

### 3D VOLUMETRIC IMAGING UNDER WEIGHT-BEARING CONDITIONS: *WORKS IN PROGRESS IMPROVING ORTHOPAEDIC DIAGNOSIS & TREATMENT*

Great strides have been made in imaging technology in the past two decades, resulting in very detailed anatomical images; yet few techniques are available to image anatomy in three dimensions (3D) while a patient remains standing or sitting upright. It is often only during these weight-bearing conditions that orthopaedic problems reveal themselves. A unique aspect of the **Philips Medical Systems'** (Bothell, WA) **MultiDiagnost Eleva**, a multi-purpose X-ray system, is its ability to make a 180° rotational isocentric scan of the anatomy. By utilizing special software developed and currently being evaluated by Philips, this system can acquire and reconstruct 3D volume images taken with the patient in an upright, weight-bearing position.

Philips has teamed with Royal Columbian Hospital (New Westminster, BC, Canada) to develop this innovative 3D technology. Several sites are currently evaluating it for clinical application in orthopaedic diagnosis and treatment. Brad Halkier, MD, Associate Director of Medical Imaging, Royal Columbian Hospital, finds this is a wonderful tool. "The 3D weight-bearing views are really good because they allow you to see exactly what's going on in the joint with the patient in the position in which they use the joint. This technique allows us to take a CT scan-like picture instead of just a snapshot and it allows much clearer visualization of the structure." Dr. William Siu, MD, Royal Columbian Hospital, agrees. "We can examine joints

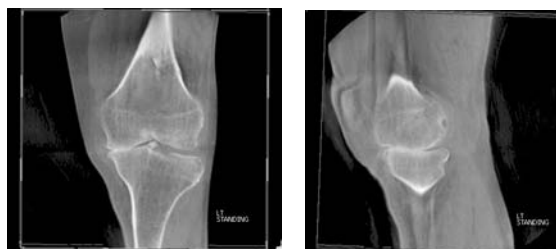
under physiologic stresses, in particular weight-bearing, which will allow for better understanding of the pathology of the problem and better treatment planning."

#### **Case1: Weight-Bearing Knee**

The following patient had pain complaints originating from the knee;



Patient supine



Patient upright

As explained by Dr. Siu, "The upright volume clearly demonstrates the change in joint space compared to the standard frontal and lateral X-ray views. With the stacked views as shown, cross-sectional detail of the bony anatomy is now possible with weight-bearing." Dr. Halkier remarked that "most joint assessments are done with normal X-rays, and often the beam is not going directly through the joint, so on a plain film you do not get a good idea of what is going on. A disadvantage with a CT or MR scan is that they

cannot be performed in a weight-bearing situation—ever. With this 3D technique, however, you can evaluate the image from a weight-bearing position and it may show entirely different things, as this case does.”

### ***Case 2: Cervical Extension and Flexion***



Cervical Flexion

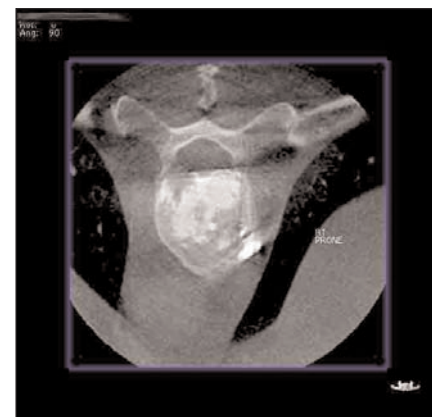


Cervical Extension

A frequent procedure is a check-up of the cervical spine after trauma to assess alignment of the vertebra. Compared with a normal



Post op 3D assessment of a vertebroplasty procedure



lateral X-ray view, the lateral slice of the 3D volume seems to visualize the C7-T1 level better and allow better assessment of facets. Dr. Sui points out that “this technique allows for cross-sectional imaging with the patient undergoing full flexion and extension range of motion, which is not possible with other modalities.” Dr. Halkier further notes that “because we can very quickly take a lot of images from many angles, we can take sequential images with the patient bending in certain ways. This will allow us to look at the images in any plane and evaluate the situation quite readily. Plain films would be much less accurate.”

According to Dr. Sui, by use of a 3D rotational scan and reconstruction, the patient could stay on the table and images could be taken of the spine right there. “This assessment could be performed without the time-consuming patient transfer from one room to another, freeing CT time and resources for other patients.” As evidenced by these films, Dr. Halkier finds “the 3D technology gives us a completely different way to look at structures. The fact that you get an image that looks very similar to CT scanning is really quite astounding.”

### ***Case 3: Vertebroplasty***

A CT scan is often performed following a vertebroplasty procedure to assess the results and cement filling.

For more information concerning Philips Medical Systems, call 1-800-229-4417, or visit the company's Web site at [www.medical.philips.com/us](http://www.medical.philips.com/us).