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CLINICAL OBSERVATIONS ON 600 CASES OF RECURRENT LARYNGEAL NERVE PALSY*

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During the period from January 1961 to September 1976, 600 cases of recurrent laryngeal nerve palsy were seen at the Voice and Speech Clinic, Dept. of Otorhinolaryngology, Univ. of Tokyo Hospital. Figure 1 illustrates the number of the cases for each year during that period. It is to be noted that we had an exceptionally large number of cases in 1970, and this topic will be discussed again later.

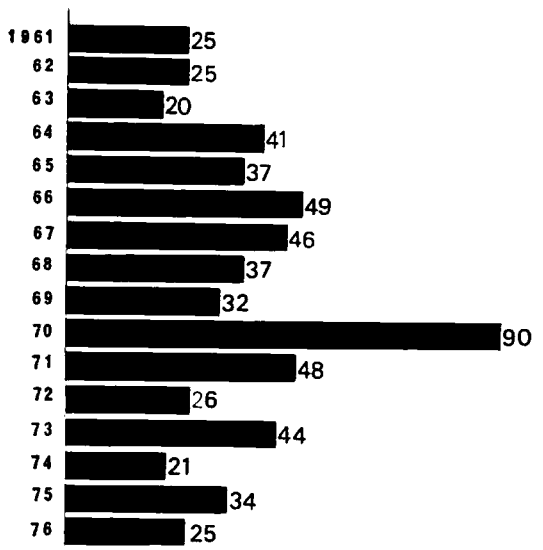

Fig. 1. Yearly incidence of recurrent laryngeal nerve palsy from Jan. 1961 to Sept. 1976.

Figure 2 shows the age and sex distributions of all the cases in the present series. As for age distribution, they were more or less evenly distributed through the third to sixth decades of life. There was no significant sex differences among these cases. In most cases, laryngeal palsy was found unilaterally, but we occasionally saw bilateral palsy.

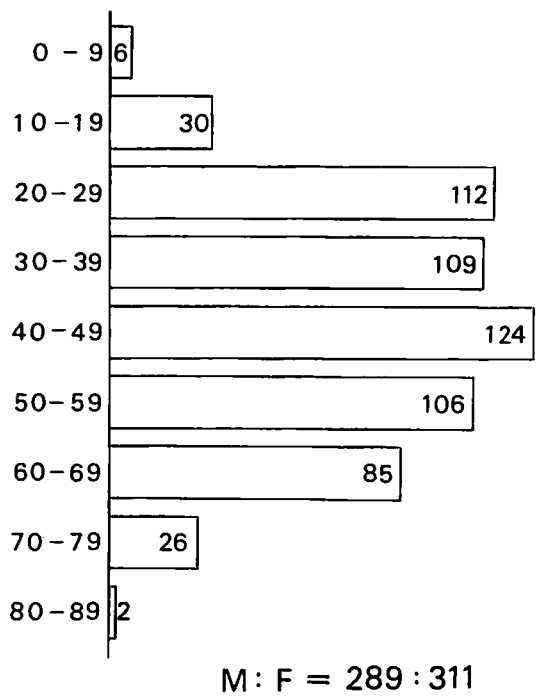

Fig. 2. Age and sex distributions

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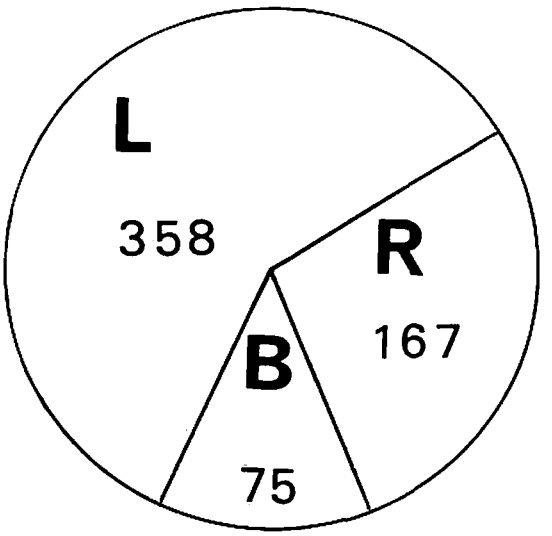

As shown in Figure 3, 358 cases had palsy on the left and 167 on the right, while 75 cases had bilateral palsy. The topic of bilateral palsy will also be discussed in a later part of the present paper.

Fig. 3. Laterality of recurrent laryngeal nerve palsy.

It has been known that there are many different causes of recurrent laryngeal nerve palsy. They can be divided into two categories, surgical and non-surgical, as shown in Table I. It is worth noting that the incidence of surgical (postoperative) palsy is considerably high in the present series. As has been reported elsewhere, thyroid surgery can be the most common cause of postoperative recurrent nerve palsy. Aside from thyroidectomy, other kinds of neck surgery can also be a direct cause of injury to the nerve. Recent developments in chest surgery have concomitantly led to an increasing number of intrathoratic or mediastinal injury to the recurrent nerve. In particular, surgery for PDA is the most common cause of recurrent nerve palsy and we had 24 such cases among those 63 cases who developed laryngeal palsy after chest surgery. Intratracheal intubation can be another important cause of postoperative palsy, even though the prognosis of postintubation palsy is known to be relatively fair.

In the non-surgical group, so-called idiopathic palsy is the most common type of recurrent nerve palsy. Similar to Bell's palsy of the facial nerve, the true mechanism of idiopathic palsy is not fully explainable as yet, but viral infection is highly suspicious. It must be emphasized, however, that when we see a patient who presents himself with an immobile cord of unknown origin, this is rather a starting point for us to search for a possible cause of the palsy. In this sense, the term "recurrent nerve palsy" does not indicate a final diagnosis but simply describes a clinical symptom, and we always have to make clear whether there is any serious disease along the entire course of the vagal and recurrent laryngeal nerves. It is suggested in Table I that we may find a malignant new growth at the base of the skull, in the deep neck or in the thorax. Also, aneurysm or cardiac hypertrophy is another important possibility. Thus, complete check-up including chest x-rays and fluoroscopy of the esophagus is mandatory before deciding on idiopathic palsy as a conclusive diagnosis.

Surgical (Postoperative)			
Neck Surgery			158(2)
thyroid surgery		135	
others		23(2)	
neurinoma	6(1)		
fibroma	1		
carotid body tumor	3(1)		
cyst	2		
nerve block	1		
lymphadenitis	4		
miscellaneous	6		
Chest Surgery			63
heart and large vessels		42	
PDA	24		
coarctation	2		
ASD	2		
mitral stenosis	5		
Fallot	3		
aneurysm	6		
others		21	
lung cancer	6		
mediastinal tumor	5		
esophageal cancer	9		
pyothorax	1		
Postintubation			20
Others (local anesthesia)			1
			242(2)

Nonsurgical		
Disorders in Neck		32
trauma	13(1)	
thyroid tumor	17	
periesophagitis	2	
Chest Diseases		55
mitral stenosis	12	
aneurysm	11	
lung cancer	14	
esophageal cancer	2	
mediastinal tumor	8	
pulmonary tbc	8	
Idiopathic (viral ?)		245 (26)
Associated Palsy with Definitive Cause		17 (17)
		358 (44)
		600 (46)

( ) = associated laryngeal palsy

Table I: Cause of recurrent laryngeal nerve palsy in 600 cases.

Another important diagnostic procedure is electromyography. We routinely perform laryngeal electromyography at the earliest possible time after the onset of palsy. Usually, the thyroarytenoid and cricothyroid muscles are examined bilaterally, using a concentric needle electrode through a percutaneous approach. The criteria for the electromyographic diagnosis of laryngeal palsy are essentially comparable with those for other limb muscles. For example, if we observe electrical silence or involuntary low amplitude discharge of fibrillation voltage, it is to be taken as a sign of complete denervation and the prognosis of the palsy is considered to be very poor. On the other hand, recovery of laryngeal movement can be expected when we observe simple reduction of neuromuscular units (NMU) at the earlier stages, even though laryngeal examination reveals apparently immobile vocal folds. In associated laryngeal palsy, we may observe high amplitude voltage from several muscles other than laryngeal muscles. This finding in electromyography is likely to indicate that multiple cranial nerve nuclei are involved at the level of the brain stem by motor neuron diseases.

Table II presents the causes of associated laryngeal palsy observed in 46 cases in the present series. Practically, it is not always easy to differentiate intracranial origins from the extracranial and, therefore, diagnostic names are simply presented in Table II.

Basilar impression	3
Motor neuron disease	3
Syringobulbia	2
Skull Fx	2
MS	2
Postop, neck	2
Cerebellar Ptosis	1
Epipharynx tumor	1
Glomus jugulare tumor	1
Platybasia	1
Neck trauma	1
Idiopathic	26
	46

Table II: Causes of associated laryngeal palsy.

Table III shows a classification of the 46 cases of associated laryngeal palsy based on the combination of the nerves involved together with the number of cases of each type. Involvement of the Xth and XIth nerves is most common and combined palsy of the velum and larynx, described as X in Table III, is the next most common.

							CASES
VI			X				1
	VII		X				1
			X				12
	VII		X	XI			2
		VIII	X	XI			1
			IX X	XI			1
			X	XI			14
VI			X		XII		1
	VII	VIII	IX X	XI	XII		1
			X	XI	XII		6
			X		XII		6
							46

X = Larynx and Velum

Table III: Combination of cranial nerves involved in 46 cases of associated laryngeal palsy.

In many textbooks, associated laryngeal palsy is classified according to the historical symptom names such as Jackson's palsy, Vernet's palsy, etc. However, these traditional namings are often confusing and, not infrequently, we come across those cases to which none of the historical classifications can be applied. Therefore, we rather prefer describing simply the names of nerves or organs involved in associated palsy.

Bilateral recurrent laryngeal nerve palsy is another important topic in the present series, in which 75 cases (13%) are included. Figure 4 illustrates the incidence of bilateral palsy for each year. It is interesting to note that the incidence is also highest in 1970.

Since the primary function of the larynx is to protect and maintain the patency of the airway, it is mandatory to keep the airway open and, therefore, surgery to open the glottis is indicated in the case of bilateral palsy, if both cords are fixed in the midline. As shown in Figure 4, 30 out of the 75 cases had bilateral palsy and all the cases (except three who dropped out from the follow-up) underwent tracheotomy to establish a sufficient airway. Out of these 27 tracheotomy cases, 22 then underwent laryngopasty operations to open the glottis. We usually perform Woodman's operation for this purpose.

For pre- and postoperative evaluation of the respiratory function, Flow-Volume (F-V) curve recording has been attempted. Figure 5 compares a normal pattern with a typical pattern of extrathoratic airway obstruction. As shown in the figure, it has been reported that simple extrathoratic airway obstruction results in the reduction in the maximum velocity of the respiratory flow and a subsequent flattening of the curve.

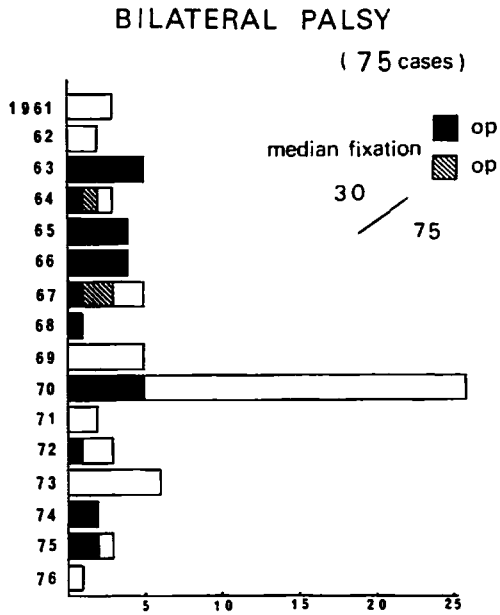

Fig. 4. Yearly incidence of bilateral recurrent nerve palsy.

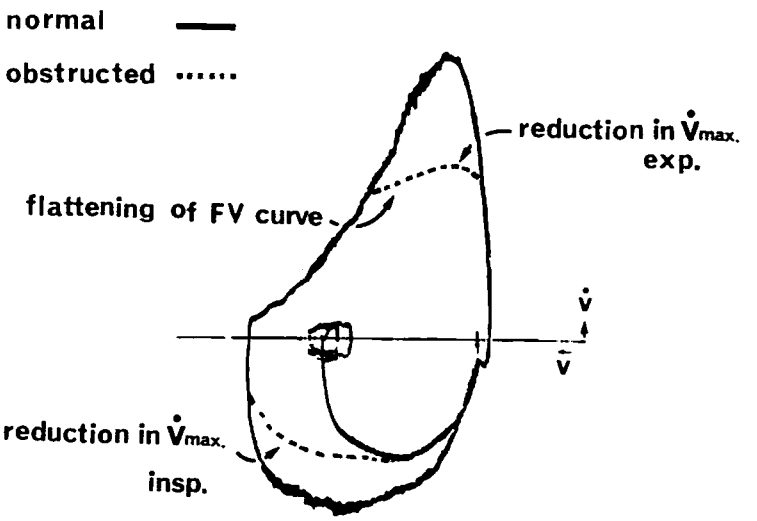

Fig. 5. Typical patterns of F-V curves in the normal subject (solid line) and the pathological case with upper airway obstruction (dotted line)

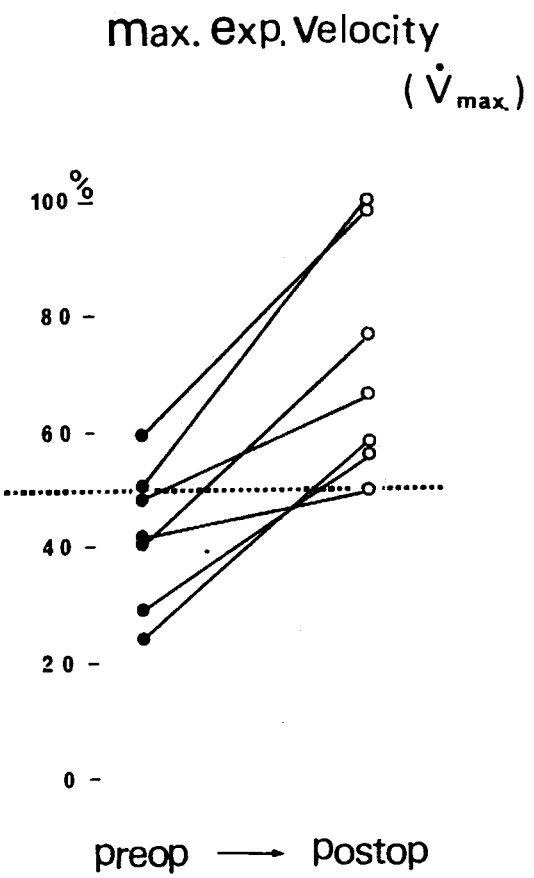

Figure 6 presents the pre- and postoperative values of the maximum expiratory flow velocity of those cases who underwent Woodman's operation on a percentage scale where the expected value is taken as 100 for each case. It is apparent in all cases that the postoperative values are over the level of 50% of the expected value, which is shown as a dotted line in the figure, and the results are considered to be satisfactory.

Fig. 6. Pre- and postoperative values of maximum expiratory velocity in the cases of bilateral laryngeal palsy.

A clinical problem we face in these cases of bilateral palsy is that we are always in a dilemma over whether it is possible to preserve satisfactory phonatory function as well as good respiratory function postoperatively. Figure 7 shows the changes in the maximum phonation time, voice range and usual spoken pitch of the patients of bilateral palsy who underwent Woodman's operation. The values are normalized, in that the difference from the average of normal subjects was divided by the standard deviation of the normal. Apparently, there is a tendency toward reduction in maximum phonation time and voice range, and

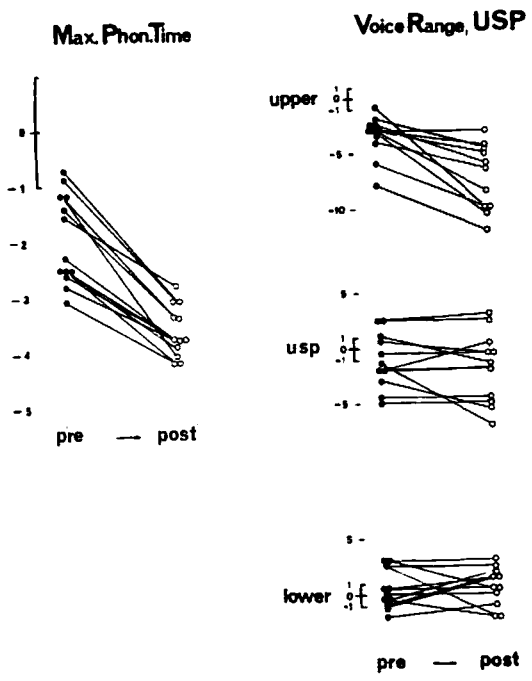

Fig. 7. Pre- and post operative values of MPT, Voice range and USP in the cases of bilateral laryngeal palsy.

these results would indicate that the postoperative phonatory function is inevitably affected to a considerable extent. However, in order to establish sufficient airway for the patient, it is our general principle to attempt to obtain as wide a glottis as possible at the time of surgery, since, in most cases, they still preserve at least serviceable voice postoperatively. As a future possibility, functional operations such as reinnervation procedures or selective severance of the adductor branch might be taken into consideration but they seem to be still at the experimental stage.

The clinical significance of the so-called idiopathic recurrent laryngeal nerve palsy cannot be overlookded particularly because of its high incidence. In the winter of 1970, there was an epidemic eruption of the so-called idiopathic palsy as shown in Table IV. If we compare the number of the cases of idiopathic palsy seen during the period from January to May 1970 with those of the preceding years as in Table V, it is obvious that the incidence was exceptionally high in 1970. The same tendency was reported elsewhere in the world and viral infection was suspected as the cause. In Japan, serum antigen titre for influenza A2 virus was reported to be high in those cases but its role as a definitive cause is still inconclusive.

1969	Dec.	1
1970	Jan.	10
	Feb.	25
	Mar.	9
	Apr.	0
	May	1

Table IV: Monthly incidence of idiopathic (viral?) laryngeal nerve palsy from December, 1969 to May, 1970.

1968 (Jan.-May)	20 (4)
1969 (Jan.-May)	14 (7)
1970 (Jan.-May)	59 (46)

Table V: Comparison of seasonal (Jan.-May) incidence of recurrent nerve palsy from 1968 to 1970.

The clinical pictures of the epidemic palsy in 1970 are rather characteristic. Among these were:

1) Symptoms of upper respiratory infection usually preceded the onset of palsy.

2) There was no case under the age of 20 in our series.

3) There were relatively large numbers of bilateral palsy and yet midline fixation was rare.

4) A follow-up study revealed that the prognosis of vocal cord mobility was fair. As for prognosis, the result of the follow-up study after 3 years is given in Table VI on 26 cases of idiopathic palsy who were first seen in 1970. It is noted that in 14 out of the 18 cases of unilateral palsy, the cord became mobile and in 8 cases of bilateral palsy, 10 sides out of the total of 16 sides became mobile. However, 3 cases of bilateral palsy developed dyspnea and eventually underwent Woodman's operation.

26 Follow-Up Cases		
Unilateral (18)		Mobile
	Rt. 6 Sides	5 Sides
	Lt. 12 Sides	9 Sides
Bilateral* (8)		
	16 Sides	10 Sides

* 3 cases developed dyspnea

Table VI: Follow-up results of idiopathic cases.

In the majority of unilateral recurrent laryngeal nerve palsies, it has been known that a spontaneous improvement of voice occurs within several months mainly by a self-compensatory action of the contralateral vocal cord. In order to enhance this action, we usually encourage the patient to talk louder or even give him voice training, such as pushing exercises. In some cases, however, severe hoarseness persists for a long time even after the unaffected cord adducts to maximal extent. In order to obtain serviceable voice, surgical adduction of the paralytic vocal cord to produce effective glottal closure should be considered. Recently, the use of a liquid silicone injection to the paralytic vocal cord under laryngomicroscopy has been attempted, but the effect does not seem to be very permanent. As an alternative method, autogenous cartilage transplantation operations (1958) have been performed with successful results and will be applied to pertinent cases in the future.

In summary, it must be emphasized that the problem of recurrent laryngeal nerve palsy is quite old but still is very important in the sense that this pathological condition always provides us with stimulating topics in the laryngological practice.

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