50 Years Ago in CORR

X-ray Projections of Anatomic Structures in the Cervical and Lumbar Vertebrae

Raymond G. Tronzo MD CORR 1960;16:249–263

In contrast to the long bones, the spine consists of complex anatomic shapes. On plain radiographs, all three-dimensional shapes are projected, so that unrelated features will be superimposed and create

images that may be confusing to interpret. The well-known “teardrop” on an anteroposterior projection of the pelvis is, in fact, a projection of the superior margin of the obturator foramen and the inner and outer tables of

the pelvis. An example from the spine is the well-known, “Scottie dog” sign in which the “neck” is “broken” in the case of a defect of the pars interarticularis; the dog, however, is not an anatomic reality, but rather reflects

Fig. 3 Lateral view cervical vertebrae. (Reprinted with permission and ©Lippincott Williams and Wilkins, from Tronzo G. X-ray projections of anatomic structures in the cervical and lumbar vertebrae. *Clin Orthop Relat Res.* 1960;16:249–263.)

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superimposed unrelated shadows. Sometimes these projected images may give the impression of abnormalities (eg, lytic lesions) that in fact do

not exist. Tronzo, in 1960, recognized the difficulty of interpreting these planar projections from the spine [1]. He obtained dry bone specimens of the

cervical and lumbar spines and painted key features with a lead-based paint to make them more apparent on the radiographs. He commented, “It was

Fig. 4 Lateral view cervical vertebrae. (Reprinted with permission and ©Lippincott Williams and Wilkins, from Tronzo G. X-ray projections of anatomic structures in the cervical and lumbar vertebrae. *Clin Orthop Relat Res.* 1960;16:249–263.)

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impractical to differentiate the finer details of the vertebrae because they appeared as superimposed shadows that were of little clinical value. Therefore, in some areas, only the gross parts were outlined by the lead paint.” By comparing the bony

specimens with the correlating radiographs, he was able to label all major structures as they appeared on the radiographs (Figs. 3 and 4). He also noted a case of a fracture-subluxation of C2 (Fig. 13), where “an experienced radiologist...(interpreted the

image)...as a ‘fracture through a cyst of C2.’ The cyst is the transverse foramen of C2, which appears as an avoid radiolucency on roentgenograms. It does not always show up on lateral roentgenograms unless C2 itself is set perpendicular to the x-ray cone.

Fig. 13 Fracture through pars of C-2 with subluxation of the body. (Reprinted with permission and ©Lippincott Williams and Wilkins, from Tronzo G. X-ray projections of anatomic structures in the cervical and lumbar vertebrae. *Clin Orthop Relat Res.* 1960;16:249–263.)

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Such a condition would happen by chance.” He notes other situations where apparent cystlike defects could be misinterpreted as Schmorl’s nodes. Even today, Tronzo’s article provides an excellent reference for those interpreting plain radiographs of the spine

and makes a key point of the need for understanding detailed anatomy when interpreting such images.

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References

1. Tronzo RG. X-ray projections of anatomic structures in the cervical and the lumbar vertebrae. *Clin Orthop Relat Res.* 1960;16:249-263.

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