



# Acute respiratory failure in goitre patients qualified for operative treatment

## Ostra niewydolność oddechowa u chorych w przebiegu wola kwalifikowanych do leczenia operacyjnego

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### Abstract

**Introduction:** To present a clinical picture and management of goitre patients with acute respiratory failure.

**Material and methods:** A total of 7,356 patients were operated on between 2000 and 2011 for various goitres, including 1,214 (16.5%) retrosternal or mediastinal types. Eight (0.1%) patients (six women and two men aged 61–84, mean 76.9 years) presented with acute respiratory failure on admission. Seven patients were intubated on admission, and one showed severe dyspnoea at rest accompanied by symptoms of peripheral cyanosis.

**Results:** Giant retrosternal goitres were found in the eight operated patients. In two cases, the goitre was recurrent in character, and another two patients had previously suffered from hyperthyroidism (one treated pharmacologically, and one using J<sup>131</sup>). X-ray examination revealed tracheostenosis in all patients. No disorders in thyroid function was observed. Preoperative unilateral paralysis of laryngeal recurrent nerve was found in three patients. The operations were considered as most urgent. Four goitres were neoplastic: two were anaplastic carcinoma, one was follicular cell carcinoma and one was squamous cell carcinoma. These patients received partial resection to enable reduction of the goitre mass. In three patients, tracheostomy was necessary. On the other hand, four patients with non-malignant goitres underwent complete resection (one patient), nearly complete resection (two), and complete resection of one lobe and partial resection of the other (one). Three patients required mechanical ventilation postoperatively. Two of them, referred to the Intensive Therapy Unit, died from acute circulatory failure on day 6 and day 10 postoperatively. The rest were discharged in good general condition.

### Conclusions:

1. Acute respiratory failure caused by a giant goitre is a life-threatening condition that almost always requires an emergency intubation.
2. Due to a high risk of complications and high mortality, patients with acute respiratory failure caused by giant goitres should be operated in hospitals that are very experienced not only in thyroid but also in mediastinal surgery. (*Endokrynol Pol* 2013; 64 (3): 215–219)

**Key words:** goitre, acute respiratory failure, thyroid carcinoma

### Streszczenie

**Wstęp:** Celem pracy było omówienie obrazu klinicznego, leczenia i rokowania u chorych z ostrą, przedoperacyjną niewydolnością oddechową w przebiegu wola.

**Materiał i metody:** W latach 2000–2011 z powodu różnych postaci wola operowano 7356 chorych, w tym 1214 (16,5%) z wolem zamostkowym i śródpiersiowym. Ośmioro (0,1%) z nich — 6 kobiet i 2 mężczyzn — w wieku 61–84 lata (śr. wieku 76,9 lat), zostało przyjętych w trybie interwencyjnym z objawami ostrej niewydolności oddechowej. Siedmioro z nich z chwilą przyjęcia było zaintubowanych, zaś ostatni wykazywał znacznego stopnia duszność spoczynkową z objawami sinicy obwodowej.

**Wyniki:** U wszystkich chorych stwierdzono wole olbrzymie zamostkowe, w tym 2-krotnie nawrotowe. Dwoje chorych było leczonych wcześniej z powodu nadczynności tarczycy, z czego jeden raz stosowano J<sup>131</sup> terapię. Dwukrotnie przy przyjęciu stosowano wentylację mechaniczną. Radiologicznie zwężenie tchawicy potwierdzono u wszystkich chorych. Nie odnotowano zaburzeń czynności tarczycy. Przedoperacyjne jednostronne porażenie nerwu krtaniowego wstecznego wystąpiło 3-krotnie. Wszystkich chorych operowano w trybie pilnym. Czterokrotnie stwierdzono nowotwór złośliwy tarczycy — dwa raki anaplastyczne, jeden pęcherzykowy i jeden płaskonabłonkowy — co potwierdzono badaniem histopatologicznym. Ze względu na miejscowe zaawansowanie zmian nowotworowych przy braku możliwości radykalnego ich wycięcia każdorazowo wykonywano częściową resekcję wola pozwalającą na znaczną redukcję jego masy (4-krotnie). Troje z nich wymagało założenia tracheostomii. U pozostałych czterech chorych, u których wole miały charakter niezłośliwy, dokonano całkowitego wycięcia tarczycy (u jednego pacjenta), prawie całkowitego (u dwóch pacjentów), względnie całkowitego wycięcia jednego płata i częściowego drugiego (u jednego pacjenta). Po operacji wentylowano mechanicznie 3 chorych. Dwoje z nich przekazano na OIT, gdzie zmarły z powodów kardiologicznych. Pozostałych wypisano w stanie dobrym.

### Wnioski:

1. Ostra niewydolność oddechowa spowodowana obecnością wola olbrzymiego jest stanem zagrażającym życiu wymagającym najczęściej doraźnej intubacji.
2. Z powodu dużego ryzyka powikłań oraz wysokiej śmiertelności chorzy z ostrą niewydolnością oddechową na tle wola powinni być operowani w ośrodkach specjalizujących się nie tylko w chirurgii tyreologicznej, ale także w chirurgii śródpiersia. (*Endokrynol Pol* 2013; 64 (3): 215–219)

**Słowa kluczowe:** wole, ostra niewydolność oddechowa, rak tarczycy



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## Introduction

Tracheal compression, if caused by an increasing thyroid gland and if accompanied by stridor and clinical symptoms of acute respiratory failure, is a definite indication to emergency operative treatment [1–3]. Acute respiratory failure can be seen in 1–5% of patients presenting with a retrosternal goitre. Intubation and surgical intervention are urgently required when the tracheal lumen has narrowed to approximately one third of its normal size.

The aim of this paper is to present a clinical picture and management of goitre patients with acute respiratory failure.

## Material and methods

A total of 7,356 patients were treated for various types of goitre in our hospital between 1 January 2000 and 31 December 2011. There were 1,214 (16.5%) patients with retrosternal or mediastinal goitres. In this group, eight (0.1%) patients (six women and two men aged 61–84, mean 76.9 years) required an emergency operation. All of them had been referred from other hospitals because of rapidly increasing symptoms of acute respiratory failure caused by giant nodular goitres that reached the retrosternal region. Seven patients were intubated on admission, and one showed severe dyspnoea at rest accompanied by symptoms of peripheral cyanosis. Upon physical examination, blood samples were taken from all patients for basic laboratory tests, including gasometric, and also to evaluate hormonal activity of the thyroid gland. USG of the neck and chest X-ray were performed as a rule. The patients received emergency operations upon internal and anaesthesiologic consultation.

## Results

Giant retrosternal goitres were found in the eight operated patients. In two cases, the goitre was recurrent in character, and another two patients had previously suffered from hyperthyroidism (one treated pharmacologically, and one using J<sup>31</sup>). Hashimoto's goitre was revealed in one patient, and non-toxic goitre led to respiratory failure in the remaining three. It was necessary to apply controlled respiration on admission in two patients. X-ray examination revealed tracheal stenosis for 5–7 mm of its cross-section, in all patients. No disorders of thyroid activity were noted, and TSH, fT4 and fT3 levels were normal in all patients. Preoperative unilateral paralysis of recurrent laryngeal nerve was found in three patients. Preoperative arterial blood examination revealed 95–97% saturation in seven intubated patients, and 85% saturation in one.

All cases were treated as emergencies. Thyroid carcinoma was revealed intraoperatively in four patients. Histopathological examination confirmed anaplastic carcinoma in two, follicular cell carcinoma in one, and squamous cell carcinoma in one. Radical resections of the malignant goitres were impossible, chiefly due to local progression of the disease. These patients received partial resection to enable reduction of the goitre mass (four). In three of them, tracheostomy was necessary. On the other hand, four patients with non-malignant goitres underwent complete resection (one patient), nearly complete resection (two patients), and complete resection of one lobe and partial resection of the other (one patient).

Three patients required mechanical ventilation postoperatively. Two of them, referred to Intensive Therapy Unit, died from acute circulatory failure on day 6 and day 10 postoperatively. The rest were discharged in good general condition (Table I, Fig. 1).

## Discussion

Acute respiratory failure is usually manifested by clear clinical symptoms. The correct diagnosis can be based on the presence of dyspnoea, often at rest, accompanied by cyanotic coverings and sweats, disorders of consciousness or significant psychomotor agitation. If the symptoms persist for a long time, the patient will adapt to new ventilation conditions. Such a situation may delay the important visit to the doctor. Sometimes the symptoms of suffocation are considered a warning signal of respiratory problems.

Apart from such causes as craniocerebral injuries, and central nervous system diseases that have a depressive effect on the respiratory centre [6], a cause of acute respiratory failure may be connected with the presence of chronic obstructive lung disease. On the other hand, tracheal stenosis can be a consequence of thyroid gland diseases [1, 4–7], which is confirmed by our patients too.

Giant goitre can lead to the development of compression changes and critical tracheal stenosis [8], the latter often accompanied by its displacement. This was confirmed by preoperative chest and neck X-ray examinations of our patients (Fig. 1). When the increasing thyroid gland becomes displaced to the retrosternal region towards the upper mediastinum, clinical symptoms of superior caval vein syndrome will soon appear [7, 9–11] as a result of too tight a space within the superior aperture of the thorax. Such changes were observed in our patients as well. Rapid progression of this process is most often caused by the presence of neoplastic changes within the gland. This applies in particular to patients presenting with anaplastic carcinoma or thyroid lymphoma [12, 13] or those with other malignant thyroid tumours [11, 14].

Table I. Patients operated for acute preoperative respiratory failure in goiter

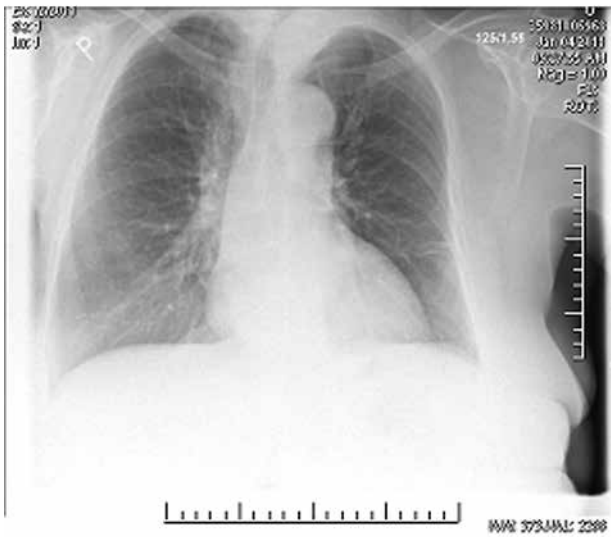
Tabela I. Chorzy operowani z powodu ostrej przedoperacyjnej niewydolności oddechowej w przebiegu wola

No	Patient	Sex Age	Goiter	Preoperative intubation	Mechanical ventilation		Preoperative chordae vocalis paresis		Thyroid operation	Histpathological paraffin examination	Early perioperative death
					Before surgery	After surgery	Unilateral	Bilateral			
1.	S.J	F 79	Giant mediastinal goiter + superior caval vein syndrome Non toxic goiter	+	-	-	-	-	Partial resection of both lobes (debulking) + tracheostomy	Ca anaplasticum	-
2.	P.J	F 76	Giant recurrent mediastinal goiter Toxic goiter	+	-	+	+	-	Total thyroid resection	Benign multinodular goiter	-
3.	A.A	F 84	Giant mediastinal goiter Non toxic goiter	+	+	+	-	-	Partial resection of both lobes	Benign multinodular goiter	+ (6 day after surgery)
4.	Z.J.	F 76	Giant retrosternal goiter Non toxic goiter	+	+	+	-	-	Total resection of one lobe + partial resection of of the other	Ca folliculare	+ (10 day after surgery)
5.	M.M	F 61	Giant recurrent retrosternal goiter Non toxic goiter	+	-	-	+	-	Partial resection of both lobes	Benign multinodular goiter	-
6.	C.A.	M 78	Giant mediastinal goiter + compression signs Toxic goiter	+	-	-	-	-	Partial resection of both lobes + trachea fixation	Benign multinodular goiter	-
7.	M.A.	F 76	Giant retrosternal goiter Non toxic goiter	+	-	-	-	-	Total resection of one lobe + partial resection of the other + tracheostomy	Squamous cell carcinoma	-
8.	M.R.	M 79	Giant mediastinal goiter + superior caval vein syndrome Non toxic goiter	-	-	-	+	-	Partial resection of both lobes (debulking) + tracheostomy	Ca anaplasticum	-

By causing significant tracheal stenosis, giant goitres may lead to malacia of tracheal cartilages and destruction of their structure. This is important in the postoperative period when the symptoms of acute respiratory failure may appear as the result of collapsing tracheal walls immediately upon removal of the intubation tube. The thyroid tumour, when invading the tracheal wall, will lead to gradual destruction of its structure, while neoplastic masses, when growing into the tracheal lumen, will lead to its stenosis [2]. Clinically, such a process will result in the symptoms of gradually increasing respiratory failure.

Apart from neoplastic goitres, acute respiratory failure may be caused by inflammatory changes within the thyroid gland. Purulent thyroiditis, when accompanied by an abscess and invasion into adjacent tissues, may soon lead to a significant enlargement of the thyroid gland followed by respiratory tract stenosis and symptoms of acute respiratory failure [15]. Riedel's goitre may also be a cause of inflammation leading to tracheal stenosis [16]. The process of fibrosis will not only cover the thyroid gland but also adjacent tissues. Clinically, it will lead to progressive respiratory failure and finally to acute respiratory failure.

A



B



Figure 1. Patient M.A 76-years old. Respiratory insufficiency by giant goiter — X-ray (A) and CT (B) examinations  
Rycina 1. Chory M.A. lat 76. Ostra niewydolność oddechowa z powodu wola olbrzymiego — RTG (A) i TK (B) klatki piersiowej



Rapid enlargement of the thyroid gland and symptoms of acute respiratory failure may also be caused by massive arterial haemorrhage to the gland accompanied by a haemorrhagic cyst of considerable size [3]. Apart from injuries or atheromatous changes, such a haemorrhage may be a complication after thin-needle aspiration biopsy [17] or a consequence of technical conditions in which the biopsy was performed together with coagulation disorders, including those connected with anticoagulants as taken by some patients.

Acute respiratory failure, caused by a massive goitre, is not only a consequence of its size and pressure on the trachea. Invasion of tumour lesions to recurrent laryngeal nerves may cause their paralysis and impairment of respiratory tract patency, resulting in a life-threatening condition [18].

Acute respiratory failure developed as a result of a goitre requires urgent operative treatment, no matter what kind of thyroid changes are involved. Emergency management includes intubation to restore the respiratory tract potency. However, such intubation involves a risk of perforating the trachea if there are invasive or ectopic lesions within the tracheal lumen [19, 20]. Some patients require mechanical ventilation. The process of qualifying patients for goitre surgery should be carried out with caution by a highly specialised team.

Resection of a giant goitre, whether retrosternal or mediastinal, can be a serious challenge to the surgeon. The operation is often connected with an increased intraoperative bleeding and a risk of dangerous complications such as damage to the trachea, pneumothorax or large vessels. As we observed among our patients, in many cases it is only possible to take samples from the thyroid lesions, release the trachea and perform tracheostomy [11], particularly if the neoplastic goitre is in an advanced stage. This also applies to patients who have suffered from preoperative paralysis of recurrent laryngeal nerves [4].

The presence of tracheal stenosis may be an indication for partial resection of the trachea or a tracheal prosthesis [20]. As indicated by our observations, the results of emergency operations for goitres accompanied by acute respiratory failure show a high percentage of complications and high mortality.

## Conclusions

1. Acute respiratory failure caused by a giant goitre is a life-threatening condition that requires an emergency intubation.
2. Due to a high risk of complications and high mortality, patients with acute respiratory failure caused by giant goitres should be operated upon in hospitals that are very experienced not only in thyroid but also in mediastinal surgery.

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