Vertebral fractures and VFA by DXA image description

Osteoporosis is a common bone disease affecting almost one in two women and one in five men. It can lead to fractures; with vertebral fractures occurring most frequently in older people. These fractures are difficult to diagnose and are often only discovered when the spine is imaged. A clinical assessment of vertebral fracture status can be performed using dual energy x-ray absorptiometry (DXA). This approach is known as vertebral fracture assessment (VFA).

**VFA by DXA images:** The following figure shows typical lateral (left) and posterior-anterior (right) scan images, which are the clinical standard for vertebral fracture assessment (VFA) by dual energy x-ray absorptiometry (DXA). They have been acquired with a Hologic Discovery A DXA scanner using the Instant Vertebral Assessment (IVA) scan option. Typical VFA images have a resolution of between 1 and 0.35 mm. This following figure has been acquired from an individual with no vertebral fractures.

For the “Automatic vertebral fracture analysis and identification from VFA by DXA” challenge, the three training and testing datasets will consist of pairs of lateral and posterior-anterior VFA scan images. For convenience, these images will be provided in bmp and vtk formats.
**Osteoporotic vertebral fractures**: In contrast with trauma fractures, osteoporotic fractures typically affect the vertebral body. Depending on the fracture morphology, they can be classified into three types: Concave, Wedge and Crush. The following spine radiograph images illustrate these three types of vertebral fracture.

The following figure presents examples of vertebral fractures imaged using VFA by DXA.
Non-fracture deformities: The major challenge encountered during the vertebral fracture assessment process is to determine whether deviations in the size and shape of vertebrae are due to true fractures or are simply non-fracture deformities.

Non-fracture deformities are due to normal anatomical variation in vertebral size and shape and are commonly observed in the general population. The following figure shows an example of a non-fractured vertebra with short anterior height (imaged using plain radiography (left)) and a lateral VFA image of several consecutive vertebrae with short vertebral height (right).
The following figure presents plain radiograph images of some other non-fracture deformities include Scheuermann’s disease (left) and Cupid’s bow (right).