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Gene and protein expression of *CXCR4* in adult and elderly patients with chronic rhinitis, pharyngitis or sinusitis undergoing thermal water nasal inhalations

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Abstract

Background: Chronic rhinitis, pharyngitis and sinusitis are common health problems with a significant impact on public health, and are suspected to be influenced by ageing factors. Nasal inhalation with thermal water may be used to reduce symptoms, inflammation and drug intake. A pre-post clinical study was conducted in 183 consecutive adult and elderly patients with chronic rhinitis, pharyngitis or sinusitis, to evaluate whether thermal water nasal inhalations could improve their symptoms, clinical signs and rhinomanometry measurements, and influence inflammatory biomarkers levels in nasal epithelial cells.

Results: Participants profile revealed that they were aged on average (mean age and SD 60.6 ± 15.2 years, median 65, range 20–86, 86 aged ≤ 65 years (47%), 96 aged > 65 years (53%)) and extremely concerned about wellbeing. Older age was associated with better compliance to inhalation treatment. Total symptom and clinical evaluation scores were significantly ameliorated after treatment ($p < 0.001$), with no substantial difference according to age, while rhinomanometry results were inconsistent. Persistence of symptom improvement was confirmed at phone follow up 1 year later ($n = 74$). The training set of 48 inflammatory genes (40 patients) revealed a strong increase of *CXCR4* gene expression after nasal inhalations, confirmed both in the validation set (143 patients; 1.2 ± 0.68 vs 3.3 ± 1.2; $p < 0.0001$) and by evaluation of CXCR4 protein expression (40 patients; 1.0 ± 0.39 vs 2.6 ± 0.66; $p < 0.0001$). CXCR4 expression was consistently changed in patients with rhinitis, pharyngitis or sinusitis. The increase was smaller in current smokers compared to non-smokers. Results were substantially unchanged when comparing aged subjects (≥ 65 years) or the eldest quartile (≥ 71 years) to the others. Other genes showed weaker variations (e.g. FLT1 was reduced only in patients with sinusitis).

Conclusions: These results confirm the clinical impact of thermal water nasal inhalations on upper respiratory diseases both in adults and elders, and emphasize the role of genes activating tissue repair and inflammatory pathways. Future studies should evaluate CXCR4 as possible therapeutic target or response predictor in patients with chronic rhinitis, pharyngitis or sinusitis.

Trial registration: Communication to Italian Ministry of Health - ICPOM 000461. Registered 10/11/2014.

Keywords: Clinical trial, CXCR4, Gene expression profiling, Balneology, Inflammation, Respiratory tract infections

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