Ann. Bull RILP (1982) No. 16, 235-245

A STATISTICAL STUDY OF VOCAL CORD NODULE, VOCAL CORD POLYP AND POLYPOID VOCAL CORD- WITH SPECIAL REFERENCE TO THE PHYSICAL AND SOCIAL HISTORIES OF PATIENTS

*Noriko Kawase, Masayuki Sawashima, Hajime Hirose and Tatsujiro Ushijima**

1. Introduction

The diagnoses of vocal cord nodule, vocal cord polyp and polypoid vocal cord are generally made by laryngeal inspection, although the diagnostic criteria for these diseases differ considerably among different institutions. At the Voice and Speech Clinic, Department of Otorhinolaryngology, Tokyo University Hospital, the diagnoses for vocal cord nodule, vocal cord polyp and polypoid vocal cord are made clinically according to the following criteria: (1) Vocal cord nodule is a small sessile mass, hard in appearance and usually located bilaterally at the middle of the membranous portion of the vocal cord. Its typical color is almost the same as the normal color of the cord. (2) Vocal cord polyp is a localized mass at the membranous portion of the vocal cord. It is usually larger and softer than a nodule in appearance. Various types of masses are included in this category. They may be small or large, sessile or pedunclated, reddish or whitish in color. (3) Polypoid vocal cord is a diffuse edematous swelling, occupying a large portion of the vocal cord (Satta et al., 1970).

Currently, the above mentioned criteria are widely accepted in many clinics and institutions in Japan (Saito, 1977; Hirano et al., 1980).

In the present study, a statistical investigation was undertaken on cases of vocal cord nodule, vocal cord polyp and polypoid vocal cord with special reference to the physical and social histories of patients.

2. Subjects and Methods

During the five-year period from 1976 to 1980, 1220 patients visited the Voice and Speech Clinic, Department of Otorhinolaryngology, Tokyo University Hospital, with complaints related to voice. Out of those cases, 445 were diagnosed as having vocal cord nodule, vocal cord polyp or polypoid vocal cord. They consisted of 152 cases of vocal cord nodule, 221 cases of vocal cord polyp, 65 cases of polypoid vocal cord and 7 mixed cases, in 2 of which nodule was seen on one vocal cord and polyp was on the other and in 5 of which polyp was found on one vocal cord and polypoid change was on the other.

* Department of Otolaryngology, Branch Hospital, University of Tokyo

A statistical study was carried out on these 445 cases with reference to age and sex distributions, history of puberty, menopause, vocal abuse, smoking habits and acute upper respiratory infection. Cases with missing data were excluded from individual sections of the study.

3. Results

3.1 Age and Sex Distributions

The age and sex distributions at the time of first visit to the clinic were distinctive of each disease (Fig. 1). Of the male patients with vocal cord nodule, 95% were under 15 years old, while 74% of the females with nodule were over 15 years old. Under the age of 15, 69% of the patients with vocal cord nodule were males, while over the age of 15, 96% were females. As for vocal cord polyp, the age distribution curves of both sexes were single peaked and resembled each other. There was no significant difference in number between the sexes. Patients in the fourth and fifth decades accounted for 60% of all the patients with vocal cord polyp. The incidence of polypoid vocal cord was higher in females. The sex difference was statistically significant at a significance level of 5%. The age distribution curves of both sexes were similar. Of the patients with polypoid vocal cord, 87% were over 40 years old, and only 3% were under 30 years old.

The age and sex distributions at the time of the patients' initial symptoms were estimated for each disease based on the statement of individual patients. They showed no significant difference from the distributions at the first visit except, that they shifted to a generation younger by a few years.

3.2 Puberty

Male patients who had passed mutation of voice and female patients who had passed menarche at the time of their first visit were regarded as postpubertal.

Of the patients with vocal cord nodule, 94% of the males were prepubertal, while only 19% of the females were prepubertal. All of the patients with vocal cord polyp and polypoid vocal cord were postpubertal.

3.3 Menopause

In 35% of the female patients with polypoid vocal cord, the initial symptoms had started after menopause. The rate was higher than in the patients with vocal cord nodule (3%) and vocal cord polyp (15%), the difference between polypoid vocal cord and other two diseases being statistically significant at a significance level of 1%.

In postmenopausal patients with polypoid vocal cord, the time lag between menopause and their initial symptoms was found to be quite variable across the cases. For example, the initial symptoms had started 10 years before menopause in one case, while in another case, 18 years after menopause.

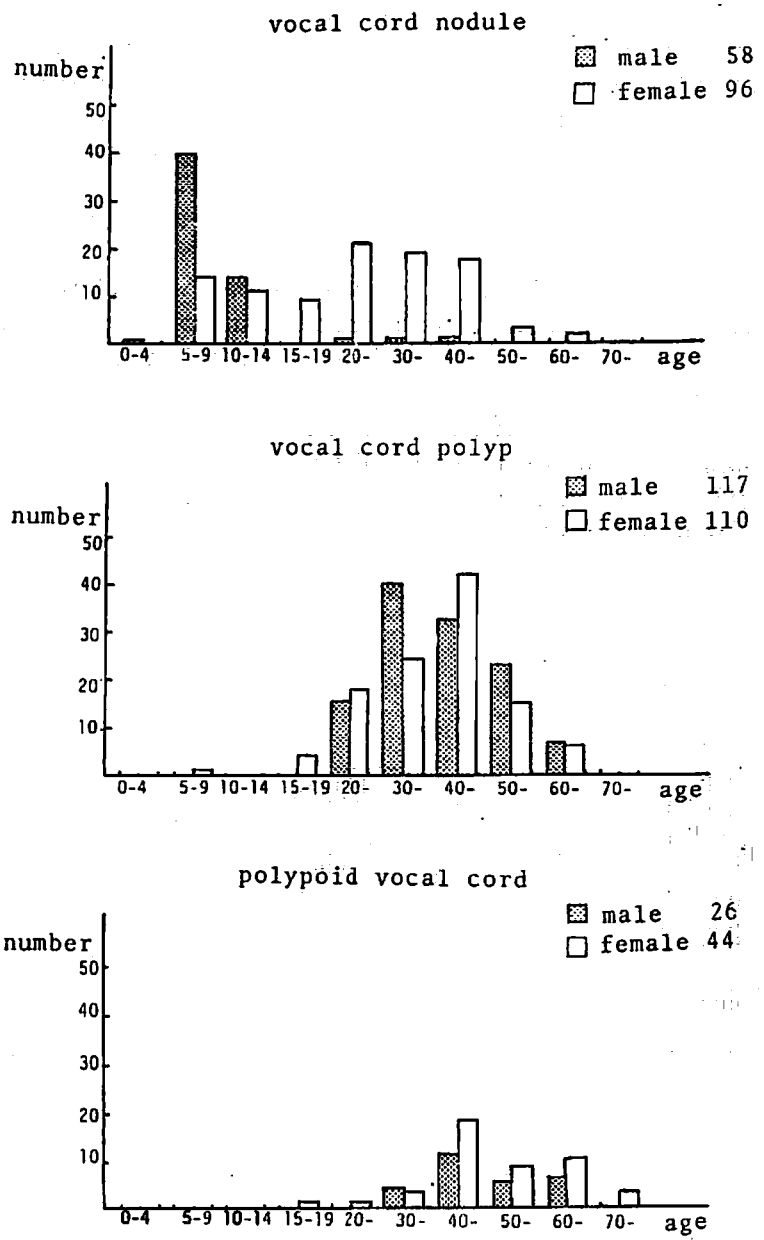

Fig. 1 *Age and sex distributions at the time of first visit. Mixed cases were counted in both categories.*

3.4 Vocal Abuse

In the present study, "vocal abuse" was classified into two types. "Temporary" vocal abuse was defined as exessive vocal usage only at the time of the onset of the disease. For example, when a patient stated that his horseness had started shortly or immediately after cheering or oration, temporary vocal abuse was suspected. "Chronic" vocal abuse was defined as follows. In children, a patient described by the parents as a screamer or incessant talker was regarded as having a history of chronic vocal abuse. In adults, occupational vocal abuse, such as in the case of teachers, was considered to be chronic vocal abuse. Patients who had histories of both temporary and chronic vocal abuse were included as cases of chronic vocal abuse.

As can be seen in Fig. 2, the incidence of chronic vocal abuse was 71% in vocal cord nodule, 28% in vocal cord polyp and 19% in polypoid vocal cord. The difference between vocal cord nodule and each of the other two diseases was statistically significant at a significance level of 1%. In the cases of vocal cord nodule, there was no significant difference in the incidence of chronic vocal abuse between children and adults or between males and females. In the cases of vocal cord polyp and polypoid vocal cord, there was no significant sex difference. As for the incidence of temporary vocal abuse, there was no significant difference among the three disease groups.

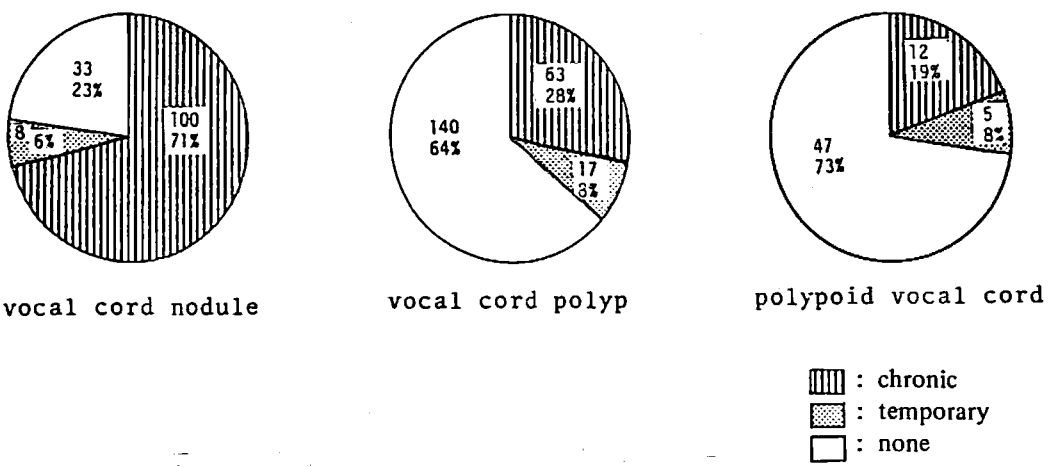

Fig. 2 *Vocal abuse. Mixed cases were excluded.*

3.5 Smoking Habits

The incidence of smoling was investigated in the patients over 20 years old (Fig. 3). A history of smoking was regarded as positive if a patient had smoked daily for years at the time of the initial symptoms. In the male patients, the incidence of smoking was 60% in vocal cord polyp and 91% in polypoid vocal cord. In the female patients, the incidence was 15% in vocal cord nodule, 29% in vocal cord polyp and 93% in polypoid vocal cord. The difference between polypoid vocal cord and each of the other two diseases was statistically significant at a significance level of 1% in both sexes.

The average amount of smoking was 26 cigarettes per day in vocal cord polyp and 33 cigarettes per day in polypoid vocal cord in males; and 20 cigarettes per day in vocal cord nodule, 17 cigarettes per day in vocal cord polyp and 18 cigarettes per day in polypoid vocal cord in females. There was no significant difference in the number of cigarettes per day among the three diseases for either sex.

3.6 Acute Upper Respiratory Infection

An investigation was made into whether the patients had suffered from cold-like symptoms (acute upper respiratory infection) at the time of the onset of their disease. The initial symptoms of a voice problem were thought to have been accompanied by an acute upper respiratory infection in 11% of the patients with vocal cord nodule, 19% of the patients with vocal cord polyp and 18% of the patients with polypoid vocal cord. The difference between vocal cord nodule and vocal cord polyp was statistically significant at a significance level of 5%. The difference between vocal cord nodule and polypoid vocal cord was not statistically significant. This might be due to the small number of cases of polypoid vocal cord included in this study.

4. Discussion

4.1 Age and Sex Distributions

The age and sex distributions in the present study are generally compatible with results reported by previous authors (Holinger et al., 1951; Saito, 1977; Hirano et al. 1980), except that they found a male predominance for vocal cord polyp, which was not found in the present study. Also, a female predominance for polypoid vocal cord was not found in some previous reports (Hirano et al., 1980; Matsuo et al., 1980).

The question still remains whether vocal cord nodule in children belongs to the same clinical entity as the vocal cord nodule found in adults. Iida (1940) regarded vocal cord nodule in children as an extreme result of the prepubertal physiological change in the vocal cord which usually subsides after puberty. On the other hand, Hirano et al. (1980) stated that vocal cord nodule is a sort of pathological reaction secondary to excessive high-pitch phonation often seen in children and in adult females. According to their hypothesis, excessive mechanical stress during the vibratory movements of the vocal cord mainly confined to its free edge induces

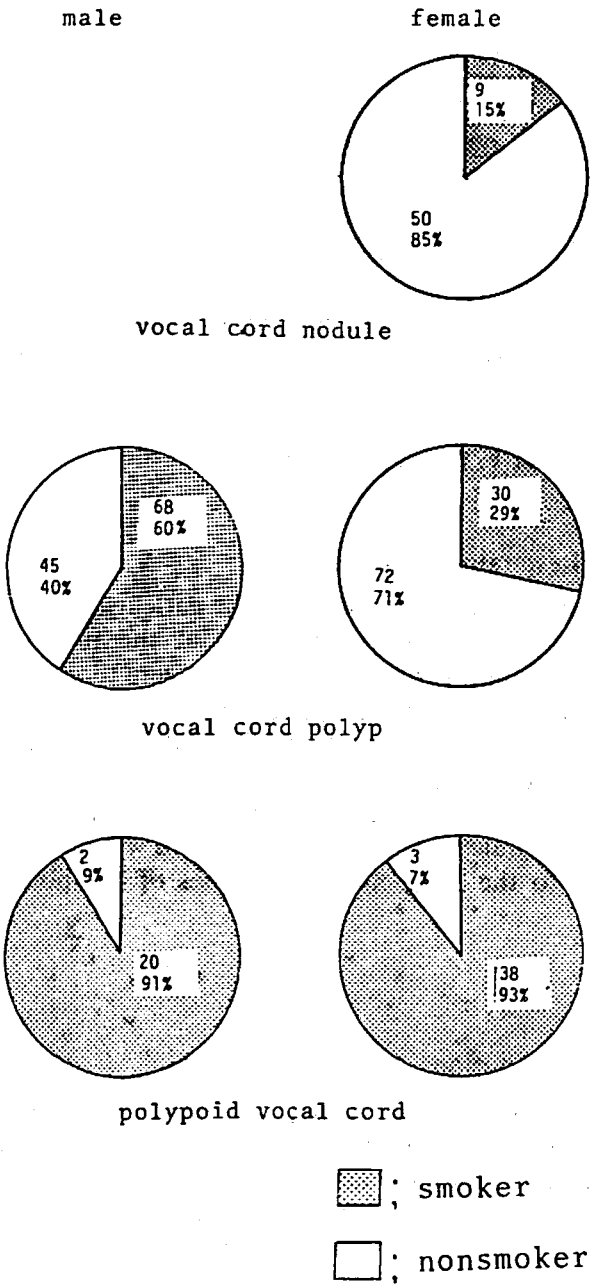

Fig. 3 *Smoking habits. Males with vocal cord nodule were excluded because the total number was only 3. Mixed cases were also excluded.*

the proliferation of subepithelial fibroblasts, which eventually results in the formation of a nodule with excessive collagenous fibers. Further studies are needed to provide a more definite answer to this question.

Vocal cord polyp and polypoid vocal cord, as well as vocal cord nodule, are no longer regarded as new growths or inflammatory tumors. Recently, several authors have suggested that circulatory disturbances in the vocal cords play some role in the formation of vocal cord polyp and polypoid vocal cord. According to Sato (1957) and Hiroto et al. (1971), the histopathological change for vocal cord polyp is mainly found in the blood vessels. Hiroto et al. (1980) suggested that localized subepithelial bleeding in the vocal cord results in the formation of vocal cord polyp. As to the histopathological picture of polypoid vocal cord, Hiroto et al. (1975) emphasized edematous changes, and Matsuo et al. (1980) reported that edema and telangiectasia in the superficial layer of the lamina propria were the most dominant findings. Recently, Kurita and Hirano (1981) reported that edematous changes in the superficial layer of the lamina propria increase in the aged. These findings are interesting in relation to the age and sex distributions of cases with polypoid vocal cord.

4.2 Menopause and Polypoid Vocal Cord

The incidence of polypoid vocal cord was significantly high in postmenopausal women in the present study. Ishii (1966) has also found that the incidence is high in postmenopausal women over 40 years of age. He has reported that there is a close relationship between the time of the onset of the disease and menopause. He also reported that administration of estrogen was effective for the subsidence of vocal cord edema in one of his study. Based on his clinical experience, Ishii postulated that an estrogen deficiency in climacteric women plays an important role in the formation of polypoid vocal cord. Ogata (1974) and Saito (1977) have also emphasized the relationship between menopause and the polypoid degeneration of the vocal cord. As stated above, however, the time lag between the onset of the voice symptoms and menopause was quite variable in the present study. Therefore, it seems inconclusive whether menopause itself triggers the onset of polypoid change in the vocal cord.

4.3 Vocal Abuse

The mechanism by which vocal abuse produces pathological reactions in the vocal cord is still unknown. Hirano et al. (1980) discussed the laryngeal tissue reaction to stress and suggested that the relationship between high-pitched phonation and the formation of vocal cord nodule, as mentioned above. They further postulated that low-pitched phonation in adults involves the deep layers of the vocal cord and that mechanical stress during such vibration causes a rupture of the venules in the deeper portion of the superficial layer of the lamina propria, resulting in the formation of vocal cord polyp. Hiroto et al. (1975) also speculated that when the vocal cord vibrates, localized hemostasis occurs and that phonation for a long time causes localized anoxia due to hemostasis, leading to edema of the vocal cord.

As to the clinical significance of vocal abuse, there is some disagreement among authors. Toohill (1975) reported that 62 out of 77 prepubertal patients with vocal cord nodule had been described by the parents as screamers. Utsumi (1970) reported that in children with vocal cord nodule, the incidence of excessive vocal abuse was only 4.7%. Brodnitz (1961) and Arnold et al. (1965) regarded vocal cord nodule, vocal cord polyp and polypoid vocal cord as pathological changes in the vocal cord resulting from excessive or inappropriate phonation. Saito (1977) reported the incidence of vocal abuse in patients with vocal cord nodule (adults), vocal cord polyp and polypoid vocal cord to be 66%, 57% and 49%, respectively. The disagreement among these authors seems partly due to the difficulty in evaluating the degree of vocal abuse, especially in children.

In the present study, chronic vocal abuse included, by definition, occupational voice usage in adult patients. From the results of the present study, it is suggested that chronic vocal abuse plays some role in the formation of vocal cord nodule.

4.4 Smoking Habits

According to an investigation by the Japan Monopoly Corporation (1981), 68.3% of adult males and 12.3% of adult females smoke daily in Japan. The average amount of smoking is 25.0 cigarettes in males and 15.9 cigarettes in females per day. Taking these results as a standard of the smoking habits of Japanese, the incidence of smoking in the present study can be interpreted as follows. In female patients with vocal cord nodule, the incidence is not significantly high. As for vocal cord polyp, the incidence is not significantly high in males but relatively high in females. As for polypoid vocal cord, the incidence is significantly high in both males and females. The average amount of smoking in our study do not significantly differ from the standard.

As for vocal cord nodule, the results of the present study agree with the observations by Sato (1977)* and Toritani et al. (1979) who stated that smoking was scarcely related to vocal cord nodule. As for vocal cord polyp, Sato (1977)** reported that the incidence of smoking was 81.2% in males and 49.1% in females. He concluded from these results that the formation of vocal cord polyp was not influenced by smoking in males. Toritani et al. (1979) reported that the incidence of smoking in vocal cord polyp was 75.16% in males and 16.46% in females. They concluded that the incidence of smoking in vocal cord polyp was high in males but not significantly different from the control in females, and that, after all, smoking should not be considered as the true origin of vocal cord polyp. In the present study, the incidence of smoking seemed to be rather high in the female patients with vocal cord polyp. Further investigation is needed on the effect of smoking on the formation of vocal cord polyp.

*, **, *** In Sato (1977), vocal cord nodule, vocal cord polyp and polypoid vocal cord are referred to as nodule type, typical type and long standing type of vocal cord polyp, respectively.

Sato (1977)***, Toritani et al. (1979) and Matsuo et al. (1980) reported that the incidence of smoking in patients with polypoid vocal cord was significantly high in both males and females. With regard to the pathogenesis of polypoid vocal cord, Toritani et al. (1979) suggested that smoking acts as an edema-producing factor on the vocal cord and that, combined with other factors such as vocal abuse, it plays some role in the formation of polypoid vocal cord. It was also suggested from the results of the present study that incidence of smoking is an important etiological factor in polypoid vocal cord.

4.5 Acute Upper Respiratory Infection

In the present series, 11% of the patients with vocal cord nodule, 19% of the patients with vocal cord polyp and 18% of the patients with polypoid vocal cord were thought to have had acute upper respiratory infection at the time of the onset of their disease. These rates are rather lower, especially for vocal cord nodule, than those reported by previous authors, except Matsuo et al. (1980).

Sato and Sumita (1965) regarded the common cold as the most frequent inducement of vocal cord nodule, vocal cord polyp and polypoid vocal cord. Hirano (1975) made the same statement, vocal abuse being next. As for the separate diseases, the percent of cases thought to have been induced by acute upper respiratory infection have been reported as follows: 23.2% for vocal cord nodule by Utsumi (1970); 36% for vocal cord polyp by Hiroto et al. (1971); and 14% for polypoid vocal cord by Matsuo et al. (1980). Toritani et al. (1979) reported that 24 out of 91 cases of vocal cord nodule, 54 out of 240 cases of vocal cord polyp and 16 out of 58 cases of polypoid vocal cord were thought to have been induced by the common cold. The reason for the discrepancy between the present study and most previous studies is ancertain.

5. Summary

A statistical study was carried out on 445 cases with vocal cord nodule, vocal cord polyp and polypoid vocal cord, the diagnoses of which were made clinically by laryngeal inspection. As a result, it was found that age and sex distributions were specific to each category. Further, some distinctive features were revealed for each disease as follows.

1) In the case of vocal cord nodule, the incidence of chronic vocal abuse was significantly higher than in the other two diseases. The effect of smoking seemed to be negligible. The incidence of acute upper respiratory infection at the time of the onset of the disease was relatively low.

2) In the case of vocal cord polyp, the influences of vocal abuse or acute upper respiratory infection seemed to be probable in some cases. In female patients, the incidence of smoking was relatively higher than the average for Japanese women.

3) In the case of polypoid vocal cord, the incidence of smoking was significantly high in both sexes. The influence of vocal abuse or acute upper respiratory infection seemed to be probable in some cases.

References

Brodnitz, F.S. (1961); Vocal rehabilitation. Am. Acad. Ophth. Otol.

Hirano, M. (1975); Phonosurgery-Basic and clinical investigations-. Otologia (Fukuoka) 21, 377 (in Japanese).

Hirano, M., S. Kurita, K. Matsuo and K. Nagata (1980); Laryngeal tissue reactions to stress. Transcripts of the 9th symposium, Care of the professional voice, Part 2, Van Laurence (Ed.), The Voice Foundation.

Hiroto, I., K. Tanaka, S. Kasa, S. Komiyama and S. Fujisawa (1975); Etiology of the polypoid hypertrophy of the vocal fold. Jpn. J. Logop. Phoniatr. 16, 135-136 (in Japanese).

Hiroto, I., T. Shin, Y. Koike and S. Hirose (1971); The etiology of laryngeal polyp. J. Otolaryngol. Jpn. 74, 866-870 (in Japanese).

Holinger, P.H. and K.C. Johnston (1951); Benign tumors of the Larynx. Ann. Otol. Rhinol. Laryng. 60, 496-509.

Iida, T. (1940); "Das Wesen der gewöhnlichen Heiserkeit bei Kindern. Über die Nomenklatur des Larynx praemutaticus od. Vox praemutatica. Eigene Ansicht über das sog. Kinderknötchen". Otolaryngology (Tokyo) 13, 987-990 (in Japanese).

Ishii, H. (1966); A consideration on the genesis of the polypoid vocal cord (polypoid degeneration of the vocal cord). J. Otolaryngol. Jpn. 69, 199-205 (in Japanese).

Japan Monopoly Corporation (1981); "Zenkoku tobacco kitsuenshya ritsu chosa" (An investigation into the smoking habits of Japanese) (in Japanese).

Kurita, S. and M. Hirano (1981); "Seitai no seichyo, hattatsu to roka" (Development, growth and aging of the vocal cord). Preprints of the 17th Meeting on Basic Laryngology, Sapporo, 3-10 (in Japanese).

Luchsinger, R. and G.E. Arnold (1965); Voice- speech- language. Wadsworth pub/co.

Matsuo, K., M. Hirano, T. Kasuya and S. Kurita (1980); Polypoid vocal fold—a review of 97 cases—. Pract. Otol. (Kyoto) 73, 1187-1198 (in Japanese).

Ogata, K. (1974); Clinical study of polypoid vocal cords—a new attempt of surgical procedure—. J. Jpn. Bronchoesophagol. Soc. 25, 22-31 (in Japanese).

Saito, S. (1977); Phonosurgery—basic study on the mechanism of phonation and endolaryngeal microsurgery—. Otologia (Fukuoka) 23, 306-324 (in Japanese).

Sato T. and K. Sumita (1965); "Koto polyp no rinshyo-teki kenkyu" (Clinical aspects of laryngeal polyp). Pract. Otol. (Kyoto) 58, 254-259 (in Japanese).

Sato, T. (1957); Laryngeal polyp—clinical and pathological aspects of. Pract. Otol. (Kyoto) 50, 487-495 (in Japanese).

Sato, T. (1977); Pathology of the larynx. J. Jpn. Bronchoesophagol. Soc. 28, 98-102 (in Japanese).

Satta, K. and I. Kirikae (1970); Textbook of voice disorders. Igaku Shoin (in Japanese).

Toohill, R.J. (1975); The psychosomatic aspects of children with vocal nodules. Arch. Otolaryngol. 101, 591-595.

Toritani, Y., M. Nagai, T. Nakashima and I. Hiroto (1979); A statistical study of polypoid lesions of the vocal fold relating to cigarette smoking. Otologia (Fukuoka) 25, 448-452 (in Japanese).

Utsumi, I. (1970): Clinical study on surgical treatment for vocal nodules in children. J. Jpn. Bronchoesophagol. Soc. 21, 166-182 (in Japanese).