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Unexpected Difficult Airway Due to Severe Upper Trachea Distortion-a case study

A Patient with Unexpected Difficult Airway

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Abstract

BACKGROUND

The difficult airway is a significant cause of anesthesia-associated death and disability ; Currently, physical examinations of thyromental distance, mouth opening, Mafampaii classification, *etc.* combined with X-ray, CT and other imaging technologies are mainly used to evaluate difficult airways. However, in many special cases, i.e., emergency surgery, imaging examinations cannot be completed preoperatively. The patient's airway can only be evaluated through general physical examination, which inevitably increases the likelihood of an unexpected difficult airway during anesthesia.

CASE SUMMARY

We report a rare case of difficult intubation because of severe upper trachea distortion after induction. Emergency holmium laser lithotripsy was performed under transurethral ureteroscopy because the patient with anuria for 4 days and the CRE 890 umol/L. Due to the urgency of the condition, chest radiographs or chest CT were not examined before surgery and the anesthesiologist did not evaluate the airway adequately, resulting in an unexpected-difficult airway.

CONCLUSION

The incidence of tracheal malformation and tracheal stenosis is extremely low, but the risk of hypoxia and even death due to difficult airways is extremely high for such patients. It is recommended to complete preoperative imaging examinations of the airway. For life-threatening emergency patients, a pre-anesthesia reassessment should be performed and prepared to prevent and manage the difficult airway.

Key Words: tracheal distortion; difficult airway; management

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Core Tip: In this work, we report a case of severe upper tracheal distortion resulting in an unexpectedly difficult airway. The incidence of tracheal malformation and tracheal stenosis is extremely low, but the risk of hypoxia and even death due to difficult airways is extremely high for such patients. It is recommended to complete preoperative imaging examinations of the airway. For life-threatening emergency patients, a pre-anesthesia reassessment should be performed, attention should be paid to bedside physical examination, and prepared to prevent and manage the difficult airway.

INTRODUCTION

The difficult airway is a significant cause of anesthesia-associated death and disability ^[1]; a previous study suggests that 30% of anesthesia-associated death events are related to improper airway safety management ^[2]. Currently, physical examinations of thyromental distance, mouth opening, Mafampaii classification, *etc.* combined with X-ray, CT and other imaging technologies are mainly used to evaluate difficult airways. However, in many special cases, i.e., emergency surgery, imaging examinations cannot be completed preoperatively. The patient's airway can only be evaluated through general physical examination, which inevitably increases the likelihood of an unexpected difficult airway during anesthesia ^[3, 4]. The anesthesia care of a patient who underwent emergency surgery with an unexpected difficult airway due to severe upper tracheal distortion was delivered.

CASE PRESENTATION

Chief complaints

Left lumbago with anuria for 4 days

History of present illness

The patient developed Left lumbago and anuria for 4 days without obvious inducement. Diagnosed left ureteral calculi accompanied by hydronephrosis and infection, renal failure, urinary tract infection, gallbladder calculi, traumatic osteoarthropathy of the right hip joint, hypertension.

History of past illness

The patient has previous hypertension for many years (taking amlodipine tablet 5mg, QD), blood pressure control was reasonable without headache, dizziness and discomfort. Self-confessed right hip injury caused childhood trauma, and has hepatitis, tuberculosis history.

Personal and family history

none

Physical examination

The positive physical examinations listed as follows: temperature: 36.5 °C; Pulse: 78 times/min; Breathing: 20times/min; Blood pressure: 213/102mmHg; Height 160cm; Weight 55kg; Chest:left and right asymmetrical Spine: scoliosis; Lungs: a few rales in the lower lungs; Limb joints: deformity of the right lower limb; Nervous system: none; Specialist examination: percussive pain in the left kidney area (+).

Laboratory examinations

Positive laboratory results mainly included CRP 47.65mg/L, WBC 12.7×10⁹/L, CRE 890umol/L, potassium 4.80mmol/L.

Imaging examinations

The positive imaging examinations listed as follows: Ultrasonography of the urinary system showed nephrectia with echogenic changes and hydronephrosis of the right kidney; compensatory renal enlargement with echogenic change and multiple renal

calculi with hydronephrosis of the left kidney, as well as dilation of the left upper ureter. Abdominal CT showed left lower ureteral calculi with upper urinary tract hydrosy, ascites, nephrectomy of the right kidney and bilateral renal small calculi. Preoperative diagnoses include renal failure, hyperkalemia, left ureteral calculi with hydrosy and infection.

FINAL DIAGNOSIS

Final diagnosis as follows

- 1.Ureteral calculus with hydronephrosis and infection (left)
- 2.Kidney failure
- 3.Urinary tract infection
- 4.Bronchitis
- 5.hypertension
- 6.Emphysema
- 7.Traumatic arthropathy of the hip (right)

TREATMENT

Emergency holmium laser lithotripsy was performed under transurethral ureteroscopy and general anesthesia.

OUTCOME AND FOLLOW-UP

Did not cause adverse events benefit from timely treatment in accordance with the guideline.

DISCUSSION

The incidence of tracheal malformation and tracheal stenosis is extremely low, and its pathogenesis is still unclear. It is believed that factors causing abnormal differentiation of tissues and organs could lead to tracheal dysplasia or malformed changes ^[5], resulting in a difficult airway perioperatively. Medical risks are also

different due to various factors such as the patient's characteristics, medical history, surgical method and current condition [6]. Since the airway cannot be opened, the chance of severe complications such as cerebral hypoxia or cardiac arrest in a short period of time increases [7]. To prevent such risks clinically, airway assessment has become a critical part of preoperative risk assessment to prevent the difficult airway from causing severe anesthesia complications or even death.

A previous study has suggested that three-dimensional reconstruction of the trachea and bronchus has high sensitivity and accuracy in diagnosing tracheobronchial stenosis [8]. The patient's postoperative CT 3D airway reconstruction results suggested a severe rightward twist at about 2.8cm below the glottis of the main trachea, and the twist turned laterally at about 1.1cm and then downward until the tracheal juga. Meanwhile, tracheoscopy revealed severe twisting of the main trachea with mild stenosis. This result revealed the difficulty of inserting the tracheal catheter after it was 2cm passing through the glottis and the condition of two consecutive turns found under fiberoptic bronchial guidance. It further confirmed that the patient's severe tracheal distortion caused the inability of the steel-wire reinforced tracheal tube to pass through the corner with stenosis. Due to surgical urgency, although the basic condition of the patient was assessed before anesthesia, because the patient's trachea was twisted high and close to his larynx, condition like malformation of the trachea was not detected in time during the assessment, resulting in the unexpected difficult airway. Fortunately, in this case, the anesthesiologist mastered good airway safety management skills and followed the difficult airway management guideline^[9] to adopt standardized procedures to manage unexpected difficult airways in the critical situation, thus leading to no serious adverse consequences.

Further questioning of the medical history after the operation revealed that the patient had secondary tuberculosis for more than 40 years and developed thoracic scoliosis five years ago, but denied the history of poliomyelitis and other diseases. Considering the patient's imaging findings, his long-term chronic secondary tuberculosis may have led to significant lateral traction of the lung tissue, which caused

a twisted trachea. In addition, given the patient's conditions of thoracic scoliosis, thoracic malformation, *etc.*, severe trachea distortion and stenosis caused by the above reasons cannot be ruled out. To this end, we searched the studies in multiple databases, and no report of severe trachea distortion caused by diseases, i.e., tuberculosis was reported. While the studies and reports about etiologies of airway distortion have suggested that ^[10, 11, 12] the history of diphtheria in childhood, airway fatty deposition, and mucopolysaccharidosis can lead to severe airway stenosis and trachea tortuosity. However, when the patient's medical history was further inquired about after surgery to understand his specific condition, it was found that the patient had only a junior level education level, paid minimal attention to his diseases, and had no relevant medical information records. As a result, the abovementioned influencing factors could not be confirmed by the patient's past illness history.

According to the above discussions, anesthesiologists should clinically pay close attention to unexpected difficult airways, especially in emergency surgery patients.[NP1] [A2] Literature ^[13] confirmed that the commonly used clinical methods to measure airway difficulty include Mafampaii classification, thyromental distance, mouth opening, head-neck range of motion, chest-chin distance, *etc.* However, these methods cannot accurately predict the probability of intubation difficulty when performing laryngoscopy directly. It is believed that no perfect airway assessment tool can comprehensively address the risk assessment needs of patients with a difficult airway. In contrast, the combined analysis of multiple assessment tools can better predict complex and difficult airways ^[14]. The study also suggests that preoperative airway ultrasound can be used to evaluate the intubation conditions of patients. However, it is unclear which specific ultrasonic scan parameters can be used as reliable indicators for evaluating difficult airways ^[15, 16].

Hence, when a patient does not have distinctive features^[17, 18] of difficult airway, such as glossohypertrophy, oral soft tissue abscesses, and lack of radiological imaging results due to emergency resuscitation or other reasons, more attention should be paid to bedside assessment, especially, preoperative airway imaging including

ultrasonography of airway and pulmonary auscultation, *etc.* are particularly important [19]. The patient was in critical condition upon admission; therefore, emergency ureteroscopy holmium laser lithotripsy was performed without a preoperative chest radiology examination, resulting in inadequate preparation before anesthesia, the inability to assess the risk of anesthesia before surgery fully, as well as an unexpected difficult airway. Fortunately, no adverse event occurred due to proper management.

[NP1]The role of anesthesiologists are vary important during a surgical interventions and they have to pay attention in severe/ difficult cases.....why such statement??

[A2]R: The difficult airway is a significant cause of anesthesia-associated death and disability; a previous study suggests that 30% of anesthesia-associated death events are related to improper airway safety management .

Related guideline compiled by Jeffrey L *et al* and published in the journal of Anesthesiology, is ¹intended for use by anesthesiologists and all other individuals who perform anesthesia care or airway management.

CONCLUSION

In summary, severe upper tracheal malformation in adult patients is very rare, but the risk of hypoxia and even death due to difficult airways is extremely high for such patients. Especially for patients with a preoperative history of neck trauma surgery, pulmonary tuberculosis, diphtheria, airway fatty deposition, mucopolysaccharidosis, *etc.*, enough attention should be paid to perioperative anesthesia and safety management. It is recommended to complete preoperative imaging examinations of the airway as much as possible. For life-threatening emergency patients, a pre-anesthesia reassessment should be performed, attention should be paid to bedside physical examination, and always be prepared to prevent and manage the difficult airway.

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