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NEWS

RSNA Press Release

Carbon Monoxide from Smoking Helps Keep Arteries Open Following Angioplasty

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At A Glance

- Smokers who continue to smoke after angioplasty have a lower rate of restenosis (re-narrowing of previously blocked arteries) than nonsmokers, because of the increased level of carbon monoxide in the bloodstream.
- Carbon monoxide protects against restenosis by dilating blood vessels and inhibiting the growth of smooth muscle cells in the artery wall.
- Although carbon monoxide helps the arteries to stay open after endovascular repair, smoking is a major contributor to the development of peripheral artery disease (PAD).

OAK BROOK, Ill.—In an unusual paradox, smoking cigarettes—a deadly habit that contributes to the development of peripheral artery disease—actually helps arteries stay open following a procedure to repair clogged blood vessels in the legs, according to a study in the June issue of *Radiology*. The study found that habitual to heavy smokers who continued to smoke after angioplasty had a lower rate of restenosis, or re-narrowing of the arteries, than nonsmokers.

As expected, the researchers who conducted the study at the University of Vienna, Austria, do not advocate smoking. But the findings suggest that increasing the level of carbon monoxide in the blood stream following angioplasty and stent placement within the lower limb arteries may help prevent restenosis.

"Smokers exhibit a higher blood concentration of carbon monoxide, a potent anti-inflammatory agent known to dilate blood vessels," said the study's lead author, Martin Schillinger, M.D., associate professor of internal medicine at the University of Vienna Medical School. "Carbon monoxide can inhibit the growth of smooth muscle cells within the artery wall, which is a key factor in the restenosis process."

In peripheral artery disease (PAD), a narrowing or blockage in the arteries causes an insufficient flow of oxygenated blood to the arms or legs. Interventional radiologists treat PAD with angioplasty, a minimally invasive procedure in which a balloon-tipped catheter—a thin, plastic tube—is threaded to the site of the blockage and inflated. Often the radiologist will place a wire mesh cylinder called a stent inside the artery to help prevent it from collapsing or becoming clogged again.

"Angioplasty and stent placement to repair obstructions in lower limb vessels have a high

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rate of restenosis," Dr. Schillinger said. "Up to 60 percent of patients who undergo endovascular interventions for PAD will experience restenosis and will need to repeat the treatment within a year."

Dr. Schillinger and his research team studied 650 patients with PAD who underwent angioplasty with or without stent placement to open arteries leading to the legs. Patients were classified as non-smokers, light smokers (one to nine cigarettes a day), habitual smokers (10 to 20 cigarettes daily) or heavy smokers (more than 20 cigarettes daily).

At six months and 12 months after the artery repairs, the treatment sites were measured to check for restenosis. Researchers observed that patients who smoked 10 or more cigarettes a day had a reduced rate of restenosis at both intervals. Among the heavy smokers, the rate of re-narrowing was 16 percent at six months and 29 percent at 12 months following the procedure. In the non-smoking patients, restenosis rates were 28 percent and 54 percent, respectively. The results suggest that delivering carbon monoxide to the site of the blockage could be a promising concept.

"It is important to find a way to improve the long-term effectiveness of lower limb endovascular interventions," Dr. Schillinger said. "Using carbon monoxide therapeutically to reduce the high rates of restenosis following angioplasty of the lower limb arteries may be worth examining."

Although smoking had a protective effect on newly opened arteries, the smokers in the patient group were being treated for PAD at a younger age and had higher rates of heart attacks and strokes compared to non-smokers.

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Effect of Smoking on Restenosis during the 1st Year after Lower-Limb Endovascular Interventions. Markus Exner, M.D., Wolfgang Mlekusch, M.D., Markus Haumer, M.D., Schila Sabeti, M.D., Ramazanali Ahmadi, M.D., Oswald Wagner, M.D., and Erich Minar, M.D., collaborated with Dr. Schillinger on this paper.

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