

## Definition

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### ► Epidemiology

Accounts for approximately 46% of cervical spine injuries.

### ► Etiology, pathophysiology, pathogenesis

Results from maximum flexion of the cervical spine • Maximum extension of posterior vertebral elements and compression of anterior elements • Often associated with anterior disk herniation.

The most important types of flexion fracture are:

*Anterior wedge fracture:* Least severe form of flexion injury • Avulsion of a fragment from the anterior margin of the superior endplate with an intact posterior margin • Higher energy trauma will produce a wedge vertebra and may involve the posterior margin.

*Teardrop fracture:* A triangular fragment resembling a teardrop is avulsed from the anteroinferior aspect of the vertebral body in flexion • This is usually combined with a tear in the posterior longitudinal ligament • Although the posterior margin is not affected, the injury is unstable • Often a cause of paraplegia • Occurs in the lower cervical spine (C5) in 70% of cases.

*Anterior subluxation or dislocation:* Tearing of the posterior ligament complex or avulsion of the ligament from the vertebral body causes one vertebra within a segment to tilt anteriorly relative to the adjacent caudal vertebra • Stability depends on the severity of the angulation and translation.

## Imaging Signs

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### ► Modality of choice

Multislice CT

- Slice thickness in the cervical spine 1 mm to maximum 3 mm with sagittal reconstructions.
- Where spinal cord injuries or injuries to the ligament complex are suspected. MRI.

### ► Radiographic findings

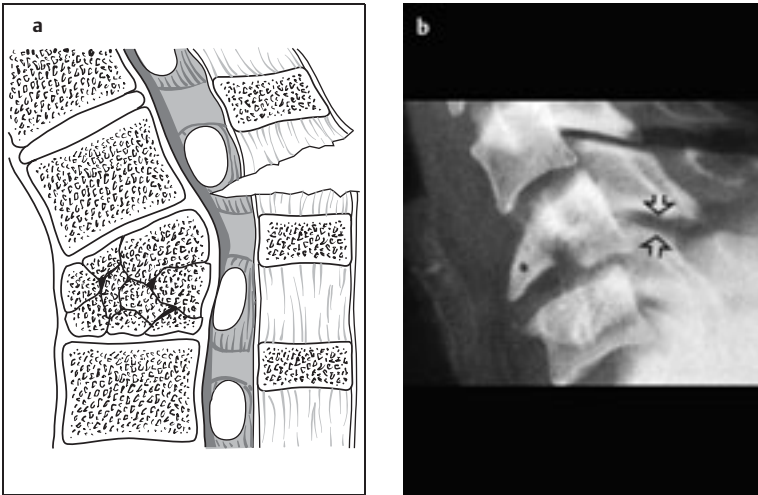
Compression of the vertebral body • Disrupted alignment • Prevertebral soft tissue swelling (normal appearance of soft tissue does not exclude a fracture) • Avulsion of the anterior margin of the superior endplate in an anterior wedge fracture • Avulsion of the anterior margin of the inferior endplate in a teardrop fracture • In anterior subluxation or dislocation, one vertebral body is tilted anteriorly, opening a gap between the spinous processes and causing incomplete articulation of the facet joints. The subluxed vertebra may be displaced anteriorly.

### ► CT findings

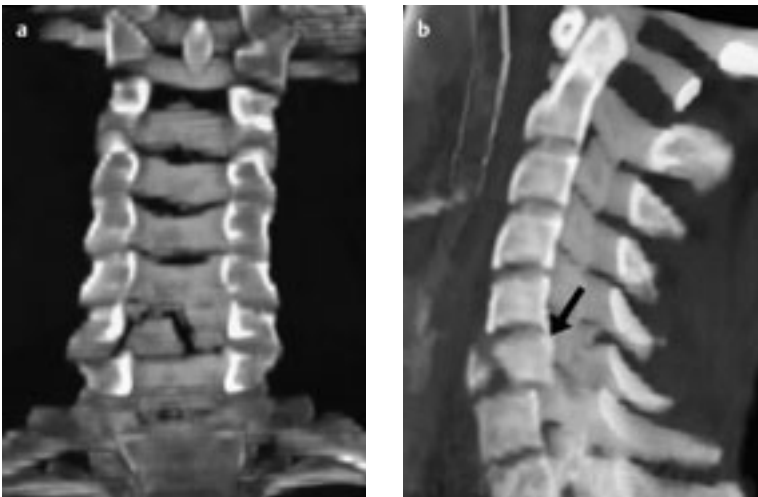
The signs seen on conventional radiographs are also visualized on CT, although with far greater sensitivity • Sagittal reformations are helpful.

### ► MRI findings

T1-weighted, T2-weighted STIR: The fracture and degree of displacement are visualized • Integrity of the ligament complex can be evaluated • Spinal cord edema and/or bleeding are visualized.



**Fig. 2.8 a, b** Schematic diagram (a). Anterior wedge fracture with rupture of the posterior longitudinal ligament, spinal canal stenosis, and spinal cord compression. Conventional lateral radiograph of the cervical spine (b). Teardrop fracture with widening of the facet joint space.



**Fig. 2.9 a, b** CT of the cervical spine (a coronal and b sagittal, volume-rendered). Teardrop fracture of C6 with posterior displacement of the vertebral body. To better visualize the injury, the respective slices anterior to the imaging plane have been cut away.

### Clinical Aspects

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– **Typical presentation**

Trauma consistent with imaging findings • Severe neck pain • Neurologic symptoms may or may not be present.

– **Complications**

Spinal cord injuries with distal neurologic symptoms.

– **Therapeutic options**

Depends on the neurologic symptoms and degree of injury • Halo fixator is indicated in the absence of neurologic symptoms • Immediate decompression is indicated where neurologic symptoms and spinal cord compression are present.

### Selected References

- Burke JT, Harris JH. Acute injuries of the axis vertebra. *Skel Radiol* 1989; 18: 335–446
- Galanski M, Wippermann B, Stamm G, Bazak N, Wafer A. *Kompendium der traumatologischen Röntgendiagnostik*. Berlin: Springer 1999