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Narrow-band UVB phototherapy of nasal polyps: Results of a pilot study ☆

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ABSTRACT

Nasal polyposis (NP) is characterized by high recurrence rate despite medical and/or surgical treatment. The major mechanism of action of ultraviolet B light (UVB) is induction of apoptosis in inflammatory cells. Therefore phototherapy may represent a new therapeutic approach in NP.

A pilot feasibility study was performed to assess the tolerability and clinical efficacy of UVB phototherapy in NP.

Thirteen subjects with bilateral grade 1–3 NP were enrolled in an open-labeled prospective pilot study. Patients were exposed to gradually increasing doses of UVB light over a 12 week period (3 exposures/week). Subjects rated their nasal obstruction symptom scores weekly on a visual analogue scale from 0 to 6. The NOSE quality of life questionnaire was used at baseline and end of treatment period. Adverse events were monitored by endoscopy. Ten subjects completed the study. Nasal obstruction symptom scores and quality of life (NOSE) improved at end of treatment compared to baseline. Treatments were well tolerated and no device related adverse events were reported. The results suggest that phototherapy may represent a potential new treatment option in nasal polyps.

1. Introduction

Nasal polyposis (NP) is a chronic inflammatory disease of the upper airways with an overall prevalence rate in the general population ranging from 1% to 4% [1]. Clinically, nasal polyps are characterized by edematous masses which prolapse into the nose, leading to nasal obstruction, loss of smell, secretion, headache and reduced quality of life. Nasal polyposis is a multifactorial disease in which chronic inflammation is a major factor. The inflammatory infiltrate comprises a variety of cells, including eosinophils, mast cells, lymphocytes, neutrophils and plasma cells. The majority of nasal polyps belong to the eosinophilic type, in which more than 60% of the inflammatory cell population is represented by eosinophils [2]. The presence of high levels of proinflammatory mediators and of epithelial damage are also characteristic of NP. Expression of cytokines such as IL-4 and IL-5 and of inflammatory mediators like eosinophilic cationic protein (ECP) is strikingly similar to the immunopathological profile documented in allergic rhinitis and asthma, two diseases with which nasal polyposis is often associated. Therapeutic strategies for NP include medical treatment, especially topical or systemic corticosteroids, surgical treatment or a combination of both. However, notwithstanding treatment, NP is characterized by high recurrence rate and a subset of patients has to undergo repeated surgeries [1,3,4].

Several studies suggest that apoptosis of inflammatory cells is the major mechanism of action for systemic and topical corticosteroids. It has been shown that treatment of NP with topical corticosteroids induces apoptosis of eosinophils and T cells and when applied long-term, reduces the number of eosinophils and T cells in vivo [5,6].

Phototherapy utilizing narrow-band UVB light (NB-UVB) has been widely used in the treatment of various inflammatory skin diseases, including atopic dermatitis and psoriasis [7]. Intranasal phototherapy has been shown to be effective in inflammatory mucosal diseases such as oral lichen planus and seasonal allergic rhinitis [8–10]. The therapeutic effect of UVB light is primarily attributed to its local immunomodulatory action. One of the most important mechanisms that explain the effects of UVB light is induction of apoptosis in inflammatory cells [11–14]. Therefore, UV phototherapy may represent a new therapeutic tool for the management of nasal polyps.

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A pilot feasibility study was performed to assess the tolerability and clinical efficacy of NB-UVB phototherapy in bilateral nasal polyps.

2. Materials and methods

An open-label prospective pilot study was conducted in 13 patients with grade 1–3 nasal polyps [15]. All subjects enrolled in the study were nonresponders to topical corticosteroids. The study was approved by the Central Ethics Committee of Hungary and the Ethics Committee of University of Szeged. All subjects signed an informed consent. The primary aims of the study were to assess the feasibility to deliver targeted phototherapy to nasal polyps under endoscopic visualization and to assess tolerability of increasing doses of UVB light in patients with nasal polyposis. In parallel the effect of UVB phototherapy on nasal symptoms and quality of life of patients was also assessed.

We excluded potential subjects from the study who had a diagnosis of cystic fibrosis, oral steroid-dependent asthma, or had upper or lower respiratory infection within 4 weeks prior to the beginning of the study or had any significant nasal structural abnormalities which can interfere with the delivery of intranasal phototherapy. We also excluded patients with known photo-sensitivities or photo-allergies to natural or artificial sunlight and those who were receiving any form of light therapy, or had used any of the following drugs: systemic and topical corticosteroids, leukotriene modifiers and/or immunosuppressive drugs within 4 weeks, membrane stabilizers and/or antihistamines within 2 weeks, prior to the beginning of the study.

Patients were exposed to gradually increasing doses of NB-UVB light (300–1200 mJ/cm^2) over a 12 week period. UV light was delivered targeted to the nasal polyp tissue under endoscopic visualization (Allux Medical Inc., Menlo Park, CA, USA). Patients were treated 3×/week.

Subjects rated their nasal obstruction symptom score weekly on a visual analogue scale from 0 (none) to 6 (very severe) [15]. The NOSE quality of life questionnaire was used at baseline and end of treatment period (score range from 0 to 100) [16]. Adverse events were monitored by endoscopy. No rescue medication was allowed during the treatment period. After finishing the treatments patients had two follow-up visits, at 1 and 3 months after final treatment. At the 1 month follow-up visit the investigators had the option to prescribe mometasone furoate nasal spray or to keep the patients without any topical steroids until the 3 month follow-up visit (decision was based on patients symptoms and endoscopic status). At both follow-up visits symptom scores and the NOSE questionnaire data were collected.

2.1. Statistical analysis

The two-sided Dunnett test was used for statistical analysis, $p < 0.05$ was considered statistically significant. Correlation between nasal obstruction scores and NOSE scores was assessed by the Pearson correlation test.

3. Results

Thirteen subjects were enrolled in the study (six men, seven women; ages: 38–61 years, mean 47). Ten subjects completed the study, three patients drop-out because of non-device related causes (one subject receiving anticoagulant medication presented spontaneous bleeding not related to the treatment, one patient with active seasonal allergic rhinitis and asthma and one patient with superior respiratory tract infection required treatment with prohibited medication). The study proved that UVB phototherapy can be delivered under endoscopic guidance (using a specially designed handpiece) in a targeted fashion to the surface of nasal polyps without causing patients significant discomfort. Treatments were well tolerated and no device related adverse events were reported.

From the 10 subjects who finished the whole treatment regimen three were de novo nasal polyps and seven had at least one sinus surgery (performed at least 1 year before enrollment). Access to nasal polyp tissue was improved in patients with prior sino-nasal surgeries.

Nasal obstruction symptom scores significantly improved at end of treatment compared to baseline ($p = 0.009$) (Fig. 1A). Significant improvement of quality of life (NOSE) at end of treatment compared to baseline was also noted ($p = 0.018$) (Fig. 1B). Changes in nasal obstruction scores showed a good correlation with changes in NOSE scores ($r = 0.81$). During the 1 month follow-up period none of the subjects received any treatment, including intranasal steroids. Nasal obstruction and NOSE scores remained stable during this period (Fig. 1). A statistically significant difference was observed in nasal obstruction and NOSE scores recorded at the 1 month follow-up visit compared to baseline ($p = 0.002$ for nasal obstruction and $p = 0.001$ for NOSE).

At the 1 month follow-up no topical steroid was prescribed in seven patients, the other three subjects received mometasone furoate nasal spray. No significant worsening was observed in nasal obstruction and NOSE scores at the 3 months follow-up visit (Fig. 1). Differences between the 3 months follow-up nasal obstruction and NOSE scores and scores recorded at baseline were statistically significant ($p = 0.035$ for nasal obstruction and $p = 0.015$ for NOSE).

Preliminary data suggest that patients with prior sino-nasal surgeries who benefited from better access to the polyp tissue presented the best improvement (Fig. 2).

4. Discussion

Nasal polyps can induce severe symptoms such as nasal obstruction, rhinorrhea and loss of smell [1]. Quality of life of NP

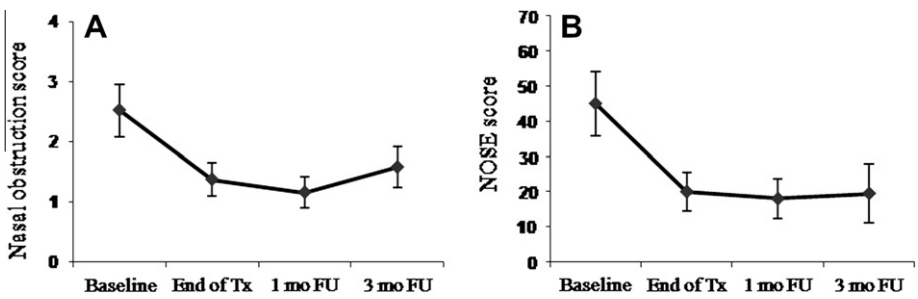

Fig. 1. Effect of narrow-band UVB phototherapy on nasal obstruction symptom scores (A) and NOSE scores (B) at end of treatment, 1 month (1 mo FU) and 3 months (3 mo FU) follow-up.