

OSTEOPOROSIS

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If you try to keep up with some of the ongoing information about certain diseases, you cannot help but notice that there are often conflicting reports about what certain therapeutic pathways have to offer. There is almost nothing in our vast array of disease information available to us that are more complex than the information about demineralization of your bones, osteoporosis, fracture risk, and tests for determining these risks. As someone who constantly reviews the literature on this and other disease processes, I find that it is still often confusing to me to understand certain aspects of osteoporosis and how to treat this condition.

There is a complex relationship between responses to osteoporosis treatment which can be measured in terms of bone mass density changes by x-ray or MRI and reduction of fracture risk. At present there is no good clinical marker to predict absolutely fracture risk reduction. Some of the newer technology promises to be able to give us this information, but at present it is difficult to offer a single therapeutic pathway to improve bone strength and fracture risk reduction.

Depending upon which pathway you read about or what information you do have access to, you can look at reduction of fracture risk in different ways. For example, the dairy industry tells you to take in more calcium with cheese, milk products, milk, ice cream, etc. The vitamin industry, on the other hand, feels that simple supplementation with calcium will put calcium into your bones and give you stronger bones because of this increased mineral stability. On the other hand, the drug industry has many large research projects going on to discover the next “most successful drug for osteoporosis” -- the magic pill to reduce fracture risk. Proponents of exercise, on the other hand, know that fracture risk is decreased by increasing stress on the bone structure with increased activity and weight bearing exercise. Combine that with what vegetarians tell us about not eating meat because the increased acid level in your body has to be modified by secretion of calcium in urine to help accomplish this. The health-oriented group is aware of the influence of soft drinks on osteoporosis and wants us to know that the phosphates necessary for the soda effect also takes calcium out of the body, thereby reducing your serum calcium level and possibly diminishing the potential for new bone production.

After looking at the various data about what makes bones stronger, calcium levels higher, and bone mass density increased, another healthy approach is to look at bone's matrix and protein structure rather than just how much calcium they contain. A good corollary would be something like a honeycomb. The honeycomb itself would be the bone matrix whose strength is dependent on nutritional intake and exercise primarily, while the calcium deposited in the bones is similar to the honey in the little cubes of space in the honeycomb.

To add to the confusion, the micro-architecture of the bone significantly contributes to its strength and is greatly responsible for fracture risk, just as the calcium level is. However, it is very difficult to measure this because it would require a bone biopsy. Some newer

techniques such as three-dimensional magnetic resonance micro imaging (MRI) are enabling us to see some of the determinants of bone structure. However, these are not yet ready for clinical use and are very expensive tests. Epidemiological data indicates that drugs such as bisphosphonate, (Fosomax®) can improve bone structure. Other drugs such as risedronate sodium (Actonel®) preserves bone architecture and volume.

It is helpful to emphasize certain dietary factors and their influence on either osteoporosis or improvement of overall bone strength. By looking at the action of these vitamins, it gives a better idea about what happens outside of the role of calcium in bones and emphasizes the role of the bone protein matrix where calcium is deposited. Such a nutritional factor is vitamin K, a fat soluble vitamin aiding in the clotting process. We know that vitamin K has a role as a cofactor for an enzyme that helps metabolize amino acids, and it is this ability of vitamin K that is so important in the production of bone matrix and maintaining bone strength. Taking a drug such as Coumadin which prevents the production of vitamin K also has a risk of increased fracture risk associated with it.

In the Nurses Health Study, 72,000 women were followed for 10 years. Those with the lowest vitamin K intakes had a 30% higher risk of hip fractures. In the Framingham Heart Study, it was found that men and women with dietary vitamin K intake in the highest quarter had a 65% lower risk of hip fracture than those in the lowest intake group. Interestingly, there was no association between dietary vitamin K intake and bone mineral density, certainly confirming the fact that there are two sides to the osteoporosis and fracture risk question. Because the primary source for vitamin K is generally green leafy vegetables, it could be that a diet high in green vegetables is what improves people's health.

Although vitamin K supplementation in tablet form is important, many foods improve the body's vitamin K level, such as kale, Swiss chard, raw spinach, cooked broccoli, raw parsley, and green leaf lettuce. Soybean oil (non-hydrogenated) also has some vitamin K present. One other piece of information is that large doses of vitamins A and E have been found to antagonize vitamin K. Cephalosporins and salicylates may decrease the body's vitamin K production. Regarding testing for fracture risk and bone density -- the DEXA (Dual-Energy X-ray Absorptiometry) scan shows the density of your bones. However, this measures calcium density rather than bone matrix strength. There is no way of using this test to measure the strength of the matrix independent from the calcium. This requires the use of a relatively new modality, the microMRI analysis.

Are you confused yet? It is clear that if you follow information on a regular basis, there are constant contradictions about what is good and bad for fracture risk. We do know that increased fracture risk in older people is a significant problem and is therefore very important. We also know that one of the things that our American population likes to do is solve a problem with a pill rather than putting effort into a dietary approach or increased exercise, nor does anyone like to restrict their intake of meat or soft drinks if this is what they enjoy. However, it is also clear on reviewing the data that increasing weight-bearing exercise, reducing meat and soda intake, and emphasizing vitamin K producing vegetable intake all reduce risk of fracture. If one is not able to follow this type of regimen, it is possible to take drugs which alter the calcium metabolism and improve the x-ray findings of bone density, but may not really alter too much fracture risk. But don't despair. If you are confused now, this will continue because there is

information coming out weekly on new drugs and new facts about bone density, bone strength, and fracture risk. We all know what the right thing to do is to improve this, but we all know it's a little bit harder that way.