

Overview

Our bones are dynamic structures – constantly undergoing a process of remodeling in which bone is both added (bone formation) and broken down (bone resorption). When thinking of bone remodeling, imagine a scale with bone formation on one side and bone resorption on the other side. In healthy bone, bone formation and resorption occur at equivalent rates meaning bone density remains relatively consistent. When bone resorption occurs at a rate exceeding that of bone formation, low bone density can occur. Decreased bone density presents in three different forms:

- **Osteoporosis:** A more serious progression of bone loss in which bone density is 2.5 or more standard deviations below average for a healthy sex-matched 30-year-old adult.
- **Osteopenia:** A less serious progression of bone loss in which bone density is 1 to 2.5 standard deviations below average for a healthy sex-matched 30-year-old adult.
- **Osteomalacia:** Softening of the bone due to vitamin D deficiency or an inability to effectively absorb or convert vitamin D.
- Other bone health conditions may be slightly heightened in patients with IBD and/or ostomy (e.g. osteonecrosis due to medication usage); however, due to their rarity, these conditions are beyond the scope of this fact sheet.

Individuals with IBD are at a heightened risk of low bone mineral density, osteopenia and osteoporosis with rates at 22-77%, 32-36% and 7-15% respectively. Overall, IBD patients are at a 40-60% increased risk of fracture. In ostomy patients, rates of osteopenia and osteoporosis ranged from 26-55% and 13-32% respectively (this rate may be different depending on the type of ostomy).

40-60%
increased risk
of fracture

In women, peak bone density is typically reached in the late 20s. Once an individual reaches 30 years of age, bone resorption becomes more predominant leading to a minimal decrease bone density until menopause. Once an individual reaches menopause, bone loss may become more significant due to changes in sex hormone release. This process of bone loss due to aging is natural; however, when bone loss becomes accelerated in comparison to this natural loss, risk of bone density issues and subsequent fracture increases. Certain factors, such as chronic steroid use and nutrient malabsorption, predispose IBD and ostomy patients to decreased bone density.



Causes and Risk Factors in the General Population

- **Age:** As we age, rates of bone formation slow as rates of bone resorption increase. To an extent, this is a natural part of aging and leads to decreased bone density.
- **Gender:** Women are at a higher risk of low bone density – particularly post-menopausal women. During and following menopause, estrogen levels decrease. Because estrogen plays a part in bone formation and remodeling, these decreased estrogen level can lead to increased bone loss and ultimately low bone density.
- **Genetics:** Having family members with low bone density increases your risk of low bone density as well.
- **Smoking:** Smoking decreases bone mineralization and calcium absorption – both of which lead to more brittle (and likely to break) bone. Smoking also increases bone loss leading to decreased bone density.
- **Excessive Alcohol Consumption:** Chronic, excessive alcohol consumption reduces bone remodeling and thus leads to decreased bone density.
- **Thyroid/parathyroid conditions:** The hormones associated with the thyroid and parathyroid glands (e.g. thyroid stimulating hormone (TSH) and parathyroid hormone (PTH)) directly influence bone formation and resorption. Health conditions associated with these glands can lead to irregular hormone release and subsequent issues with bone density.

Causes and Risk Factors in IBD/Ostomy Patients

- **Chronic steroid use:** Steroids are often a necessary tool for IBD and ostomy patients – particularly when trying to calm a flare. Steroid use leads to reduced rate of bone formation as well as issues with calcium absorption and increased loss of calcium in the urine. When used short-term, the body is able to effectively compensate for these issues; however, long-term use can lead to decreased bone density. IBD and ostomy patients are at risk for chronic steroid use because they may have to utilize short-term steroids multiple times making the steroid use long-term. Steroids taken orally or intravenously are more likely to lead to decreased bone density as they are more easily absorbed via the bloodstream (as opposed to steroids in enemas or suppositories).
- **Chronic inflammation:** Inflammation from IBD and ostomies can cause elevated cytokine levels which in turn can impact bone density. Elevated cytokine levels are known to suppress sex hormone release – particularly estrogen which is involved with bone formation.



Causes and Risk Factors in IBD/Ostomy Patients (continued...)

- **Malabsorption of key nutrients:** Bone requires certain nutrients in order to form – particularly calcium and vitamin D. Calcium is a critical component of bone mineralization, while vitamin D is required for the absorption of calcium. IBD and ostomies can impact the ability of an individual to absorb these key nutrients – particularly those with small bowel involvement or removal of the intestine.
- **Low Body Weight:** Being at a low body weight can put one at risk for amenorrhea (loss of menstruation) and subsequent decreased bone density. Loss of one's period can lead to decreased estrogen levels. Because estrogen plays a key role in bone formation, decreased levels can lead to poor bone density. Individuals with IBD and/or ostomies may struggle with eating, diarrhea and nausea making it difficult to keep on weight. This can exacerbate issues with bone density.
- **Minimal Physical Activity:** When we exercise, our muscles pull on our skeletal system. This tension of muscle on the bones leads to bone remodeling in that area and subsequent increased bone density. Individuals with IBD and/or ostomy may struggle to engage in physical activity due to fatigue, pain, diarrhea or other symptoms. This prevents these individuals from receiving the increased bone density benefits from exercise.

Signs and Symptoms

When it comes to bone health, there are typically no outward visible signs or symptoms of bone loss until a bone has already fractured. Individuals may believe they will be aware of decreased bone density because they will experience bone aches or pains – this is not generally the case. The first easily identified, outward sign/symptom of low bone density is a fracture. This fracture will likely induce pain and can lead to loss of mobility. For this reason, prevention of decreased bone density is key in order to avoid a fracture.

Diagnosis and Treatment

Your physician will likely recommend you get a DEXA (dual energy x-ray absorptiometry) scan. This test utilizes low-energy x-ray beams to assess your bone mineral density at increased risk sites for fragility fractures (fractures associated specifically with low bone density). The DEXA scan will typically assess bone density at your lower back (L5 of the spine), your hip (femoral neck) and wrist (distal radius). For this test, you will lay down on the imaging platform for about 5-10 minutes while the scan is completed. The test is totally painless.



Diagnosis and Treatment (continued...)

In addition to a DEXA scan, your physician may also request you complete lab work. Calcium, vitamin D and phosphorus levels will likely be taken as these minerals/vitamins contribute to bone composition with low levels putting you at risk for decreased bone density. Your physician may also take labs on TSH, PTH, a complete blood count, kidney and liver studies and more to check for other health conditions that can contribute to decreased bone density (e.g. thyroid issues).

Because issues with nutrient malabsorption play such a critical role in bone health, your physician may also have you get an endoscopy or capsule endoscopy to assess for further gastrointestinal issues beyond IBD and/or ostomy (e.g. celiac disease).

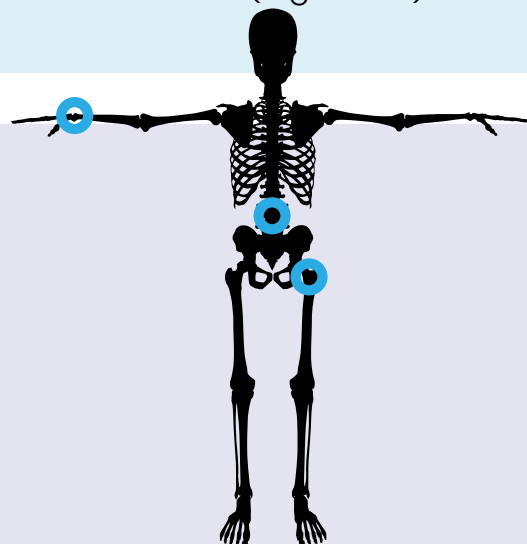
If you have decreased bone density, your physician may have several recommendations dependent upon the severity of bone loss and the cause. Vitamin D and calcium supplementation will likely be recommended. With calcium intake, it is important to note the body can only absorb 500-600 mg at a time so splitting up your calcium intake two to three times per day is advised. Exercise, particularly resistance-based exercise (e.g. resistance bands, bodyweight strength exercises or weightlifting) is crucial in building bone density as well. The pull of muscles on the bone during resisted movement leads to bone remodeling and increased bone density. Your physician may recommend medication options such as bisphosphonates (e.g. Fosamax), monoclonal antibodies (e.g. Prolia) or PTH analogs (e.g. Tymlos).

Prevention

Because decreased bone density is difficult to detect outwardly, the utilization of DEXA scans for early detection and diagnosis is critical. Generally, individuals are recommended to get a DEXA scan every two years if they have a history of vertebral fracture, are post-menopausal, over the age of 50, have chronic corticosteroid use or hypogonadism (reduced testosterone or estrogen production).

Prevention of decreased bone density focuses on:

- Strengthening the bones.
- Reducing risk factors associated with further bone loss.



In a DEXA scan, bone density is generally acquired at L5 of the spine, the femoral neck and distal radius.

Prevention (continued...)

Strengthening the bones:

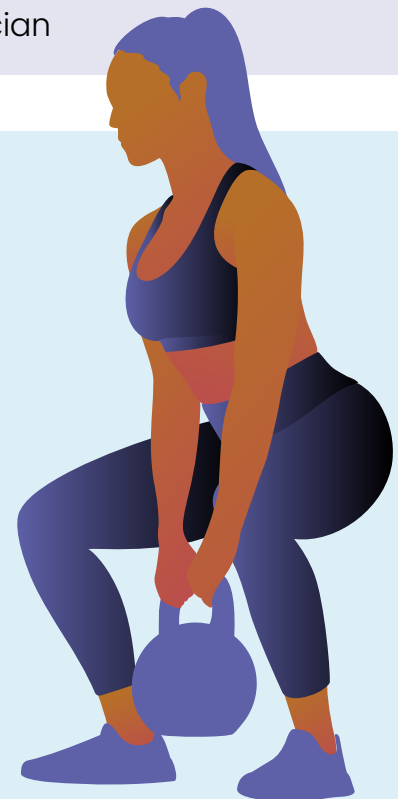
- Participate in regular exercise – particularly resistance-based strength training.
- Get appropriate calcium intake both through your diet and via supplements if needed – keep in mind the body can only absorb 500-600 mg of calcium at a time, so split your intake up two to three times per day.
- Get appropriate vitamin D intake – vitamin D is manufactured in the skin from sunlight exposure. If you have low sunlight exposure, focus on dietary intake of vitamin D (fortified dairy products or orange juice and oily fish such as salmon). If needed, you may also utilize supplementation.

Reducing risks associated with further bone loss:

- Smoking cessation
- Minimize alcohol consumption
- Reduce corticosteroid use if possible and under the guidance of a physician
- Utilize steroid-sparing drugs (e.g. azathioprine, 6-MP, methotrexate, infliximab or budesonide) if possible and under the guidance of a physician

Further Resources

- American Bone Health (<https://americanbonehealth.org/>)
- Bone Health and Osteoporosis Foundation (<https://www.bonehealthandosteoporosis.org/>)
- Crohn's and Colitis Foundation: Bone Loss Fact Sheet (<https://www.crohnscolitisfoundation.org/sites/default/files/legacy/assets/pdfs/boneloss.pdf>)
- Crohn's and Colitis UK: Bones (<https://www.crohnsandcolitis.org.uk/about-crohns-and-colitis/publications/bones-and-ibd>)
- International Osteoporosis Foundation (<https://www.osteoporosis.foundation/>)
- NIH Osteoporosis and Related Bone Diseases National Resource Center: What People With Inflammatory Bowel Disease Need to Know About Osteoporosis (<https://www.bones.nih.gov/health-info/bone/osteoporosis/conditions-behaviors/inflammatory-bowel>)



Regular exercise, especially strength training, can help increase bone density.

Citations

1. Ratajczak, A. E., Rychter, A. M., Zawada, A., Dobrowolska, A., & Krela-Kaźmierczak, I. (2020). Nutrients in the Prevention of Osteoporosis in Patients with Inflammatory Bowel Diseases. *Nutrients*, 12(6), 1702. <https://doi.org/10.3390/nu12061702>
2. Schüle, S., Rossel, J. B., Frey, D., Biedermann, L., Scharl, M., Zeitz, J., Freitas-Queiroz, N., Kuntzen, T., Greuter, T., Vavricka, S. R., Rogler, G., Misselwitz, B., & Swiss IBD cohort study (2017). Widely differing screening and treatment practice for osteoporosis in patients with inflammatory bowel diseases in the Swiss IBD cohort study. *Medicine*, 96(22), e6788. <https://doi.org/10.1097/MD.00000000000006788>
3. Gupta, S., & Shen, B. (2013). Bone loss in patients with the ileostomy and ileal pouch for inflammatory bowel disease. *Gastroenterology report*, 1(3), 159–165. <https://doi.org/10.1093/gastro/got030>

Written by Catherine Liggett

Medically reviewed by Nathan Schomaker M.D. & Kathryn Vidlock M.D.

