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Flat chest may be an acquired deformity of the thoracic cage in patients with pleuroparenchymal fibroelastosis http://ow.ly/tyqfq

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Received: Sept 16 2013 | Accepted after revision: Oct 14 2013

Support statement: This work was partly supported by a grant to the Diffuse Lung Diseases Research Group (Dept of Respiratory Medicine, Jichi Medical University, Tochigi, Japan) from the Ministry of Health, Labour and Welfare (Tokyo, Japan).

Conflict of interest: None declared.

Provenance: Submitted article, peer reviewed.

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Specific inhalation challenge tests for occupational asthma in Europe: a survey

To the Editor:

Asthma is described as ''occupational'' if it has been induced by an agent encountered in the workplace. The avoidance of further exposure to the causative agent often results in resolution of the asthma, especially if it can be achieved soon after the onset of symptoms [1]. Consequently, occupational asthma is one of the very few types of asthma that are potentially curable.

The implications of this include the importance of early recognition of occupational asthma and of accurate identification of the causative agent. A variety of methods are available to make a diagnosis [2], among which specific inhalation challenge (SIC) testing is generally considered to be the reference standard [3–5]. In this context, SIC testing is the controlled exposure of a patient, under laboratory conditions, to an agent

encountered in their workplace. The technique is complex, specialised and practised only in a limited number of centres. If performed carefully it is an effective, efficient and low-risk strategy for making (or in some cases refuting) a diagnosis of occupational asthma and for identifying a specific causal exposure.

In 2011, we established a Task Force on occupational SIC testing, comprising 15 specialist physicians from 10 European countries; funding was granted by the European Respiratory Society (ERS). Our principle aim was to issue guidance on the indications, methodology and interpretation of SIC tests for those who already provide the service and for those who wish to do so in the future. The work programme included a survey of European centres where SIC testing is currently offered; here we present a summary of the responses to this survey.

Members of the Task Force devised a 40-item questionnaire designed to enquire about the experience and practice of occupational SIC over the previous 3 years. This was sent, by e-mail, to every European member of the Occupational and Environmental Group (6.2) of the ERS. We received and collated responses from 24 separate centres that conduct occupational SIC tests in 12 countries.

Figure 1 maps the separate European centres where SIC is practised. The international distribution across the continent is uneven: while some countries (notably Finland, Belgium, Italy, Germany and the UK) have several centres, many have none. There is greater variation still in the rates of SIC, depicted by the size of the circles in figure 1, which bear no clear relationship with population numbers.

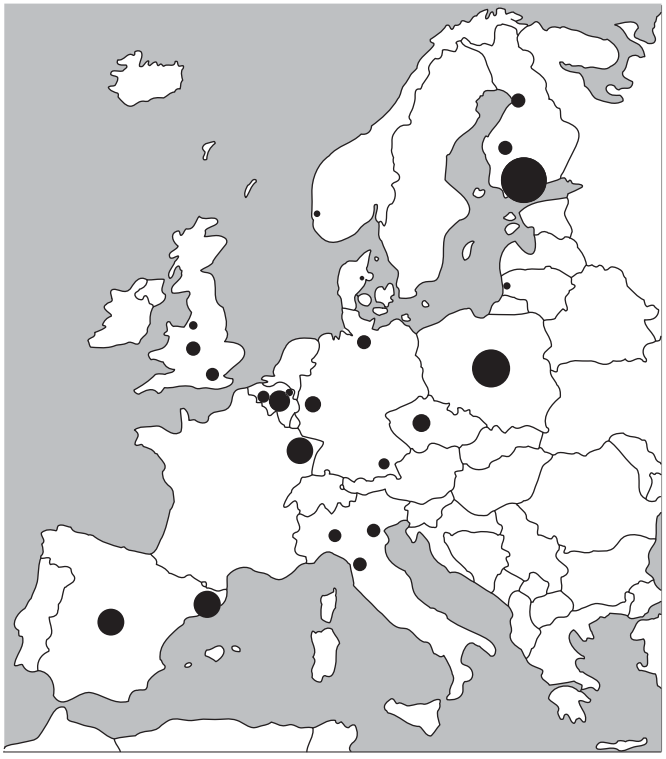

FIGURE 1 European centres where specific inhalation challenges are used in the diagnosis of occupational asthma. The size of each circle is proportional to the number of patients challenged each year. The biggest circle (Helsinki) represents 136 patients per year and the smallest circle (Aarhus) represents one patient per year. Information was derived from an online survey of members of the European Respiratory Society Occupational and Environmental group in 2012. The following centres are shown: Finnish Institute of Occupational Health, Helsinki, Finland; Nofer Institute of Occupational Medicine, Łodz, Poland; Hospital Vall d'Hebron, Barcelona, Spain; Fundacion Jimenez Diaz, Madrid, Spain; Strasbourg University Hospital, Strasbourg, France; Centre Hospitalier Universitaire de Mont-Godinne, Yvoir, Belgium; General University Hospital, Prague, Czech Republic; Birmingham Heartlands Hospital, Birmingham, UK; The Institute for Prevention and Occupational Medicine of the German Social Accident Insurance, Bochum, Germany; Seinäjoki Central Hospital, Seinäjoki, Finland; Oulu University Hospital, Oulu, Finland; Royal Brompton Hospital, London, UK; Helsinki University Central Hospital, Helsinki, Finland; Universitair Ziekenhuis, Brussels, Belgium; University of Padova, Padova, Italy; Institute for Occupational and Maritime Medicine, Hamburg, Germany; University of Pisa, Pisa, Italy; Fondazione Salvatore Maugeri, Pavia, Italy; University of Munich, Munich, Germany; North Manchester General Hospital, Manchester, UK; University Hospitals Leuven, Leuven, Belgium; Republican Klaipeda Hospital, Klaipeda, Lithuania; Haukeland University Hospital, Bergen, Norway; Aarhus University, Aarhus, Denmark.

In the 3 years prior to the survey, the centres had collectively performed 1612 SIC tests, half of them with low molecular weight agents. Table 1 summarises their facilities, practise and experiences over this period after categorisation into two groups of "high" and "low" activity based on the median number of tests (n=12) undertaken annually. In 38% of centres, SIC is routinely used in the diagnosis of occupational asthma; the remainder employ it when alternative diagnostic tests have failed to provide an adequate diagnosis. All but three centres have an enclosed and ventilated chamber dedicated to occupational SIC testing. In all centres, the tests are overseen by a physician; in two-thirds a nurse performs the test, advised by a technician, occupational hygienist or chemist in 54% of centres. These proportions did not differ markedly by the level of activity.

Half of the centres routinely admitted patients to hospital for the duration of the SIC, the remainder carried out the test on an outpatient basis; almost all centres preferred to perform the test after asking patients to stop all treatments for asthma. Simulating work tasks is the most common method of delivering exposure; in almost all centres this was carried out with exposure to an inactive control agent on a separate day to provide a basis for comparison of responses to active exposures. It was rare for more than one active agent to be tested on any one day, although different doses of the same active agent were used in about half of the centres. For almost all centres, the exceptions being two centres in Germany where airway conductance was measured, serial measurements of forced expiratory volume in 1 s were the primary outcome. In addition, assessment of bronchial reactivity was commonly used and, in many centres, the newer techniques of exhaled nitric oxide fraction measurement and sputum cytology were routinely included.

We asked each centre to report the number of excessive asthmatic reactions requiring treatment with oral corticosteroids provoked by SIC over the previous 3 years. Half of the centres reported none; in the remainder (with one exception where an incidence of 18% was reported), the incidence was between 2% and 8%. These proportions were not related to the level of activity in the centre.

We doubt that we have captured the full picture, but in any case, a large number of occupational SIC tests are performed in Europe. However, the distribution of centres that offer tests and the numbers undertaken in each centre are uneven and reflect neither the populations they serve nor the likely regional incidence of

TABLE 1 Responses to questionnaire items for all centres and after categorisation by median level of annual activity

	All	High activity	Low activity
Centres n	24	12	12
SIC used			
Systematically to confirm occupational asthma	9 (38)	6 (50)	3 (25)
Only if other tests are inconclusive	14 (58)	6 (50)	8 (67)
Number of SIC annually	12.2 (0.3–124)	25.0 (12–124)	8.0 (0.3–12.0)
Dedicated[#] facilities for SIC	21 (88)	11 (92)	10 (83)
Physician oversees SIC	24 (100)	12 (100)	12 (100)
Nurse performs SIC	16 (67)	8 (67)	8 (67)
Hygienist, chemist or technician involved in SIC	13 (54)	7 (58)	6 (50)
Informed consent from patient	19 (79)	10 (83)	9 (75)
Patients routinely admitted to hospital	13 (54)	8 (67)	5 (42)
Inhaled steroids stopped prior to SIC[¶]	22 (92)	11 (92)	11 (92)
Control exposure used	23 (96)	12(100)	11 (92)
Simulation of work tasks	20 (83)	10 (83)	10 (83)
GenaSIC[+] or comparable device	5 (21)	3 (25)	2 (17)
Different doses of active agent used on same day	15 (63)	7 (58)	8 (67)
Different active agents used on same day	4 (17)	4 (33)	0 (0)
FEV_1 as primary outcome	21 (88)	11 (92)	10 (83)
NSBHR routinely used as an outcome parameter	17 (71)	9 (75)	8 (67)
Sputum cytology used as an outcome parameter	11 (46)	8 (67)	3 (25)
F_{ENO} used as an outcome parameter	16 (67)	8 (67)	8 (67)
SIC with low molecular weight agents in the past 3 years	822 (51)	693 (51)	129 (50)
Percentage of SIC with excessive asthmatic response	0 (0–18)	2 (0–6)	0 (0–18)

Data are presented as n (%) or median (range), unless otherwise stated. SIC: specific inhalation challenge; FEV_1: forced expiratory volume in 1 s; NSBHR: nonspecific bronchial hyperreactivity; F_{ENO}: exhaled nitric oxide fraction. [#]: enclosed and ventilated chamber reserved for SIC; [¶]: inhaled steroids were stopped prior to SIC always or when possible; [+]: GenaSIC (SCL Medtech, Montréal, QC, Canada) is a closed-circuit chamber that facilitates the production of aerosols at steady concentrations.

occupational asthma. This variation has probably arisen through the interests and customs of local specialists as, as far as we are aware, no jurisdiction in Europe absolutely requires the use of SIC in the diagnosis of occupational asthma for reasons of compensation. Over half of European countries appear to offer no SIC service. Structurally, there seems to be a high degree of consistency between centres, with few differences between those where relatively high or low numbers of challenge tests are carried out. There is more variation in procedure, especially in the practice of admitting patients to hospital, in the use of devices that deliver precise doses of challenge agent and in the measurement of (secondary) outcome indicators. These variations have been collated and are presented in the full Task Force report, which also includes a practical "handbook" of methods for SIC with the wide variety of occupational agents [6].

SIC is an important tool in the diagnosis of occupational asthma. While other tools are available, only SIC testing has the potential, in every case, to identify with precision the causative agent(s) and so provide the information necessary for appropriate management. Approximately a third of the surveyed centres used SIC routinely, that is in every, or almost every, case of suspected disease; the remainder reserved it for cases where other methods have failed or are impractical. As above the variation is likely to be driven by local custom, but it will also reflect structural arrangements (*e.g.* the ease of timely access to hospital beds), whereby SIC is or is not a more efficient method than the alternatives.

The provision of services for SIC tests is far higher in Europe than in other parts of the world where, with the notable exception of some provinces in Canada, it is rarely, if at all, available. Nonetheless, we suggest that access to occupational SIC testing in Europe should be broader and provided at least on a national level in each country. We hope that these findings and those in the full Task Force report [6] will provide the necessary impetus for this development.

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How is specific challenge testing used in diagnosis of occupational asthma in Europe? This survey provides a summary http://ow.ly/uaujD

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Received: Jan 17 2014 | Accepted: Jan 19 2014

Conflict of interest: None declared.

Provenance: Submitted article, peer reviewed

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