IS YOUR KNOWLEDGE UP-TO-DATE?

Case history

Ms. Barker has fully recovered from extensive physical injuries she incurred during a car accident. She has been in a rehabilitation centre for the past 14 months. During Ms. Barker's recovery, she was on a ventilator for 3 weeks, when she contracted pneumonia. She has returned to the office to resume dental treatment.

Social history

Smoked at least one pack of cigarettes for the past 20 years.

Medical history

Moderate to severe chronic obstructive pulmonary disease (COPD) with symptoms of occasional coughing and shortness of breath while walking at a hurried pace or up a slight hill.

Medication

1. Amoxicillin antibiotic treatment for recent acute exacerbation.
2. Short-acting bronchodilator salbutamol/fluticasone.
3. Prednisone inhaler.

Dental history

Brushes once daily and does not floss since the accident and physical injuries.

Clinical situation/mouth inspection

Extra-oral examination

- Tempro-mandibular joints and other structures within normal limits.

Intra-oral examination

- Generalized periodontal pocketing ranging from 6 to 8 mm, gingival recession, Grades II and III furcation involvement and localized mobility.
- Moderate tobacco staining.
- The hard palate had a grey-like colour, with the mucosal tissue appearing wrinkled like cracked paint and the soft palate with raised red dots.
- Generalized moderate biofilm accumulations.
- Red bulbous interdental papilla in the anterior sextants and cratered spongy gingival tissue in the posterior regions.

Radiographic image

- Horizontal and vertical bone loss.
- Dental caries on the mandibular right distal occlusal first premolar and the maxillary right second molar.

Questions

1. What aetiological factor(s) could have been associated with the patient's pneumonia?
2. What are the contributing factors in the patient's intra-oral findings?
3. What factors have to be considered for the dental hygiene appointment?
4. What role can dental professionals play as members of the multidisciplinary care team?

Rationale

1. What aetiological factor(s) could have been associated with the patient's pneumonia/VAP?

Pneumonia is an infection of the lungs caused by bacteria, mycoplasma, viruses, fungi or parasites. Bacterial pneumonia is a common and significant cause of mortality and morbidity in human populations. Pneumonia together with influenza is a top cause of death in the world, and the leading cause of death in elderly nursing home residents (1). Bacterial pneumonia includes community-acquired pneumonia and hospital-acquired (nosocomial) pneumonia. Nosocomial pneumonia occurring >48–72 h after admission to a hospital or nursing home can be divided into two subtypes: ventilator-associated pneumonia (VAP) and non-VAP (1). The distinction is important because the pathogens implicated and the preventive measures taken are very different for the two types (2).

Aspiration of oral anaerobes is still believed to be very significant in the genesis of aspiration pneumonia, either inside or outside institutions. However, in the setting of the hospital or nursing home, multiple anaerobic and aerobic organisms can colonize in the mouth and saliva and can be aspirated. Gram-negative aerobes are known nosocomial pathogens that can colonize the mouth and saliva of hospitalized or nursing home patients (3). It is therefore possible that accumulation of oral pathogens associated with periodontal disease may increase the risk for serious lower respiratory tract infection in susceptible subjects, including pneumonia in hospitalized subjects or exacerbation and progression of COPD (4). Oral bacterial load increases during intubation and higher dental plaque scores predict risk of pneumonia (5).

It is well known that teeth and gingival margin are places that favour bacterial colonization, and periodontal pockets may serve as reservoirs for potential pathogens of pneumonia. Periodontitis together with poor oral hygiene or by facilitating colonization of dental plaque may promote pneumonia (1). One cubic millimetre of dental plaque contains about 100 million bacteria (6) and may serve as a persistent reservoir for potential pathogens, both oral and respiratory bacteria. It is likely that oral and respiratory bacteria in the dental plaque are shed into the saliva and are then aspirated into the lower respiratory tract and the lungs to cause infection (1, 7, 8). When the endotracheal tube is placed, it goes through the vocal cords, and the glottis is open continuously and cannot prevent the aspiration of oral contents. Therefore, intubated patients are at a greater risk for microaspiration of bacteria from the oral cavity (9).

Multiple defence mechanisms operate within the healthy respiratory tract to eliminate aspirated bacteria from the lower airway, but their effectiveness can be impaired by a variety of conditions such as malnutrition, smoking, chronic obstructive pulmonary disease (COPD, which includes bronchitis and emphysema), diabetes, corticosteroid use and endotracheal or nasogastric intubation (10). Diminished salivation and salivary pH may promote colonization by respiratory pathogens; these conditions occur in ill patients and in those receiving various medications (11). Abnormalities in the salivary flow caused by invasive tubes and some medications place patients at risk for overgrowth of these organisms, with dental plaque providing a rich environment for growth (5). Colonization of the oral cavity with bacteria that then are aspirated into the lower respiratory tract can lead to inflammation and development of pneumonia (12). In a healthy subject, the respiratory tract is able to defend against aspirated bacteria. Patients with diminished salivary flow, decreased cough reflex, swallowing disorders, poor ability to perform good oral hygiene or other physical disabilities have a high-risk of pulmonary infections (1).

2. What are the contributing factors in the patient's intra-oral findings?

Nicotine stomatitis is a benign lesion on the hard palate associated with smoking, most typically pipe and cigar smoking, but it occurs with cigarette smoking as well.

The initial response of the palatal mucosa to the heat from these substances is an erythematous appearance. Following the increase in kerantinization, raised red dots are observed at the opening of the ducts of the minor salivary glands, which become inflamed as a result of obstruction by keratin at the mucosal opening of the ducts (13).

Smoking is a risk factor for oral cancer and periodontal disease, in addition to the contributing factor in COPD. Individuals who smoke have increased calculus, greater bone loss and increased pocket depths, but have the same levels of plaque accumulation and the same or less gingival inflammation (14).

Smoking increases the risk of periodontal disease and interferes with the ability of the gingiva and bone to respond to treatment. This mechanism is probably through an altered host response. Effects of smoking seem to be related not only to the local effects in the oral cavity (heat, dryness and increased plaque and calculus deposits), but also to a suppression of the immune system altering the host response to periodontal pathogens (15). Smoking is the primary risk factor for chronic respiratory diseases, such as emphysema and chronic bronchitis, both of which are major conditions of COPD (16).

A high priority should be given to the primary prevention of COPD by reducing the number of people who start to smoke. For patients who have already developed COPD, smoking cessation reduces the rate of lung function decline (17). Most smokers have tried to stop at some time and repeated attempts are often needed to achieve success. Smoking cessation should be seen as a constant target and patients may need to be encouraged to go through the cycle of contemplation of cessation, positive action and relapse many times. Various degrees of support are possible from simple advice to pharmacological and behavioural therapy (18).

3. What factors have to be considered for the dental hygiene appointment?

There is no cure for COPD as the damage to the lungs cannot be reversed. The currently available medications for COPD can reduce or abolish symptoms, increase exercise capacity,

reduce the number and severity of exacerbations and improve the status (19, 20). Respiratory infections, such as acute bronchitis, pneumonia and influenza, can aggravate COPD symptoms. Antibiotics can help fight bacterial infections, but are recommended only when necessary (18, 20).

The institution of broad-spectrum antibiotics, followed by the appropriate use of organism-specific antibiotics, once the organism is identified, is the approach used in intensive care units (21). Pathogens may be difficult to identify in exacerbations of COPD. Commonly used antibiotics are amoxycilin, tetracycline derivates and amoxycillin/claulanic acid. Alternative treatments include newer cephalosporins, macrolides and quinolone antibiotic. Patients are encouraged to keep a course of antibiotics in reserve and start treatment when symptoms suggest an infective exacerbation (18).

An exacerbation of COPD, an event in the natural course of the disease characterized by a change in the patient's baseline dyspnoea, cough and/or sputum, beyond day-to-day variability is sufficient to warrant a change in management (19). Even with ongoing treatment, patients may experience times when symptoms suddenly get worse and can cause lung failure without prompt treatment. Exacerbations may be caused by a respiratory infection or a change in temperature or air pollution (20). Bronchodilators are inhaler drugs that relax smooth muscles in the airways, which relives coughing and shortness of breath and makes breathing easier (22). There are three groups of suitable drugs: β_2-agonists, anticholingeric drugs and methylxanthines. The inhaled route of drug delivery results in fewer adverse effects. Many devices are available, including metered-dose inhalers with or without large-volume spacer attachments, breath-actuated metered-dose inhalers and dry-power inhalers (18).

Combining medications of different classes seems a convenient way of delivering treatment and obtaining better results for improved lung function and symptoms. Research findings that have reported combining long-acting inhaled β-agonist and inhaled corticosteroids show a significant additional effect on pulmonary function and a reduction in symptoms in those receiving combining therapy compared with its components (23). Some medications are taken on a regular basis and others as needed. Depending on the severity of the disease, the patient may need a short-acting bronchodilator such as salbutamol/albuterol between activities, or a long-acting bronchodilator (β_2-andrenoceptor agonist) that is used daily. Most patients have reported side effects that include the unpleasant taste of the medication as with cough as the commonest side effect (18, 20, 22).

Inhaled corticosteroid medications are prescribed for patients with moderate to severe COPD (19, 22). The use of inhaled steroids can reduce airway inflammation. However, prolonged use of these medications can lead to side effects such as obesity, muscle weakness, diabetes mellitus, osteoporosis, oral candidiasis and hoarseness (18). Patients who are prescribed corticosteroids require their dose to be increased, if there has been adrenal suppression; (24) therefore, the patients' physicians or pulmonologists should be consulted prior to the dental hygiene appointment. Patients who are prescribed inhaled corticosteroids such as prednisolone and prednisone may develop oral candidosis. To reduce the risk of systemic absorption of the corticosteroid, patients are advised to rinse their mouth and throat with water and spit out after inhalation. An antifungal drug such as a topical 2% oral gel of miconazole is used to treat candidosis (24).

The patients' medical history, COPD severity and the extent of oral disease are factors for consideration when planning the dental hygiene treatment. Dental hygiene treatment for patients with COPD needs to be modified as patients with COPD do not tolerate being placed in a horizontal position. As there is often an association between COPD, coronary heart disease and hypertension, the patients' blood pressure should be monitored. There is no consensus regarding the use of ultrasonic instrumentation during dental hygiene treatment of a patient with COPD; however, when used, the contaminated aerosol can be managed with a high-speed evacuation system, in addition to a preprocedural antimicrobial rinse to minimize the oral bacterial load (25, 26). While deciding to use ultrasonics instrumentation for a patient diagnosed with COPD, the patient's health history, COPD severity and oral health status should be considered. However, the use of air polishing is not recommended for use in severe COPD patients (25). There are no contraindications for the use of local anaesthesia; however, caution should be taken when administering nitrous oxide in patients diagnosed with mild to moderate COPD, but contraindicated for patients with severe COPD (27).

Integrated care for COPD involves the patient and a team of clinical professionals working in primary care, cooperating with secondary care and rehabilitation services (19). The implementation of novel preventive strategies that include rigorous oral hygiene may significantly reduce the prevalence and/or mortality and thus cost of treating these conditions (10). Oral interventions to reduce pulmonary infections have been examined in both mechanically ventilated ICU patients and non-ventilated elderly patients (1). Attention to oral hygiene, either by the use of mechanical cleaning and/or oral antiseptic rinses such as betadine or chlorhexidine gluconate, significantly reduces the rate of lower respiratory infection in institutionalized subjects (28).

One regime used an oral care kit with a cetylpyridium antiseptic rinse agent with both toothbrush and the oral swabs every 4 h, in addition to a deep oral-pharyngeal suction catheter as part of the oral care process. The process included brushing the teeth every 12 h, swabbing every 4 h and using deep suction above the cuff every 12 h and before the patient's head-of-bed was placed flat for procedures (12). Through an innovative, interdisciplinary collaborative approach to the prevention of VAP, interventions can be identified that may potentially improve patient outcomes (12).

4. What role can dental professionals play as members of the multidisciplinary care team?

Dental care must consider the impact of periodontal infection on systemic health. As oral disease–systemic disease linkages are further defined, the treatment of oral disease will be considered a requirement for complete disease management (29). Clinical decisions for patients require integrating a range of interacting biological, psychological, social, cultural and environmental factors. For disease to manifest, the aetiological agents must be present, the host must be susceptible, the environment conducive and sufficient time available for the factors to interact. Early diagnosis and prompt treatment require an understanding of the pathology and of the diagnostic, prevention and treatment modalities (30). The development of tailored treatment plans will require incorporating all these factors together with input from the patient's health care providers, taking into consideration the patient's interests and needs (30).

The dental hygienist is often the member of the dental team who regularly spends most of the time with the patient, updates the medical history and listens to the patient's description of the medical condition. Therefore, it is often the role of the dental hygienist to initiate communication within the dental team and with the medical office concerning the care of the patient (31). Patients with periodontal infection/inflammation and chronic respiratory disease also may benefit from co-management by the health care team (25). There is a necessity for oral health education and provision among the high-risk people of the community, nursing homes and intensive care units, which are necessary in reducing the occurrences of systemic diseases with oral health links (32), especially with the introduction of specific oral hygiene courses for caregivers in long-term institutions (2). Emphasizing frequent preventive or periodontal maintenance therapy through daily oral hygiene practices, possibly including antimicrobial rinses, is important to reduce dental biofilm formation and bacterial aspiration and to maintain periodontal health (25).

The collaborative model that is taught in the dental hygiene curriculum, and is often at work between the dentist and dental hygienist, needs to be extended to include communication with other medical specialists. Dental hygienists need to use their clinical knowledge of oral disease to communicate with their patients' medical providers when necessary (31).

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