Sleep apnoea syndrome secondary to rheumatoid arthritis

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Abstract

A patient who developed severe sleepiness and sleep apnoea in association with adult acquired retrognathia and subluxation of the cervical spine at the level of C3-C4, both resulting from rheumatoid arthritis, is described. The possible causative factors of the association between sleep apnoea and rheumatoid arthritis include reduction of the size of the upper airway by temporomandibular joint destruction, brainstem compression due to rheumatoid arthritis affecting the cervical spine, sleep fragmentation, and drug effects.

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Keywords: sleep apnoea syndrome, retrognathia, rheumatoid arthritis, airways obstruction.

Anatomical abnormalities of the upper airway include a large uvula and/or a wide base of the tongue, with or without residual tonsillar tissue, and are causative factors of the sleep apnoea syndrome.¹ Craniomandibular abnormalities, especially retrognathism, have also been reported in association with sleep apnoea.¹

Adult acquired micrognathia occurs rarely in the course of rheumatoid arthritis and may result in the sleep apnoea syndrome.² Furthermore, sleep apnoea due to brainstem compression by the odontoid has been observed in rheumatoid arthritis.³

We report a patient who developed severe sleepiness and sleep apnoea in association with adult acquired retrognathia and subluxation of the cervical spine at the C3-C4 level as a result of rheumatoid arthritis.

Case report

A 62 year old woman was referred for daytime sleepiness. She had a 19 year history of rheumatoid arthritis with development of pyramidal neurological signs since 1988 due to subluxation of C3-C4. The cervical spine was fixed surgically in order to correct the subluxation and there was an improvement in the neurological symptoms.

In 1975 retrognathism developed over a few weeks. A rotational luxation occurred with the gonion (mandibular angle) dislocated upwards and forwards, and the gnathion (point of chin) downwards and backwards. The course of this rotational luxation was favoured by the removal of upper molar teeth (fig 1). She then developed gradual increased snoring. Morning

headaches and daytime sleepiness had begun two years previously. Because of back pain she could only sleep supine and this, associated with the retrognathism, probably allowed the posterior displacement of the tongue and upper airway collapse during sleep.

Physical examination revealed a low body mass index (20.4 kg/m^2) and a normal blood pressure. She had severe deforming arthritis of multiple joints with no active synovitis. Severe dental malocclusion was observed with a significant overbite and evident retrognathia (fig 1). Radiography of the temporomandibular joints revealed that the condyles of the mandible were almost completely eroded with a severe reduction of the ramal height of the mandible. There was no history of cardiovascular disease nor acute respiratory failure.

The forced expiratory volume in one second (FEV_1) was 1.32 l , vital capacity (VC) 1.93 l , and total lung capacity (TLC) 4.41 l (75%, 87%, and 101% of predicted respectively). The FEV_1/VC ratio was 68% and the residual volume 129% of predicted. Transfer factor for carbon monoxide (TlCO) was normal. Arterial blood gas tensions breathing room air showed pH 7.39, PaO_2 10.8 kPa, PaCO_2 5.9 kPa, Sao_2 95%. Chemosensitivity assessed by the carbon dioxide rebreathing technique was normal.

Snoring, daytime sleepiness, retrognathia, and mild alveolar hypoventilation suggested the sleep apnoea syndrome, as a result of the craniomandibular abnormalities.

SLEEP STUDIES

Standard polysomnography was performed in the sleep laboratory by measurement of electroencephalogram, electro-oculogram, chin electromyogram, and electrocardiogram. Nasal and oral thermistors and uncalibrated inductive plethysmography were used to measure air flow and respiration, respectively. Sao_2 was measured using a Biox-Ohmeda 3700 oximeter. Sleep was staged manually according to international criteria.⁴ There were 58.4 apnoeas + hypopnoeas/hour of sleep (2% central, 5%

Figure 1 Cephalometric radiograph showing retrognathia and rotational mandibular luxation with the gonion (mandibular angle) dislocated upwards and forwards and the gnathion (point of chin) downwards and backwards due to destruction of the temporomandibular joint.

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Figure 2 (A) Sleep structure and oxygen saturation (SaO₂) profile during the diagnosis night. O₂ SAT = transcutaneous SaO₂; obstr=obstructive apnoeas; central = central apnoeas; mixed = mixed apnoeas (for each type of event the vertical line represents one single respiratory event and the height of each line expresses the duration of this episode). (B) Total number of arousals/hour of sleep compared with the normal values for our laboratory. The arousals associated with respiratory events (apnoeas or hypopnoeas) are shown in black and represent 90% and 75%, respectively, of the total amount during the diagnosis and CPAP test nights.

mixed, 88% obstructive, 5% hypopnoeas). Mean nocturnal SaO₂ was 89% with a minimal nocturnal SaO₂ of 55%. Rapid eye movement (REM) sleep was reduced (2.5% of the total sleep time) and there was no stage 3 and 4 sleep (fig 2A). The number of micro-arousals was 50/hour of sleep (normal value <10/hour in our laboratory), 45 (90%) of which were directly related to respiratory events (fig 2B).

UPPER AIRWAY EVALUATION
Cephalometric radiographs were performed and analysed by the technique described by Riley *et al.*⁵ These showed a reduction of the

posterior airway space (PAS) to 7 mm. The length of the soft palate was normal at 40 mm. The mandibular plane-hyoid bone (MP-H) distance was increased at 25 mm and the ANB angle (from subspinale (A) (deepest point on the premaxillary outer contour between anterior nasal spine and central incisor) to the nasion (N) and supramentale (B) (deepest point on the outer mandibular contour between mandibular incisor and pogonion)), which measures discrepancies between the mandible and the maxilla, showed a severe mandibular deficiency (7°) (normal = 2°) (fig 1).

Pharyngeal computed tomographic scanning was used to measure the luminal area of the airway at the nasopharyngeal, oropharyngeal, and hypopharyngeal levels.⁶ The oropharyngeal and hypopharyngeal cross sectional areas were reduced at 21 and 68 mm² (10% and 31% predicted respectively).

Continuous positive airway pressure (CPAP) at 8 cm H₂O applied via the nose prevented sleep apnoea, as documented by polysomnography showing an apnoea + hypopnoea index of 12/hour of sleep. Slow wave sleep increased from 0% of the total sleep time on the night before treatment to 16% during treatment. Similarly, REM sleep increased from 2.5% to 13% of total sleep time. The number of micro-arousals under CPAP was reduced to 16/hour of sleep, 12 (75%) of which were directly related to residual respiratory events (fig 2B). Sleepiness was dramatically improved. Under CPAP mean and minimal nocturnal SaO₂ were 95% and 89% respectively, compared with 89% and 55% for the diagnosis night.

Discussion

There is no large prospective study in the literature which has systematically studied the association between sleep apnoea and rheumatoid arthritis. Only two studies addressing sleep fragmentation⁷ and effects on sleep of non-steroidal anti-inflammatory drugs⁸ in rheumatoid arthritis provide information about the prevalence of the sleep apnoea syndrome in this condition. These studies reported two of 16 (12.5%) and four of 13 (31%) patients, respectively, having both sleep apnoea and rheumatoid arthritis, whilst the prevalence of sleep apnoea in the general population is about 4%.⁹

What are the possible reasons for a high incidence of sleep apnoea among patients with rheumatoid arthritis? A reduction in the size of the upper airway can occur in patients with rheumatoid arthritis in association with temporomandibular joint destruction. Redlund-Johnell *et al*¹⁰ have retrospectively reviewed more than 400 patients who had cervical radiographs for rheumatoid arthritis. Twenty three (6%) had a reduction in the size of the upper airway, mainly associated – as in our case – with severely reduced ramal height of the mandible; 70% of these patients described upper airway obstruction but, unfortunately, no sleep studies were performed. To our know-

ledge only one patient has been reported with an association between obstructive sleep apnoea proven by a sleep study and adult acquired micrognathia due to rheumatoid arthritis.³ However, in that case there was no upper airway imaging. Our patient showed an extremely reduced upper airway area (21 mm² and 68 mm² at the oropharyngeal and hypopharyngeal levels, respectively) which may have been a major factor in the collapse of the upper airway.

The destruction of the cervical spine by rheumatoid arthritis, leading to potential compression of the cord or medulla, has been advocated as a causative factor for central sleep apnoea.³ Although our patient had an atlanto-axial dislocation and a subluxation of C3–C4, she had predominantly obstructive apnoeas, a normal ventilatory response to carbon dioxide, and no brainstem compression on the CT scan. This mechanism is therefore unlikely to explain the sleep apnoea syndrome in this case.

Sleep fragmentation in rheumatoid arthritis with marked disruption of sleep continuity⁷ can occur without sleep apnoeas as a result of pain, periodic leg movements, depression, and effects of drugs. Sleep fragmentation could favour respiratory instability and sleep apnoea including obstructive events.

In the present study, however, the abnormalities of the upper airway can reasonably be considered to be the main cause of the obstructive sleep apnoeas.

In clinical practice it is important to consider the diagnosis of sleep apnoea in patients with rheumatoid arthritis with temporomandibular joint destruction or cervical spine lesions who present with sleepiness, snoring, and/or cardiovascular disease. Prospective studies to assess the incidence and causative factors of sleep apnoea in large groups of patients with rheumatoid arthritis are needed.

- 1 Pépin JL, Lévy P, Veale D, Ferretti G. Evaluation of the upper airway in sleep apnea syndrome. *Sleep* 1992;15: S50–5.
- 2 Davies SF, Iber C. Obstructive sleep apnea associated with adult-acquired micrognathia from rheumatoid arthritis. *Am Rev Respir Dis* 1983;127:245–7.
- 3 Fisher MA, Casey LC, Ellman MH, Perlick SJ. Sleep apnea due to odontoid brainstem compression in a patient with rheumatoid arthritis (abstract). *Neurology* 1986;36(Suppl 1):163.
- 4 Rechtschaffen A, Kales A. *A manual of standardized terminology, technique and scoring system for sleep stages of human sleep*. Brain Information service, Brain Information Institute, University of California, Los Angeles, 1968.
- 5 Riley R, Guilleminault C, Herran J, Powell N. Cephalometric analyses and flow-volume loops in obstructive sleep apnea patients. *Sleep* 1983;6:303–11.
- 6 Pépin JL, Ferretti G, Veale D, Romand Ph, Coulomb M, Brambilla C, et al. Somnofluoroscopia compared with computerised tomography of the airway and cephalometry in obstructive sleep apnoea. *Thorax* 1992;47:150–6.
- 7 Mahowald MW, Mahowald ML, Bundlie SR, Ytterberg SR. Sleep fragmentation in rheumatoid arthritis. *Arthritis Rheum* 1989;32:974–83.
- 8 Lavie P, Nahir M, Lorber M, Scharf Y. Nonsteroidal anti-inflammatory drug therapy in rheumatoid arthritis patients. Lack of association between clinical improvement and effects on sleep. *Arthritis Rheum* 1991;34:655–9.
- 9 Young T, Palta M, Dempsey J, Skatrud J, Weber S, Badr S. The occurrence of sleep-disordered breathing among middle-aged adults. *N Engl J Med* 1993;328:1230–5.
- 10 Redlund-Johnell I. Upper airway obstruction in patients with rheumatoid arthritis and temporomandibular joint destruction. *Scand J Rheumatol* 1988;17:273–9.

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Paradoxical vocal cord adduction in an adolescent with cystic fibrosis

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Abstract

Many patients with cystic fibrosis have symptoms of dyspnoea and wheeze which are responsive to treatment with bronchodilators. An adolescent woman with cystic fibrosis is described who presented with inspiratory stridor and in whom the classical features of paradoxical vocal cord adduction were found.

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Paradoxical vocal cord adduction is a very rare functional disorder caused by inappropriate adduction of otherwise normal vocal cords. Typically, it affects women under 40 years of age who often have a background of employment in health care. The upper airways obstruction associated with this condition may be mistaken for asthma and symptoms may persist in spite of varying therapeutic interventions. We describe here an adolescent woman with cystic fibrosis with the classical features of paradoxical vocal cord adduction – an association, to our knowledge, not previously described.

Case report

A 17 year old adolescent woman was admitted in July 1993 for assessment of chronic, predominantly dry, daytime and nocturnal cough with minor hoarseness. Cystic fibrosis was diagnosed at birth and she attended the Adult Cystic Fibrosis Unit at St Vincent's Hospital, Dublin from 1991. Features of her illness included chronic bronchiectasis, multiple nasal polyps, pancreatic insufficiency, and recurrent meconium ileus equivalent. Her sputum was