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Surgical Technique

Basic principles of microlaryngeal surgery in benign larynx lesions

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Abstract

Microlaryngeal surgery is of great importance in benign larynx diseases because of both diagnostic and therapeutic purposes. Although it is mostly a safe surgery, because of the surgery involving the upper airways and serious complications that may occur, Anesthesiologists as well as Otorhinolaryngologists should be careful. The risk of difficult intubation may be determined by pre-operative evaluation and tests to be performed and necessary precautions can be taken in advance. Interventions to ensure adequate exposition of the larynx provide great comfort in surgery. For a successful operation, it is essential to pay attention to many important points preoperatively, intraoperatively and postoperatively. The aim of this paper is to define the basic principles of microlaryngeal surgery in benign larynx lesions to increase the operation success and diminish the complication rates in the light of current literature.

Introduction

Most voice disorders can be recovered with medication or voice therapy, while some diseases require microlaryngeal surgery. In addition to treatment options for benign laryngeal diseases, microlaryngeal surgery is required for biopsy in the diagnosis of suspected laryngeal cancer. Microlaryngeal surgery is performed in vascular cord dysfunction, obstructed tumor, recurrent papilloma, foreign body as well as nodules, polyps, cysts, granulomas, reincerebral edema originating from benign epithelial region. Although most surgeons prefer cold surgery technique in many benign laryngeal lesions, CO_2 laser is preferred because of its coagulation feature especially in the surgery of vascular lesions such as papillomatosis, granuloma, vascular polyp [1,2].

The first endolaryngeal phonosurgery was performed in 1861 by Victor Von Bruns. With the use of a suspension laryngoscope by Killian in 1912, the surgeon was able to use both hands. With the introduction of endotracheal intubation in the 1950s, patient stabilization was achieved and the success rate in surgery increased. In 1960, with the introduction of suspension microlaryngoscopy surgery and the technique popularized by Kleinsasser in 1974, lesions were observed with larger microscope size, and surgical sharpness and success were increased [3,4,6]. Though endolaryngeal phonosurgery is not a new technique and performed largely for a long time, there are still many points to be emphasized. The aim of this paper is to define the basic principles of microlaryngeal surgery in benign larynx lesions to increase the operation success and diminish the complication rates in the light of our experience and current literature.

Anatomy

It is important to know the anatomy and histology of vocal cords for successful surgical intervention. According to Hirano, vocal cords are composed of epithelium, lamina propria (superficial, middle and deep layers) and thyroidarithioid muscle. According to S. Gray, who studies the basement membrane, the basement membrane, which is located between the epithelial cover and the superficial layer of the lamina propria, is firmly attached to both layers [5-7].

Clinical picture

A detailed history to be taken from the patients before the surgery and the subsequent examination is of great importance. Benign vocal cord lesions are mostly manifested by voice changes, while chronic obstructive pulmonary diseases, dysphagia and glottic cancer that cause dyspnea can also be manifested by voice changes. Low-pitched and coarse voice changes suggest subglottic pathology, while high-pitched,

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rustling, aphonic or respiratory sounds suggest the glottic pathology. The best position of breathing should be determined in the presence of difficulty in swallowing and inspiratory-explanatory stridor, otherwise, serious problems may occur during induction of anesthesia. Cardiovascular and respiratory problems in the patient should also be examined. Laryngoscopic examinations determine the location, size and severity of the lesions. In the presence of subglottic and tracheal pathology, chest radiography, Computed Tomography (CT) and Magnetic Resonance Imaging (MRI) may be needed [8,9].

Preoperative preparations

A valuable key to successful surgery is to ensure adequate exposure. The laryngoscope selected for this purpose should be as large as possible for at least two instruments with a large diameter and suitable for binocular microscopy. An important consideration when choosing a laryngoscope is to use the appropriate laryngoscope instead of the lesion. Jako-Kleinasser type laryngoscopes are large-diameter and oval and show anterior commissure, but have the ability to show the posterior commissure better. Dedo-type laryngoscopes are narrow-angle and are more successful in demonstrating anterior lesions. The neck should be brought to hyperextension while the laryngoscope is placed. In this position, along with the cervical vertebra, tongue, mandible, supraglottic structures are displaced anteriorly and the airway is better visualized. Following the placement of the laryngoscope, the procedure is followed by the suspension apparatus which gives the surgeon the advantage of using both hands. In order to perform this task, the patient should be under endotracheal anesthesia and complete muscle relaxation should be achieved. Then, the binocular operation microscope is switched. A magnification of 16-25 times with a 400 mm lens is sufficient under the microscope [10-13].

Anaesthesia for microlaryngeal surgery

Preoperative evaluation of the airway by anesthesiologists is an important part of successful airway management. Prediction of difficult airway; it also helps to reduce many complications caused by insufficient ventilation, incorrect esophageal intubation and difficult intubation. A detailed anamnesis should be taken before the operation and systemic diseases, congenital anomalies, previous surgeries, treatments, difficult air intubation history should be considered. In this way, the possibility of difficult intubation can be anticipated and necessary measures can be taken. For this purpose, various risk factors, measurements, physical examination techniques and various algorithms to be applied in difficult intubation cases guide anesthesiologists in emergency situations. There are also many methods that determine the difficulty of intubation. In this way, preparations for difficult intubation are made in advance.

After the preoperative evaluation, the necessary team and equipment should be available in the operating room environment for possible and unforeseen emergencies during anesthesia. Before anesthesia induction, airway management and algorithm should be determined and preparations should be completed accordingly. As in the case of difficult intubation, a pre-planned strategy should be used during the extubation phase. For microlaryngeal surgery, the intubation tube should be 30 cm long, small (No. 4-6 mm) in diameter and standard cuffed. The cuff should be low pressure and high volume, should stand between the arytenoid cartilage and some of the glottic space should be seen. Laser protected intubation tube should be used in patients undergoing laser surgery. Before the intervention, the eyes of the patient and the subglottic area should be covered with wet cloths, and those in the room should wear glasses. Potential complications such as laryngeal edema, bleeding, trachea or esophageal trauma, aspiration, and pneumothorax may develop after difficult intubation interventions. In this respect, respiratory distress, dysphagia, emphysema under the skin of the head and neck should be closely monitored. Another important point is to inform the patient and his / her relatives verbally about the difficult airway experienced in order to guide in future operations. This should be indicated in the patient epicrisis. Many disadvantages of intubation may occur in microlaryngeal surgery (Table 1).

Table 1: Disadvantages of intubation in microlaryngeal surgery.

1. Access and viewing of the lesion may be limited.
2. The use of small diameter tubes can cause high balloon pressure.
3. Higher airway resistance, aspiration difficulty, clogging and tube folding may occur.
4. Vocal cords and lesions during intubation can be damaged.

Intravenous cortisone should be used to reduce edema during surgery. In microlaryngeal surgery, antibiotic use is not required except for surgery in the infected or contaminated area. Before laryngeal surgery, anticoagulant medications should be discontinued 7-10 days in advance to avoid bleeding problems [10-15].

The adequate exposure of the larynx is the crucial point in microlaryngeal surgery. Laryngoscope which is a standardized preoperative assessment protocol including some parameters such as interincisors gap, thyro-mental distance, history of previous open-neck and/or radiotherapy, Mallampati's modified score, and body mass index may be a good predictor of difficult laryngeal exposure [16-18].

Microlaryngoscopy technique

Anesthesia should be on the right side of the patient, the patient's head in extension, 90 degrees to the anesthesia and 30 degrees above the bed. When intubating, the upper lip can be pulled from the right corner to assist easy intubation. To protect the teeth before placing the laryngoscope, the plastic dental protection apparatus must be placed in the mouth. The patient is placed in the supine position, head, nose and chin parallel to the floor with the head restraint and the head is raised to the ideal position (Boyce position). The surgeon using his right arm holds the laryngoscope with his left hand, and the right hand is released to hold the other instruments. The laryngoscope is inserted through the right lingual sulcus and advanced to the lingual surface of the pharynx, lingual root,

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vallecula and epiglottis for examination. The hand is slightly slid forward along the horizontal handle of the laryngoscope, the laryngoscope is advanced just below the epiglottic tip and lifted. As the laryngoscope is advanced further into the larynx vestibule, the vocal cords and glottic aperture are completely exposed by gently separating the aryepiglottic plicas and pseudo-cords, and then the system is fixed with the suspension device. According to the anatomical features, shortening the length of the arm of the suspension device provides easier exposition to see the anterior commissure. In spite of all this, it may also be very useful for an assistant to apply external pressure on the larynx to see the anterior commissure. After proper exposition is achieved by fixation, the image is enlarged with a binocular surgical microscope. In this way, microsurgical procedures can be performed. Microlaryngeal surgery; in suspected or known laryngeal carcinomas, plays a major role in determining the anatomic localization and stage of the lesion. Microlaryngeal surgery for diagnostic and therapeutic purposes gives us the advantage of palpating and manipulating the vocal cords. In microlaryngeal surgery, very thin tools such as cutter, holder and separator are used. It is very important not to damage the vocal cords and especially the vocal ligament during surgery. Intervention to the vocal ligament should be avoided to prevent scar formation. Inspection and palpation should be performed to detect diseases such as sulcus vocalis, scar and web that are not fully selected preoperatively. Surgery should not interfere with the anterior part of both vocal cords at the same time to prevent web formation. Unnecessary surgery should be avoided to prevent scar formation. The phonation property of the preserved mucosa during surgery is better than that of the scarring mucosa. Small adrenaline cottons and fine-tipped monopolar electrocautery should be available for hemostasis. At the end of surgery, all blood and secretions in the trachea, larynx and pharynx should be aspirated to avoid contamination of the downstream airways when removing the laryngoscope.

Surgical complications

Microlaryngeal surgery is usually safe. As with any surgery, it still carries some risks (Table 2).

Postoperative care

Postoperative care is also as important as the operative period for the success [19-22]. The postoperative care after Microlaryngeal surgery is summarized in Table 3.

Table 2: The risks of microlaryngeal surgery.

1. Complications of bleeding, infection, anesthesia
2. Tongue, lip and tooth damage
3. Potential hoarseness, breathing and swallowing problems
4. After all operations, some scar formation occurs during healing.
5. Hypoglossal nerve palsy may also occur temporarily due to compression of the laryngoscope.
6. In surgical excisions, anterior commissure resections may cause synechiae
7. The tracheostomy set must be available in the operating room.

Table 3: The postoperative care after microlaryngeal surgery.

1. The comfort of the airway should be monitored postoperatively.
2. If excessive manipulation of the vocal cords is performed, steroids intravenously should be used to reduce edema.
3. Antireflux treatment, adequate fluid intake and humidification of the environment is recommended.
4. Patients are asked to have a voice rest for 7-10 days, not to speak at all, and to communicate by writing and to avoid smoking
5. Videolaryngoscopy and voice therapy can be started after 6 weeks postoperatively.

Conclusion

Although microlaryngeal surgery is a safe surgery, ENT specialists are required to cooperate with anesthesiologists and to work meticulously because of the serious complications that may occur in the upper airway. For a successful surgical operation, it is necessary to pay attention to many important rules starting in the preoperative period.

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