## **Microvascular risk factors**

Microvascular risk factors are elements that contribute to damage in the small blood vessels, or microvasculature, of the body. These factors are associated with various chronic conditions and can lead to complications in organs that rely heavily on microvascular networks, such as the eyes, kidneys, nerves, and heart. The primary microvascular risk factors include:

1. **Hypertension**: High blood pressure increases stress on the small vessels, causing thickening and narrowing that can lead to reduced blood flow and damage to organ tissues.

2. **Diabetes**: High blood glucose levels can damage the endothelial cells lining blood vessels, leading to conditions like diabetic retinopathy, nephropathy, and neuropathy.

3. **Dyslipidemia**: Elevated levels of lipids (cholesterol and triglycerides) in the blood contribute to plaque buildup in vessels, which can obstruct blood flow and damage small vessels over time.

4. **Obesity**: Excess body weight is linked to inflammation and insulin resistance, both of which can lead to endothelial dysfunction and microvascular damage.

5. **Smoking**: Smoking causes oxidative stress and inflammation in blood vessels, leading to endothelial injury and reduced nitric oxide availability, which impairs blood flow regulation.

6. **Chronic Inflammation**: Conditions causing chronic inflammation, such as autoimmune diseases, lead to ongoing endothelial damage and contribute to the thickening and scarring of small vessels.

7. **Sedentary Lifestyle**: Physical inactivity is associated with poor blood glucose control, obesity, and increased risk for hypertension and dyslipidemia, all of which impact microvascular health.

8. **Age**: Aging naturally leads to changes in microvascular structure and function, including reduced elasticity and thickening of vessel walls, making older adults more vulnerable to microvascular complications.

Managing these risk factors through lifestyle changes, medications, and regular monitoring can help reduce the risk of microvascular complications and associated chronic diseases.

All patients with idiopathic normal pressure hydrocephalus (INPH) who underwent shunting in Sweden in 2008-2010 were compared to age- and sex-matched population-based controls. Inclusion criteria were age 60-85 years and no dementia. The 10 most important vascular risk factor (VRFs) and cerebrovascular and peripheral vascular disease were prospectively assessed using blood samples, clinical examinations, and standardized questionnaires. Assessed VRFs were hypertension, hyperlipidemia, diabetes, obesity, psychosocial factors, smoking habits, diet, alcohol intake, cardiac disease, and physical activity.

In total, 176 patients with INPH and 368 controls participated. Multivariable logistic regression analysis indicated that hyperlipidemia (odds ratio [OR] 2.380; 95% confidence interval [CI] 1.434-3.950), diabetes (OR 2.169; 95% CI 1.195-3.938), obesity (OR 5.428; 95% CI 2.502-11.772), and psychosocial factors (OR 5.343; 95% CI 3.219-8.868) were independently associated with INPH. Hypertension, physical inactivity, and cerebrovascular and peripheral vascular disease were also overrepresented in INPH. Moderate alcohol intake and physical activity were overrepresented among the controls. The population-attributable risk percentage was 24%.

The findings confirm that patients with INPH have more VRFs and lack the protective factors present in the general population. Almost 25% of cases of INPH may be explained by VRFs. This suggests that INPH may be a subtype of vascular dementia. Targeted interventions against modifiable VRFs are likely to have beneficial effects on INPH <sup>1</sup>.

1)

Israelsson H, Carlberg B, Wikkelsö C, Laurell K, Kahlon B, Leijon G, Eklund A, Malm J. Vascular risk factors in INPH: A prospective case-control study (the INPH-CRasH study). Neurology. 2017 Jan 6. pii: 10.1212/WNL.00000000000003583. doi: 10.1212/WNL.0000000003583. [Epub ahead of print] PubMed PMID: 28062721.

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