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Assessment of the results of glottis-dilating operations using lung function tests

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Abstract Our aim was to obtain an objective evaluation of the airway before and after glottis-dilating operations utilizing lung function tests. The charts of 109 patients who underwent either reversible or irreversible glottis-dilating operations by Lichtenberger were reviewed. 64 non-selected cases of these patients, all with irreversible glottis-dilating operations, were studied. Lung function tests that were performed were body-plethysmography, forced inspiratory volume (FIV₁), forced expiratory volume (FEV₁), peak inspiratory flow rate (PIF), peak expiratory flow rate (PEF) and resistance of the airways (RAW). The FEV₁, FIV₁, PEF and PIF all improved following irreversible glottis-dilating operations. The RAW was remarkably decreased post-operatively as compared to pre-operatively. In conclusion, the airways of patients undergoing irreversible glottis-dilation operations improved moderately to well following such surgeries. Lung function tests are an objective means of evaluating the airway before and after surgery.

Keywords Vocal cord paralysis · Glottis-dilating operation · Lung function test · Body-plethysmograph

Introduction

The Lichtenberger methods for treatment of abductor vocal cord paralysis were developed in animal experiments between 1977 and 1980 [1]. This technique was further developed by clinical experience over the next 20 years. These methods, based on endo-extralaryngeal suture techniques, have been introduced in many institutions in the clinical practice of laryngology. During this period of time,

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both reversible and irreversible glottis-dilation operations have been developed and presented [2, 3, 4, 5, 6, 7, 8, 9]. Initially, these operations were done via an anaesthesia method involving gamma hydroxybutyrate and diazepam without intubation, allowing patients to have the surgery done without tracheostomy [4]. In recent times, the glottis-dilation operation is performed with high frequency JET ventilation, especially for those undergoing reversible glottis dilation [9]. In the past decade, endo-extralaryngeal glottis-dilating operations have become popular in both Europe and the United States [2, 5, 6, 8]. Rovó et al. recently presented a minor modification of the Lichtenberger technique and reversible glottis-dilating operations [6]. Improvement of these operations have not been objectively tested in the areas of voice quality and airway improvement. In general, voice quality is diminished after these operations, but in most cases, it is surprisingly good despite the dilation and separation of the larynx and lack of good vocal cord mobility. It is felt that lung function tests can be objectively studied in both the pre-operative and post-operative periods of patients undergoing glottis-dilation operations. The purpose of this presentation is to review lung function testing in a series of patients who have undergone irreversible glottis-dilating operations utilizing the Lichtenberger technique.

Subjects and methods

From January 1980 until December 1999, 109 patients suffering from bilateral abductor vocal cord paralysis were operated on using the Lichtenberger method of glottis dilation. Sixty-four non-selected patients were examined who had irreversible glottis-dilating operations with and without tracheostomy. Procedures performed on these patients were endo-extralaryngeal-laryngomicrosurgery lateralization without arytenoidectomy and the same procedure with arytenoidectomy. Techniques of these operations have been previously described [8]. The lung-testing methodology involved an immediate pre-operative evaluation followed by an immediate post-operative evaluation of the airway. FEV₁ and FIV₁ were performed in the immediate period before and after the glottis-dilating operations. PEF and PIF measurements were also conducted at the same time. Final tests were RAW (resistance of the airways) before and after the operations.

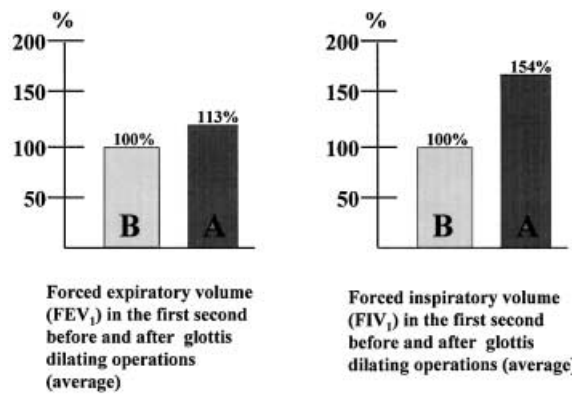


Fig. 1 The FEV₁ and FIV₁ before and after glottis dilating operations

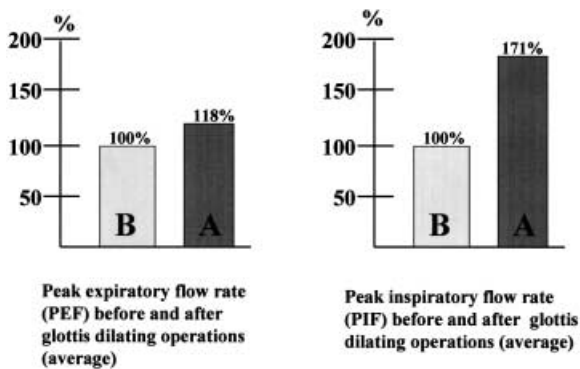


Fig. 2 The PEF and PIF before and after glottis dilating operations

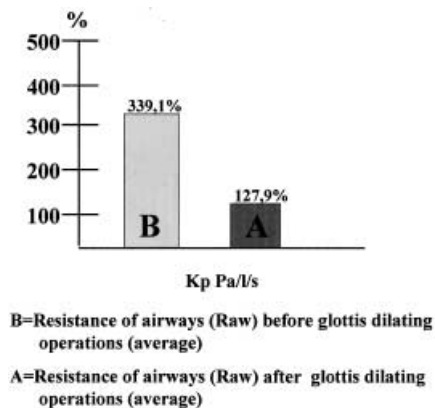


Fig. 3 The Raw before and after glottis dilating operations

Results

Improved breathing results were noted in all lung function tests performed. FEV₁ improved 3% and the FIV₁ 54% after the operations. PEF and PIF improved 18% and 71% after surgery. The most important values that were obtained were the RAW scores before and after the operations. On average, the RAW was 339.1% before the operations, and after dilation, this decreased to a level of 127.9% (Figs. 1, 2, 3). Figure 4 shows the case of a 45-year-old male pa-

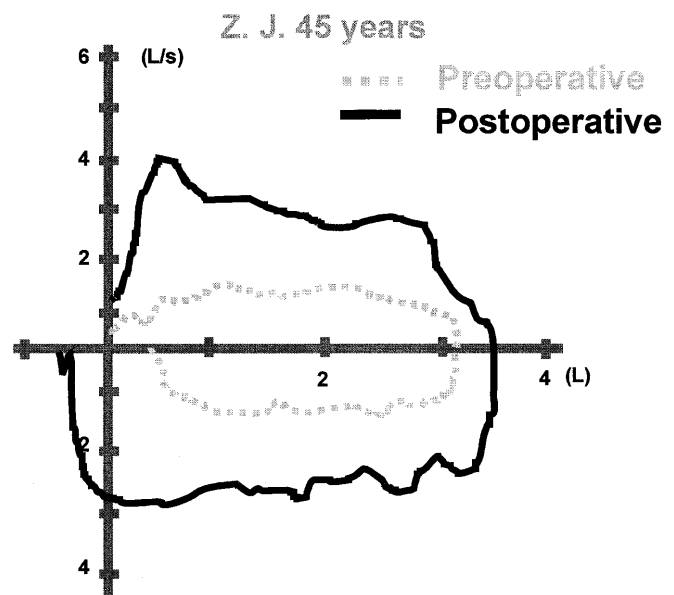


Fig. 4 Flow volume diagram of Z.J. 45-year-old male patient

tient who had bilateral vocal cord paralysis after thyroid surgery. He underwent an irreversible endo-extralaryngeal microsurgical lateralization with arytenoidectomy, and the diagram shows remarkable improvement of his airway following surgical intervention.

Discussion

Quantitative evaluation of functional results gives excellent objective confirmation of the improved airways following irreversible glottis-dilating operations. While this information has been widely available from subjective questioning of patients undergoing these surgeries, the objective information obtained confirms the notation of airway improvement. There is a need for objective confirmation of vocal quality following these operations. Preliminary studies have indicated moderate to good voice production following such operations [8]. Future studies of voice quality are needed to confirm the advantages of glottis-dilating operations using the endo-extralaryngeal suture techniques.

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