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Relationship of the Shape of Epiglottis and the Endotracheal Intubation

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Abstract

Background and Purpose: Surgeons may encounter rare cases of difficult intubation. It is known the Cormack and Lehane grading as the prediction method of the intubation difficulty. However, the shape of the epiglottis greatly affects the visible range of the vocal cords. We report a classification of the shape of the epiglottis and the relationship between the shape and the grading.

Target and Method: By observation at their laryngeal expansion at tracheal intubation for 181 adult thyroid patients undergoing surgery, it was estimated the shape of the epiglottis and the grading.

Result: The shapes of the epiglottis were classified into five types. The classification of the shape was possible to know the difficulty of intubation and the frequency based on the grading. If the risk of intubation was recognized the shape, it was possible to infer immediately without the larynx expansion.

Discussion: The three axes theory for the easy intubation has been explained. If the three axes are close to parallel, the success of the tracheal intubation is depending on the shape of the epiglottis. There has been no discussion about the shape of the epiglottis that makes it difficult to see the vocal cords until now.

Many have been reported the intubation of children to be difficult because of the shape of the epiglottis. This study for adults is consistent with the cases of children. Many new safe and easy tools for difficult intubation are easily not considered the influence of the shape of the epiglottis.

Conclusion: Syphilis seropositive cases were observed among married women who come from a rural area with the age group of 26-35 years. Therefore, health education on etiology, prevention, and control of syphilis has to be provided for the community.

Keywords: Classification, Cormack and lehane grading, Vocal cords, Difficult intubation, Three axes theory, Laryngeal expansion.

Background and Purpose

Surgeons need to insert an endotracheal tube for maintenance of the airway and respiratory care for patients who changed suddenly. However, surgeons may encounter rare cases of technical difficult intubation. In crisis management, it is better to encounter difficult intubation the surgeon has predicted it beforehand than encountering such cases unexpectedly. Since the surgeon can take a variety of measures by the prediction it is possible to respond more safely. On the other hand, various reports have been made regarding the prediction of intubation difficulties [1-3]. There is the Cormack and Lehane grading in one of them [1] (Figure 1). As the evaluation method about the prediction of the intubation difficulty, this grading is well known. This is used at four stages that indicate the difficulties to intubate by the view range of the vocal cords when the larynx is expanded. One of the important factors in this grading is the range to which the vocal cords are not visible by the epiglottis.

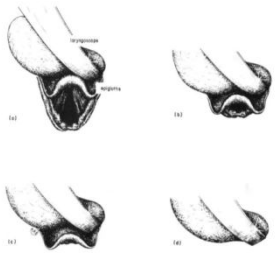

Figure 1: The Cormack and Lehane grading. The Cormack and Lehane grading was determined by the visible range of vocal cords when the larynx was expanded. Grade I is the case where all the vocal cords are visible. Grade II is a case where a part of the vocal cords is not visible. Grade III is when the epiglottis is only seen, and not seeing the vocal cords. Grade IV is when the epiglottis is not visible at all (Extract from Figure 2 in reference 1).

However, although it is predicted that the shape of the epiglottis greatly affects the visible range of the vocal cords, a detailed report has not been made. Our previous report has elucidated that epiglottis is lifted by being towed to the ventral side of the hyoepiglottic ligament in the epiglottic vallecula during intubation [4]. Therefore, when the ligament is towed, the shape of the epiglottis is predicted to affect the degree of lifting of the epiglottis attached to the ligaments. We report a classification of the shape of the epiglottis and discuss the relationship between the shapes of the epiglottis and the Cormack and Lehane grading. Surgeons will be able to discover the risk of the difficult intubation at the early step by the classification of the shape of the epiglottis.

Target and Method

The target persons are 181 adult thyroid patients undergoing surgery at the special hospital for thyroid disease. The patients had a median age of 46 (range; 30-62) and consisted of 30 males and 151 females. The cases with obvious deformations around their airway and vocal cords have been excluded. Since these patients may be difficult to insert endotracheal tubes depending on the shape of the tumor at operations, they will always be confirmed the anatomical structure of the neck with the neck side X-ray inspection and neck Computed Tomography (CT) as their preoperative inspections. Patient safety is confirmed prior to surgery by this diagnostic imaging about the patient's airways. General anesthesia in thyroidectomy was induced with propofol (2.3 mg/kg of body weight), vecuronium (1 mg/kg of body weight) and fentanyl (0.1 mg of the total dose) under oxygen gas. Next, their laryngeal expansions for intubation were performed in the patient. By observation at their laryngeal expansion at tracheal intubation, it was estimated the shape of the epiglottis and the Cormack and Lehane grading at the same time. Those observations were usually carried out in the introduction of anesthesia and were not special.

Result

The shapes of the epiglottis were classified into five types in this study (Figure 2).

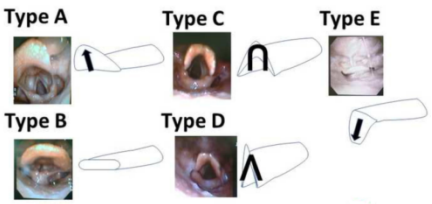

Figure 2: The classification of the shape of epiglottises. The epiglottis of the reverse shoehorn type was shaped in being mildly curved to their dorsal and the warped tip to the ventral side (type A: 97 cases). The epiglottis of flat type was shaped in almost flat (type B: 18 cases). The epiglottis of roll type was shaped in the folio to the anteroposterior of the epiglottis, could be observed their vocal cords from the crack as reverse U-shaped (type C: 8 cases). The epiglottis of folio type was shaped in the folio to the anteroposterior of the epiglottis, could not be observed their vocal cords from the crack being shielded by the epiglottis as reverse V-shaped (type D: 11cases). The tip of the epiglottis of apron type was dripping (type E: 47cases).

These were classified according to the range that the vocal cords are visible in consideration of the predicted effect on the elevation of the epiglottis by laryngeal expansion.

The relationship between the types of the shape of the epiglottis and the Cormack and Lehane grading are shown in Table 1. The Cormack and Lehane grading of type A, B, and C were only the grade I. Type D was the grade I (3.3%) and II (2.8%). Type E contained grades III and VI, although it did not contain Grade I. The grades were higher in the order of ABC, D, and E.

Type/ Grade	I	II	III	IV	Total
A	97 (53.6%)	0	0	0	97 (53.6%)
B	18 (9.9%)	0	0	0	18 (9.9%)
C	8 (4.4%)	0	0	0	8 (4.4%)
D	6 (3.3%)	5 (2.8%)	0	0	11 (6.1%)
E	0	35 (19.3%)	11 (6.1%)	1 (0.6%)	47 (26.0%)
Total	129 (71.3%)	40 (22.1%)	11 (6.1%)	1 (0.6%)	181 (100%)

This study showed that the classification of the shape of the epiglottis was possible to know the difficulty of intubation and the frequency based on the Cormack and Lehane grading. Until now, it has not been possible to know the intubation difficulty without the larynx expansion. However, this study showed that if the risk of intubation was recognized the shape of the epiglottis, it was possible to infer immediately without the larynx expansion.

Discussion

The three axes theory for the easy intubation has been explained as that pharyngeal axis, oral axis and larynx axis are approached parallel [5]. However, the relationship between these three axes just gives a great reason until inserting a laryngoscope into the oral cavity during intubation. This study shows the factors for the successful tracheal intubation after the blade of the laryngoscope was put into the epiglottis valley at the next step to perform tracheal intubation. In other words, even if the three axes are close to parallel, the success of the tracheal intubation is depending on the shape of the epiglottis.

The grading of cases to be difficult to intubate has been made by the view range of the vocal cords. This depends on the extent to which the view to the vocal cords is blocked by the epiglottis. However, the shape of the epiglottis is not always the same. We have concentrated only to expand that the vocal cords are visible because the target point of the tracheal intubation is the vocal cords. There has been no discussion about the shape of the epiglottis that makes it difficult to see the vocal cords until now. Despite the emphasis on the Cormack and Lehane grading as the range to be able to observe the vocal cords, no research has been made on the epiglottis which is the main cause. The relationship between the shape of an epiglottis and the three axes will clarify the reason for the difficulty of intubation.

It may not be necessary to divide in type A, B, and C because proportions of the Cormack and Lehane grading of each type were equal data. Type D was less seen the vocal cords because the gap in an epiglottis is narrower than type C. The laryngeal expansion was difficult because the epiglottis at type E is dripping down. As a result, it is thought that the vocal cords are seen in type E less than type D.

From the above, since type C equivalent state if the gap in type D is widened, type D is predicted that the grade goes up. The grade of type E will be improved if it is possible to lift the tip of drooping epiglottis.

The cause of difficult intubation at tracheal intubation has not been solved because it had concentrated on observing the vocal cords up to now. Many have been reported the intubation of children to be difficult because of the shape of the epiglottis [6,7]. In other words, the reason is that their epiglottises are small in shape ratio and that their epiglottises of undeveloped cartilage often are the type D and E. This study for adults is consistent with the cases of children.

In these years, many new safe and easy tools for endotracheal intubation have been developed. Those tools can easily be used while observing the oral cavity directly with the monitor, by devising the shape of the laryngoscope blade, or by lifting the blade tip with holding the lever at hand (the McCoy laryngoscopy). However, from the results of this study, any of the tools is only to correct the parallelism of the three axes, it is difficult to avoid the influence of the shape of the epiglottis [8]. This study revealed that the grades differ with the shape of the epiglottis, so it was possible to consider the correspondence corresponding to the shape.

Limitation

The study may be that the number of samples for each epiglottis classification is inadequate. The proportion of grades in this study was almost the same as the current reports [9-11]. In addition, it is considered that the cases cannot eliminate the anatomical effects of the thyroid tumor.

Conclusion

The five classified shapes of the epiglottis observed each proportion according to the Cormack and Lehane grading. Type E hinders the view of the vocal cords. Type E was contained grade III and IV which is determined to be intubation difficult and was 6.7% in total. The Cormack and Lehane grading, which predicts intubation difficulties, has been considered based on the three axes theory. But the shape of the epiglottis is an important factor in difficult intubation cases. Many surgeons will be able to judge the risk of tracheal intubation by the shape of the epiglottis as quickly as possible.

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