QCT BMD Imaging vs DEXA BMD Imaging

by Charles (Chuck) Maack – Prostate Cancer Advocate/Activist

Disclaimer: Please recognize that I am not a Medical Doctor. I have been an avid student researching and studying prostate cancer as a survivor and continuing patient since 1992. I have dedicated my retirement years to continued research and study in order to serve as an advocate for prostate cancer awareness, and, from a activist patient's viewpoint, to help patients, caregivers, and others interested develop an understanding of prostate cancer, its treatment options, and the treatment of the side effects that often accompany treatment. Readers of this paper must understand that the comments or recommendations I make are not intended to be the procedure to blindly follow; rather, they are to be reviewed as my opinion, then used for further personal research, study, and subsequent discussion with the medical professional/physician providing prostate cancer care.

Dual-Energy X-ray Absorptiometry (DEXA) or Quantitative Computerized Tomography (QCT) to measure Bone Mineral Densitometry (BMD)?
This has been a regular question posed by patients. When you go to the internet and search "DEXA vs QCT" you will find many reports, among which several recommend both, with one for a specific requirement and the other for another specific requirement. Unfortunately, I doubt that Medicare, for example, would pay for both a DEXA and a QCT scan.

My reasons for recommending the Quantitative Computerized Tomography (QCT) Bone Mineral Density (BMD) imaging scan over the supposed "Gold Standard" DEXA imaging scan to determine osteopenia or osteoporosis:

Renown Medical Oncologist Stephen B. Strum, who has specialized specifically in prostate cancer research and treatment since 1983, had regularly included in his posts to patients on the physician-to-patient (p2p@prostatepointers.org) list regarding bone mineral density imaging his view that QCT is superior to DEXA since DEXA has proven to falsely read calcification and calcium in blood vessels close to bone as being bone density. Vascular calcifications and degenerative joint disease (DJD) will thus confound a DEXA study. I suspect at least some of his conclusion is based on information found at http://qct.com/ **. Admittedly this link is biased, but convincing.**

Dr. Strum also provides the following supportive information

Quantitative Computerized Tomography in Prostate Cancer
Stephen B. Strum, Mark C. Scholz

Introduction and Objective: Increasing publications have recently focused on the importance of the bone micro-environment in prostate cancer (PC). Bone loss leads to osteopenia and osteoporosis, which is associated with morbidity and mortality and health care costs of $327 million per day. Moreover, bone loss is associated with release of bone-derived growth factors believed to facilitate and enhance bone metastases. Smith et al (Cancer 91:2238, 2001) compared DEXA with quantitative CT QCT) bone mineral density (BMD) in hormone-naïve PC. Using QCT, osteoporosis was found in 63% of patients and osteopenia in 32% of patients. In contrast, the same patients studied with DEXA had only 5% osteoporosis and 29% osteopenia. We report a community study of PC patients evaluated by both modalities to evaluate this important observation by Smith et al.

Methods: 14 patients in a community practice of PC patients were evaluated with both DEXA and QCT BMD. Of 14 patients, 7 were hormone naïve and 7 had prior androgen deprivation therapy. Since only lumbar spine BMD is routinely evaluated by QCT, comparisons between the T score of the lumbar spine using QCT versus DEXA were made. In patients where a major difference between QCT and DEXA was found, efforts were made to obtain routine lumbar spine x-rays.

Results: Using QCT technology, 14 of 14(100%) patients studied had either osteopenia or osteoporosis per WHO definitions. Of 14 patients, 7(50%) had osteoporosis and 7(50%) had osteopenia. Using DEXA in the same patients, 55% had either osteopenia or osteoporosis. In these 14 patients using DEXA, 1 (5%) had osteoporosis while 7 had osteopenia. The average T score using QCT was -2.65. The average T score of the lumbar spine using DEXA was -1.1. In 4 patients that had T scores more than 2 standard deviations apart comparing QCT with DEXA, we were able to obtain plain lumbar x-rays in 3. These showed moderate to extensive degenerative joint disease.

Conclusions: Quantitative CT bone densitometry is superior to DEXA in evaluating bone density in middle to older age patients with PC. The DEXA scan, considered to be the "gold standard" in BMD, is known to be significantly affected by arthritic changes and vascular calcifications and falsely "normalizes" the actual BMD. In light of the significance of bone integrity in the natural history of PC, QCT bone densitometry should be the preferred method of investigation.

This is also reported in the Insights newsletter of the Prostate Cancer Research Institute (PCRI). See; http://www.prostate-cancer.org/resource/pdf/Is8-2.pdf
Scroll down to the article "Who's at risk for what" where it refers to Osteoporosis.

I admit to being biased towards QCT BMD, however in addition to supporting my reasoning for my bias, I have included a few other considerations and your own research may help you make your own judgement call:

- As noted here: http://www.springerlink.com/content/uw3m87k164542545/ : "In conclusion, spinal QCT, supine lateral spine DXA and femoral neck DXA are the best BMD methods to screen for osteoporosis, whereas AP spine DXA is a poor screening method in women (my note: and I expect men) over 60 years of age. Spinal QCT and lateral spine DXA correlate well with Vertebral compression fractures (VCFs), whereas correlations of VCFs with AP spine DXA, femoral neck DXA and distal third radial DXA are poor."

-Another case for both DEXA and QCT:
http://www.medigraphic.com/pdfs/ortope/or-2005/ors051d.pdf

- Yet another case for both DEXA and QCT: "Given the current state of the art, DXA (DEXA) is the preferred technique for bone mineral density assessment. The technique is precise (reproducible), accurate, fast, and low in radiation dose to the patient. A typical examination consists of an evaluation of the lumbar spine and femoral neck. If a single site is desired, especially in younger patients or to assess therapy, the lumbar spine alone might be chosen, as the precision is better in the lumbar spine than in the femoral neck. However, extensive degenerative disease or vascular calcification may complicate the interpretation of lumbar spine measurements" (MY NOTE: THIS LAST SENTENCE IS ONE OF THE ARGUMENTS POSED BY DR. STRUM IN SUPPORT OF QCT)

From a personal viewpoint, my initial DEXA scan some years back after having been on androgen deprivation therapy indicated no osteopenia or osteoporosis. My DEXA scan two years later indicated no osteopenia or osteoporosis. My DEXA scan two years after that indicated I was better in all areas than the two scans before! That certainly raised a red flag having been on androgen deprivation therapy (ADT) for several years, so, as a precautionary measure to at least determine if my bone resorption was low (since I would not be approved by Medicare to get yet another BMD imaging with QCT) I had a Pyrilinks-D Dpd deoxypyridinolene bone resorption urine test to find my level was elevated to a significantly high 9.4nmol/mmol. I immediately began Fosamax that subsequently reduced the level to a preferred range <5.4nmol/mmol. I would recommend to all patients that in addition to having either a QCT or DEXA Bone Mineral Density scan, a Pyrilinks-D Dpd deoxypyridinolene bone resorption urine test be included. Should either be abnormal, the addition of one of the bisphosphonates Fosamax, Boniva, Actonel, Zometa, Aredia, or the more recent Xgeva should be discussed with your physician.

Below are "snips" of portions from a report presented over a decade ago by two specialists in imaging regarding QCT vs DEXA. Pertinent remarks are underlined. What is so particularly noteworthy that once diagnosed with osteoporosis and then treated, the results of that treatment can be determined with QCT **years** before DEXA! Everyone

should save, print, and hand these remarks to any physician who downplays the importance and efficiency of QCT BMD as compared to DEXA.

3D QCT: A Useful Tool in Following Therapy

Jean M. Weigert, M.D., Imaging Center of West Hartford, CT
Christopher E. Cann, Ph.D., University of California, San Francisco

<SNIP>

If patients enter therapy with very low bone mass, **the need for additional therapy can be determined by QCT at the end of one year, while it may take 2-3 years to make this determination with DXA.**

Monitoring the effects of therapy using QCT instead of DXA allows individual treatment decisions to be made earlier. We saw that 75% of patients placed on alendronate had a measurable increase in BMD on an average 1 year followup, **whereas it takes 3 years to show a comparable improvement using DXA** (8). The average improvement with QCT was **11%** in that first year, compared to an average with DXA of **3-4%.** Other studies predict that the 3–4% improvement with DXA should lead to a 10% reduction in fractures, not the 50% seen (9). The average increase by QCT, 0.4 T-score units, predicts a 40% decrease in fractures based on odds ratios (10). **Therefore, BMD changes measured by QCT may be a better indicator of reduced fracture risk than changes measured by DXA.**

<SNIP>

.....NOTE: THE FOLLOWING WERE ADDITIONAL PARAGRAPHS OF IMPORTANCE OF WHY QCT IS SUPERIOR TO DEXA:

3D QCT may also be useful as a tool for research on emerging therapies that may have different effects on different bone regions. For example, PTH has been shown to increase trabecular bone while it may increase cortical porosity, reducing the density of cortical bone (11). Using DXA, increased trabecular density with increased cortical porosity in the proximal femur results in little change in total BMD, while 3D QCT can isolate the trabecular and cortical bone components and determine their independent responses to these therapies.

We conclude that 3D QCT is a precise and accurate method for following patients treated for osteoporosis using a variety of therapies.

.....NOTE: FOLLOWING WERE REFERENCES SITED IN THE ENTIRE ARTICLE:

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