The crescent trachea: a new radiological sign of subclinical tracheal compression in patients with large goitres

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Abstract

The term goitre refers to an enlarged thyroid gland. This can present as an asymptomatic nodule, or progress to compressive symptoms such as cough/irritation, dysphonia, dysphagia and, in extreme cases, respiratory compromise. We report on a new radiological finding, a 'crescent shaped' trachea, which has been noted in patients with clinically palpable goitres.

This is the first published description of a previously unrecognised radiological sign. Failure to recognise a crescent trachea can result in erroneous under-classification of high-grade goitres. This is important to establish, as tracheal compression may not be obvious on clinical examination nor history, but can result in significant tracheal narrowing.

Recognition of subclinical tracheal compression, based on a positive crescent trachea sign, is a relative indication for surgery, and can help optimise peri-operative management as well as patient safety.

Key words: Goitre, thyroid, thyroidectomy

Introduction

The term goitre refers to an enlarged thyroid gland(1). This can present as an asymptomatic nodule, or progress to compressive symptoms such as cough/irritation, dysphonia, dysphagia and, in extreme cases, respiratory compromise(2,3). Patients may also present with symptoms relating to thyroid hormone imbalance depending on the aetiology. Common causes of goitre include Graves' disease, Hashimoto thyroiditis, familial or sporadic multinodular goitre, iodine deficiency, colloid nodule/cyst and malignancy(2,3). Goitre prevalence varies significantly based on geographic location, with estimates approaching 80% in areas with systemic iodine deficiency, and as low as 1% in high-income countries(1,4).

Case

A 50-year-old man presented with a palpable thyroid mass increasing in size over 3 months without any upper respiratory symptoms. He had no past medical history and took no regular medications. He had no known history of previous radiation exposure, or family history of thyroid cancer. Physical examination revealed palpable thyroid and left neck masses. The trachea was midline and Pemberton's sign was negative. Nasendoscopy was also unremarkable. He went on to have an ultrasound scan of the neck which demonstrated a 40mm left thyroid mass and two left lateral neck masses, up to 49mm in size. Pre-operative Computed Tomography (CT) demonstrated a large thyroid mass and a 'crescent shaped' trachea. This finding has also been noted on other patients with clinically palpable goitres (Figures 1-3). Fine needle aspirate from the thyroid and left neck masses demonstrated a metastatic papillary thyroid carcinoma (PTC) (Bethesda category 6). The patient subsequently underwent total thyroidectomy and central and left lateral neck dissection. Post-operative CT showed almost complete resolution of the crescent shaped trachea (Figures 4 & 5).

Figure 1. The crescent trachea sign (CT scan)

Figure 2. Large goitre causing tracheal deviation and a crescent trachea (MRI)

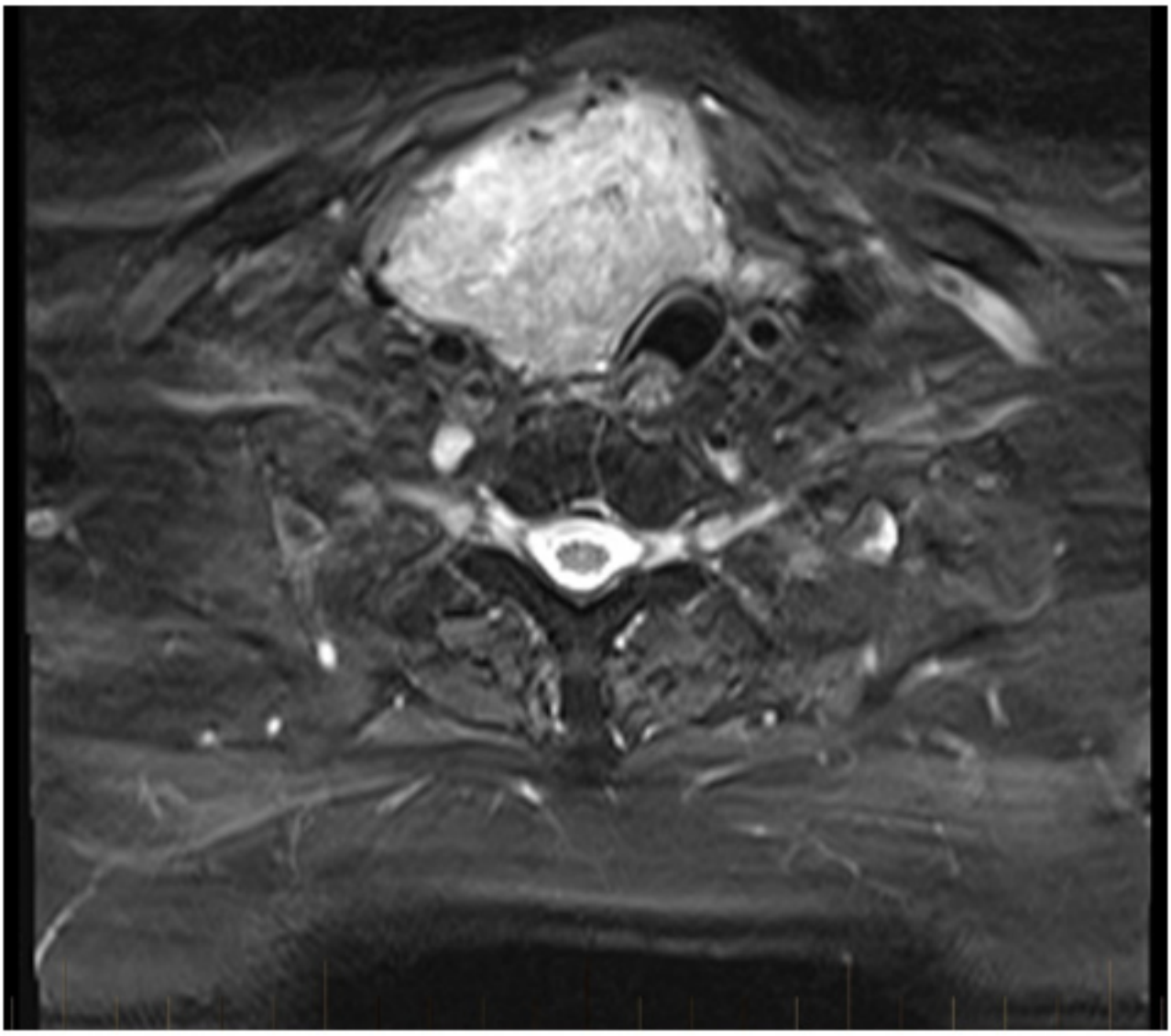


Figure 3. The crescent trachea sign with apparent double-lumen (the posterior lumen is the oesophagus) (CT scan)

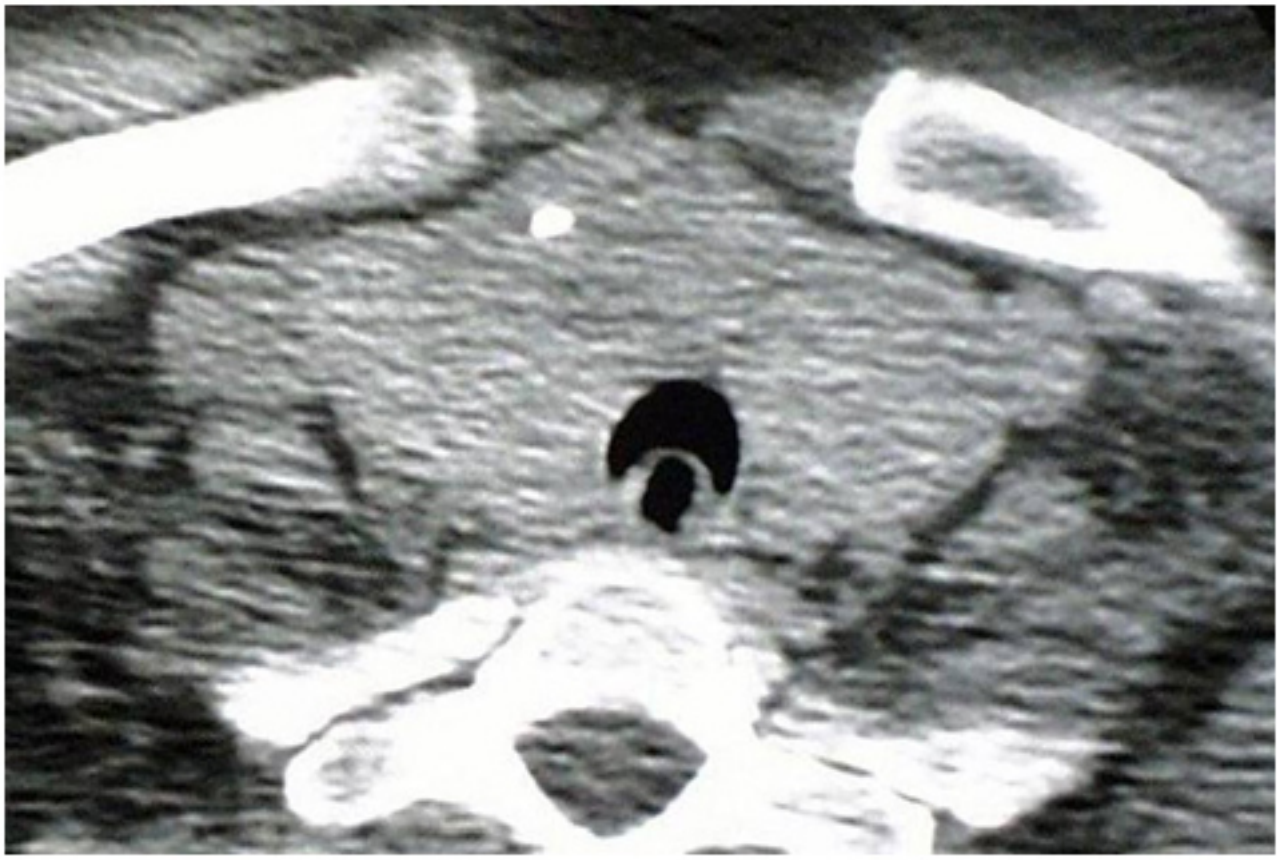


Figure 4. Pre-operative CT scan of the neck demonstrating crescent trachea sign

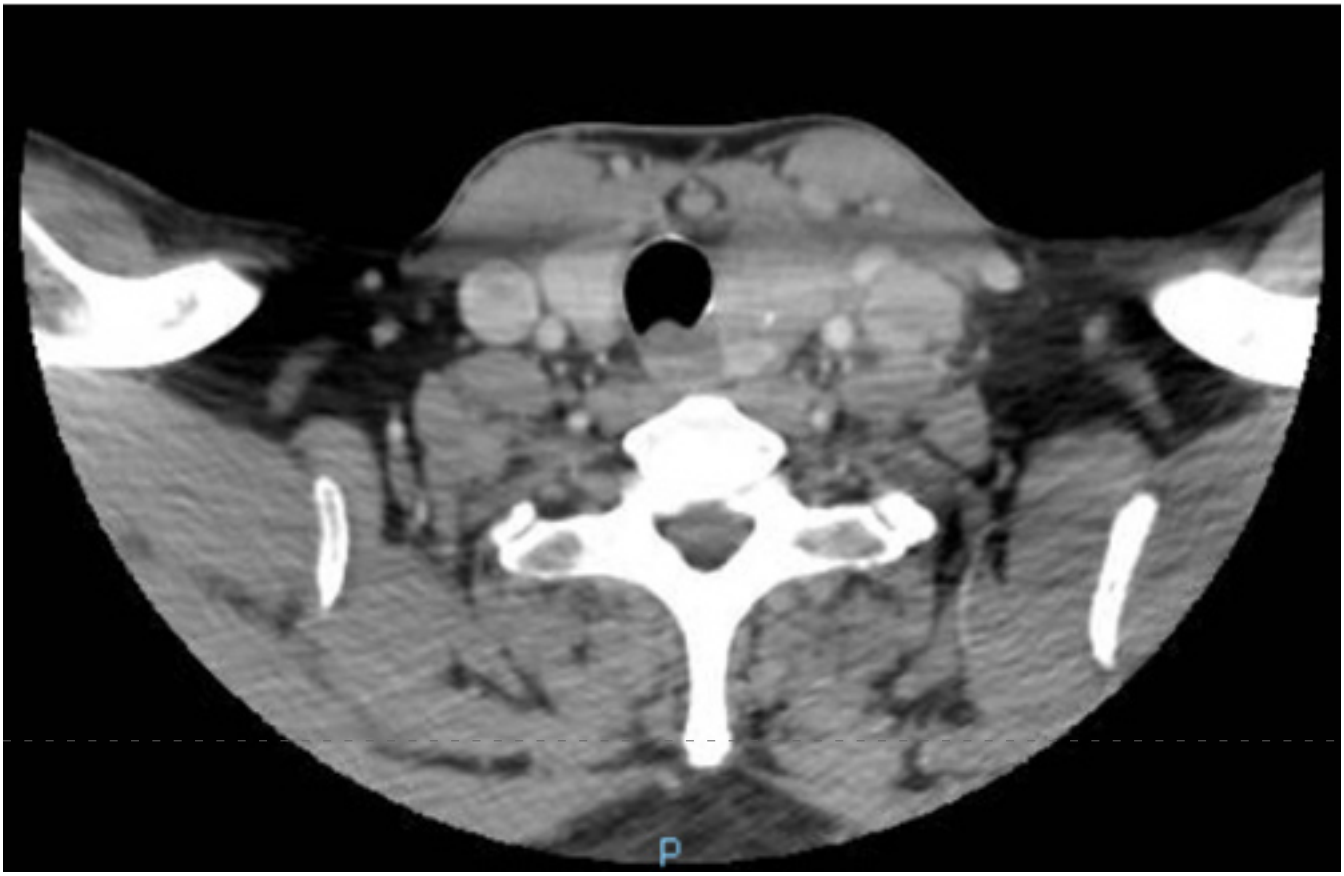


Figure 5: Post-operative CT scan of the neck demonstrating resolution of crescent trachea

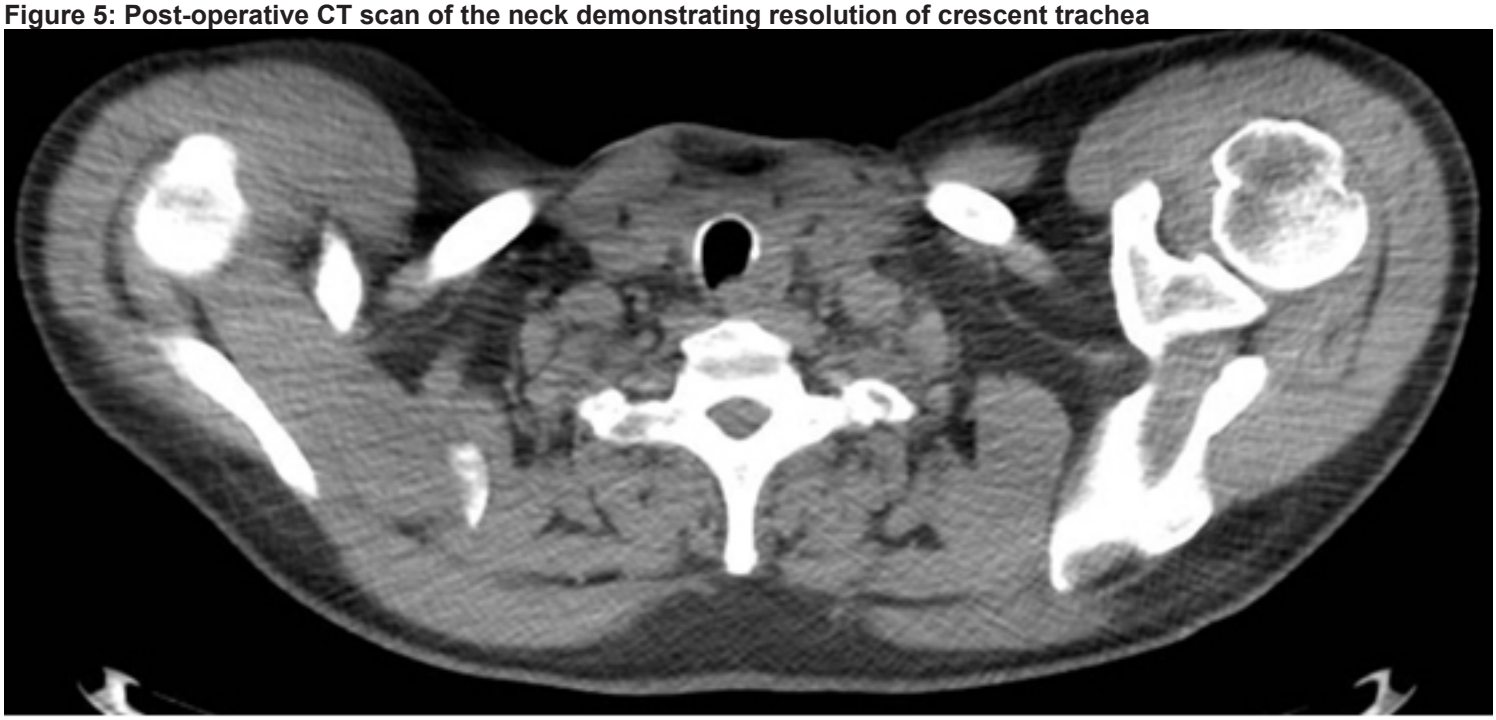


Figure 6: Endo-luminal view of the trachea with cricoid pressure applied demonstrating the crescent trachea shape, in a "normal" patient without a goitre.

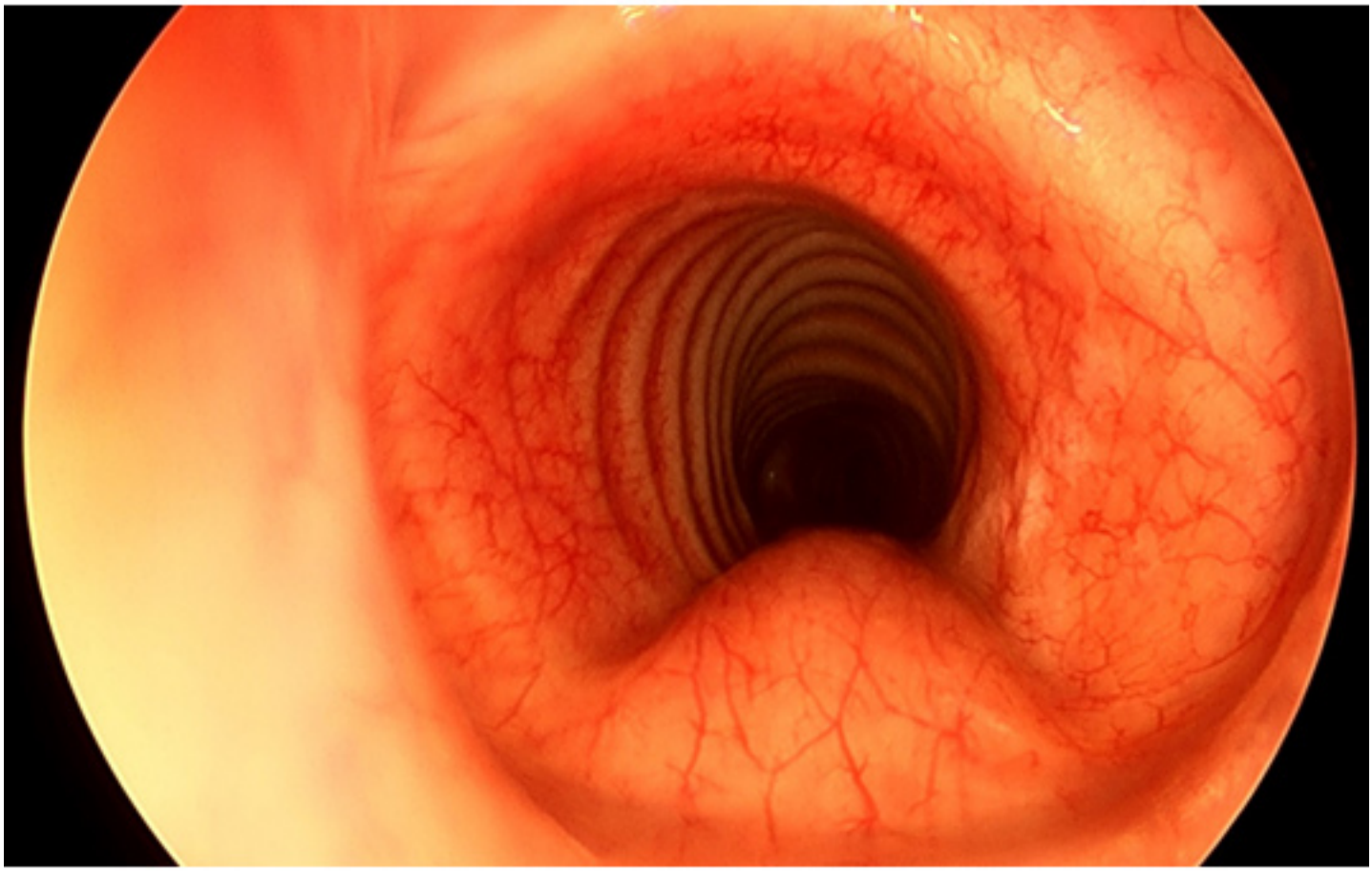
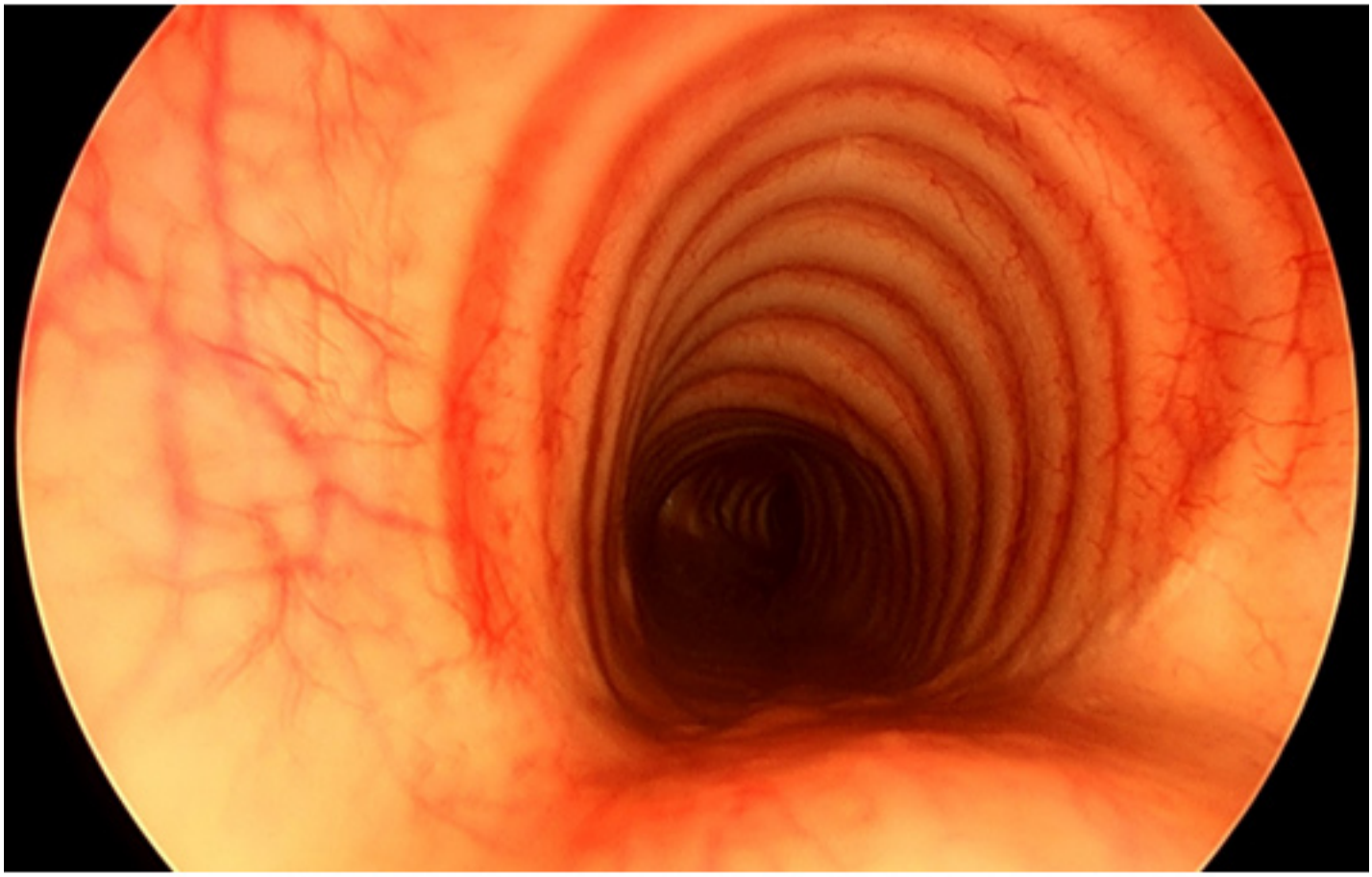


Figure 7: Trachea without cricoid pressure applied showing resolution of the crescent trachea



Discussion

To our knowledge, this is the first published description of a previously unrecognised radiological sign associated with large multinodular goitre. Diagnostic imaging modalities such as Ultrasonography (US), CT and Magnetic Resonance Imaging (MRI), can provide valuable information and assist with clinical monitoring, diagnosis and surgical planning. Surgical planning is particularly important in cases where airway compromise or difficult intubation may be a concern(5).

The World Health Organization classifies goitres based on size from 0-III which can aid in identifying potentially difficult airway cases(1). Class 0 is no palpable goitre, Class I corresponds to a palpable neck mass, Class II a visible, palpable mass that undermines the curves and neckline, and Class III which is a very large goitre with retrosternal extension, tracheal deviation or compression of the trachea or oesophagus(1,6).

Unilateral goitres cause deviation of the trachea to the opposite side, with some degree of side-to side compression. However, the crescent occurs when there is a bilateral bulky thyroid, particularly with retrosternal extension, and if there is a thick isthmus, all of which can compress the trachea posteriorly. This causes the Trachealis muscle to bulge forward, resulting in a crescent shaped trachea. This principle is demonstrated during tracheoscopy performed without an endo-tracheal tube, with simple cricoid pressure, which causes a compressive force similar to that of a large goitre, and thus a crescent trachea shape forms, as shown in the endoscopic photos (Figure 6). If the pressure is removed, the trachea returns to its normal shape (Figure 7).

The case discussed above, and others, that demonstrate a crescent trachea, should be designated as a Class III goitre. This is important to establish, as tracheal compression may not be obvious on clinical examination nor history but may nevertheless result in significant tracheal narrowing. From our experience, these patients often present without any clinically overt signs of respiratory compromise, as they become accustomed to the airway restriction or often have age related co-morbidities that prevent them exercising enough to notice dyspnoea on exertion. Any degree of tracheal compression, however, can provide challenges during surgery, particularly for the anaesthetist(1,4,6,7).

Conclusion

Failure to recognise the crescent trachea sign can result in erroneous under-classification of high-grade goitres. This crescent may not be evident on ultrasonography but seeing the crescent trachea on pre-operative CT or MRI can help in recognising sub-clinical obstruction, even in the absence of a positive Pemberton's sign. This is a relative indication for surgery and can help optimise peri-operative management as well as patient safety.

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