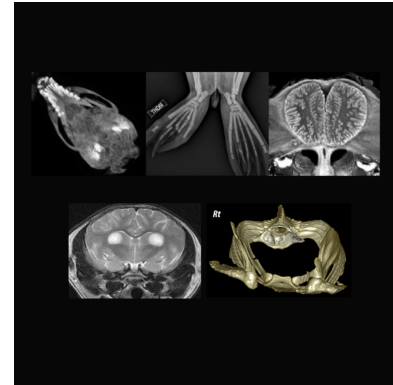
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IMAGING REPORT

Report ID: WCS_011213_MADAGASCAR_01

Report Date: January 12th 2013

Patient ID: N2008-0624-MAD308-Pe002

Study Date: June 23rd 2008

Study: High-resolution CT scans with bone reconstruction algorithms of the individual ears (removed from cadaver) are provided for review. Per the image DICOM meta-data accessed from the images provided, images are 0.5mm slice thickness acquired at 0.1mm increments. Additional MPR and 3D images are also available and further reconstructions were performed to aid evaluation.

History: Madagascar mass stranding of melon headed whales.

Imaging Findings:

Left ear:

The tympano-periotic complex is intact and has some residual surrounding soft tissues present. Occasional small, up to 0.9mm diameter mineralized structures are present within the peribullous soft tissues. A small volume of gas is present within the semicircular canal. There is no evidence of bone disruption observed. Wispy soft tissue attenuating tissues extends across the lumen of the middle ear. The tympanic bone is intact. The auditory ossicles are observed and are subjectively within normal limits for position. Compared to the contralateral side, there is roughening/irregularity, fissuring and lysis or malacia of the rostral aspect of the tympanic bone at the tympano-periotic suture.

Right ear:

The tympano-periotic complex is intact and some residual surrounding soft tissues are also present. There is a fissure through the medial aspect of the periotic bone with chronic fragmentation that is not present in the contralateral structure. Several closely associated fragments are present. The largest fragment is round and measures 2mm x 2.4mm. There is no evidence of displacement. All fragment margins are rounded and smooth. Gas is present within the semicircular canals. The middle ear contains both gas and soft tissue attenuating material. The auditory ossicles are observed and are subjectively within normal limits. Several small round to linear mineral attenuating structures are observed within the surrounding tissues that remain attached to the tympano-periotic complex.

Diagnostic Interpretation:

Mineralizations within peribullar soft tissues Ddx: Otoliths, parasitic granulomata, dystrophic mineralization or bone fragments associated with dissection.

Right periotic bone chronic fragmentation Ddx: historical damage vs. developmental abnormality.

Semicircular canal gas Ddx: secondary to dissection vs. cavitation vs. decomposition vs. de novo formation.

This report is based on DICOM metadata embedded in the images, diagnostic imaging findings observed from the images and available history, and not on a physical examination or direct observation of the patient or tissues. All findings described must be interpreted alongside other available data including physical examination and histology data. Report generated January 12th 2013.

Rostral left tympanic bone chronic lysis/malacia with fissuring and irregular margination is suggestive of low grade, chronic inflammation.

Comments:

The findings observed are all considered chronic in nature and a definitive cause for the stranding of this individual has not been determined. Correlation with gross and histological examination of the aural structures is needed.



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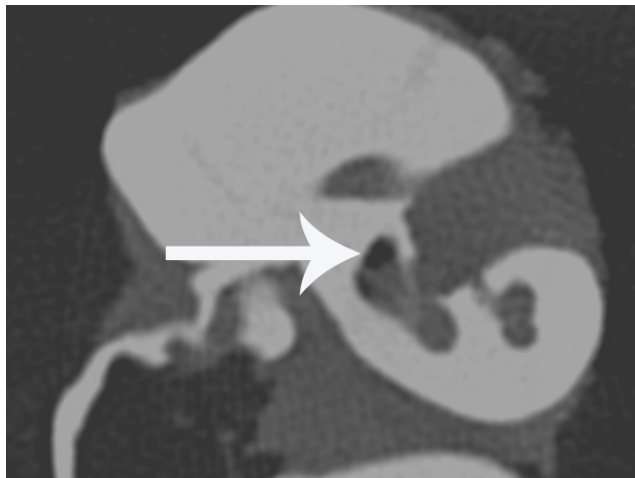


Figure 1: There is gas within the semicircular canal (arrow).

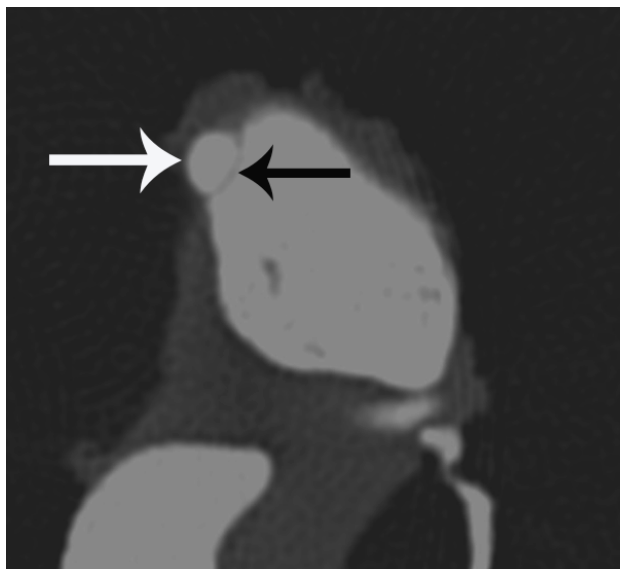


Figure 2: There is fissuring and fragmentation of the medial aspect of the periotic bone. The fragment margins are rounded and smooth, and this is considered chronic.

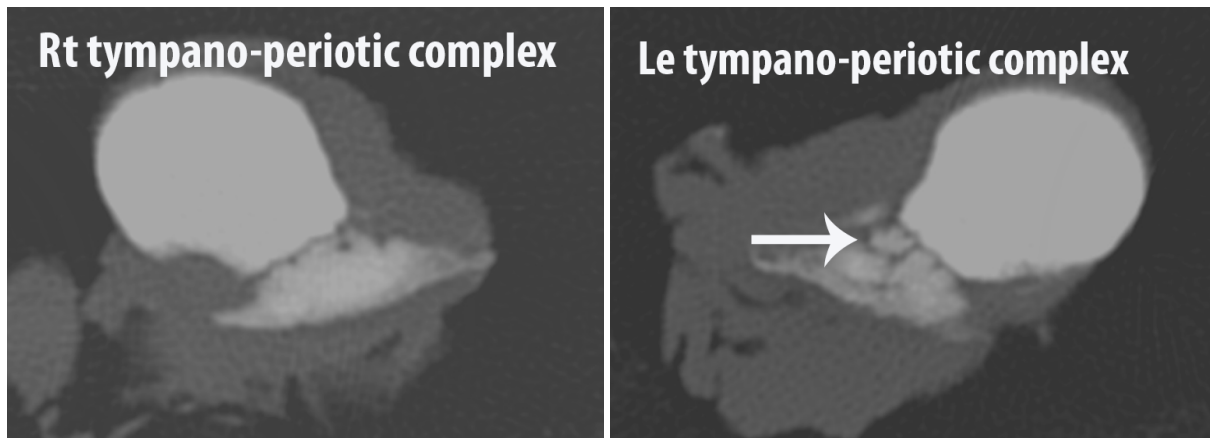


Figure 3: The difference between the rostral aspects of the tympanic bones is shown with irregularity, fissuring and decreased attenuation on the left (arrow) compared to the right.

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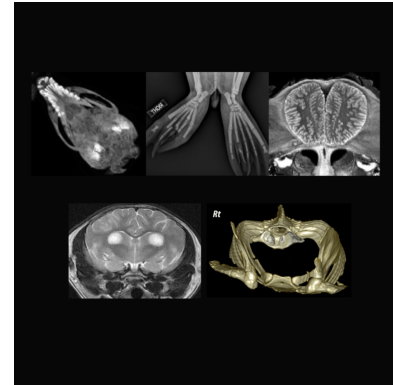
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IMAGING REPORT

Report ID: WCS_011213_MADAGASCAR_02

Report Date: January 12th 2013

Patient ID: N2008-0623-MAD308-Pe001

Study Date: June 23rd 2008

Study: High-resolution CT scans with bone reconstruction algorithms of the individual ears (removed from cadaver) are provided for review. Per the image DICOM meta-data accessed from the images provided, images are 0.5mm slice thickness acquired at 0.1mm increments. Additional MPR and 3D images are also available and further reconstructions were performed to aid evaluation.

History: Madagascar mass stranding of melon headed whales.

Imaging Findings:

Left ear:

The tympano-periotic complex is intact. Some surrounding soft tissues remain adhered/attached to the complex and are included in the study. There is a very small, linear defect in the most caudal aspect of the periotic bone that extends to the surface and is not seen in the contralateral structure. The medial surface of the periotic bone is mildly irregular. Several small, less than 1mm diameter, mineral fragments are observed within the peribullous soft tissues. The semicircular canal contains a small volume of gas. The tympanic bone is normal. The auditory ossicles are seen and are subjectively within normal limits.

Right ear:

The tympano-periotic complex is intact. Some surrounding soft tissues remain attached to the complex. Occasional linear to round mineralized fragments are seen within the surrounding soft tissues. The medial surface of the periotic bone is mildly irregular and this observation, seen also on the contralateral side, is slightly more advanced than the contralateral side. The auditory ossicles are seen and are subjectively normal.

Diagnostic Interpretation:

Peribullous mineral fragments Ddx: parasitic granulomata, dystrophic mineralization, bone fragments secondary to dissection.

Defect in the caudal left periotic bone is considered most likely an artifact of dissection based on the location and lack of associated changes.

Roughening of the periotic bone surface Ddx: secondary to surrounding low-grade inflammation vs. age-related variant.

Left semicircular canal gas Ddx: artifact of dissection vs. decomposition vs. de novo formation.

Comments:

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A definitive cause for the stranding of this patient has not been determined. The observed abnormalities are all chronic in nature, or suspected to be dissection artifact. Correlation with histological evaluation is needed to confirm the likely significance.



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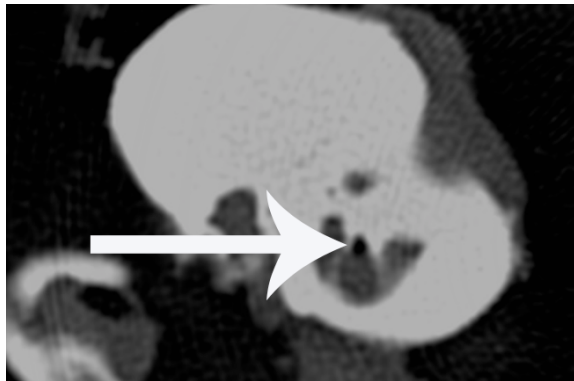


Figure 1: There is gas within the semicircular canal (arrow) of the left inner ear.

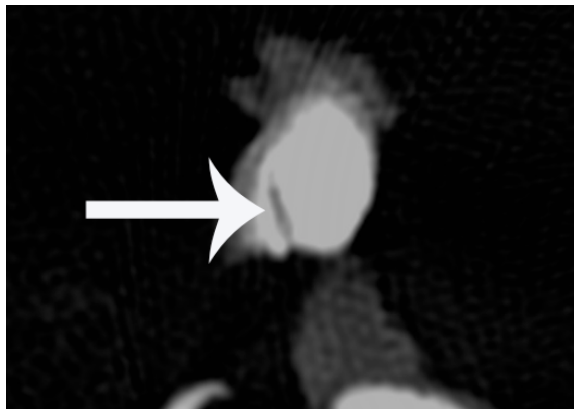


Figure 2: The defect in the caudal aspect of the left petriotic bone is shown (arrow).

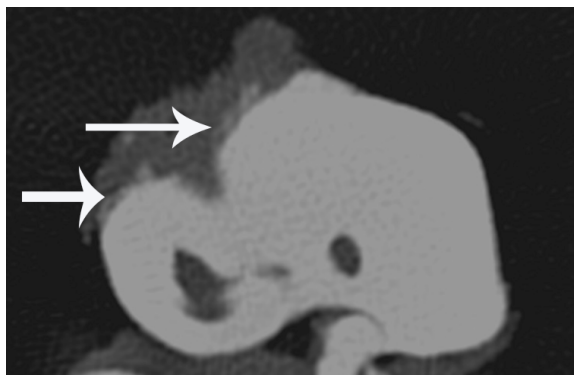


Figure 3: The irregular surface of the right petriotic bone is shown (arrows).

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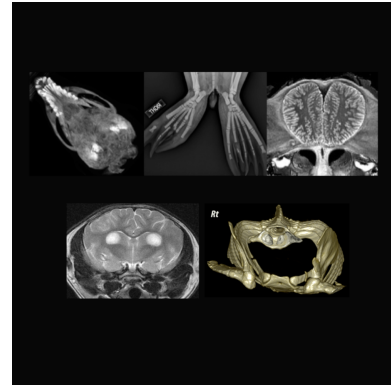
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IMAGING REPORT

Report ID: WCS_011213_MADAGASCAR_03

Report Date: January 12th 2013

Patient ID: N2008-0625-MAD308-Pe003

Study Date: June 23rd 2008

Study: High-resolution CT scans with bone reconstruction algorithms of the individual ears (removed from cadaver) are provided for review. Per the image DICOM meta-data accessed from the images provided, images are 0.5mm slice thickness acquired at 0.1mm increments. Additional MPR and 3D images are also available and further reconstructions were performed to aid evaluation.

History: Madagascar mass stranding of melon headed whales.

Imaging Findings:

Left ear:

The tympano-periotic complex is intact and some peribullous soft tissues remain attached to the complex. The middle ear is partially filled with fluid, based on the meniscus present at the interface between the material and a gas bubble. Both the periotic bone and the tympanic bone have regions of surface irregularity that are chronic in appearance. Small mineral fragments that are mostly round in shape are seen both within the middle ear soft tissues and the residual peribullous soft tissues. The auditory ossicles are seen and are subjectively normal.

Right ear:

The tympano-periotic complex is intact and some residual peribullous soft tissues are present. There are three subtle fissure lines observed coursing at different levels through the medial tympanic bone. There is no evidence of displacement at any site and these are not seen on the contralateral side (or in other studies provided). There is no evidence of adjacent lysis however sclerosis is difficult to assess due to the very hyperattenuating nature of the bone. The middle ear is partially filled with soft tissue attenuating material and air. There is no fluid line evident, unlike the contralateral side. There is the impression of similar periotic and tympanic bone surface roughening compared to the contralateral side. A small amount of gas is present within the semicircular canal. The auditory ossicles are seen and are subjectively within normal limits.

Diagnostic Interpretation:

Left middle ear fluid Ddx: formaldehyde vs. bodily fluid (ante-mortem vs. post-mortem).

Right tympanic bone fissures without displacement Ddx: trauma vs. artifact of dissection.

Peribullous soft tissue mineralizations Ddx: parasitic granulomata, dystrophic mineralization vs. but less likely given the distribution, contamination with bone fragments from dissection.

Tympanic and periotic bone surface roughening Ddx: secondary to adjacent low-grade inflammation vs. age-related changes or normal variant.

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Right semicircular canal gas Ddx: artifact of dissection, decomposition, de novo formation.

Comments:

The fissure lines through the right tympanic bone are interesting in this study, however they are interpreted with caution given that the ears were dissected prior to imaging. Correlation with histological examination to determine if these occurred ante or post mortem is needed. Sampling of the fluid contained within the middle ear is needed to determine its significance. It is possible that it is either formalin or fluids secondary to dissection/autolysis but hemorrhage or other clinically significant fluid (inflammatory/purulent) cannot be ruled out based on imaging alone particularly given the time between death and scanning. There is no evidence of associated tympanic bone changes.



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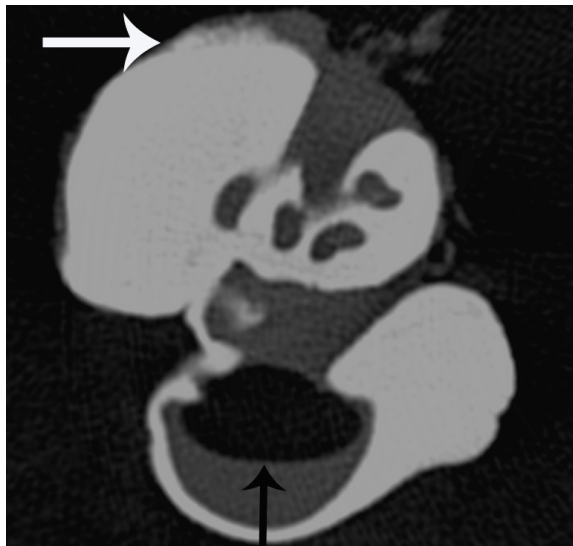


Figure 1: The periotic surface irregularity is shown (white arrow). The fluid line within the middle ear (black arrow) is seen.

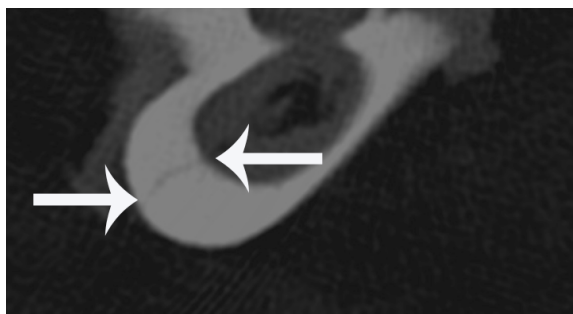


Figure 2: A fissure line is seen coursing through the right temporal bone (between arrows). There is no displacement observed.

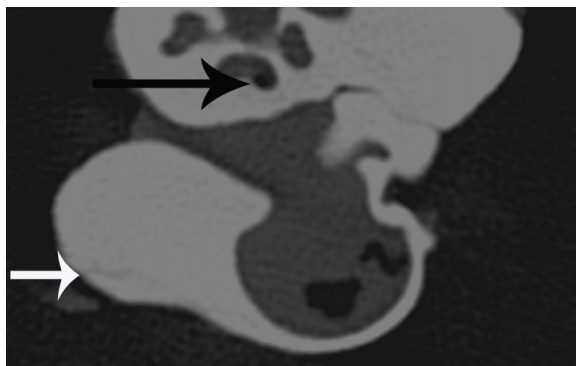


Figure 3: Another subtle fissure line is suspected (white arrow) within the tympanic bone. A small amount of gas is present within the semicircular canal (black arrow).

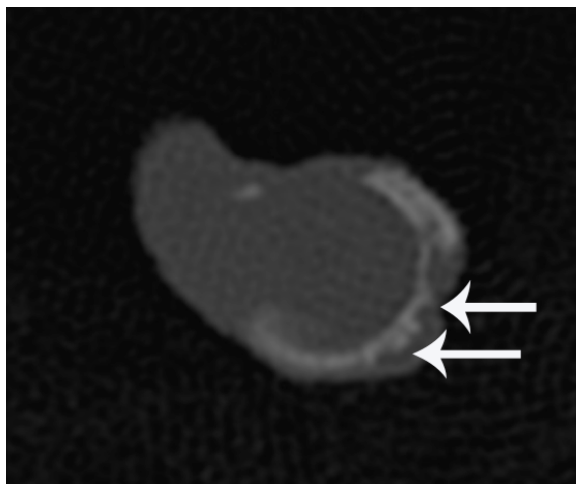


Figure 4: The irregular surface of the tympanic bone (arrows) is shown.

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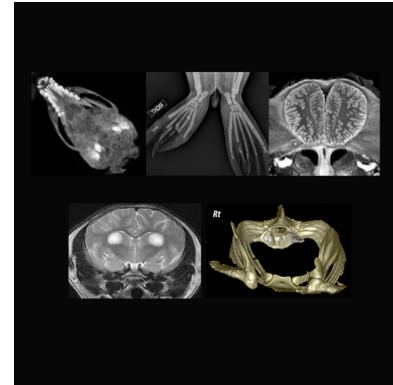
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IMAGING REPORT

Report ID: WCS_011313_MADAGASCAR_04

Report Date: January 13th 2013

Patient ID: N2008-0626-MAD108-Pe003

Study Date: June 23rd 2008

Study: High-resolution CT scans with bone reconstruction algorithms of the individual ears (removed from cadaver) are provided for review. Per the image DICOM meta-data accessed from the images provided, images of the right periotic bone and the left tympano-periotic complex are 0.5mm slice thickness acquired at 0.1mm increments. The right tympanic bone is separate from the periotic bone and has been imaged separately with 0.5mm slice thickness at 0.5mm increments. MPR and 3D images are also available and further reconstructions were performed to aid evaluation.

History: Madagascar mass stranding of melon headed whales.

Imaging Findings:

Left ear:

There is separation of the tympanic and periotic bones with displacement and relative rotation between these structures. Some residual attached peribullous soft tissues are present. Using reconstructions, separation of the periotic and tympanic bones near but not entirely through the suture is suspected with fragments of both tympanic and periotic bone associated with each part. Several fractures of the tympanic bone are seen. The ends of the fractures are sharp and there is no obvious evidence of bone remodeling or callus formation observed. Evaluation for adjacent sclerosis is difficult due to the hyperattenuating nature of these bones. The auditory ossicles are present and are abnormal in position, primarily due to the fractures present. A small volume of gas is present within the semicircular canals. Several small, mineralized fragments are present within the peribullous soft tissues.

The right tympanic and periotic bone have separated at the suture line and were scanned individually, thus are reported separately.

Right periotic bone:

The semicircular canal is within normal limits. Not all the auditory ossicles have been accounted for although the stapes is present and in situ. The incus and malleolus are not specifically identified. Mineralized fragments that are larger than seen in other studies are seen in the surrounding soft tissues, and may represent fragments of the incus and malleolus. The surface of the periotic bone is irregular and roughened.

Right tympanic bone:

Several fractures are present within the tympanic bone with displacement. The margins of the fractures are sharp. There is no obvious evidence of remodeling or callus formation. Sclerosis adjacent to the fracture margins cannot be evaluated accurately due to the hyperattenuating character of the bones. A fissure line is also present that traverses the tympanic bone perpendicular to the surfaces of the bone.

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Diagnostic Interpretation:

Bilateral tympano-periotic separation. Determination of pathological separation vs. artifact of dissection has not been determined.

Bilateral multiple tympanic bone fractures. Determination of ante- or post mortem trauma has not been determined.

Left semicircular canal gas Ddx: artifact of dissection vs. decomposition or de novo formation.

Right periotic bone irregular margins Ddx: secondary to surrounding soft tissue inflammation vs. age-related changes or normal variant.

Comments:

Trauma to both tympano-periotic complexes is present however determination of when that trauma occurred (pre vs. post mortem) has not been determined. Correlation with histological examination results is needed to determine the significance of these findings.



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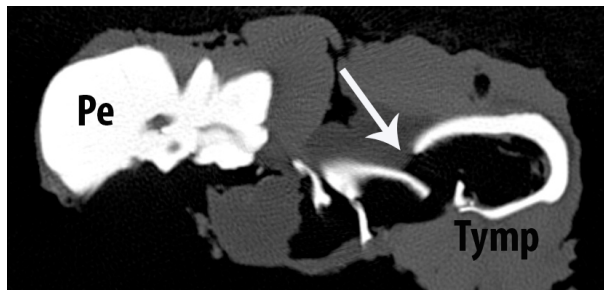


Figure 1: The left tympano-periotic complex is separated. Pe = periotic bone, Tymp = tympanic bone. There is fracture of the tympanic bone shown (white arrow).

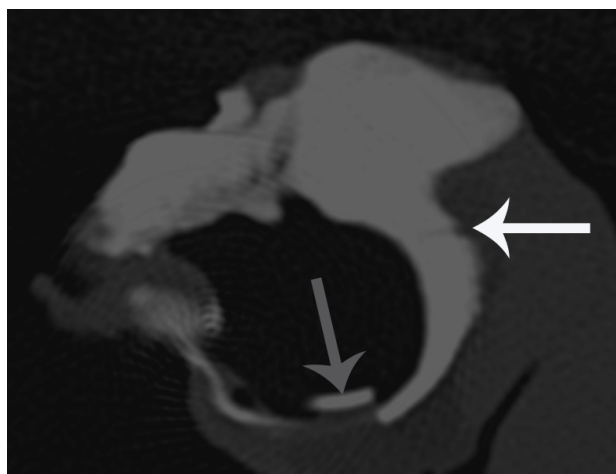


Figure 2: There is a fissure line through the right tympanic bone (white arrow) and a fracture (grey arrow) is also shown.

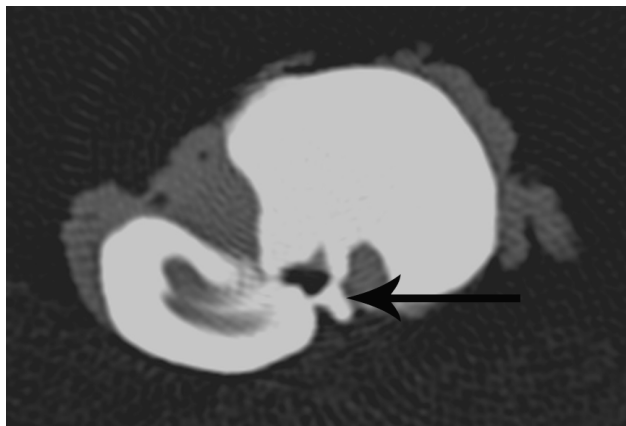


Figure 3: The right stapes is in a subjectively normal position, although the other auditory ossicles are not specifically identified.

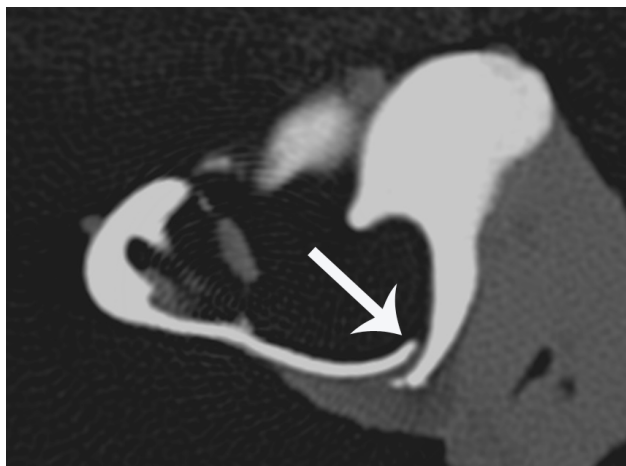


Figure 4: Another fracture of the right tympanic bone is shown (arrow). The margins are sharp. There is no evidence of callus formation or remodeling.

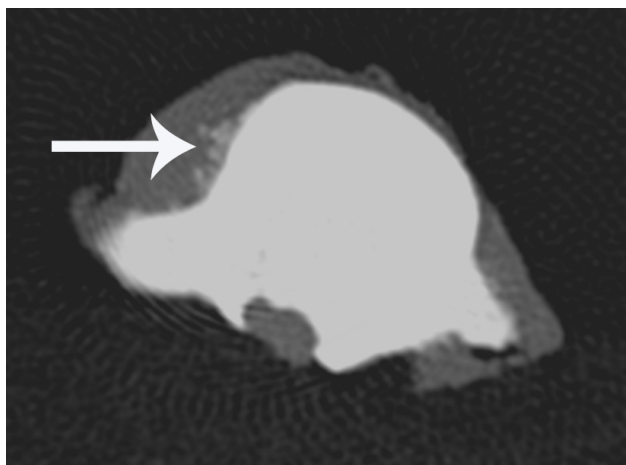


Figure 5: The right periotic bone has an irregular margin (arrow).