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Commentary

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Occupational Asthma: The Knowledge Needs for a Better Management

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Abstract

The management of occupational asthma (OA) may be influenced by several factors and removal from exposure is the main tertiary prevention approach, but it is not always feasible without personal and socioeconomic consequences. Reducing the delay between the onset of suggestive symptoms of OA and the diagnosis of OA is associated with a better prognosis. Workers' education to increase awareness to trigger agents and a medical surveillance program directed especially at at-risk workers could be helpful in reducing this latency time. An early identification of workers who develop rhinitis and conjunctivitis which often precede the onset of asthma symptoms could be important for an early identification of OA. This is particularly important for cases of asthma caused by high-molecular-weight sensitizers and in the early years of employment. The availability of financial support and compensation measures for workers with OA may influence the latency time before diagnosis and, consequently, may influence the OA outcomes. In conclusion, there is a need for high-quality cohort studies that will increase knowledge about risk factor that may influence the

timing of diagnosis of OA. This knowledge will be useful for implementation of future surveillance and screening programs in workplaces.

Keywords: management; professional asthma; surveillance

Introduction

Occupational asthma (OA) is defined as asthma induced by sensitizer or irritant work exposures (Tarlo *et al.*, 2008) and the costs related to OA patients are greater than those related to non-work-related asthma (WRA) (Lemière *et al.*, 2013). The complete avoidance of exposure is the first measure to be taken, but sometimes may not lead to a complete recovery from asthma (Baur *et al.*, 2012). It can be at the expense of adverse socioeconomic consequences (Vandenplas *et al.*, 2003), and it is not always feasible. Alternative possible measures are reduced exposure to causal agents, education of workers and employers and improvement of the personal protection of asthmatic workers (Lau and Tarlo, 2019).

A recent Cochrane systematic review (Henneberger *et al.*, 2019) on the effectiveness of workplace interventions for the treatment of OA has shown good evidence of improvement of respiratory symptoms and lung function, comparing removal from exposure versus continued exposure among patients exposed to low-molecular-weight (LMW) agents, whereas the findings are less clear for high-molecular-weight (HMW) agents. The findings are based on observational studies only, as no randomized controlled trial was identified. All studies were rated as 'very low certainty of evidence' according to the GRADE Working Group grades of evidence. Based on these evaluations, there is a need for data from good quality studies, especially additional cohort studies that provide incident data on outcome(s) and objective measures of exposure, objective diagnostic assessments, and standardized methods for evaluation of follow-up of symptoms and clinical course in prognostic terms. Prospective enrollment of newly diagnosed OA for longitudinal follow-up has been suggested, following all participants at predefined intervals since diagnosis including more details about socioeconomic impact (Henneberger *et al.*, 2019).

Early diagnosis

An accurate and early diagnosis is the first step to manage OA (Lau and Tarlo, 2019; Cullinan *et al.*, 2020). The best prognosis is associated with an early diagnosis, early removal from exposure and milder asthma at the time of diagnosis (Maestrelli *et al.*, 2012). Diagnostic testing while the patients are still at the workplace significantly improves sensitivity of the diagnosis of OA. It is important that the diagnostic investigations (e.g. the non-specific airway responsiveness tests) begin when patients are still exposed to the suspected causal agent(s). When the patient is still working, the sensitivity of non-specific airways responsiveness test reaches 95% and a negative predictive value of 98% (Pralong *et al.*, 2016). Early recognition of suggestive symptoms and early diagnosis of OA are needed for timely and appropriate preventive measures (Baur *et al.*, 2012). The diagnostic procedures include a detailed clinical history, immunological tests, measurement of lung function, and markers of airway inflammation, as well as various methods that relate clinical, functional, and inflammatory changes to workplace exposure(s) (Cullinan *et al.*, 2020).

A reduced delay between the symptoms onset and diagnosis of OA can influence the subsequent course of the disease. Patients with the shortest durations of employment had the highest rate of recovery (Rachiotis *et al.*, 2007) and an early detection of OA and care in specialist centers are associated with a more favorable prognosis (Feary *et al.*, 2020). Asthma from LMW agents nearly always has an onset within the first 2 or 3 years of exposure (Lau and Tarlo, 2019), while asthma for HMW agents is recognized with a longer interval between the beginning of exposure the onset of symptoms in the workplace, and the diagnosis of OA (Miedinger *et al.*, 2010; Vandenplas *et al.*, 2019). The median delay for OA is 4 years, while work exacerbated asthma (i.e. preexisting or concurrent asthma worsened by work factors) (Tarlo *et al.*, 2008) often requires fewer years to be diagnosed (Fishwick *et al.*, 2007; Santos *et al.*, 2007). If the patient continues to be exposed, the symptoms aggravate, and the pharmacological control becomes less efficient.

Patient education and medical surveillance program

Focusing on improving awareness and knowledge of WRA (OA and work exacerbated/aggravated asthma) through patient education as well as worker information on the characteristics of WRA seems to lead to better case management (MacKinnon *et al.*, 2020). Furthermore, a medical screening strategy and surveillance program should be applied to at-risk workers (Baur *et al.*, 2012). Some researchers suggest medical surveillance programs for OA with a respiratory questionnaire, spirometry, and specific immunologic tests before initiating work and thereafter, consecutive assessments every 6–12 months

(Lau and Tarlo, 2019) in order to identify any symptoms at an early stage and provide an early diagnosis of OA.

Research needs

(1) Cohort studies on asthma, rhinitis, and conjunctivitis

More cohort studies are needed in order to evaluate the incidence of OA, but also of WRA and other respiratory symptoms. The majority of patients with a diagnosis of OA also suffer from occupational rhinitis that often precedes the development of OA (Moscato *et al.*, 2008). Wheezing, nasal and ocular itching at work can be positively associated with the presence of OA and early asthmatic reactions, especially for HMW agents (Vandenplas *et al.*, 2019). Therefore, identifying individuals who develop rhinitis and conjunctivitis could be useful in identifying those who will develop WRA symptoms. Identification of subjects with rhinitis or conjunctivitis (Maestrelli *et al.*, 2020) among workers exposed to HMW agents could be important also to evaluate the onset of work-related respiratory symptoms over time and, if necessary, implement measures to reduce or eliminate exposure to the suggested causative agent. In addition, identification of pre-employment individual risk factors (e.g. atopy) and early identification of rhinitis symptoms may be relevant for medical surveillance of exposed workers and for minimizing the latency between the onset of respiratory symptoms and the diagnosis of OA (Moscato, 2013).

(2) Studies of OA phenotypes

HMW and LMW asthma have different phenotypic characteristics that may influence the outcome of OA (Vandenplas *et al.*, 2019). However, few studies have assessed these or other possible OA phenotypes. Asthma caused by HMW sensitizers is associated with worse outcome (Rachiotis *et al.*, 2007; Maestrelli *et al.*, 2012) in terms of persistence of bronchial responsiveness. In some studies, patients whose disease was attributed to HMW agents appeared to be related to a higher risk of airflow limitation (Vandenplas *et al.*, 2019), whereas others found that LMW agents are associated with more severe manifestations (Meca *et al.*, 2016). The differences are, at least partly, due to the definition of the outcome: persistence of non-specific bronchial responsiveness (Rachiotis *et al.*, 2007), number of exacerbations (Meca *et al.*, 2016; Vandenplas *et al.*, 2019), or airflow limitation (Vandenplas *et al.*, 2019). These are different indicators of the severity of the disease and have specific medium- and long-term impact on the patients quality of life. There is a need to expand the number of studies related to HMW asthma as reported by the Cochrane research (Henneberger *et al.*, 2019). Furthermore, additional information is needed regarding the best education methods to increase patients' awareness about inducers and triggers (Walters *et al.*, 2015) for these two types of OA. It has been shown that referral to an occupational health service may also improve the OA outcomes (Feary *et al.*, 2020).

(3) Therapy and compensation measures for workers

Related to the importance of early detection and appropriate treatment of OA (Vandenplas *et al.*, 2012; Tarlo and Lemiere, 2014; Cormier and Lemière, 2020; Tiotiu *et al.*, 2020), information regarding the need for pharmacological treatment to achieve asthma control and, eventually, specific immunotherapy or other therapeutic options to modify the natural history of the disease is useful when assessing OA patients. The diagnosis and evolution of OA may affect worker's career, income and, sometimes, can lead to unemployment (Feary *et al.*, 2020). The fear of losing work and income may make workers reluctant to report respiratory symptoms in the workplace and may delay the OA diagnosis and treatment. Workers with older age, higher salary, and asthma caused by HMW seem to have an increased latency time between the onset of symptoms and the diagnosis and, consequently, a longer exposure duration to the harmful agent (Miedinger *et al.*, 2010). Adequate information about the availability of economic support and compensation measures for workers with OA may contribute to reducing the exposure time before the diagnosis of OA and, consequently, may influence the outcomes of OA (Dewitte *et al.*, 1994; Miedinger *et al.*, 2010).

Conclusions

Future data from high-quality cohort studies will increase knowledge about risk factors for and management of OA and inform future surveillance and screening programs at workplaces with possible exposure to irritants as well as HMW and LMW agents (Tan and Bernstein, 2014).

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Conflict of interest

The authors declare that there is no conflict of interest.

Data availability

No data were used in this study.

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