



# Death due to external compression of the trachea in a patient with multinodular hemorrhagic goiter

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## Abstract

In this paper we describe the case of an 81-year-old Caucasian female (142 cm tall, weighing 45 kg) who suffered from a multinodular goiter for approximately 40 years. Following the onset of a clinical condition characterized by acute respiratory failure, she was transported to the emergency room by ambulance, where she died within a few hours after admission. A recent cardiac examination showed the absence of risk factors for cardiovascular disease, sinus tachycardia with a heart rate of 131 bpm, negative objectivity for signs of cardiocirculatory failure, a blood pressure of 120/80 mmHg and modest exertional dyspnea. A recent hemochemical laboratory analysis showed a TSH value of 0.01 microUI/mL, FT3 value of 4.76 pg/mL and FT4 value of 2.33 ng/mL, pointing to a pattern of hyperthyroidism, attributable to Basedow's goiter. Autopsy showed some peculiarities, and we came across two extremely rare findings; the thyroid gland had reached a very large size in relation to the patient's body mass (1510 g, in a patient of 142 cm and 45 kg), and the death of the patient was due to the development of a massive intra-thyroid hemorrhage that had caused acute external compression of the trachea. To the best of our knowledge this very rare event has not previously been reported in the international scientific literature.

**Keywords** Intra-thyroid hemorrhage · Basedow's goiter · Acute external compression of the trachea · Death

## Case report

An 81-year-old Caucasian female (142 cm tall, weighing 45 kg), who had been suffering from a multinodular goiter for approximately 40 years, was transported to the emergency department by ambulance following the onset of a clinical condition characterized by acute respiratory failure. Unfortunately she died within a few hours after admission.

A recent cardiac examination of the descendent showed the absence of risk factors for cardiovascular disease, sinus tachycardia with a heart rate of 131 bpm, negative objectivity for

signs of cardiocirculatory failure, a blood pressure of 120/80 mmHg and modest exertional dyspnea.

A recent hemochemical laboratory analysis showed a TSH value of 0.01 microUI/mL (normal value 0.46–4.68 mIU/L), FT3 value of 4.76 pg/mL (normal value 2.0–3.5 pg/mL) and FT4 value of 2.33 ng/mL (normal value 0.8–1.8 ng/dL), pointing to a pattern of hyperthyroidism, attributable to Basedow's goiter.

At autopsy some peculiarities were noted. Firstly, the thyroid, weighing 1510 g, exhibited a greatly increased size and had an irregular, hemorrhagic appearance, compatible with the development of an extensive hemorrhagic framework within a massive multinodular goiter (Fig. 1).

The respiratory tract was blocked and showed an extensive hemorrhagic infiltration of the mediastinal soft tissues and a framework of tracheomalacia due to compression and dislocation caused by the bulky thyroid mass (Fig. 2a).

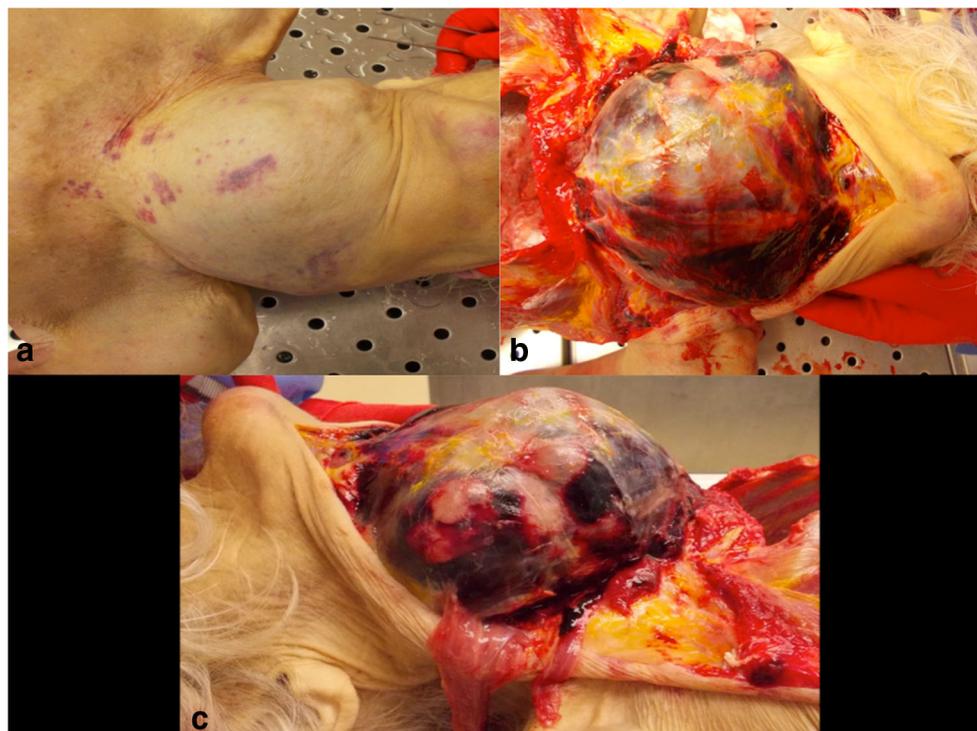
Microscopic examination confirmed the presence of a large hemorrhagic area extending to the perithyroidal soft tissues, a subpleural intra-alveolar accumulation of erythrocytes, amorphous eosinophilic material in the alveolar spaces, and blood congestion in the pulmonary vessels (Fig. 2b–d).

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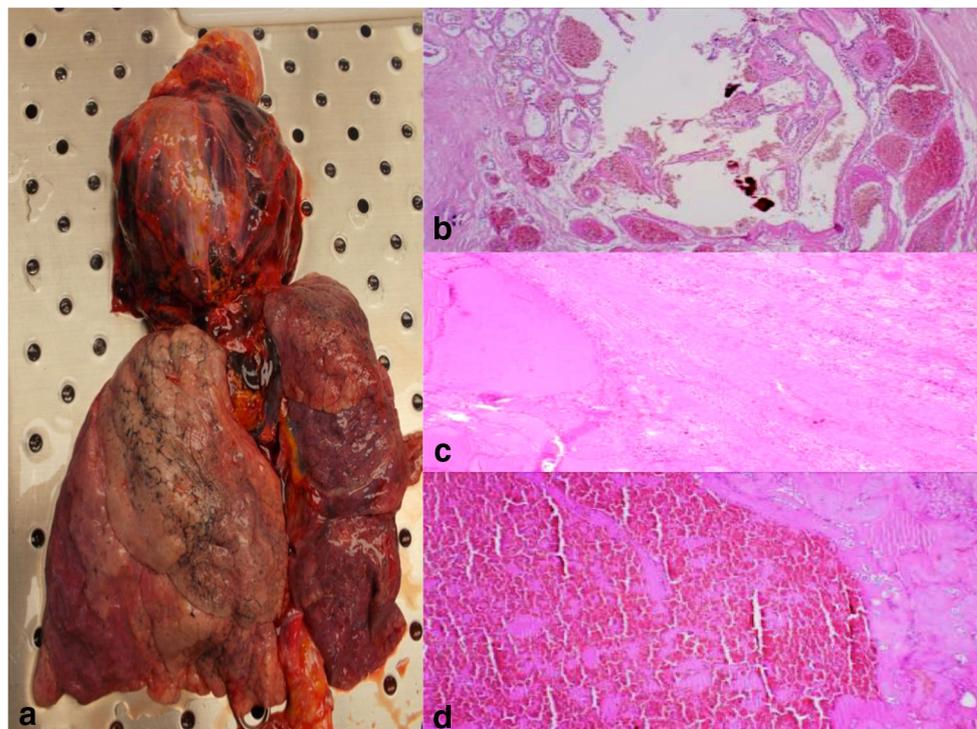
**Fig. 1** **a** Bulky mass occupying the entire anterior region of the neck. **b** Multinodular thyroid goiter associated with hemorrhagic areas involving the capsule and perithyroidal and mediastinal soft tissues: view from above. **c** Multinodular thyroid goiter associated with hemorrhagic areas involving the capsule and perithyroidal and mediastinal soft tissues: view from the right



The combined microscopic and macroscopic findings suggested that the cause of death was mechanical asphyxia and was not attributable to external agents. The goiter (which was overly bulky for a patient of the decedent's height and weight) was

complicated by the development of multiple intrathyroid and intracapsular hemorrhages, involving the perithyroidal tissues and upper mediastinum and causing acute swelling of the gland and external compression of the trachea, leading to death.

**Fig. 2** **a** Macroscopic section of the respiratory tract that shows extensive hemorrhagic infiltration of the mediastinal soft tissues and a framework of compression and dislocation of the trachea caused by the bulky thyroid mass. **b** Multinodular thyroid hyperplasia in (c) colloid-cyst involution associated with (d) hemorrhagic area involving the capsule and perithyroidal soft tissues



## Discussion

In the case described in this paper we came across two extremely rare findings. The thyroid gland had reached an extremely large size in relation to the patient's body mass (1510 g, in a patient who was 142 cm tall and weighed 45 kg) and the death of the patient was due to the development of a massive intrathyroid hemorrhage that had caused acute external compression of the trachea. To the best of our knowledge this very rare event has not been reported in the international scientific literature before.

The thyroid gland, which weighs approximately 0.2 g at birth, is characterized in adults by a considerable variability in size, and, on average, reaches a weight of 25 g.

Goiter is the most common thyroid disease in the world; in Italy, with a prevalence of approximately 6 million individuals, it is above the 5% threshold set by the OMS to identify endemic countries [1]. Although goiter is currently only abstractly reported as a possible cause of death in industrialized countries, unavoidable thyroidectomy for severe compression symptoms is not entirely rare [2], although it is more common in developing countries [3].

Occasionally, it is possible to see patients, especially elderly ones, who have neglected this pathology until they experience the onset of complications, which can be severe, such as dysphonia, dysphagia, and dyspnea. Our case was unusual as the gland had become extremely large in relation to the patient's height-weight ratio.

By regularly monitoring patients, especially ones with low socioeconomic status who may not seek medical assistance unless they perceive it to be an emergency, extreme cases such as the one described in this paper, in which their multinodular goiter had reached a weight fifty times higher than normal, can be prevented.

As we have already mentioned, the death of a patient due to the development of a massive intrathyroid hemorrhage, causing acute external compression of the trachea, is a very rare event. Indeed, although the thyroid is a highly vascularized organ, intraparenchymal bleeding is a sporadic event, generally self-limiting and poorly symptomatic, though it is more frequent in patients with risk factors such as thyroid nodules, goiter or parenchyma dysomogeneity [4].

Risk factors for intraparenchymal bleeding include the use of anticoagulants [5, 6], fibrinolytic therapy [7, 8], trauma [9–11], and invasive diagnostic procedures such as thyroid needle biopsy [12–14], although rare cases of spontaneous bleeding have been described [15].

Two possible mechanisms responsible for the onset of intrathyroid bleeding have been described; vascular abnormalities that cause high fragility and easy breakage of veins, and the formation of an artero-venous shunt in the context of a parenchyma with subverted architecture, as in the case of a multinodular goiter [16].

In the present case, given the size and the structural changes in the thyroid, as well as the existing compression and trauma to the trachea, even minimal physical stress may have acted to trigger the observed intrathyroid bleeding. The bleeding developed very rapidly within the thyroid and resulted in significant swelling of the gland, causing further external compression of the trachea and the development of acute asphyxia. Microscopic examination of the lungs showed diffused atelectasis and emphysema, findings that confirm the diagnosis of death due to asphyxia.

In conclusion, the presented case is extremely rare in medicine and unique in the international scientific literature, both for the enormous size that the gland reached in relation to the body mass of the patient and for the development of a massive intrathyroid hemorrhage that caused the death of the patient by acute external compression of the trachea.

## Compliance with ethical standards

**Conflict of interest** The authors declare that they have no conflicts of interest.

**Ethical approval** This paper was approved by all authors.

**Informed consent** Informed consent was obtained from the Judicial Authority for whom identifying information is included in this article.

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