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International Osteoporosis Foundation

Clearing the air • links between smoking and osteoporosis strengthened

Young or old, man or woman, smoker or non-smoker • no matter what category you fit into, cigarette smoke can weaken your bones and increase your risk for fractures, according to new research presented this week at the IOF World Congress on Osteoporosis in Toronto.

Smoking has long been known to increase the risk for osteoporosis in women, but the new studies, two conducted in Sweden and one in China, find that smoking also hastens the erosion of men's bones. In addition, the Chinese study demonstrates, for the first time, that even second-hand smoke can significantly increase the risk for osteoporosis and fractures in both men and women.

Bad News from GOOD Study

The deleterious effects of smoking can readily be detected in young bones. That's one conclusion from the Gothenburg Osteoporosis and Obesity Determinants (GOOD) study, which has been following the health of young Swedish men (see conference Abstract No. OC31).

"Though smoking has previously been linked to low bone density in the elderly population, its effects on adolescents has remained controversial. Now, we clearly demonstrate that young smokers also have significant losses in bone density," said Mattias Lorentzon, lead author on the study.

Lorentzon, working with Prof. Claes Ohlsson and colleagues at the Center for Bone Research at the Sahlgrenska Academy, Gothenburg University, measured bone mineral density--a measure of bone strength--in over 1,000 Swedish men between 18 and 20 years old. They found that in smokers, bone density in the spine, hip, and body as a whole, was lower than in their non-smoking peers. The most significant effects were in the hip, where the mineral density was over 5% lower than in non-smokers--typically, a 10% loss of bone mineral density doubles the risk of fracture.

Their results explain why previous findings have been equivocal. In this case the researchers used a sophisticated computer assisted X-ray machine (CAT scanner) to get three-dimensional images of bone. These 3D images showed that smoking primarily affects a specific type of bone called cortical bone. This very dense bone forms a layer, similar to the enamel on teeth, around softer, spongy bone. Lorentzon and colleagues found that smoking reduces the thickness of cortical bone. The findings indicate that smoking may significantly affect bone strength. "If you think of bone as a pencil, then the thicker the pencil the harder it will be to break," said Lorentzon.

Mr. OS--Sweden

In a separate study, Center for Bone Research colleagues Dan Mellström and co-workers have been measuring how a variety of lifestyle and biological factors influence the likelihood of bone fracture in elderly men (see conference Abstract No. P117). Mr. OS, as it is called, is being conducted internationally. Mellström and colleagues have recruited over 3,000 elderly men for the Swedish part of the study and correlated smoking history with bone density measurements and fracture incidence. "We find that in elderly men a history of smoking is associated with weak bones and almost a twofold increase in vertebral fracture incidence," said Mellström, who presented the data this week in Toronto. Vertebral fractures are a major sign of osteoporosis and a strong predictor of future fractures.

Mellström and colleagues took X-rays of the neck and back spine in over 1,300 men to screen for vertebral fractures--these fractures are often asymptomatic and go undetected. They found that nearly 17 percent of the men had an identifiable vertebral fracture, but when they compared fracture rate to smoking history they found that 24% of smokers had fractures compared to only 14% or those who never smoked. They also measured bone mineral density in the hip, thigh bone, and spine. Mellström reported that bone density in all regions tested was significantly lower in men who were current smokers, or who used to smoke. Overall the findings suggest that smoking reduces bone strength and dramatically increases the risk for bone fractures.

Second-Hand Smoke, First-Hand Problem

In the first ever analysis of the effects of second-hand smoke on bone density, researchers in the U.S. have found that Chinese men and pre-menopausal women have

significantly lower bone density if they are exposed to second-hand smoke, even if they are themselves smokers (see conference Abstract No. P114).

Yu-Hsiang Hsu and colleagues from the Harvard School of Public Health measured hip bone mineral density in over 14,000 men and women in rural China--hip fractures are a major cause of morbidity and mortality worldwide. They also used recorded non-spine fractures and smoking history.

When they correlated smoking with osteoporosis and fracture history, they found that the largest effects were seen in pre-menopausal, non-smoking women--only 6% of women in the study were smokers, versus 87% of men. "Compared to non-smokers that are not exposed to second-hand smoke, premenopausal women exposed to second-hand smoke have a threefold higher risk of having osteoporosis and a 2.6 times greater risk for a non-spine fracture," said Hsu. Though smoking itself is a risk factor for osteoporosis, Hsu and colleagues also deduced that smokers were at increased risk if they were also exposed to smoke from other family members on a daily basis.

Though this is the first reported study of the effects of second-hand smoke on bone health, previous studies have reported that second-hand smoke may alter levels of estrogen, which is a key hormone for bone health in both women and men, Hsu explained. "Our finding is consistent with this hypothesis," said Hsu, who now plans a follow up study to correlate serum levels of cotinine, a nicotine derivative that only appears in blood of those exposed to tobacco smoke, with serum hormone levels.

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Osteoporosis, in which the bones become porous and break easily, is one of the world's most common and debilitating diseases. The result: pain, loss of movement, inability to perform daily chores, and in many cases, death. One out of three women over 50 will experience osteoporotic fractures, as will one out of five men 1, 2, 3.

Unfortunately, screening for people at risk is far from being a standard practice. Osteoporosis can, to a certain extent, be prevented, it can be easily diagnosed and effective treatments are available.

The International Osteoporosis Foundation (IOF) is the only worldwide organization dedicated to the fight against osteoporosis. It brings together scientists, physicians, patient societies and corporate partners. Working with its 172 member societies in 85

locations, and other healthcare-related organizations around the world, IOF encourages awareness and prevention, early detection and improved treatment of osteoporosis.

1 Melton U, Chrischilles EA, Cooper C et al. How many women have osteoporosis? Journal of Bone Mineral Research, 1992; 7:1005-10
2 Kanis JA et al. Long-term risk of osteoporotic fracture in Malmo. Osteoporosis International, 2000; 11:669-674
3. Melton LJ, et al. Bone density and fracture risk in men. JBMR. 1998; 13:No 12:1915

IOF World Congress on Osteoporosis, held every two years, is the only global congress dedicated specifically to all aspects of osteoporosis. Besides the opportunity to learn about the latest science and developments in diagnosis, treatment and the most recent socio-economic studies, participants have the chance to meet and exchange ideas with other physicians from around the world. All aspects of osteoporosis will be covered during the Congress which will comprise lectures by invited speakers presenting cutting edge research in the field, and 35 oral presentations and more than 680 poster presentations selected from 720 submitted abstracts. More than 70 Meet the Expert Sessions covering many practical aspects of diagnosis and management of osteoporosis are also on the program.

For more information on osteoporosis and IOF please visit: www.osteofound.org

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