CASE REPORT

Acute suppurative thyroiditis with *Klebsiella pneumoniae* thyroid abscess and concomitant pneumonia

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SUMMARY

Thyroid abscess is an uncommon infectious pathology. The thyroid is highly resistant to infection due to its high iodine content, capsular encasement, and rich in vascularity. Acute suppurative thyroiditis represents <1% of the thyroid diseases that could be potentially life-threatening. We report a case of a 64-year-old Indian lady with underlying long-standing type 2 diabetes mellitus presented with painful anterior neck swelling and diagnosed with *Klebsiella pneumoniae* thyroid abscess. Unfortunately, despite surgical drainage, she succumbed to death due to overwhelming sepsis and renal failure. Thyroid abscess in adult is rare but potentially life threatening. Physicians must have a high index of suspicion when dealing with immunocompromised or diabetic patients with sepsis. Early diagnosis with appropriate medical and surgical treatment can improve patient's outcome.

INTRODUCTION

Acute suppurative thyroiditis (AST) is extremely rare and it accounts for <1% of thyroid diseases.[1] Due to the encasement of the gland, its rich blood supply, high iodine content, and good lymphatic drainage, the thyroid gland is relatively resistant to most infections. Pre-existing thyroid gland pathology such as Hashimoto's thyroiditis, large goitre, and thyroid cancer; retained foreign body and local anatomic abnormalities, such as pyriform sinus fistula and thyroglossal duct, are predisposing factors for AST.[2] It is usually caused by hematogenous spread or direct inoculation of a pathogen. Treatment includes systemic antibiotics targeting the causative organism although the gold standard remains surgical drainage. Here, we present a case of thyroid abscess caused by *Klebsiella pneumoniae* with concomitant pulmonary infection.

CASE REPORT

A 64-year-old lady with diabetes presented to us with progressive painful anterior neck swelling for the past 4 days. It was associated with odynophagia, dysphagia, hoarseness of voice, and breathlessness. Two weeks prior to this, she experienced high-grade fever with chills and rigors along with dysuria. Physical examination was unremarkable, and there was no neck swelling. Her C-reactive protein level was elevated at 166.8 mg/L (<5mg/L). She was initially treated as urinary tract infection and her blood culture grew *Klebsiella pneumoniae*; however, her urine culture isolated *Escherichia coli*. Ultrasound abdomen did not show any intraabdominal abscesses and ophthalmology examination had no evidence of endophthalmitis. She completed two days of intravenous piperacillin-tazobactam 2.25g four times a day and de-escalated to five days of intravenous cefuroxime 1000mg three times a day after culture and sensitivity results of both blood and urine samples were available and discharged with seven days of oral cefuroxime 500mg bd. Despite that, she had persistent fever at home and subsequently developed painful anterior neck swelling. On examination, the patient appeared toxic looking, tachycardic with the heart rate of 124 beats/minute, normotensive with blood pressure of 134/71 mmHg, tachypnoeic with respiratory rate of 24/minute and stridor, and febrile with temperature of 39.8°C. She had a firm, tender, non-fluctuant, warm, and erythematous anterior neck swelling extending from mandible to clavicle measuring 7cmx5cm which moved with swallowing. There was no cervical or supraclavicular lymphadenopathy. Otherwise, she had no other thyrotoxic signs such as tremors, sweaty palms, thyroid eye signs, or pretibial myxoedema. Her respiratory examination showed coarse crepitations over the right lower zone.

Laboratory studies showed leucocytosis with white blood cells of 20.7 x 10^9/L (4—11 x 10^9/L), and raised C-reactive protein of 368 mg/L (<5 mg/L). The erythrocyte sedimentation rate was >120 mm/h (0—20 mm/h). Blood sugar level was elevated, 25 mmol/L with blood ketone of 0.3 mmol/L. She was clinically euthyroid; however, serum-free thyroxine (FT4) was 38.6 pmol/L (7.9—14.4 pmol/L), and thyroid-stimulating hormone concentration (TSH) was 0.268 mU/L (0.34—5.6 mU/l). Her anti-thyroglobulin level was < 0.9 U/mL (<1.0 U/ml) and anti-thyroid peroxidase antibody was mildly elevated with the level of 78.15 (<10 u/mL). Her electrocardiogram showed sinus tachycardia with no ischaemic changes or arrythmia. Her other significant laboratory findings are seen in Table I. Her chest radiograph showed right middle and lower zone consolidation consistent with lobar pneumonia.

She was started on intravenous meropenem 1000mg twice a day, insulin infusion, and low dose beta blocker and admitted to intensive care unit. The flexible indirect laryngoscope examination revealed narrowing of the subglottic region and she was intubated for airway protection. Post intubation, computed tomography (CT) scan of the neck showed anterior

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Table I: Laboratory results

Investigations	Day 1	Day 2	D3 (Post op D1)	Reference range
Hb (g/dL)	9.7	8.5	8.5	12–15 g/dL
WBC (10^9/L)	20.7	14.9	13.9	4—11 x10^9/L
Platelets (10^9/L)	327	294	323	150–450 x 10^9/L
Na (mmol/L)	119	124	131	136—146 mmol/L
K (mmol/L)	4.8	5.5	4.3	3.5—5 mmol/L
Urea (mmol/L)	12.4	15.8	20.5	2.8—7.2 mmol/L
Creatinine (umol/L)	216	272	313	45—84 umol/L
FT4 (pmol/L)	38.6	ND	ND	7.9—14.4 pmol/L
TSH (mU/L)	0.268	ND	ND	0.34—5.6 mU/L
ESR (mm/h)	>120	ND	ND	0—20 mm/h
CRP (mg/L)	368	ND	ND	<5 mg/L
HbA1c (%)	10.4	ND	ND	<6.5%

Hb: haemoglobin
WBC: white blood cell
Na: sodium
K: potassium
TSH: thyroid stimulating hormone
ESR: erythrocyte sedimentation rate
CRP: C-reactive protein

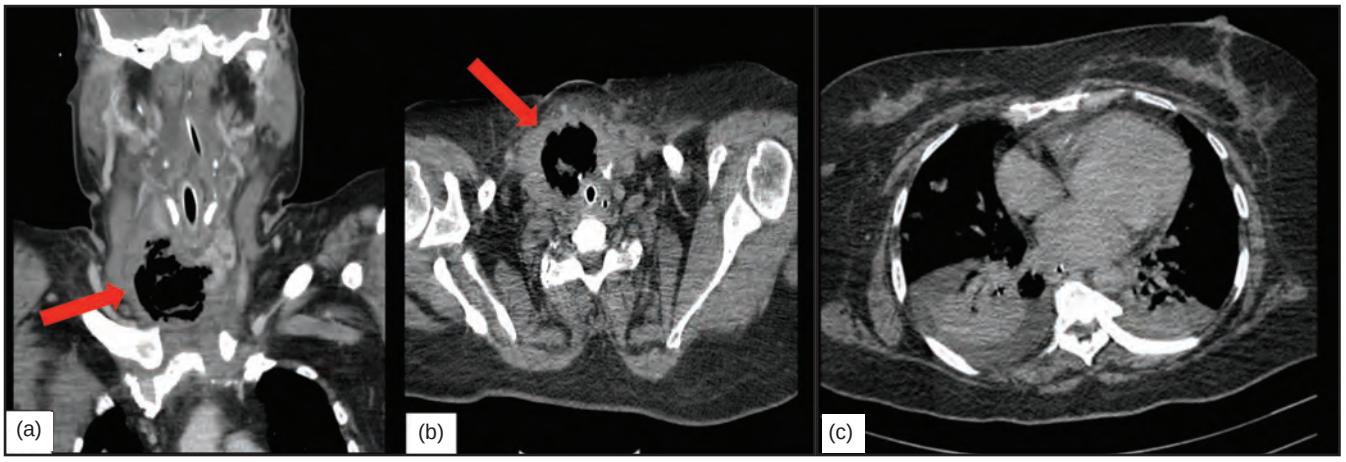

Fig. 1: Computer tomography (a) Coronal view and (b) axial view of the neck showing anterior neck collection (red arrow) measuring 5.7x7.4x6.3 cm (APxWxCC) with large air locules arising from the right thyroid gland with extrathyroidal extension and compression on trachea. CT of the thorax (c) showing extensive patchy collapsed consolidations seen in both lungs (right> left), most severely affecting the right lower lobe with minimal pleural effusions

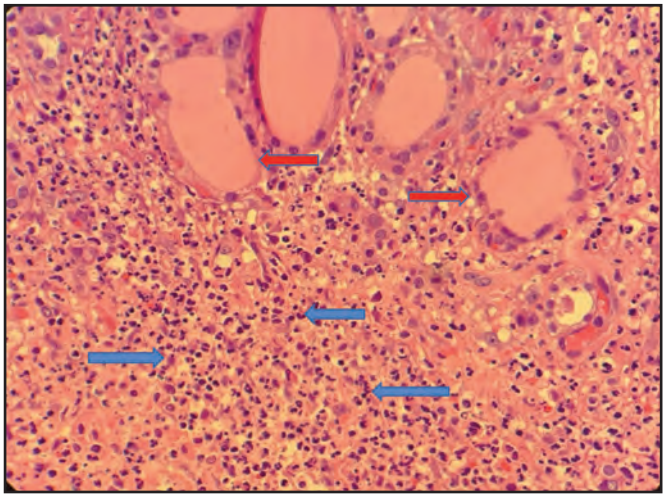

Fig. 2: Microscopic image: Hematoxylin & Eosin (H&E) X 400: Destructions of thyroid follicles (red arrows) by acute inflammatory cells with localized collection of neutrophils (blue arrows)

neck collection measuring 5.7x7.4x6.3 cm (APxWxCC) with large air locules arising from the right thyroid gland with extrathyroidal extension (Figure 1a, 1b). There were also extensive patchy consolidations in both lungs, most severely affecting the right lower lobe (Figure 1c). The diagnosis of AST with thyroid abscess and concomitant pulmonary infection was made and she underwent surgical drainage on day 3 of admission. Intraoperatively, the surrounding muscles appeared oedematous, and the thyroid tissue appeared unhealthy and sloughy with pus within. The pus and tissue culture isolated *Klebsiella pneumoniae* which showed the same antibiotics susceptibility pattern to amoxicillin-clavulanic acid, ampicillin-sulbactam, cephazolin, cefuroxime, and gentamicin. The histopathological examination showed fibro-fatty thyroid tissue with localized collections of neutrophils, lymphocytes, and foamy macrophages. There were areas of haemorrhages and cystic degenerations with focal chronic inflammatory cells infiltration and multinucleated giant cells suggestive of thyroid abscess. There is no cellular atypia or evidence of malignancy seen

(Figure 2). Her tracheal aspirate and repeated blood culture (both aerobic and anaerobic bottles) isolated *Klebsiella pneumoniae* which have a similar sensitivity as well. The recent *Klebsiella pneumoniae* bacteraemia had triggered hematogenous dissemination to the thyroid and lungs, resulting in thyroid abscess and pneumonia formation. Unfortunately, the patient succumbed to overwhelming sepsis and renal failure two days after surgery.

DISCUSSION

The major pathogens that can cause thyroid abscess are *Staphylococcus* and *Streptococcus* species accounted for about 35%–40% of the cases. Gram-negative organisms such as *Klebsiella, Escherichia coli, Salmonella,* and *Acinetobacter sp* cause about 25% cases, whereas anaerobes around 9% to 12%. The rest are fungal and *Mycobacterium tuberculosis* etiologies.[3] Mycobacterial and fungal cases tend to be more common in immunocompromised patients and are chronic in nature, while bacterial causes are more acute.[4]

The clinical presentation of AST is typically a short non-specific prodrome followed by fever, intense pain, and erythema around the neck, resulting in dysphagia and odynophagia. Occasionally, thyroid abscess manifests as a medical emergency, with laryngeal oedema or tracheal compression, necessitating early intubation. Thus, a patient with stridor should undergo immediate endoscopic evaluation with a flexible endoscopy, to exclude laryngeal or tracheal compression. Our patient presented with painful enlarging anterior neck swelling with airway compromise as evidenced by stridor and subglottic narrowing in flexible laryngoscopy examination which required early intubation to prevent respiratory collapse.

The differential diagnosis of AST includes subacute thyroiditis, Hashimoto's thyroiditis, acute suppurative lymphadenitis, rapidly enlarging thyroid carcinoma and cyst, infected thyroglossal duct cyst or branchial cleft cyst, anterior neck abscess or cellulitis. Clinical examination, history, and diagnostic imaging, such as ultrasound and computed tomography (CT) scan, can distinguish these entities. Ultrasound often demonstrates a heterogeneous echotexture of the thyroid gland with a superimposed anechoic or hypoechoic mass, while CT findings of abscesses vary depending on the stage of infection with heterogeneous enhancement of the thyroid gland.[5] Furthermore, CT scan is able to provide information on extra thyroidal involvement and demonstrate anatomical defect such as pyriform sinus fistula and thyroglossal duct which are associated with AST. Thyroid abscess associated with pyriform sinus fistula usually occurs in young children and predominantly involves the left lobe more than the right,[4] however it was not seen in our patient. The CT scan of the neck and flexible indirect laryngoscope did not visualise any pyriform fossa fistula and the thyroid abscess is mainly arising from right thyroid gland.

The risk factor for developing AST in this patient was poorly controlled diabetes. *Klebsiella* infection tends to occur in people with diabetes mellitus and AST secondary to *Klebsiella pneumoniae* has been mostly described in diabetics.[2,6] Chemotaxis and phagocytosis are impaired among diabetic patients.[7] Poorly controlled blood sugar levels enhance the severity of AST. Besides that, recent admission with *Klebsiella pneumoniae* bacteraemia may cause hematogenous spread to the thyroid gland. This patient was treated with 2 days of intravenous piperacillin-tazobactam and de-escalated to 5 days of intravenous cefuroxime after culture sensitivity results were available and discharged with 7 days of oral cefuroxime during the first admission. The initial choice of antibiotics was based on the patient's background of poorly controlled diabetes mellitus, hence a broad-spectrum agent with anti-pseudomonal activity like piperacillin-tazobactam was chosen. Once the sensitivity results were available, the antibiotic therapy was de-escalated to intravenous cefuroxime. The duration of antibiotic for uncomplicated *Klebsiella pneumoniae* bacteraemia is 7–14 days. However, in poorly controlled diabetics, the intravenous antibiotics duration should be at least 14 days. Despite 14 days of antibiotic, the patient remained unwell and developed persistent fever at home. This should raise the suspicion that the source of infection remained unrecognised. In addition, her urine culture which isolated *Escherichia coli* was different from the blood culture. Hence, a repeated blood and urine cultures should be performed during the first admission to determine the causative pathogens and antibiotics susceptibility pattern. More thorough examination including CT scan of the whole body should be done to identify the source of infection. Furthermore, *Klebsiella pneumoniae* is known to cause disseminated infection to the lungs, eyes, skin, liver, muscle, kidney, prostate, and cerebrospinal fluid particularly in immunocompromised or diabetics. Delayed in identifying the source of infection and inadequate duration of intravenous antibiotics in this patient had caused disseminated infection and overwhelmed sepsis with multiorgan failure.

Thyroid function is usually normal in AST, but diffuse inflammation of the thyroid gland and the disruption of follicles with the release of preformed thyroxine and triiodothyronine into circulation can lead to transient thyrotoxicosis.[2] Yu et al.[8] reviewed 191 cases of AST and reported most patients (83.1%) with bacterial infections were euthyroid, whereas those with fungal or mycobacterial infections tended to be hypothyroid (62.5%) and hyperthyroid (50%), respectively. Although this patient had elevated free thyroxine level, the TSH level was not very much suppressed. Non-thyroidal illness can also present with discordant thyroid function test. Free T4 and free T3 typically low or low-normal, with normal or low (but rarely fully suppressed) TSH. However, elevated FT4 may also be found, and it is not uncommon for the same sample to yield markedly discordant FT4 concentrations when run on different assay platforms. She was only given beta blocker for symptomatic control and no other antithyroid drug was initiated. Antithyroid drugs have no role in the management of destructive thyroiditis as the excess thyroid hormone levels result from the release of preformed thyroid hormones from inflamed tissue. In some patients, thyroiditis can result in permanent thyroid gland destruction, and it may be severe enough to cause permanent hypothyroidism. Thus, follow-up thyroid function studies are recommended specially in cases of more diffuse thyroiditis.

AST requires immediate parenteral antibiotic therapy before the formation of thyroid abscess. In the presence of thyroid abscess, surgical drainage is generally necessary in addition to antibiotic therapy. Complications of thyroid abscesses include tracheal or oesophageal perforation, descending necrotizing mediastinitis, extension into the deep spaces of the neck, airway obstruction, internal jugular vein thrombosis, and sepsis.[9] Mortality with suppurative thyroiditis is reported to range from 3.7 to 12.1%[10] and tends to be higher in immunocompromised patients. Berger et al. reported that with no therapy, the mortality rate in bacterial thyroiditis is almost 100%. Early diagnosis and treatment are essential to decrease the morbidity and mortality associated with suppurative thyroiditis and thyroid abscess.

CONCLUSION

Thyroid abscess in adult is rare and potentially life threatening. Physicians must have high index of suspicion when dealing with immunocompromised or diabetic patients with sepsis. Early diagnosis with appropriate medical and surgical treatment can improve patient's outcome. It is also important to recognize AST with abscess formation in the differential diagnosis of anterior neck pain in diabetic patients.

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