

Perioperative Anesthesia Management for a Patient Presented with Acute Cardiopulmonary Compromise Secondary to a Complicating Retropharyngeal Abscess Extending to the Mediastinum. A Rare Case Report

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Background: A retropharyngeal abscess is a bacterial infection of the back of the throat. It rarely results in deadly complications such as mediastinitis and thoracic empyema from deep neck infections involving soft tissues of the face, arising from oropharyngeal infections, particularly dental caries. Thus, complicating retropharyngeal abscess extending to mediastinitis poses an increased risk of high mortality rate as a result of its significant invasive potential and the fact that the recognition and diagnosis must be made early, as this is usually delayed. Complicating retropharyngeal abscess increases airway compromise and difficult airway management during anesthesia. We present a 40-year-old, male patient who transferred from another primary hospital to our institution's surgical emergency outpatient department with a complaint of neck swelling of 10 days secondary to tooth extraction. He had a complaint of dull-itching pain, localized initially to the submandibular area and subsequently involving the oropharyngeal, neck, and descending to the chest and mediastinum. He was diagnosed with a complicated retropharyngeal abscess extending to the mediastinum (mediastinitis) and thoracic empyema as a complication of odontogenic infection in origin. Besides intravenous antimicrobial therapy, deep neck incision and drainage, and thoracotomy was done under general anesthesia. After adequate venous access and the patient positioned in head-up position, premedication was given. General anesthesia with an endotracheal tube was provided with a ready tracheostomy set. Inhalational induction was conducted and laryngoscopy was performed after the adequate depth of anesthesia was achieved. We experienced anticipated difficult intubation after induction. After multiple attempts, the tracheal tube was placed correctly by using a bougie. Halothane was used for maintenance anesthesia with intermediate-acting muscle relaxant under controlled ventilation.

Conclusion: On top of a detailed review of the patient's history, physical examination, laboratory investigations, and imaging profiles; early recognition of the airway compromise from the complicated retropharyngeal abscess, and proper readiness to manage potentially challenging airway compromise, and difficult airway management during the perioperative period.

Keywords: anesthesia, anesthesia management, dental infections, incision and debridement, Ludwig angina, mediastinitis, mediastinal abscess, retropharyngeal abscess, airway management, retropharyngeal abscess

Introduction

Dental caries is considered a multifactorial disorder and it may present with mild pain which might produce patient discomfort to severe progressive pain that has a significant impact on the quality of life.¹ Progressive dental decay and attending pain or infection which may present with subsequent increments in severity mandate the need for dentist management.^{1,2}

It is suggested that inadequately managed dental procedures, especially in the case of poor periodontal care may precipitate the likelihood of developing certain serious clinical conditions such as infective endocarditis, mediastinal infections leading to mediastinal inflammation, and necrotizing fasciitis. These infectious conditions rarely may cause descending infections to the lower respiratory tract leading to pulmonary complications, and may also induce the formation of empyema and/or pleural effusions.^{3–5}

Retropharyngeal infections can manifest as acutely progressing signs and symptoms such as sore throat, neck pain, and neck swelling, cough, dyspnea, voice changes, and fever. Moreover, untreated infections may gradually spread to the adjacent prevertebral area and chest causing life-threatening sequelae. This could happen particularly in the circumstances of delayed recognition in diagnosis and initiating appropriate treatment. Lung contamination with the infections may present in the form of pleural empyema, deadly respiratory compromise or failure, and cardiovascular instability from pericarditis, pericardial effusion, or mechanical compression from the dangerously developed infectious-generated abscess.^{6–9}

Inflammation or infection of the mediastinal may develop subsequently after esophageal problems such as esophageal perforation, or secondary to certain infectious conditions affecting the sternum. However, in rare clinical cases, mediastinal infections or abscess-generating conditions may happen following retropharyngeal abscess and/or Ludwig's angina or might be secondary to a deep neck soft tissue infection; basically due to dental infections involving the second and or third inferior molar teeth.^{10–12}

It was reported that mediastinal abscess from dental origin has a greater impact on the medical and surgical management of the patient. This clinical situation may compromise the patient airway and cardiovascular system due to the direct compression of vital anatomical structures.¹³ Thus, priority should be given to airway patency, which mandates a critical and planned intubation to manage the patient airway. Careful attention should be paid during handling such patients as the administration of sedative-hypnosis and/or tracheal intubation using paralyzing agents may lead to fatal airway collapse as a result of decreased chest compliance and heightened compressional effects of the mass on the vital structures.^{10,13}

It was suggested that necrotizing fasciitis spreading down to the mediastinum tends to affect the younger adult population with male predominance. Hence, it needs immediate diagnosis and management as it is a fatal clinical situation with a high mortality rate of 40%.^{10,14}

The provision of antibiotics was considered primarily as the clinical signs of infection were evident. In addition, antibiotics were commenced in some clinical situations of dental practice such as in immunocompromised patients, presence of evidence of infections (local and/or systemic), and existing evidence of subsequent signs and symptoms of rapid infection progress, since even small retropharyngeal abscess may successfully respond to antibiotic therapy.^{3,15}

The anticipated difficult airway is the mainstream of perioperative anesthesia concern in patients presenting with retropharyngeal abscess, as it causes airway distortion, and might rupture leading to aspiration of abscess. It is essential to get ready a difficult airway management kit with all necessary equipment, and an emergency surgical airway (tracheostomy, requiring the ENT surgeon). Assessment of volume status and promoting adequate hydration is advocated to combat dehydration, and/or associated hemodynamic instability requiring fluids and vasopressors. Premedication should be addressed carefully in light of potential airway compromise. During induction of anesthesia, permit head-up position and inhalation induction that prevent aspiration of abscess contents and respiratory compromise after anesthesia (particularly with the use of muscle relaxants leading to complete airway obstruction). Adequate level of anesthesia should be achieved before airway manipulation, and rapid, gentle non-traumatic intubation is desirable in such cases to prevent abscess rupture, aspiration and acute airway compromise. Awake fiber-optic intubation under local anesthesia, and video laryngoscopes are the best option for difficult airway management. The degree of preoperative airway compromise (obstruction, aspiration, manipulation, edema) needs to be assessed, and a plan made for postoperative ventilation. If early extubation is planned at the end of the surgery, the patient should be fully awake.^{16–18}

We present a case of cardiorespiratory compromise secondary to a complicated retropharyngeal abscess extending to the mediastinum, leading to mediastinitis and thoracic empyema as an odontogenic infection in origin, who underwent neck fasciotomy, and thoracotomy in a resource-limited area.

Case Description

A 40-year-old, male patient (174 cm, 60 kg) presented with cardiopulmonary compromise from a complicated retropharyngeal abscess extending to the mediastinum leading to mediastinitis or abscess and thoracic empyema. He was referred from another primary hospital to our institution's surgical emergency outpatient department. On admission, he had neck swelling for 10 days secondary to tooth extraction. Associated with this he had complaints of dull-itching pain which were localized initially to the submandibular area and subsequently involved the oropharyngeal, neck, and descending to the chest and mediastinum. The swelling progressively increased in size, extending to the chest with the associated difficulty of breathing, vomiting, and voice change.

He had drooling of saliva, dysphagia, grade II-trismus, high-grade fever of the same duration. He discontinued the prescribed antibiotics one week before admission, and he refused surgery (incision and debridement) under local anesthesia before 5 days, for unknown reasons.

At admission to our institution, he was in cardiorespiratory distress on oxygen supplementation with the face mask. He had tender and diffuse swelling over the neck, a hyper-resonant chest with extremely decreased air entry, and crepitation over 2/3 of the lower right chest.

Vital Signs

Arterial blood pressure 90/60 mmHg, pulse rate 132 beats per minute, respiratory rate 26 breaths per minute, temperature 38.2°C, and peripheral oxygen saturation of 85% on mask ventilation with 100% O₂.

Investigations

Laboratory test results depicted total white blood cells count – $14 \times 10^3/\text{L}$ ($4.0\text{--}10.0$) $\times 10^3/\text{L}$, red blood cells count; $2.89 \times 10^3/\text{L}$ ($3.5\text{--}5.5$) $\times 10^3/\text{L}$, hemoglobin – 10.2 g/dl, hematocrit – 28.3%, platelet count of $187 \times 10^3/\text{L}$. Normal liver and renal function test. Within normal range electrolyte profiles. Blood group and Rh – O positive.

Imaging Findings

Head, neck, and chest CT scans showed the collection of fluids in the retropharyngeal space, extending to the right submandibular and para pharyngeal area, and the mediastinum, with large fluid collection in the right pleural cavity.

Upon arrival at the operation room waiting area, written informed consent was obtained after discussing the techniques, procedure, and risks of anesthesia clearly with the patient's attendants. Accordingly, we decided to provide general anesthesia with the tracheal tube for emergency fasciotomy by deep neck incision and debridement, and mediastinal abscess drainage, confirming the intensive care unit bed for post-operative intensive care. A drainage tube (chest tube) was inserted prior to taking to the operation room under local anesthesia and decompression was made with around 1500 mL of the abscess drained.

Standard monitors (noninvasive blood pressure, pulse oximetry, electrocardiography (on the back), and temperature monitors were placed. An 18G cannula was placed on bilateral upper extremities and intravenous fluid started with isotonic balanced salt solutions.

The patient was positioned in a view to prevent further respiratory compromise (distress) and abscess aspiration. The large vein was opened with an 18G IV cannula on both hands, and 2 units of x-matched blood were prepared. The patient was premedicated with atropine 20 mcg/kg and dexamethasone 0.2 mg/kg IV injection. General anesthesia with an endotracheal tube was planned keeping ready tracheostomy set. Inhalational induction was initiated at the pace of anticipated difficult airway management (difficult mask ventilation, difficult intubation, and laryngoscopy). After adequate (5 minutes) preoxygenation with a high flow of 100% oxygen (8 L/min), anesthesia was induced with an incremental dose of halothane (up to 4% in 100% oxygen) while maintaining spontaneous ventilation. Intravenous lidocaine was injected to attenuate the airway reflex. After the adequate depth of anesthesia was achieved, laryngoscopy was performed. The first attempt at intubation failed due to the inability to visualize the cords from airway edema, swollen pharyngeal wall, and laryngeal shift. The most senior anesthetist available tried the second attempt with careful positioning, suctioning, and external laryngeal manipulation visualizing some portion of the vocal cords leading to

difficult intubation. Following the grade-three laryngoscopy view, the trachea was intubated by using a bougie with a standard cuffed endotracheal tube (7.0 mm ID) on the third attempt. The cuff was inflated, the correct placement of ETT was checked, and halothane was used for maintenance anesthesia. Intermediate-acting muscle relaxant was administered, and mechanical ventilation was initiated with the lung protective ventilation strategy with volume-controlled mode. Deep neck incision (fasciotomy) debridement, and mediastinal abscess drainage and debridement were done.

After 20 minutes of the procedure, his blood pressure dropped to 80/50 mmHg with an incidental episode of cardiac arrest, which we managed promptly by initiating chest compression and intravenous adrenaline was given, and return of spontaneous circulation was restored within 3 minutes of chest compression. Intravenous fluids and dopamine infusion were continued to maintain blood pressure. A total volume of 500 mL of isotonic crystalloid was given and two units of O-positive blood were transfused intra-operatively. Intraoperative urine output was 150 mL/h. The operation took 90 minutes and the estimated blood loss was 800 mL. The stomach was deflated with a 16Fr nasogastric gastric tube.

Post-operatively, the patient was transferred to the intensive care unit as intubated and not reversed for continuous observation, ventilation support, and intensive care. Routine monitoring, including pulse oximetry, non-invasive blood pressure, body temperature, and urine output were monitored thoroughly in the intensive care unit. Antibiotics were continuously administered at the intensive care unit along with routine intensive care. The patient was weaned from the mechanical ventilator and extubated 6 hours postoperatively. He was transferred to a ward with improvement after 5 days of intensive care unit stay. On the 21st day of the hospital visit, home discharge was made after giving advice on oral and dental hygiene with good outcomes.

Discussion

This case report extrapolated the clinical features, peri-operative anesthesia management, and outcomes of a patient who presented with acute cardiopulmonary compromise secondary to a complicated retropharyngeal abscess extending to the mediastinum leading to a mediastinal abscess and thoracic empyema as a result of delayed management of dental caries. After drainage was made through chest tube insertion, deep neck fasciotomy and thoracotomy were done under general anesthesia with an endotracheal tube in a resource-limited area.

This study earmarked several points of discussion since the surgery was done under general anesthesia with endotracheal intubation and controlled ventilation with intra-operative events of cardiac arrest and successful management.

A complicating retropharyngeal abscess extending to the mediastinum may cause chest necrotizing fasciitis and mediastinitis and/or abscess from complicating infections of dental caries. Consequentially, this infectious condition poses an immediate life-threatening emergency, with the potential to compromise the airway and other catastrophic clinical problems such as cardiopulmonary instability and cardiac arrest.^{12,15}

A complicating retropharyngeal abscess needs early recognition and diagnosis with proper time-sensitive management including medical and emergency surgery to control the spread of infection.¹² However, delayed diagnosis and treatment might be experienced in the context of different clinical situations. The main reasons for delayed presentation and treatment in our case may be related to the associated socioeconomic factors, lack of awareness towards oral care, and negligence in management.^{12,19}

Although delay in early diagnosis and initiating treatment of any medical disease is not uncommon in medical practice, sometimes it might result in surgical emergencies. Evidence suggests that low socioeconomic status influences one's health and morbidity. It affects clinical decision-making and healthcare delivery as physicians may delay management, or avoid referral to specialty care for their patients.

It is suggested that patient ignorance of the minor symptoms, because of the anxiety over the affordability of medical care is the main reason behind delayed diagnosis and management. Above all, the reluctance toward seeking medical care and subsequent delay in definitive management might lead to needless suffering as well as poor outcomes from medical therapy and surgical procedures. Delayed care increases the likelihood of experiencing certain complications and, thus, may influence the efficacy of the surgical intervention.

Even though the evidence is lacking on the cardiac adverse events of complicated descending mediastinitis or abscess under general anesthesia and perioperative adverse events during anesthesia for such cases, in our case we provided

general anesthesia with an endotracheal tube. However, such a case presents a unique challenge to the anesthetists due to the complicated nature of the disease presentation including cardiac decompensation leading to hypovolemic shock, sepsis and/or cardiac arrest, and respiratory compromise such as fatal airway obstruction, and difficult airway management. In our case, the occurrence of cardiac arrest prevailed with better outcomes and is a rare life-threatening complication of retropharyngeal abscess after surgery. This was in line with several studies that reported the complication of retropharyngeal abscess after surgery. Likewise, some studies showed that a complicating retropharyngeal abscess with thoracic empyema and cardiac compromise heightens the likelihood of postoperative cardiac and respiratory collapse. However, another study revealed that in spite of the occurrence of cardiac complications, the experienced outcome was good. This is in corroboration with our finding, in which the cardio-respiratory compromise was dictated due to delayed management of dental caries in its early stages.^{2-4,20}

Despite the fact that significant rare life-threatening complications can happen secondary to a retropharyngeal abscess, the overall prognosis is generally favorable if identified early and managed appropriately. In a large series of retropharyngeal abscesses in the United States, no fatality was reported, while in other studies, the mortality rate was 1–2.6%. The dominant cause of the higher mortality rate was sepsis initiating multi-organ failure. In addition, the increased mortality rate associated with retropharyngeal abscess is due to its association with airway obstruction, mediastinitis, aspiration pneumonia, jugular venous thrombosis, and necrotizing fasciitis.^{9,15}

It is suggested that the morbidity rate has been significantly reduced with the advent of advanced microbiology and broad-spectrum antibiotics, the development of sophisticated diagnostic tools, improved surgical skills, and improved medical care and awareness of physicians.¹⁵

The precautions behind anesthesia management are related to preexisting dehydration resulting in electrolyte disturbance and metabolic impairments secondary to poor intake. Investigating the evidence of infection might be needed, to rule out the presence of septicemia.^{21,22}

Delayed presentation increases the risk of developing other complications such as necrotizing fasciitis of the neck, empyema, and mediastinitis as in the present case. The main anesthesia concern is difficult airway management and hemodynamic instability. Difficult airway management is due to distorted airway anatomy, potential edema, and decreased or limited mouth opening; increasing the risk of difficult tracheal intubation, difficult laryngoscopy, and mask ventilation. The possibility of rupturing abscess and subsequent laryngospasm, tracheal compression, and aspiration pneumonia increase the risk of airway-related problems. The bulged oropharynx from the retropharyngeal abscess made the correct placement of supraglottic airway devices (Laryngeal Mask Airway) difficult, and renders tracheal intubation is challenging. Hence, awake fiber-optic or video laryngoscope intubation was proposed as a critical maneuver in such conditions for difficult airways.^{16,18,21,22} However, in our case, as we have no access to fiber-optic and video-laryngoscope, tracheal intubation was achieved by using a blind bougie with the senior anesthetist following multiple attempts.

The treatment of mediastinal abscess secondary to complicated retropharyngeal abscess include medical management with antibiotics, and surgical drainage in severe cases. The ideal time to make the drainage is in dispute. Some suggest local antibiotic injection at the same time as surgical drainage. In our study, the use of surgical drainage was required and the antibiotics were respectively sufficient to control the collection and to obtain a favorable outcome. The treatment of early complications is crucial. Early recognition of the airway compromise from the complicated retropharyngeal abscess, and appropriate readiness to manage the difficult airway is very important. Ensuring a smooth postoperative course includes hemodynamic and ventilator support, as in our study we necessitated an intensive care unit bed for cardiorespiratory support. We believe that, besides the resource constraints and low facilities, we effectively managed our case as a surgical emergency with early recognition and prompt attention being paid to the airway and hemodynamic support in collaboration with the multidisciplinary teams in our institution.

Conclusion

In general, dental origin mediastinal abscess needs early recognition and diagnosis so as to provide proper and effective management. Surgery is a crucial part of the treatment profile for such rare clinical conditions to increase the survival rate of the patient as it is the only means to provide definitive relief of the cardiopulmonary compromise. Detailed examination of a patient's history, physical examination, laboratory investigations, and imaging profiles are the

cornerstone in the early recognition, diagnosis, and management of life-threatening complications of retropharyngeal abscess, potentially challenging airway compromise, and difficult airway management during the perioperative period. Early recognition of airway compromise from the complicated retropharyngeal abscess, and proper readiness to manage the difficult airway has paramount importance in the perioperative period.

Data Sharing Statement

Data are available from the corresponding author upon reasonable request.

Ethics Approval and Consent to Participate

Institutional approval was not required to publish the case details. We received proper patient consent to participate in this study. The patient has given his consent for the clinical data to be incorporated into the paper. Confidentiality was maintained throughout, with due concerns made to protect his privacy.

Publication Consent

Written informed consent has been provided by the patient for publication of the case details and images.

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Author Contributions

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis, and interpretation, or in all these areas; took part in drafting, revising, or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

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Disclosure

The authors report no conflicts of interest in relation to this work.

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