The effect of odontogenic sinusitis with periapical lesions on quality of life

Marta Kwiatkowska¹ABDEF, Kornel Szczygielski¹AEF, Aldona Chloupek²EF, Paulina Panasiewicz²BD, Dariusz Jurkiewicz¹AE

¹Department of Otolaryngology, Military Institute of Medicine in Warsaw, Poland; Head: prof. Dariusz Jurkiewicz MD PhD
²Department of Cranio-Maxillo-Facial Surgery, Military Institute of Medicine in Warsaw, Poland; Head: Aldona Chloupek MD PhD

ABSTRACT:

Introduction: Usually the symptoms presented in odontogenic sinusitis do not differ from chronic sinusitis of other origin. However, odontogenic sinusitis is considered as an independent disease which requires specific diagnostic approach and treatment.

Aim: The aim of the study is to define the main symptoms of odontogenic rhinosinusitis with periapical lesions and its impact on the quality of life.

Material and methods: The SNOT-22 and OHIP-14 questionnaires were distributed among 26 symptomatic patients suffering from odontogenic sinusitis with periapical lesions in the teeth that remain in close contact with the maxillary sinus floor. Data was collected by means of an interview and standard examination performed by an otolaryngologist and a maxillofacial surgeon. The symptoms were also objectified using nasal endoscopy and radiological studies. The acquired data was statistically analyzed.

Results: The total OHIP-14 score was 14.7 ± 11.3, whereas the total SNOT-22 score was 44.6 ± 18.8. Women scored significantly higher in the total SNOT-22 score as well as domains concerning nasal symptoms, quality of sleep, and emotional symptoms. The answers given in similar items were comparable between both questionnaires.

Conclusions: Properly diagnosed odontogenic sinusitis (OS) with periapical lesions (PAL) will improve the quality of healthcare and spare the patients inadequate procedures. Standard examination should include a unified and validated questionnaire concerning both sinonasal and oral symptoms. Painful aching in the mouth and discomfort during eating might help to identify the OS with PAL during a medical interview and help both ENT (ear-nose-throat) specialists and dentists to establish proper patient-oriented diagnosis and treatment.

KEYWORDS: chronic rhinosinusitis, odontogenic sinusitis, OHIP-14, periapical lesion, quality of life, SNOT-22

INTRODUCTION

Chronic rhinosinusitis (CRS) is a very prevalent disease that affects 11.6% of Americans [1] and 10.9% of Europeans [2]. It is now a well-defined state in which most pathogenic features and the clinical evolution have been described and summarized in the EPOS 2020 [3] – the recently updated official position paper on rhinosinusitis.

Quality of life is now recognized as a valid parameter in patient assessment in almost every area of physical and mental healthcare.

It is a function of various experiences, symptoms, social background and it represents the person’s subjective perspective [4].

According to Gliklich and Metson [5], CRS has a greater impact on social functioning and quality on life than angina or chronic heart failure.

In contrast, odontogenic rhinosinusitis (OS), a subtype of sinusitis that develops from a dental origin, is a common but frequently unappreciated cause that differs in pathogenesis and management from rhinogenic sinusitis. It is a poorly described condition and its impact on health-related quality of life (HRQoL) is still not well investigated [6].

The impact of odontogenic periapical lesions on inflammatory changes in the maxillary sinus was primarily described in 1943 by Bauer [7]. According to number of recently published reviews, periapical lesions are considered to be one of the major causes of odontogenic sinusitis [8], along with iatrogenic cause and periodontitis, especially when the Schneiderian membrane is affected [8, 9, 10].

Odontogenic maxillary sinusitis with periapical lesion is fundamentally an endodontic infection manifesting initially in the maxillary sinus. It is caused by exudate from a periapical or periodontal...
infection of a maxillary posterior tooth that has eroded through the bone superiorly to drain into the sinus [11]. Thus, medical treatment will not resolve the disease if the endodontic source is overlooked [12]. Therefore, patients are often subjected to teeth extraction due to the relapse of sinusitis or severity of odontogenic symptoms.

Representative sinonasal symptoms are purulent rhinorrhea, unilateral cheek pain or anterior maxillary tenderness, nasal obstruction, foul odor and/or taste, headaches and postnasal drip. According to Kim [13] these symptoms cannot be distinguished from other causes of rhinitis, nor can any typical symptom be considered predominant in OS.

Patients with primary sinonasal symptoms will typically seek care from a primary care physician or ENT specialist who might not address the odontogenic pathology.

Furthermore, the condition is also often overlooked in general dental practice because of lack of typical dental symptoms such as thermal pain, periapical sensitivity or swelling.

Several studies included in a review by Little et al. [8] have already documented that dental disease may be frequently overlooked on CT by radiologists, leading to misdiagnosis.

There have been several recent developments in the understanding of mechanisms, diagnosis and treatment of odontogenic sinusitis, but given its high prevalence (even 40% of maxillary sinusitis cases) [14], there exists an important gap in knowledge.

In published Polish data [15], odontogenic foci were found even among 86.1% patients with chronic sinusitis.

To the best of our knowledge there are only two studies [16, 17] which aimed to establish the value of HRQoL specific for OS but both focused on sinonasal symptoms and their comparison between CRS and OS. They also did not distinguish the patient subgroups presented with different odontogenic causes. We have not found any other studies that would analyze that specific subgroup of patients: presented with odontogenic sinusitis related to periapical lesions.

**AIMS**

The aim of the study was to characterize the main symptoms of odontogenic sinusitis with periapical lesions and their impact on quality of life.

The secondary goal was to specify which items on the dental OHIP-14 form, added to the traditional SNOT-22 questionnaire, could be used as a predictive factor for the odontogenic cause of chronic rhinosinusitis.

**MATERIAL**

The study group consisted of 26 patients (12 women and 14 men). The mean age was 47.5 (SD ± 15.2 years), the median was 47 years (range from 21 to 78 years). Women constituted 46% of the study group, and 54% were men. Statistical analysis was performed for the entire group of patients and separately for each sex. The mean age of women was 44 ± 16 years, the median age was 40.5 years (range 21 to 69 years), and the mean age of men was 52.4 ± 14.3 years (median age 52 years, range 29 to 78 years).

**METHODS**

In accordance to published guidelines [3], Sino-Nasal Outcome Test 22 (SNOT-22) is a suitable, self-administered tool for assessing the HRQoL in patients with CRS. It was validated by Hopkins et al. in 2009 [18].

OHIP-14 (Oral Health Impact Profile by Slade 1997) is a specific questionnaire used for assessing quality of life in relation to oral health. It was validated for Polish language by Skośkiewicz-Malinowska et al. in 2015 [19] and has been proven as a useful diagnostical instrument that has demonstrated good validity and reliability with the original English version.

Each patient provided information on demographics such as gender, age, place of residence, and occupation. Information concerning previous dental treatment and antimicrobial therapy administered in the months prior to ongoing medical consultation was also meticulously gathered. The patients were guided by a physician through the questionnaires in order to assure their comprehension.

Data was collected through an interview and standard ENT examination. The symptoms were also objectified using nasal endoscopy and radiological studies.

The diagnosis of odontogenic source of infection was based on the agreement on the temporal and etiological relationship between the dental cause and sinonasal complication among the same otolaryngologist and oral/maxillofacial surgeon as well as on the radiological findings on computed tomography (CT) or Cone-Beam Computed Tomography (CBCT) scans [20]. The radiographic criteria of inclusion were periapical lucencies exceeding 2 mm involving the teeth with a close contact with the maxillary sinus floor. Smaller radiolucencies were not included as they tend to be described as a thickened periodontal ligament space [21]. Taking into consideration that there is currently no consensus regarding the pathological condition of the Schneiderian membrane thickness [9], in our study we presumed that a thickening exceeding 3 mm is more likely to reflect a clinically important inflammatory response [10, 12].

Exclusion criteria included previous sinus surgery, coexistence of dental disease other than periapical lesions concerning the causative tooth with sinus inflammation, edentulous patients, patients with dentures or prosthesis, recent infection. Patients suffering from asthma and depression were also excluded as it was proven
in a study by Farhood [22] that these conditions are associated with higher SNOT-22 scores.

OHIP-14 consists of 7 conceptual domains: functional limitation, pain, psychological discomfort, physical disability, psychological disability, social disability, and handicap. Each consists of 2 questions. The answers provided were rated according to Likert’s scale as follows: 0 – never, 1 – hardly ever, 2 – occasionally, 3 – fairly often, 4 – very often. Answers 3 and 4 indicate a negative impact of oral health on an individual’s life, and a positive impact is indicated by answers 2, 1, 0 [19].

In SNOT-22 the principal factors are also referred to certain domains grouped as: “nasal symptoms”, “otologic symptoms”, “sleep symptoms”, and “emotional symptoms”. The questionnaire itself consists of 22 items, rated from 0 (“no problem at all”) to 5 (“worst possible symptom”). Possible SNOT-22 total scores range from 0 to 110. To unify the analysis, patients were asked to consider the last month of their symptoms.

In the presented study, at first an “additive method” of scoring was used for each questionnaire (SNOT-22 and OHIP-14) separately. The total score was calculated by summing up the item codes. The higher the value of the score, the worse the symptoms were considered to be. Next, the analysis of each domain was conducted with special emphasis on the differences between men and women.

Due to the fact that the numbers in the subgroups were small, non-parametric Mann-Whitney U-test was used to verify the hypotheses to check whether there are statistically significant differences between men and women concerning the total results and in individual domains. The significance level was assumed to be equal to 0.05.

This study was approved by the Bioethics Committee of the Military Institute of Medicine (Protocol No. 43/WIM/2019). The written consent was collected from all of the participants enrolled in this study.

RESULTS

The total OHIP-14 score was 14.7 ± 11.3, with the highest value in domains describing physical pain (mean 2.5 ± 2.3, median 1.5) the lowest for functional limitation (mean 1.6 ± 1.5, median 1.5) and physical disability was obtained (mean 1.7 ± 1.8, median 1). Concerning specific item analysis, the highest score was obtained in item 13 – felt life less satisfying – scored 3 by 50% of participants.

The most frequent answers marked as “never” – 0 were obtained in the items “Been totally unable to function” (scored 0 by 80.8% of the participants) in the “Handicap” domain and in “trouble to pronounce any words” (scored 0 by 61.5%) in the “functional limitation” domain. Interestingly, statistically significant differences between men and woman were found for the “handicap” variable with p value = 0.031. Women have a statistically significantly higher score in the overall handicap domain and they fairly often feel that life is less satisfying due to their oral health. The remaining results concerning each domain are given in Tab. I.

**Tab. I.** OHIP-14 scores between women and men presented overall and in each domain with their p-value.

<table>
<thead>
<tr>
<th></th>
<th>TOTAL WOMEN SCORE</th>
<th>TOTAL MEN SCORE</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall OHIP-14</td>
<td>188</td>
<td>163</td>
<td>0.193</td>
</tr>
<tr>
<td>Functional limitation</td>
<td>154</td>
<td>197</td>
<td>0.705</td>
</tr>
<tr>
<td>Physical pain</td>
<td>183</td>
<td>168</td>
<td>0.297</td>
</tr>
<tr>
<td>Psychological discomfort</td>
<td>190</td>
<td>162</td>
<td>0.160</td>
</tr>
<tr>
<td>Physical disability</td>
<td>157</td>
<td>195</td>
<td>0.781</td>
</tr>
<tr>
<td>Psychological disability</td>
<td>197</td>
<td>155</td>
<td>0.076</td>
</tr>
<tr>
<td>Social disability</td>
<td>189</td>
<td>163</td>
<td>0.176</td>
</tr>
<tr>
<td>Handicap</td>
<td>204</td>
<td>148</td>
<td>0.031</td>
</tr>
</tbody>
</table>

The total SNOT-22 score was 44.6 ± 18.8, with the highest value in domains describing nasal symptoms (mean 19.8 ± 6.4, median 20.5) and the lowest for emotional symptoms (mean 2.8 ± 2.0, median 3.0). Two items that were mostly pointed as 4 – “severe problem” and 5 – “worst possible problem” were “need to blow your nose” (scored 4 by 42.3% and 5 by 11.5%) and “running nose” (scored 4 by 30.8% and 5 by 11.2%). The items considered as 0 – “no problem” or 1 – “very mild problem” most frequently were “earache” (scored 0 by 65.4% and 1 by 11.5%) and facial pain (scored 0 by 42.3% and 1 by 15.4%).

In the domains concerning nasal symptoms, symptoms related to the quality of sleep and emotional symptoms as well as total SNOT-22 score, statistically significant differences were found between both genders, with women presenting higher scores than men. The obtained p values are given in Tab. II.

Descriptive statistical analysis divided by gender is presented in Tab. III. and IV.

In both questionnaires 4 items seem to be comparable even though their definition differed slightly: difficulty to feel “tastes” (and/or “smells” in SNOT-22), pain in facial or oral region, being frustrated and irritated, being embarrassed/feel of shame.

In our analysis no statistically significant differences were found concerning the answers given for comparable questions between the questionnaires, in the majority of cases patients responded...
To date there have been only two studies which aimed to establish the value of HRQoL specific for OS. A retrospective study performed by Gaudin et al. [17] focused on answering the question whether there is a difference in the impact of sinonasal symptomatology (measured with SNOT-22) on general HRQoL (measured by the health utility index from the 5-item EuroQoL survey) in odontogenic CRS compared to non-odontogenic CRS.

The study also showed no statistically significant difference in the total SNOT-22 score between the CRS and OS patients but was significantly associated with decreased general HRQoL. According to the authors, their findings suggest that sinonasal symptoms may have a greater impact on general HRQoL in odontogenic CRS compared to non-odontogenic CRS [17].

Another study by Simuntis et al. [16], also compared the sinonasal symptoms between patients with CRS and OS but based just on the SNOT-22 questionnaire.

“Malodor”, considered to be one of the most characteristic symptoms of OS, was added to the SNOT-22 questionnaire as an additional item, and differed significantly between the two groups in disadvantage of OS patients. Although the total SNOT-22 score was not significantly different in two groups, patients with equally. However, the obtained p-value for the question about impaired sense of taste and the irritability/irritation in contacts with people was on the border of the level of significance.

**DISCUSSION**

The illness affects not only the patient’s physical but also emotional, social, and professional functioning. According to Finlayson et al. [23], as objective clinical indicators are not sufficient to assess the overall effect of disease, there is a growing interest in clinical practice which focuses on including patient-reported measures in health condition assessment. That comprises the illness itself and its consequent therapy.

The basic research tools used for evaluating quality of life are questionnaires, which are easy tools that enable to obtain a quantitative result that could serve as a basis for comparison with other studies [19]. In clinical practice, they are helpful and non-invasive instruments which help to establish the proper diagnosis.

The concept of HRQoL defined by the World Health Organization, is multidimensional and subjective. It tracks the general health condition and takes into consideration the influence of coexisting systemic diseases and the natural ageing process [19, 24].
OS scored significantly higher with regard to emotional disturbance, while CRS patients scored significantly worse in sleep and functional disturbance [16]. In contrast to published data, emotional symptoms were most often scored low among our subgroup of patients.

Periapical lesions are among the most frequent pathologies in the alveolar bone [25]. In a systematic review by Eggmann et al. [9], the majority of the included studies showed a positive association between periapical lesions and the thickening of the Schneiderian membrane, which in retrospective studies is considered as a sign of sinusitis. However, Schneiderian membrane thickening occurs on CT scans incidentally in approximately a third of an asymptomatic population [9]. Rhinosinusitis is a disease with well-defined clinical symptoms [3] and radiological findings are not sufficient to establish the diagnosis. In OS with periapical lesions when the infection of periradicular tissues persists after treatment of the acute state, the periapical lesion remains, and may also be asymptomatic [25], which hinders the diagnostic process and obscures the pathophysiological connection.

This is why we decided to explore the exact symptoms reported by patients in a specific group of OS. Czarnecka et al. [15] emphasize the difficulty in diagnosing tooth-related sinusitis, since the progression of the infection often takes place in a very slow manner, with few visible clinical signs and sometimes without any tooth pain experienced by the patient.

Our results, similarly to the previously mentioned study and the paper by Skośkiewicz-Malinowska et al. [6], confirm previous assumptions according to which dental problems and related odontogenic sinusitis may also cause emotional disabilities and disorders, and not only physical pain.

Interestingly, among the participants of our research, facial pain was most frequently a low scored item in the SNOT-22 questionnaire. On the other hand, the physical pain domain in OHIP-14 which refers to painful aching in the mouth and discomfort while eating any food obtained the highest values.

In conclusion, adding this oral-pain item in standard SNOT-22 could help to identify the OS with periapical lesions during medical interview.

If clinical symptomatology is overlooked, patients are referred to different specialists (dentist, maxillofacial surgeons, ENT specialists) and risk undergoing redundant treatment. With the development of radiological and endoscopic diagnostic techniques, odontogenic etiology is now identified as the main cause of sinusitis in almost 40% of all cases [15].

Thus, in the work by Finlayson et al. [23] the researchers underline the importance of concerning both objective and subjective symptoms. In case of odontogenic sinusitis, the former would comprise CT or CBCT scan analysis and endoscopic evaluation, and the latter – the patient’s main complaints referred to the clinician, objectified by disease-specific questionnaires like SNOT-22. Since the patient’s experience of disease can range from asymptomatic to debilitating, the presence of any form of disease can diminish quality of life in multiple realms. Yet sometimes, experiencing more symptoms or having greater disease severity in some patients does not necessarily translate to lower HRQoL. [23].

In several studies the median value of 7 is taken as the “normal” SNOT-22 score in people without CRS [26] and with no sinonasal disease at all [27] and can be considered as a reference in clinical settings and research. With the mean total score of 44.6, odontogenic sinusitis with periapical lesions is a disease with a strong impact on the quality of life.

According to Sischo et al. [4] the use of HRQoL as an evaluative outcome measure is congruent with patient-centered care. When considering the use of generic or disease-specific questionnaires, the latter seem to be advantageous, providing better sensitivity and more detailed information [4, 23].

The Oral Health Impact Profile (OHIP) as an example of a disease-specific tool is correlated to oral health conditions to a higher extent than the generic one, i.e., the Short Form Health Survey (SF-36) [4, 28].

In a study by Gaudin et al. [17], odontogenic CRS was not associated with a difference in SNOT-22 score but was significantly associated with decreased general HRQoL measured by the health utility index from the 5-item EuroQol.

Simuntis et al. [16] found that OS and CRS patients differed in 2 domains of symptoms in the SNOT-22. Emotional disturbance was higher in the OS patients (P 1⁄4 .046) and sleep and functional disturbance in the CRS patients. Our study could not support a similar hypothesis, as patients with OS and periapical lesions had most often pointed to “nasal symptoms” as the most severe problem.

An analysis performed by Kim [13] revealed that unilateral nasal obstruction with facial pain and pressure is a common symptom in OS, and foul odor with a rotten taste combined with tooth pain appears to clinically differentiate CMS and OS. We also stated that concerning the OHIP-14 form, “physical pain” was mostly scored at 3 or 4 which suggests the importance of this symptoms in patients’ complaints and differential diagnosis.

Even though currently no evidence supports the link between sinusitis and halitosis, a paper by Ferguson [11] states that anaerobic infections which lead to purulent sinusitis may cause “malodor”. Possible mechanisms include stagnation of secretions resulting in increased bacterial load and possible release of volatile sulfur compounds. Another origin is related to mouth breathing and xerostomia caused by obstructive nasal pathology.

In a paper by Greguri et al. [29] who analyzed the differences in HRQoL between patients suffering from two clinical phenotypes of rhinosinusitis – with and without nasal polyps – gender was a significant covariate for total SNOT-22 score, with women having higher SNOT-22 scores. In our study we also proved that in OS related to periapical lesions, women score significantly higher and as in the mentioned analysis, we have not found the positive correlation between age and SNOT-22 score.

Currently there is no official diagnosis nor treatment protocol in case of odontogenic sinusitis. Researchers agree that it involves a combination of medical treatment, endodontic treatment or dental surgery and/or endoscopic sinus surgery [8]. Despite the growing incidence and awareness among ENT specialists and
dentists, odontogenic sinusitis with periapical lesions has not been explored thoroughly. To the best of our knowledge this is the first paper describing the quality of life in this group of patients with the use of not only rhinological but also oral HRQoL questionnaires.

CONCLUSIONS

Treating OS patients requires individualized medical and surgical options, and an interdisciplinary approach is mandatory.

REFERENCES


Clinicians who can accurately identify odontogenic sources can increase the efficacy of medical and surgical treatments and improve patient outcomes. The HRQoL measure tools along with clinical assessments allow healthcare professionals to better weigh the risks and benefits of the proposed treatment and evaluate its efficacy.

The unified and validated questionnaire, comprising rhinological and oral symptoms included in the standard examination of patients with odontogenic sinusitis and periapical lesions, may help both ENT specialists and dentists properly diagnose and treat their patients.
<table>
<thead>
<tr>
<th>DOI:</th>
<th>10.5604/01.3001.0015.4539</th>
<th>Table of content: <a href="https://otolaryngologypl.com/issue/14402">https://otolaryngologypl.com/issue/14402</a></th>
</tr>
</thead>
<tbody>
<tr>
<td>Copyright:</td>
<td>Some right reserved: Polish Society of Otorhinolaryngologists Head and Neck Surgeons. Published by Index Copernicus Sp. z o.o.</td>
<td></td>
</tr>
<tr>
<td>Competing interests:</td>
<td>The authors declare that they have no competing interests.</td>
<td></td>
</tr>
<tr>
<td>Corresponding author:</td>
<td>Marta Kwiatkowska MD, Department of Otolaryngology, Military Institute of Medicine in Warsaw; Szaserów street 128, 04-142 Warsaw, Poland; Phone: +48 022 261 816 475; E-mail: <a href="mailto:mkwiatkowska1@wim.mil.pl">mkwiatkowska1@wim.mil.pl</a></td>
<td></td>
</tr>
<tr>
<td>Cite this article as:</td>
<td>Kwiatkowska K., Szczygielski K., Chloupek A., Panasiewicz P., Jurkiewicz D.: The effect of odontogenic sinusitis with periapical lesions on quality of life; Otolaryngol Pol 2022; 76 (1): 13-20</td>
<td></td>
</tr>
</tbody>
</table>