Ludwig's angina and mediastinitis due to *Streptococcus milleri*: usefulness of computed tomography


ABSTRACT: Despite intensive use of antibiotics, Ludwig's angina remains a potentially lethal infection because of the risk of upper airway obstruction and spread into the mediastinum. We present two patients who survived mediastinitis complicating Ludwig's angina due to *Streptococcus milleri*. Computed tomography performed early in the course of the disease detected pus collections and directed appropriate drainage procedures.

Eur Respir J., 1990, 3, 728-731.

Ludwig's angina (LA) is a rapidly spreading cellulitis involving sublingual and submaxillary spaces [1]. Two major complications of LA are life-threatening upper airway obstruction and infectious seeding of the mediastinum, which were responsible for a high mortality rate before the antibiotic era: more than 50% in LA [2], and from 50% (with surgical drainage) to 86% (without surgical drainage) in mediastinitis [3]. We report two cases of LA and mediastinitis of dental origin. Although the detection of the cervical and mediastinal collections is usually difficult in such cases, the early use of computed tomography (CT) allowed appropriate surgical drainage and probably contributed to the survival of our patients.

Case 1

A mildly retarded 17 yr old girl was admitted because of fever and dysphagia. She complained of toothache for several days. Two days before entry, temperature rose to 39.5°C.

Physical examination showed bilateral submandibular swelling, trismus and oedema of the floor of the mouth. Pulse rate was 120 b·min⁻¹. Temperature was 36.8°C and the patient was not dyspnoeic.

Abnormal laboratory findings included erythrocyte sedimentation rate 70 mm·h⁻¹, fibrinogen level 622 mg·dl⁻¹, white blood cell count 11,800·mm⁻³ with 10,000 neutrophils. Chest X-ray showed slight enlargement of the superior mediastinum. Ampicillin (2 g i.v. every 6 h) was given as well as indomethacin (100 mg·day⁻¹ for 2 days) and a single dose of methylprednisolone (125 mg) for the incipient upper airway obstruction.

On the second day, cellulitis extended to the anterior chest wall with subcutaneous emphysema. A left pleural rub was heard and the abdomen was tender and silent.

Fig. 1. – Chest X-ray, subject 1, day 2. Enlargement of the superior mediastinum (arrowheads); right pleural effusion (arrow); enlargement of the cardiac area; swelling of the cervical soft tissues.

Fig. 2. – Cervical X-ray, subject 1, day 2. Gas bubbles are visible in front of the trachea (arrow); enlargement of the root of the tongue; loss of the normal cervical lordosis.
Chest X-ray showed a right pleural effusion, gas bubbles in the pretracheal space and enlargement of the cardiac area (figs 1 and 2).

On the third day, a loud pericardial friction rub was noted. Temperature was 37.6°C. Blood cultures remained sterile. Cervical echography failed to demonstrate an abscess formation, whereas CT showed free gas in the pretracheal space and in the retrosternal space, an abnormal density of fat due to infiltration by the infectious process with partial blurring of the normal cervico-mediastinal structure, and a right pyothorax (fig. 3). Echocardiogram was normal.

The patient was transferred to the intensive care unit. After endotracheal intubation, surgical drainage of the cervical, mediastinal and pleural collections were performed according to the CT data. Cultures yielded *Streptococcus milleri* sensitive to penicillin and its derivatives.

Despite an acute respiratory distress syndrome, the patient’s condition slowly improved. Her carious teeth were extracted and she was discharged after 77 days.

**Case 2**

A 49 yr old alcoholic man presented 7 days after multiple dental extractions with stridor, swelling of the cervical region, trismus and elevation of the floor of the mouth. Temperature was 39.6°C. Erythrocyte sedimentation rate was 70 mm·h⁻¹, fibrinogen level 579 mg·dl⁻¹, white blood cell count 19,800·mm⁻³. Chest X-ray showed a normal mediastinum and bilateral basal pulmonary infiltrates. The patient was treated with amoxycillin (1 g i.v. every 6 h) and metronidazole (500 mg i.v. every 8 h);

---

Fig. 3. – CT scan of subject 1, day 3 (without contrast medium). a) CT scan of the neck at the level of the subglotic trachea. Infectious process infiltrates the anterior part of the neck with gas production and abnormal densities of fat, partially blurring the thyroid and vessels margins. b) CT scan of the chest at the level of the carina. Gas bubbles in the anterior compartment of the mediastinum; posterior right pleural collection. c) CT scan of the chest at the level of the right inferior pulmonary vein. Gas is visible in the retrosternal space. Right pleural collections are visible in the interlobar and posterior pleural space.
methylprednisolone (40 mg every 8 h) was added because of upper airway oedema.

Eighteen hours after entry, subcutaneous emphysema was noted with persistent stridor and increased dyspnoea. Chest X-ray showed enlargement of the superior mediastinum. The patient was transferred to the intensive care unit. Pharyngeal haemorrhage and aspiration of blood required endotracheal intubation.

On the third day, CT showed a mandibular abscess extending to the pretracheal space and the anterior mediastinum with bilateral pulmonary infiltrates. Surgical drainage of the cervical and mediastinal collections allowed aspiration of foul-smelling pus. Cultures yielded *Streptococcus milleri*.

Despite a cardiac arrest with resuscitation, the patient's condition improved slowly and he was discharged after 67 days.

**Discussion**

Causative organisms of LA are mostly commensals of oropharyngeal mucosa (streptococci, anaerobes). Mixed aero-anaerobic infections are common [1, 4]. In the two reported cases, the only isolated pathogen was *Streptococcus milleri*, but cultures were obtained after the beginning of treatment with antibiotics and we cannot be sure that *S. milleri* was the only causative micro-organism. This microaerophilic bacterium was first isolated in dental abscesses [5], but it may cause other supplicative infections including sinusitis, meningitis, arthritis, endocarditis, peritonitis, perineal hiradenitis, perirenal abscess and empyema [6-8]. It is one of the most common pathogens isolated in frontal brain [9] and liver abscesses [10]. *S. milleri* is susceptible *in vitro* to penicillin, clindamycin and chloramphenicol; it is resistant to tetracyclines in 36% of the cases and always resistant to metronidazole [6].

The most common aetiological factor of LA is dental infection, which is responsible for 85% of cases [11]. Other causes include nasopharyngeal surgery or trauma, tonsillitis (post-anginal sepsis) and rarely submandibular sialadenitis, erysipelas, furuncles or infected thyroglossal duct cysts [4, 12].

In a recent review on LA, spread of infection into the neck and mediastinum occurred in 5 of 141 cases (4%) [11]. This spread is influenced by several factors: 1) the anatomy of the cervical fascia allows cervical infections to spread easily into the mediastinum, by creating longitudinal spaces: the pretracheal space, the retropharyngeal space, and the visceral compartment containing carotid arteries, jugular veins and vagus nerves [12-14]; 2) the inspiratory negative intrathoracic pressure occurring during spontaneous ventilation might favour aspiration of infected material (air, saliva, bacteria) from the neck into the mediastinum [13]; 3) spread of cervical infections is more frequent in diabetics, alcoholics and in other conditions of immunodepression and poor nutrition [11, 15]; 4) inadequate initial management and treatment can worsen the prognosis, e.g. insufficient or delayed surgical drainage, or use of antibiotics inactive against anaerobic flora. Corticosteroids were used in our cases and in some others [16-18] in order to reduce the upper airway oedema. Although no controlled studies are available concerning their efficacy or harmfulness, steroidal and nonsteroidal anti-inflammatory agents might be deleterious in a clearly infectious process because of their immunosuppressive action [19].

The complications of mediastinitis include empyema (often bilateral), pneumothorax, pulmonary abscess, aspiration pneumonia, pericarditis with or without effusion, septic oesophageal perforation, erosion of the aorta, subphrenic abscess and retroperitonitis [4, 12, 13, 15].

Other complications of LA include thrombophlebitis of the internal jugular vein, rupture of the carotid artery, metastatic abscesses and necrosis of the tongue [4, 11, 13].

Because of the rapid spread of this infection through the cervical and mediastinal compartments, and the possible insidious initial course of the disease, CT should be performed as soon as possible. Conventional X-ray films of the neck and chest may show gas in the tissue, air-fluid levels, loss of the normal cervical lordosis or mediastinal widening [13, 16], but they do not delineate the extension of the infection. In contrast, in our cases and in some others [16, 20-23], CT adequately detected pus collections and mediastinal extension. CT findings included pleural and pericardial effusions [22, 23], oesomyelitis of the rib [22], retropharyngeal, parapharyngeal and mediastinal abscesses or air collections [16, 20-22], usually ill-defined and infiltrating the normal cervico-mediastinal structures. These findings allowed adequate surgical drainages, which are mandatory when mediastinitis is present.

Although the number of patients is too small to draw definite conclusions, the early use of CT appears to improve the prognosis of these patients.

**Acknowledgements:** The authors thank Dr J. Orehek and Dr W. Merrill for their suggestions concerning the manuscript.

**References**

5. Guthof O. - Pathogenic strains of *Streptococcus viridans*, streptococci found in dental abscesses and infiltrates in the region of the oral cavity. *Zentralbl Bakteriol Naturwiss*, 1956, 166, 553-564.