INDEX COPERNICUS INTERNATIONAL

ORIGINAL ARTICLE

Galectin-1 and -3 contents in primary and recurrent nasal and paranasal sinus polyps

Authors' Contribution:
A – Study Design
B – Data Collection
C – Statistical Analysis
D – Data Interpretation
E – Manuscript Preparation
F – Literature Search
G – Funds Collection

Jarosław Markowski[1ABEG], Krzysztof Siemianowicz[2ADEF], Wirginia Likus[3CD]

[1]Department of Laryngology, Faculty of Medical Sciences in Katowice, Medical University of Silesia in Katowice, Poland; Head: Prof. Jarosław Markowski MD PhD
[2]Department of Biochemistry, Faculty of Medical Sciences in Katowice, Medical University of Silesia in Katowice, Poland; Head: Tomasz Francuz MD PhD
[3]Department of Anatomy, Faculty of Health Sciences in Katowice, Medical University of Silesia in Katowice, Poland; Head: Wirginia Likus PhD

Article history: Received: 28.10.2019 Accepted: 21.11.2019 Published: 22.11.2019

ABSTRACT:

Introduction: Nasal and paranasal sinus polyps are one of the most common laryngological problems. Often, despite surgical treatment of nasal and paranasal sinus polyps, they grow back and require surgical retreatment. It is very difficult to predict which patients are particularly exposed to it. Markers are still being sought to predict which patients are particularly exposed to regrowth of polyps and thus require increased clinical surveillance. Galectins are a group of glycoproteins that have been intensively studied recently. The sugar part of these proteins can play a role in transmitting intercellular signals. Laryngologists are especially interested in galectins-1 and -3. The determination of their increased content in cancer tissue is considered as a marker of malignancy, which worsens prognosis in patients. Recently, more and more attention has been paid to the role of galectins in benign lesions, and such are the nasal and paranasal sinus polyps.

Materials and methods: In our work, the contents of galectin-1 and-3 were determined in the tissue of the surgically removed primary (n = 35) and recurrent polyps (n = 15).

Results: The content of galectin-1 and-3 showed no statistically significant differences between primary and recurrent polyps.

Conclusions: The content of galectin-3 was lower in recurrent polyps, however the observed difference did not reach statistical significance (p = 0.07). Since the obtained „p" value is close to the significance limit, it is advisable to broaden the submitted studies to a larger group of patients in order to be able to fully assess whether the determination of the content of galectin-3 may be helpful in assessing the risk of recurrence of nasal and paranasal sinus polyps.

KEYWORDS: galectins, paranasal sinus, polyps, reccurent polyps

ABBREVIATIONS

CRS – chronic rhinosinusitis
EPOS – European Position Papers on Rhinosinusitis and Nasal Polyps

INTRODUCTION

Chronic rhinosinusitis, or CRS is one of the more common inflammatory diseases affecting even 15–16% of the population. The yearly cost of treatment of various forms of rhinosinusitis in the United States totals approximately 6 billion dollars a year, and the number of days of incapacity for work due to rhinosinusitis is similar to those due to bronchial asthma. The European Position Paper on Rhinosinusitis and Nasal Polyps (EPOS 2007, 2012) divides chronic sinusitis into with or without polyps [1–3]. Another division distinguishes 3 forms of chronic sinusitis: with polyps, without polyps and allergic fungal sinusitis [4]. The incidence of nasal and paranasal sinus polyps in the general population is estimated at 4% [5], up to 4% or 0.5–4.3% [6, 7]. A patient who suffers from this unpleasant condition may experience a significant deterioration in the quality of life. Despite the fact that diagnosis is not a concern, the effects of treatment are limited due to frequent recurrence. It is estimated that every tenth patient who has undergone surgical removal of nasal and paranasal sinus polyps will experience a recurrence with serious ailments causing deterioration of the quality of life and requiring reoperation [6]. Some authors believe that as much as 60% of patients who have undergone surgery to remove nasal or paranasal sinus polyps may experience recurrence, and approx. 27% of those will decide to undergo reoperation [8]. Much research has been devoted to the etiopathogenesis of nasal and paranasal sinus polyps, with particular attention paid to inflammatory factors (interleukins IL-5, IL-6, IL-8, IL-12, IL-25, IL-32, IL-33; TNF-α, TGF-β, INF-γ), eosinophilic infiltrate and fungal infections [7, 9–11]. Relatively few researchers have attempted to find markers to predict which patients may expect a recurrence after surgery for nasal and paranasal sinus polyp removal. Determination of interleukin-5 raises some hope, but the results are inconclusive [7]. Determination of eosinophil content in polyps [12] or the amount of eosinophils and basophils in peripheral blood [13] also raises some hope.

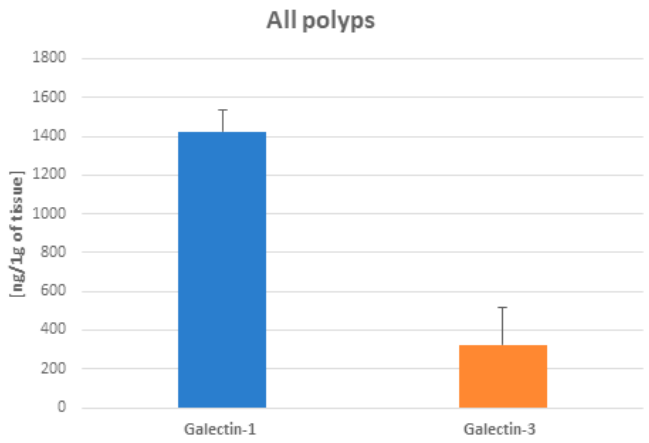

Fig. 1. Galectin-1 and galectin-3 contents in all nasal and paranasal sinus polyps (mean ± standard deviation).

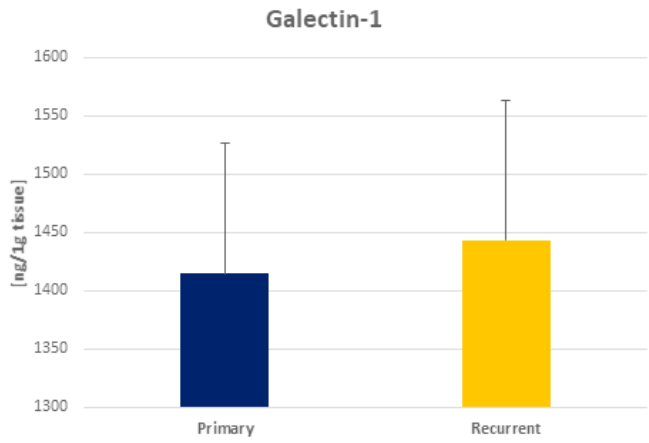

Fig. 2. Galectin-1 content in primary and recurrent polyps of the nose and paranasal sinuses (mean ± standard deviation; p = 0.42).

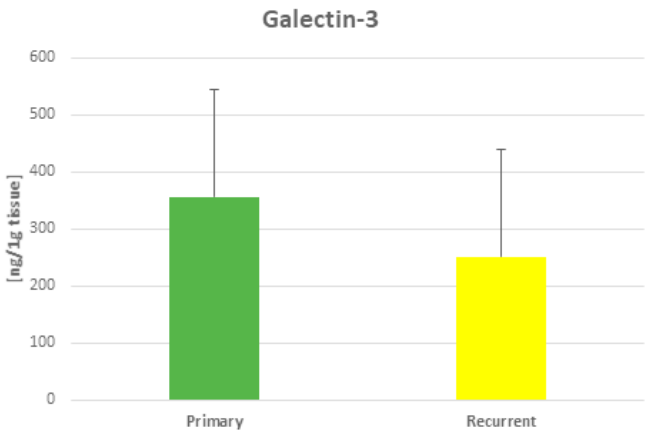

Fig. 3. Galectin-3 content in primary and recurrent polyps of the nose and paranasal sinuses (mean ± standard deviation; p = 0.07).

In recent years, galectins have enjoyed considerable interest from researchers. They constitute a family of endogenous lectins and show high affinity for β-galactosides. These interactions are important in transmitting intercellular signals: in the regulation of cell-cell adhesion, cell growth, immune processes and tumor development [14]. Furthermore, they affect receptors. The above-mentioned characteristic of galectins contributes to an increasing discussion about the ability of glycans to store biological information. Of the 16 known, 12 can be found in humans. It is worth emphasizing that galectins play an important role in cancer, e.g. in squamous cell carcinoma of the throat; increased expression of galectin-1 may be a negative prognostic factor [15]. In turn, galectin-3 shows increased expression in invasive laryngeal cancer [16]. Galectins-1 and -3 have also been researched in the tissue of nasal and paranasal sinus polyps, and their increased content was found in some studies [17–20]. Considering that galectins-1 and -3 are not only associated with the proliferation of cancer cells, but also play a role in inflammatory and allergic diseases, we decided to check whether their content in the tissue of primary and recurrent polyps shows differences.

MATERIAL AND METHODS

The study involved 50 patients with nasal and paranasal sinus polyps: primary (n = 35) and recurrent (n = 15). The study was approved by the Bioethics Committee of the Silesian Medical University (decision No: KNW/0022/KB1/127/I/16). Patients characteristics are presented in Tab. I. After surgical resection, the polyps were frozen in –70°C – until the analysis. After homogenization, galectin-1 and -3 content was determined by ELISA using commercial kits Quantikine® ELISA Human Galectin-1 Immunoassay i Quantikine® ELISA Human Galectin-3 Immunoassay of R&D Systems (Minneapolis, USA). The laboratory analysis was performed by the Anchem laboratory in Katowice. Student's t-test was used for statistical analysis.

RESULTS

Fig. 1. presents contets of both evaluated galectins in all nasal polyps. Statistical analysis showed no statistically significant differences in galectin-1 content between primary and recurrent polyps of the nose and paranasal sinuses (Fig. 2.). Although the content of galectin-3 did not differ statistically significantly between the primary and recurrent polyps (Fig. 3.), value p = 0.07 is close to the limit of statistical significance (0.05).

DISCUSSION

Paranasal sinus polyps often remain undiagnosed. Data cited in the introduction regarding their incidence in the general population may be underestimated, since they concern patients in whom, as a rule, polyps of the paranasal sinuses caused ailments that required the initiation of diagnostics ending with the detection of polyps. However, there remain people with asymptomatic polyps of the paranasal sinuses. In 2004, Larsen and Tos [21] assessed the frequency of nasal and paranasal sinus polyps in the dissected specimen. Their presence was found in as many as 32% of autopsied bodies. Similar data (31.7%) was previously obtained by Tarp et al., who analyzed images obtained in magnetic resonance imaging of the head performed for various neurological indications. In 2001, French researcher Crampette stated that among people with nasal

polyps, about half have undergone a previous polypectomy [22]. However, our data does not support this statement. Among the patients included in our study, people with recurrent nasal and paranasal sinus polyps accounted for only 30%.

It is worth emphasizing that nasal and paranasal sinus polyps often coexist with other conditions, the most important of which include asthma and allergic fungal sinusitis. Furthermore, in recent times attention has been drawn to the fact that nasal and paranasal sinus polyps may be associated with other pathologies such as eosinophilic granulomatosis with vasculitis, primary ciliary dyskinesia and cystic fibrosis [11, 23].

Data on galectin-1 and -3 contents in the tissue of nasal and paranasal sinus polyps are not homogeneous. In the studies of Dilci et al. expression of galectin-1 in nasal polyps did not differ statistically compared to nasal turbinates [24]. Sena et al. found that nasal polyps have lower expression of the galectin-1 gene, while with steroid treatment it increases [18]. In turn, Delbrouck et al. found that nasal polyps have a greater expression of both galectin-1 and galectin-3 than nasal turbinates [17]. In the cited work of Delbrouck et al. and in the research of Duray et al. [14] it was noted that the contents of galectin-1 and galectin-3 do not differ in allergic and non-allergic polyps of the nose and paranasal sinuses. Based on these observations, in our study we decided not to separate primary and recurrent polyp groups into subgroups of allergic and non-allergic polyps. Multifactorial analysis of recurrent polyps, performed in Chinese patients, showed that the greatest risk of polyp recurrence was associated with increased expression of interleukin-5, IgE, cationic eosinophilic protein (ECP) and *Staphylococcus aureus* enterotoxin-specific immunoglobulin E (SE-IgE) [9]. The literature cited in our work indicates that there is still no commonly accepted indicator that would allow to assess the risk of recurrence of nasal and paranasal sinus polyps. The observed differences in galectin-3 content between primary and recurrent polyps found in our work are not statistically significant, although $p = 0.07$ is close to 0.05, which is the limit for statistical significance. In this case, it is advisable to repeat our research on a larger group of patients with primary and recurrent nasal and paranasal sinus polyps in order to be able to fully assess whether the determination of the content of galectin-3 may be helpful in assessing the risk of recurrence of nasal and paranasal sinus polyps.

Tab. I. Patients characteristics.

	WOMEN	MEN	AGE IN YEARS [AVERAGE ± SD]
All polyps	8	42	53.6 ± 12.8
Primary polyps	8	27	52.0 ± 12.7
Recurrent polyps	0	15	57.3 ± 12.8

REFERENCES

1. Van Zele T. et al.: Differentiation of chronic sinus diseases by measurement of inflammatory mediators. Allergy 2006; 61(11): 1280–9.
2. Fokkens W.J. et al.: EPOS 2012: European position paper on rhinosinusitis and nasal polyps 2012. A summary for otorhinolaryngologists. Rhinology 2012; 50(1): 1–12.
3. Thomas M. et al.: EPOS Primary Care Guidelines: European Position Paper on the Primary Care Diagnosis and Management of Rhinosinusitis and Nasal Polyps 2007 – a summary. Prim Care Respir J., 2008; 17(2): 79–89.
4. Georgy M.S., Peters A.T.: Chapter 8: Rhinosinusitis. Allergy Asthma Proc., 2012: 33(Suppl 1): 24–27.
5. Settipane R.A., Peters A.T., Chiu A.G.: Chapter 6: Nasal polyps. Am J Rhinol Allergy 2013; 27(Suppl 1): S20–S25.
6. Rajguru R., Nasal polyposis: current trends. Indian J Otolaryngol Head Neck Surg., 2014; 66(Suppl 1): 16–21.
7. Huriyati, E. et al.: Differences in Expression of Inflammatory Mediator in Mucosal and Polyp Tissue between Chronic Rhinosinusitis and Recurrent Chronic Rhinosinusitis. Open Access Maced J Med Sci., 2019; 7(11): 1733–1738.
8. Wynn R. and Har-El G.: Recurrence rates after endoscopic sinus surgery for massive sinus polyposis. Laryngoscope 2004; 114(5): 811–3.
9. Wei B. et al.: Multivariate analysis of inflammatory endotypes in recurrent nasal polyposis in a Chinese population. Rhinology 2018; 56(3): 216–226.
10. Danielsen A. et al.: Interleukin 5, IL6, IL12, IFN-gamma, RANTES and Fractalkine in human nasal polyps, turbinate mucosa and serum. Eur Arch Otorhinolaryngol., 2006; 263(3): 282–9.
11. Koennecke M. et al.: Subtyping of polyposis nasi: phenotypes, endotypes and comorbidities. Allergo J Int., 2018; 27(2): 56–65.
12. Brescia G. et al.: Histopathological and hematological changes in recurrent nasal polyposis. Int Forum Allergy Rhinol., 2019; 9(7): 813–820.
13. Brescia G., Sfriso P., Marioni G.: Role of blood inflammatory cells in chronic rhinosinusitis with nasal polyps. Acta Otolaryngol., 2019; 139(1): 48–51.
14. Duray A. et al.: Galectin fingerprinting in naso-sinusal diseases. Oncol Rep., 2014; 32(1): 23–32.
15. Saussez S. et al.: High level of galectin-1 expression is a negative prognostic predictor of recurrence in laryngeal squamous cell carcinomas. Int J Oncol., 2007; 30(5): 1109–17.
16. Miranda F.A. et al.: Galectin-3 overexpression in invasive laryngeal carcinoma, assessed by computer-assisted analysis. J Histochem Cytochem., 2009; 57(7): 665–73.
17. Delbrouck C. et al.: Expression patterns of galectin-1 and galectin-3 in nasal polyps and middle and inferior turbinates in relation to growth regulation and immunosuppression. Arch Otolaryngol Head Neck Surg., 2003; 129(6): 665–9.
18. Sena A.A. et al.: Spatial expression of two anti-inflammatory mediators, annexin 1 and galectin-1, in nasal polyposis. Clin Exp Allergy 2006; 36(10): 1260–7.
19. Delbrouck C. et al.: Galectin-1 is overexpressed in nasal polyps under budesonide and inhibits eosinophil migration. Lab Invest 2002; 82(2): 147–58.
20. Fernandes A.M. et al.: Expression of genes that encode the annexin-1 and galectin-1 proteins in nasal polyposis and their modulation by glucocorticoid. Braz J Otorhinolaryngol., 2010; 76(2): 213–8.
21. Larsen P.L. Tos M.: Origin of nasal polyps: an endoscopic autopsy study. Laryngoscope 2004; 114(4): 710–9.
22. Crampette L. et al.: French multicenter prospective epidemiologic study (ORLI Group) of allergic and lung diseases associated with nasal polyposis. Rev Laryngol Otol Rhinol (Bord) 2001; 122(4): 231–6.
23. Brescia G. et al.: Nasal polyposis pathophysiology: Endotype and phenotype open issues. Am J Otolaryngol., 2018; 39(4): 441–444.
24. Dilci A. et al.: Expression profiles of CD11b, galectin-1, beclin-1, and caspase-3 in nasal polyposis. Turk J Med Sci., 2017; 47(6): 1757–1764.

Word count: 3060 Tables: 1 Figures: 3 References: 24

DOI: 10.5604/01.3001.0013.5915 Table of content: https://otolaryngologypl.com/issue/12543

Competing interests: The authors declare that they have no competing interests.

Corresponding author: Krzysztof Siemianowicz MD PhD; Department of Biochemistry, Faculty of Medical Sciences in Katowice, Medical University of Silesia, Medyków Str. 18, 40-752 Katowice, Poland; E-mail: ksiem@mp.pl

Cite this article as: Markowski J., Siemianowicz K., Likus W.: Galectin-1 and -3 contents in primary and reccurent nasal and paranasal sinus polyps; Otolaryngol Pol 2020; 74 (1): 13-16

Funding: Statutory tests of SUM No. KNW-1-082/N/4/0.