Appendix 1: Irritant induced asthma

The focus of this BTS statement is occupational asthma (OA) due to sensitisation. Irritant induced asthma (IIA) is a separate entity but is included here for completeness and to highlight important differences between the two diseases. IIA refers to asthma that arises as a direct consequence of exposure to agents that irritate the respiratory tract once inhaled and is distinct from allergic OA in many ways, most notably by the absence of immunological sensitisation as the underlying mechanism.[1,2] In contrast to allergic OA, there is no period of latency and no clear associations with smoking or atopy have been identified for specific causal agents.

Acute IIA was previously known as reactive airways dysfunction syndrome (or RADS) and first described by Brooks in 1985[3], who set out strict diagnostic criteria in a series of ten cases:

- the absence of pre-existing asthma symptoms
- a rapid onset of asthma symptoms within the first 24 hours following a single exposure to very high levels of irritant vapour, gas, fume or smoke
- demonstrable airflow obstruction with bronchodilator reversibility or non-specific bronchial hyper-responsiveness
- exclusion of other diagnoses that might explain the symptoms.

Brooks originally described persistence of these symptoms for at least three months, but it is now recognised that, in some cases, they may resolve over a few weeks[2-4]. The exposure frequently occurs in, but is not limited to, the workplace; in cases of industrial accidents, more than one person may be affected. In the original Brooks paper[3], acute IIA was caused by exposure to uranium hexafluoride, floor sealant, spray paints, hydrazine, heated acid, fumigating fog, metal coat remover and fire/smoke. There is inconsistent reporting of acute IIA in the literature but, based on results of a recent review, the most commonly implicated agents are chlorine-containing compounds.[5] This is supported by unpublished data from SWORD (2010-2019), with the most common reported agents being cleaning products; dusts; cement, plaster and masonry; sterilising agents and disinfectants; and fuels, oils and diesel. [personal communication]

In almost all cases, there are no accurate measurements of the irritant compounds generated during inhalation accidents. Therefore, estimation of the intensity of exposure is generally qualitative (and may be affected by recall bias) and can be difficult to prove. This may be an important point to acknowledge with the patient. Management should be focused on objective assessment of the presence (or absence) of disease including the assessment of non-specific bronchial hyper-responsiveness or demonstration of significant bronchodilator reversibility of reproducible spirometry. Treatment of acute IIA is with standard asthma therapy including inhaled corticosteroids and bronchodilators. There is a paucity of data on the long-term prognosis of acute IIA but evidence suggests a range of responses from complete resolution to persistent respiratory disability.[6-8] Asthma medication should be reviewed regularly and withdrawn and stopped if possible. Because the underlying mechanism is not due to IgE mediated allergy, individuals can continue in their usual work environment so long as there are measures to prevent further high-level exposures.

Physicians should be aware that some of the situations in which the exposure occurred may have been extremely frightening (e.g. explosion at work) and psychological factors which arise as a result may impact on recovery. [8] An inhalation injury can result in anxiety and fear about returning to the workplace. Hyperventilation and other breathing pattern disorders, inducible laryngeal obstruction, chronic rhinitis, perceived issues with chemical sensitivity and post-traumatic stress disorder may mimic asthma symptoms and should be explored and managed. IIA is not a prescribed disease and thus affected individuals are not eligible for IIDB, but not infrequently a personal injury claim will ensue.

In addition to acute IIA, other possible phenotypes of IIA have been described, including asthma occurring as a result of repeated symptomatic high-level exposure to irritants (Brookes used the term "not-so-sudden-onset" IIA[4]) or chronic exposure to moderate dose irritants;[1,] the underlying mechanisms responsible for these conditions are less clearly defined and remain an active area of research interest.

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