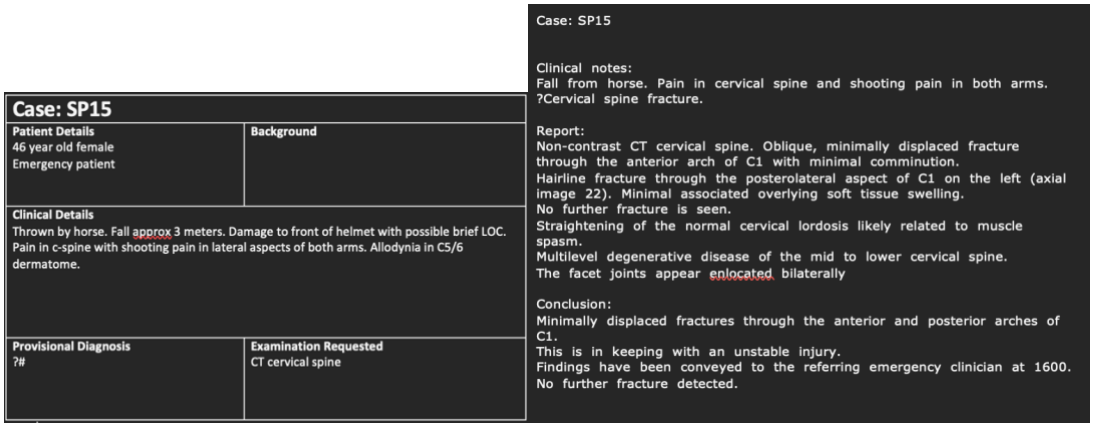

Case: SP15

Patient Details	Background
46 year old female Emergency patient	

Clinical Details
Thrown by horse. Fall approx 3 meters. Damage to front of helmet with possible brief LOC. Pain in c-spine with shooting pain in lateral aspects of both arms. Allodynia in C5/6 dermatome.

Provisional Diagnosis	Examination Requested
?#	CT cervical spine

Case: SP15

Clinical notes:
Fall from horse. Pain in cervical spine and shooting pain in both arms.
?Cervical spine fracture.

Report:
Non-contrast CT cervical spine. Oblique, minimally displaced fracture through the anterior arch of C1 with minimal comminution.
Hairline fracture through the posterolateral aspect of C1 on the left (axial image 22). Minimal associated overlying soft tissue swelling.
No further fracture is seen.
Straightening of the normal cervical lordosis likely related to muscle spasm.
Multilevel degenerative disease of the mid to lower cervical spine.
The facet joints appear enlocated bilaterally

Conclusion:
Minimally displaced fractures through the anterior and posterior arches of C1.
This is in keeping with an unstable injury.
Findings have been conveyed to the referring emergency clinician at 1600.
No further fracture detected.

1. Methods for the image acquisition based upon a thorough analysis of the radiological request form.

The doctor has referred the patient to get a cervical spine CT scan as the patient has fallen from a horse from a 3m height. She may have experienced a brief loss of consciousness (LOC) and currently has pain extending from her cervical spine down across both arms. She is also experiencing pain in her C5/C6 dermatome in response to sensations that do not normally elicit pain (Whitman et al. 2023). This may be due to a fracture that has caused nerve damage to the sensory nerves that supply the radial side of the upper arm, forearm, and thumb. in this case, a non-contrast CT is sufficient to show any associated bone injuries. The patient should lie supine and headfirst in the scanner with arms to her side. Given that the patient suffered from LOC, the patient should be assessed for any head injury that may have occurred during the fall. Usually for trauma imaging, we should image from the EAM down to the T3 vertebra. Soft tissue and bone algorithm MPRs can then be reconstructed.

2. Provide a written description of the **typical CT appearances** of the **disease process** under investigation.

The patient also has multilevel degenerate disease in her mid to lower C spine which may explain the allodynia in her C5/C6 dermatome. This appears as a deterioration and erosion of cervical discs between the vertebrae. The patient also has two fractures on her C1 vertebrae, one on the anterior arch that has shattered into few pieces and is minimally displaced from its original orientation, and another on the posterolateral side that appears to be a thin, hair-like division. As both sides of the arch are fractured this injury will be categorized as unstable. All unstable injuries risk the likelihood of the deformity getting worse if no action is taken to fix the issue, with higher levels of instability meaning there may be potential damage to nerves (Strømsøe K. (1992). There is also soft tissue swelling which appears as enlargement and fluid absorption of the neck soft tissue. Typically fractures of the C1 vertebral arch are specifically called Jefferson fractures and are often associated with odontoid fractures too Mohile et al. (2023).

3. Explain the **importance** of **CT imaging** in the **disease process** under investigation.

CT is far better than X-ray when it comes to detecting small fractures such as hairline fractures. Another study found 64 fractures in a group of cervical trauma patients and then conducted a CT exam to find 71 more minor fractures that could not be seen on the X-rays even in retrospect (Acheson et al. 1987). According to Fotakopoulos et al. (2022), CT has a sensitivity of 98% and rarely misses spinal fractures. To obtain more detail regarding soft tissue injuries and neurological status an MRI could be utilised. CT has the ability to define

the position of fracture fragments in relation to the spinal canal which is extremely crucial to ruling out the risk of nerve damage in trauma patients. Mead et al. (2016), states that C1 fractures are harder to see on X-rays and do not usually cause neurological issues because fracture fragments typically spread out further from the spinal canal.

4. Review fine slice image data on the Siemens Syngo.Via Workstation, identify and describe any abnormalities present in the images.

Figure 1. Shows the hairline fracture of the posterolateral aspect of the C1 arch.

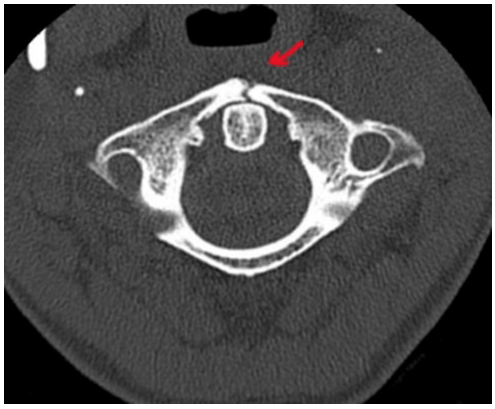

Figure 2. Shows the fracture of the anterior C1 arch.

Figure 3. Here we can see the minimal comminution of the C1 anterior arch fracture.

Figure 4. Shows the mild degenerated C5/C6 disc. The C6/7 vertebra also had a degenerated disc (not shown here).

Figure 5. Shows the straightened cervical spine that does not have its natural lordotic curve.

References

Acheson, M. B., Livingston, R. R., Richardson, M. L., & Stimac, G. K. (1987). High-resolution CT scanning in the evaluation of cervical spine fractures: comparison with plain film examinations. *AJR. American journal of roentgenology*, *148*(6), 1179–1185. https://doi.org/10.2214/ajr.148.6.1179

Fotakopoulos, G., Brotis, A. G., & Fountas, K. N. (2022). Magnetic Resonance Imaging in Cervical Spine Trauma: More Than Soft Tissue Illustration. *Cureus*, *14*(1), e21493. https://doi.org/10.7759/cureus.21493

Mead, L. B., 2nd, Millhouse, P. W., Krystal, J., & Vaccaro, A. R. (2016). C1 fractures: a review of diagnoses, management options, and outcomes. *Current reviews in musculoskeletal medicine*, *9*(3), 255–262. https://doi.org/10.1007/s12178-016-9356-5

Mohile, N. V., Kuczmarski, A. S., Minaie, A., Syros, A., Geller, J. S., & Maaieh, M. A. (2023). Management of combined atlas and axis fractures: a systematic review. *North American Spine Society journal*, *14*, 100224. https://doi.org/10.1016/j.xnsj.2023.100224

Strømsøe K. (1992). Instabile ryggskader. Retningslinjer for behandling [Unstable spinal injuries. Guidelines for treatment]. *Tidsskrift for den Norske laegeforening : tidsskrift for praktisk medicin, ny raekke*, *112*(10), 1282–1286.

Whitman PA, Launico MV, Adigun OO. (2023). Anatomy, Skin, Dermatomes. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2024 Jan-. Available from: https://www.ncbi.nlm.nih.gov/books/NBK535401/