Exhaled nitric oxide measurement using hand-held devices: An attractive tool for in-office monitoring of disease activity in patients with Crohn's disease?

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Background: Gut inflammation in inflammatory bowel disease (IBD) is associated with increased activity of inducible nitric oxide synthase. Increased mucosal, plasma and fractional exhaled nitric oxide (FENO) levels have been described in IBD patients with clinically active disease, but their correlation with established disease markers (laboratory parameters, endoscopy and faecal calprotectin) has never been investigated. Nowadays, hand-held FENO measurement devices are available, which allow fast in-office FENO analysis.

Aim: To investigate whether hand-held FENO measurement could be used for the evaluation of disease activity in patients with Crohn's disease (CD).

Methods: Fifty-one patients with CD and 23 healthy controls (HC) were included. All subjects had to fill in a questionnaire on smoking and medical history. Exclusion criteria were a history of asthma, hay fever or eczema or the presence of any airway symptoms (coughing, thoracic pain, dyspnoea). At time of inclusion, the Crohn's Disease Activity Index (CDAI) was calculated and a fecal sample was requested for measurement of the calprotectin levels. A blood sample was taken for measurement of CRP, white blood cell (WBC) count and sedimentation rate. FENO was then measured with a hand-held device. In case endoscopy was performed, the CDEIS was calculated.

Results: Of the 50 included CD patients, 31/50 had a faecal sample for analysis of the calprotectin levels and 28/50 patients underwent an endoscopy for which the CDEIS was calculated. FENO was increased in steroid-free CD patients with clinically active disease (CDAI >150; FENO: 21.58±1.1 ppm) compared to CD patients in clinical remission (CDAI <150; FENO: 12.0±0.97 ppm; P < 0.001) and healthy controls (FENO: 17.7±1.0 ppm; P < 0.05). Active CD patients treated with corticosteroids had significantly lower FENO compared to active CD patients without steroids (steroids vs steroidfree: 21.58±1.1 ppm vs 13.3±3.0 ppm; P < 0.05). Overall, FENO showed good correlation with the CDAI (R² = 0.67; P < 0.001), CRP (R² = 0.44; P = 0.01) and sedimentation rate (R² = 0.44; P < 0.05). No significant correlation was found with faecal calprotectin (R² = 0.29; P = 0.13) and the CDEIS (R² = 0.29; P = 0.16).

Conclusions: This pilot study suggests that exhaled NO concentrations measured with hand-held devices are a useful and very convenient non-invasive indicator of systemic inflammation in CD, but perhaps a less good reflector of the extent and/or severity of mucosal lesions.