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*The Pickwickian syndrome – where does it fit in contemporary
medical terminology of breathing disorders?*

The term Pickwickian syndrome was introduced by Burwell et al. in 1956 (1). It clearly alluded to the title of a famous novel by Charles Dickens, *The Pickwick Papers*. In this book the author described “the wonderfully fat boy Joe”, who had an irritating tendency to snore and used to fall asleep even during the day. For decades snoring was not perceived as a serious health problem. Pioneer research in this respect started by Burwell half a century ago gave rise to a series of detailed studies, which contributed a great deal to the relatively thorough contemporary understanding of the problem.

SLEEP-RELATED BREATHING DISORDERS

Originally, the Pickwickian syndrome indicated the coexistence of three major clinical findings, i.e. obesity, excessive sleepiness in the daytime and impaired lung ventilation during sleep. The contemporary medical approach to classification regarding breathing disturbances during sleep is more complex. Four main categories can be distinguished depending on the mechanisms involved. These encompass the central and the obstructive type sleep apnea, the upper airway resistance syndrome as well as the obesity-hypoventilation syndrome (2). As a matter of fact, the term Pickwickian syndrome no longer functions in medical terminology to such an extent as it once used to. Nowadays it is commonly replaced with the mentioned name of the obesity-hypoventilation syndrome or alveolar hypoventilation in the obese (3). It is important to stress that the obesity-hypoventilation syndrome should not be considered synonymous with the obstructive type sleep apnea (4). Clinical observations suggest that these two conditions coexist quite often; however considering them the same pathology is, in fact, incorrect (3).

EPIDEMIOLOGY AND DIAGNOSTIC CRITERIA

The occurrence of the obesity-hypoventilation syndrome in the general population depends on age and incidence of obesity; detailed data in this respect are not available however. This is due to the fact that the condition has been poorly defined in the past and often confused with obstructive sleep apnoea.

The obesity-hypoventilation syndrome is diagnosed in obese patients with a body mass index exceeding 30 kg/m² in whom considerable pathological shifts in arterial blood gases are observed. The following parameters are of diagnostic significance: arterial oxygen tension pO₂ < 70 mmHg and daytime arterial carbon dioxide tension pCO₂ > 45 mmHg (5). Lung diseases (e.g. COPD or pneumonia), neuromuscular and metabolic conditions, which potentially affect gas exchange need to be excluded prior to making the diagnosis (6).

PATHOPHYSIOLOGY

The pathomechanism of the Pickwickian syndrome is strictly linked to obesity. The initial change in a sequence of pathological events includes an increase of chest as well as abdomen mass due to accumulation of fatty tissue. This results in a significant decrease in chest compliance and reduction in functional lung volume, the consequence of which is inadequate ventilation (7, 8). In case of insufficient adaptation mechanisms and decreased ventilatory drive hypercapnia, hypoxemia and polycythaemia are likely to develop (9). Further possible complications of the Pickwickian syndrome encompass serious pathologies such as pulmonary hypertension, right ventricle failure and arrhythmia. This syndrome is also believed to be a common cause of arterial hypertension, representing the most common cause of the secondary arterial hypertension (5).

The above-mentioned pathological shift in arterial blood gases is considered secondary to the mechanical ineffective ventilation process. Potential factors resulting in the airway obturation or those aggravating the existing breathing pathology in a patient diagnosed with the obesity-hypoventilation syndrome are listed in Table 1.

Table 1. Factors responsible for constriction of upper airways in an individual with the Pickwickian syndrome

Accumulation of soft tissues in the neck area leading to nasopharyngeal obturation (i.e. fat, thyroid gland)
Obesity-dependent decrease in chest wall compliance
Elevated abdominal pressure
Anatomical defects (nasopharynx pathology, micrognathia, macroglossia, enlarged tonsils, chest deformities)
Agents decreasing the tension of respiratory muscles (i.e. alcohol, antihistamine drugs, sedatives)
Agents increasing the spasm of bronchial tree (i.e. betablockers, salicylates, nicotine)

CLINICAL SYMPTOMS

The typical characteristics of a patient diagnosed with the Pickwickian syndrome is given below. It is usually a middle-aged male (30–60 years old), moderately obese with arterial hypertension in history, complaining of snoring and a non-relaxing sleep. Members of their family often witness episodes of apnea during nighttime's rest.

Symptoms of the Pickwickian syndrome represent a relatively broad spectrum of clinical findings as listed in the table below (Table 2). The majority of those can be easily identified while taking a detailed medical history. Some, by contrast, are reported by members of a patient's family, who typically discover recurrent episodes of apnea during sleep followed by dramatic choking or loud snoring.

Obesity with accumulation of fat around the neck is quite a typical finding on clinical examination. Most people suffering from the Pickwickian syndrome do not present advanced stages of obesity however. It is rather of moderate intensity. Obesity may be accompanied by other abnormalities such as tachypnoe, cyanosis or drum fingers. It is very important to focus on the examination of the head in detail. Potential anatomical deformities impairing normal airflow through the upper respiratory tract may be diagnosed. These include for instance micrognathia or other mandibular congenital defects, macroglossia, enlarged tonsils, nasal polyps and nasal septum deviation as well as soft palate and uvula hypertrophy.

Table 2. Symptoms of the Pickwickian syndrome

A non-relaxing sleep, frequent nightmares
Drowsiness during the day
Lack of concentration
Snoring and sweating at night
Morning headaches and confusion
Morning dry mouth or sore throat
Intellectual impairment
Heart palpitations
Dyspnea, peripheral oedema, hepatomegaly, increased jugular pressure suggesting heart failure and pulmonary hypertension

ADDITIONAL TESTS

A detailed evaluation of a patient requires additional tests. The list of widely accepted additional tests performed in order to diagnose or assess the advancement of the pathology is given in the table below (Table 3). Doctors can also make use of a practical tool devised for individual assessment of apnea risk, e.g. Sleep Apnea Clinical Score.

The polysomnographic examination is considered most accurate for identifying apnea episodes. It is also used for quantitative assessment providing information about the severity of the detected problem. The most detailed approach involves simultaneous recording of ventilation parameters, arterial blood saturation, ECG coupled with electromyography, electroencephalography and electrooculography.

Table 3. The Pickwickian syndrome – additional diagnostic tests

Arterial blood gases
Morphology
Chest x-ray
ECG
Echocardiography
Otolaryngological and dentist examination
Spirometry
Polysomnography

TREATMENT STRATEGIES

The treatment of the Pickwickian syndrome is a very complex task. It focuses primarily on developing long-term behavioral changes in an individual. Patients are encouraged to reduce their body mass, observe a low calorie diet, give up smoking and limit drinking alcohol. In some cases surgery is necessary to reduce morbid obesity. Various techniques are used in order to ensure better airflow through the nasopharynx. Some are very simple and call for changes in lifestyle, e.g. avoidance of sleeping on the back. Nevertheless, this approach frequently does not produce satisfactory results. More advanced techniques are then employed, especially in case of the hypoventilation syndrome coexisting with the airway obstruction. These include the use of mechanical devices preventing the mandible to retreat as well as surgical interventions such as uvulopalatopharyngoplasty, tonsillectomy

and polypectomy, which are performed most often (10). Some patients benefit a lot from nasal continuous positive airway pressure (CPAP) (11). The idea behind this technique is to breathe via nose with air that is applied under pressure, which prevents the upper respiratory airways from collapsing. Unfortunately, some patients do not accept this method. There is evidence to suggest that every fourth patient starting CPAP therapy no longer continues it after one year. In patients with marked daytime hypoxaemia (arterial oxygen tension $pO_2 < 55$ mmHg) conventional oxygen therapy, both nocturnal and diurnal, is required (12).

Only recently advanced surgical techniques have also been developed to treat obesity hypoventilation syndrome. They are found useful in controlling obstructive sleep apnea as well. These are highly technical invasive procedures such as laser midline glossectomy, TBRHE technique (Tongue Based Reduction with Hyoepiglottoplasty), maxillomandibular and hyoid advancement or electrical stimulation of the hypoglossal nerve (13–15). The results of the above-mentioned approaches may seem promising but at this stage it is too early to evaluate the definite long-term effects since well-documented experience is still limited (13).

It is believed that pharmacotherapy plays a certain role in the treatment of the Pickwickian syndrome, especially in those cases with concomitant obturation of airways. Nasal steroid inhalations, tricyclic antidepressants, medroxyprogesterone acetate and acetazolamide are among most commonly prescribed medications. Unfortunately, due to the observed side-effects, the long-term effects of such an approach are often described as disappointing (16). The use of pharmacotherapy should be considered adjunctive therapy. It should be stressed that the above-mentioned techniques focusing on improving the biomechanics of breathing remain the key element in the Pickwickian syndrome treatment strategy (16).

CONCLUSIONS

The epidemic of obesity as observed nowadays in the well-developed countries, especially in the US and Western Europe, will result in a high incidence of the obesity hypoventilation syndrome in the decades to come. That is also why better understanding of this problem among clinicians is so very important. Hopefully, more efficient methods of fighting the noisy killer – as the Pickwickian syndrome is often referred to – will be available both for patients and clinicians in the near future.

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SUMMARY

The term 'Pickwickian syndrome' was introduced by Burwell et al. in 1956. Nowadays this term no longer functions in medical terminology so broadly as it once did. It is usually replaced with the name of obesity-hypoventilation syndrome or alveolar hypoventilation in the obese. Pickwickian syndrome or chronic alveolar hypoventilation syndrome is diagnosed in obese patients with a body mass index exceeding 30 kg/m² in whom the following parameters are observed: arterial oxygen tension $pO_2 < 70$ mmHg and arterial carbon dioxide tension $pCO_2 > 45$ mmHg. Diseases that may result in shifts in arterial blood gases need to be excluded prior to making the diagnosis. A sequence of pathological events associated with obesity in respect to metabolic and organ complications are presented in this paper. Practical and clinical approach to a patient is discussed. Finally, contemporary additional tests and therapeutic methods are highlighted.

Zespół Pickwicka – jego miejsce we współczesnej terminologii zaburzeń oddychania w czasie snu

Termin zespół Pickwicka wprowadzony został do nomenklatury medycznej w r. 1956 przez Burwella i wsp. Obecnie określenie to jest stosowane we współczesnej terminologii medycznej dość rzadko, częściej natomiast zastępowane jest synonimami, jak zespół hypowentylacji pęcherzykowej czy zespół zależnej od otyłości hypowentylacji. Kryteria rozpoznania obejmują współlistnienie otyłości (BMI >30 kg/m²) z hiperkapnią ($pCO_2 > 45$ mmHg) oraz hypoksemią ($pO_2 < 70$ mmHg) przy braku innych chorób pierwotnie ingerujących w obraz gazometrii krwi tętniczej. W pracy przedstawiona została pokrótce kaskada niekorzystnych patologicznych zjawisk związanych z otyłością w aspekcie powikłań narządowych i metabolicznych. Szczególny nacisk położony został na omówienie danych klinicznych chorego z podejrzeniem zespołu Pickwicka. Wskazano również na badania dodatkowe oraz metody lecznicze, jakie według współczesnej wiedzy medycznej dostępne są w diagnostyce i terapii tego zespołu.