UpToDate®

Original Link: http://www.uptodate.com/contents/calcium-and-vitamin-d-for-bone-health-beyond-the-basics

Patient information: Calcium and vitamin D for bone health (Beyond the Basics)

Author
Harold N Rosen, MD
Assistant Professor in Medicine
Harvard Medical School

CALCIUM AND VITAMIN D OVERVIEW

Osteoporosis is a common bone disorder that causes a progressive loss in bone density and mass. As a result, bones become thin, weakened, and easily fractured. It is estimated that more than 1.3 million osteoporosis-associated (or "osteoporotic") fractures occur every year in the United States, primarily of bone within the spine (the vertebrae), the hip, and the forearm near the wrist. (See "Patient information: Bone density testing (Beyond the Basics)".)

A number of treatments can help to prevent loss of bone and treat low bone mass. However, the first step in preventing or treating osteoporosis is to consume foods and drinks that provide calcium, a mineral essential for bone strength, and vitamin D, which aids in calcium breakdown and absorption. (See "Patient information: Osteoporosis prevention and treatment (Beyond the Basics)".)

CALCIUM AND VITAMIN D BENEFITS

Good nutrition is important at all ages to keep the bones healthy.

- Taking calcium reduces bone loss and decreases the risk of fracturing the vertebrae (the bones that surround the spinal cord).
- Consuming calcium during childhood (eg, in milk) can lead to higher bone mass in adulthood. This increase in bone density can reduce the risk of fractures later in life.
- Calcium also has benefits in other body systems by reducing blood pressure and cholesterol levels.
- Calcium and vitamin D supplements have been shown to help prevent tooth loss in older adults.

RECOMMENDATIONS FOR CALCIUM

General recommendations — Premenopausal women and men should consume at least 1000 mg while postmenopausal women should consume 1200 mg (total diet plus supplement). You should not consume more than 2000 mg of calcium per day (total diet plus supplement) due to the risk of side effects.

Calcium in the diet — The primary sources of calcium in the diet include milk and other dairy products, such as hard cheese, cottage cheese, or yogurt, as well as green vegetables, such as kale and broccoli (table 1). Some cereals, soy products, and fruit juices are fortified with up to 1000 mg of calcium per serving.

Calcium supplements — The body is able to absorb calcium contained in supplements as well as from dietary sources. If it is not possible to get enough calcium from dietary sources, consult a healthcare provider to determine the best type, dose, and timing of calcium supplements. The table shows the calcium and vitamin D content in commonly available supplements (table 2).

- Calcium carbonate is effective and is the least expensive form of calcium. It is best absorbed with a low-iron meal (such as breakfast). Calcium carbonate may not be absorbed well in people who also take a specific medication for gastroesophageal reflux (called a proton pump inhibitor or H2 blocker), which blocks stomach acid. (See "Patient information: Acid reflux (gastroesophageal reflux disease) in adults (Beyond the Basics)".)
- Many natural calcium carbonate preparations such as oyster shells or bone meal contain some lead. The low lead levels in calcium supplements are unlikely to be a health risk because calcium blocks lead absorption.
- Calcium citrate is well absorbed in the fasting state.
- Calcium doses above 500 mg are not absorbed as well as smaller doses, so large doses of supplements should be taken in divided doses (eg, in the morning and evening).
- Calcium supplements do not replace other osteoporosis treatments such as hormone replacement, bisphosphonates (eg, risedronate [Actonel] and alendronate [Fosamax]), and raloxifene (Evista).

  Calcium and vitamin D supplements alone are usually insufficient to prevent age-related bone loss, although they may be beneficial in some subgroups (the elderly, those with very low intake). In most patients with or at risk for osteoporosis, the addition of medication or hormonal therapy is necessary in order to slow the breakdown and removal of bone (ie, resorption). (See "Patient information: Osteoporosis prevention and treatment (Beyond the Basics)".)

Underlying gastrointestinal diseases — Patients who do not adequately absorb nutrients from the gastrointestinal tract (due to malabsorption) may require more than 1000 mg of calcium per day. In such cases, a healthcare provider can help to determine the optimal dose of calcium.

Medications — All medications should be discussed with a healthcare provider to ensure that possible interactions with calcium are identified. Certain medications change the amount of calcium that is absorbed and/or excreted. As an example, loop diuretics (eg, furosemide [Lasix]) increase the amount of calcium excreted in the urine.

On the other hand, thiazide diuretics (eg, hydrochlorothiazide [HCTZ]) can reduce levels of calcium in the urine, potentially reducing the risk of bone loss and kidney stones (see 'Kidney stones' below).

Side effects of calcium — Calcium is usually easily tolerated when it is taken in divided doses several times per day. Some people experience side effects related to calcium, including constipation and indigestion. Calcium supplements interfere with the absorption of iron and thyroid hormone and, therefore, these medications should be taken at different times.

Kidney stones — There is little evidence that consuming large amounts of calcium (from foods and drinks) increases the risk of kidney stones, or that consuming small amounts of calcium decreases the risk. In fact, avoiding dairy products is likely to increase the risk of kidney stones.

However, use of calcium supplements may increase the risk of kidney stones in susceptible individuals by raising the level of calcium in the urine. This is particularly true if the supplement is taken between meals or at bedtime. (See "Patient information: Kidney stones in adults (Beyond the Basics)".)

IMPORTANCE OF VITAMIN D

Vitamin D decreases bone loss and lowers the risk of fracture, especially in older men and women. Along with calcium, vitamin D also helps to prevent and treat osteoporosis. To absorb calcium efficiently, an adequate amount of vitamin D must be present.

Vitamin D is normally made in the skin after exposure to sunlight. (See "Patient information: Vitamin D deficiency (Beyond the Basics)".)

Recommendations for vitamin D — The current recommendation is that men over 70 years and postmenopausal women consume at least 800 international units of vitamin D per day. Lower levels of vitamin D are not as effective while high doses can be toxic, especially if taken for long periods of time. Although the optimal intake has not been clearly established in premenopausal women or in younger men with osteoporosis, 600 international units of vitamin D daily is generally suggested.

Vitamin D is available as an individual supplement and is included in most multivitamins and some calcium supplements (table 2). Milk is a good dietary source of vitamin D, with approximately 100 international units per cup (240 mL), and salmon has 800 to 1000 units of vitamin D per serving (table 3).

WHERE TO GET MORE INFORMATION

Your healthcare provider is the best source of information for questions and concerns related to your medical problem.

This article will be updated as needed on our web site (www.uptodate.com/patients). Related topics for patients, as well as selected articles written for healthcare professionals, are also available. Some of the most relevant are listed below.

Patient level information — UpToDate offers two types of patient education materials.

The Basics — The Basics patient education pieces answer the four or five key questions a patient might have about a given condition. These articles are best for patients who want a general overview and who prefer short, easy-to-read materials.

Patient information: Calcium and vitamin D for bone health (The Basics)
Patient information: Osteoporosis (The Basics)
Patient information: Vitamin D deficiency (The Basics)
Patient information: Diet and health (The Basics)
Patient information: Health and nutrition for women who breastfeed (The Basics)
Patient information: Ankylosing spondylitis (The Basics)
Patient information: Primary hyperparathyroidism (The Basics)
Patient information: Common wrist injuries (The Basics)
Patient information: Finger fracture (The Basics)
Patient information: Clavicle fracture (The Basics)
Patient information: Hip fracture (The Basics)
Patient information: Rib fractures in adults (The Basics)
Patient information: Shinbone fracture (The Basics)
Patient information: Vertebral compression fracture (The Basics)
Patient information: Ankle fracture (The Basics)
Patient information: Boxer's fracture (The Basics)
Patient information: Neck fracture (The Basics)
Patient information: Pelvic fracture (The Basics)
Patient information: Toe fracture (The Basics)
Patient information: Vitamin supplements (The Basics)
Patient information: Medicines for osteoporosis (The Basics)
Patient information: Vitamin D for babies and children (The Basics)
Patient information: Monoclonal gammopathy of undetermined significance (The Basics)
Patient information: Paget disease of bone (The Basics)

Beyond the Basics — Beyond the Basics patient education pieces are longer, more sophisticated, and more detailed. These articles are best for patients who want in-depth information and are comfortable with some medical jargon.

Patient information: Bone density testing (Beyond the Basics)
Patient information: Osteoporosis prevention and treatment (Beyond the Basics)
Patient information: Acid reflux (gastroesophageal reflux disease) in adults (Beyond the Basics)
Patient information: Kidney stones in adults (Beyond the Basics)
Patient information: Vitamin D deficiency (Beyond the Basics)

Professional level information — Professional level articles are designed to keep doctors and other health professionals up-to-date on the latest medical findings. These articles are thorough, long, and complex, and they contain multiple references to the research on which they are based. Professional level articles are best for people who are comfortable with a lot of medical terminology and who want to read the same materials their doctors are reading.

Calcitonin in the prevention and treatment of osteoporosis
Calcium and vitamin D supplementation in osteoporosis
Causes of vitamin D deficiency and resistance
Diet in the treatment and prevention of hypertension
Epidemiology and etiology of premenopausal osteoporosis
Evaluation and treatment of premenopausal osteoporosis
Overview of the management of osteoporosis in postmenopausal women
Vitamin D deficiency in adults: Definition, clinical manifestations, and treatment

The following organizations also provide reliable health information.

- National Library of Medicine

(www.nlm.nih.gov/medlineplus/healthtopics.html)

- Osteoporosis and Related Bone Diseases National Resource Center (ORBD-NRC)

(www.osteo.org)

- National Osteoporosis Foundation

(www.nof.org)

- Osteoporosis Society of Canada

(www.osteoporosis.ca/)

- The Hormone Foundation

(www.hormone.org/public/osteoporosis.cfm, available in English and Spanish)

[1-7]

Literature review current through: Oct 2013. | This topic last updated: Oct 7, 2013.