



VOICE ANALYSIS OF LARYNGEAL CANCER PATIENTS

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Introduction

I have been applying voice analysis described by the previous paper written by Professeor Kasuya, clinically, to mass screening for laryngeal cancer, and 8 cases of vocal cord cancer and one hypopharyngeal cancer, have been discovered as a result. That is the topics of this paper.

As you all know, the prognosis of laryngeal cancer is good. The goal of treating laryngeal cancer at the present time is to increase the cure rate and at the same time to preserve the larynx, in other words to allow patients to retain their own voice, because there is a great difference in the quality of patient's life depending on whether the patients has a larynx.

Early detection of laryngeal cancer is necessary to preserve the larynx, and mass screening is an effective means of early detection.

In Japan, mass screening is currently being performed for gastric cancer, uterine cancer and colorectal cancer, and good results have been obtained. In the past, mass screening examinations were also performed for tuberculosis, and thus, in Japan, people undergo mass screening examinations without any feeling of uneasiness.

Key Words : Voice Analysis, Laryngeal Cancer, Mass Screening.

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Material and Method

We have been performing mass screening for laryngeal cancer in northern Hokkaido since 1983, and the first thing I would like to report on is this screening activity.

Fig 1 shows our screening region. It covers 12,670 km² in the northernmost part of Hokkaido in Japan, where there is hardly any new influx of population. There are 3 cities and 26 towns in this region, with a population of 102,014. The population 40 years of age and over is about 57,000, and those people are our target population. About 2% of them or 1,000 people participate in the screening. Screening is performed in places in this region where there are no ENT specialists. When we started this study there was only one ENT doctor. Now there are ENT specialists in 3 cities.



Hokkaido
 objective area ; 12,670km²
 Population over 40y ; 59,000

Fig 1.

We use the device which is shown Fig 2. The lower one is for recording and upper one is for monitoring. We have used this device for 13 years from the beginning.

Fig 3 shows a schematic diagram of the screening system. I discuss the matter with the city, town or authorities, and decide on a date and site for the screening examination. Laryngoscopy is performed during screening along with voice recording to avoid missing lesions. The recorded voices analyzed at Utsunomiya Univ. The examinees' auditory perceptions is also evaluated during the screening process. Initially Dr.Ebihara performed the perceptual evaluation, but Professor Kasuya and I are performing them now. The

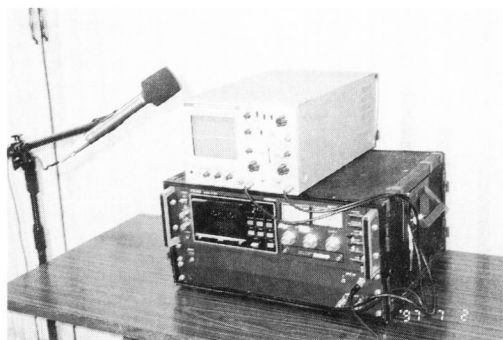


Fig 2.

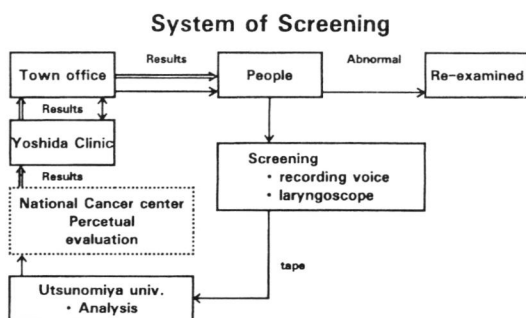


Fig 3.

Table 1. Schedule of 1997

Town	Date	
Esashi	April	4th (Fri)
Utanobori	April	4th
Otoineppu	May	16th
Nishi-Okoppe	May	23rd
Rishiri	June	16th
Rishiri-Fuji	June	17th
Rebun	June	18th
Sarufutsu	June	27th
Shimokawa	July	4th
Bifuka	July	11th
Hamatonbetsu	July	25th
Nakatonbetsu	July	25th
Teshio	Aug	8th
Enbetsu	Aug	8th
Wassamu	Aug	11th
Kenbuchi	Aug	22nd
Toyotomi	Sept	12nd
Horonobe	Sept	12nd
Nakagawa	Sept	26th
Asahi	Oct	24th
Furen	Oct	24th

subjects are notified of any abnormal findings through the city or town office.

Table 1 shows the schedule of this year. We will be travelling to 21 towns this year.

Table 2 shows cities and towns screened and numbers of examinees screened each year. The numbers at the bottom are the totals for each year, with approximately 1,000 persons being examined. In 1984 we visited 15 towns. Year after year, the town we visited are increasing. Last year we did mass screening in 23 towns .

Table 3 shows summary of Table 2. From 1984 to 1994, we collected 12,963 voice samples during these 11 years.

Table 4 shows the numbers of persons screened each year according to age. About 2% of those 40 years of age and over, have been screened. The sex ratio shows 43% men and 57% women.

Table 2. The number of Examinee in each city and town

town's name	'84	'85	'86	'87	'88	'89	'90	'91	'92	'93	'94
Shimokawa		66	38	27	25	16	25	29	35	34	23
Nakagawa	79	51	48	49	33	39	27	32	23	28	28
Otoineppu	48	34	47	48	42	38	30	38	34	32	32
Utanobori	65	52	31	51	65	29	29	50	77	94	49
Esashi	88	70	63	90	46	52	54	89	46	63	67
Furen	83	45	37	78	52	25	54	38	84	40	56
Nakatonbetsu	50	59	37	31	44	39	51	28	39	27	30
Hamatonbetsu	41	45	13	51	38	21	48	33	23	33	47
Toyotomi	60	84	48	69	95	88	76	72		73	82
Bifuka	71	22	19	32	33	65	43	75	68	86	78
Okoppe	48	64	34	40	32	79	40	52	54	44	39
Omu	48		55	35	18	19					
Sarufutsu	76	44	60	59	66	57	91	70	41	58	59
Horonobe	58	59	35	42	63	45	73	94		68	78
Tesho	97	57	49	54	69	71	98	60	76	111	96
Enbetsu	81	45	40	56	70	70	85	104	69	57	85
Wassamu		157	103	105	88	78					45
Nishi-Okoppe			81	52	22	31	35	15	28	25	21
Takinoue			102	47	63	40	57	46	46	52	26
Asahi			135	56	48	39	60	66	61	65	78
Kenbuchi				82	84	62	70	38			43
Rishiri				100	100	140	165	146	80	107	96
Rishiri-Fuji						53	81	77	95	73	71
Rebun						43	38	27	48	36	44
total	993	944	1,075	1,254	1,196	1,239	1,330	1,324	1,027	1,294	1,287

Table 3. The Number of Examinee for every Year

'84	'85	'86	'87	'88	'89	'90	'91	'92	'93	'94	total
993	944	1,075	1,254	1,196	1,239	1,330	1,324	1,027	1,294	1,287	12,963

Table 4. The Number and the Age of Examinee

Age	'84	'85	'86	'87	'88	'89	'90	'91	'92	'93	'94	total
under 40ies	52	40	51	79	40	159	43	13	59	101	118	755
40~49	185	180	154	180	213	192	238	204	132	176	145	1,999
50~59	366	279	387	412	346	363	387	413	288	333	334	3,908
60~69	259	303	335	384	381	344	425	439	357	456	416	4,099
over 70ies	131	142	148	199	216	181	237	255	191	228	274	2,202
total	993	944	1,075	1,254	1,196	1,239	1,330	1,324	1,027	1,294	1,287	12,963
populations over 40ies	37,796	38,036	49,105	54,087	53,836	59,032	55,468	52,189	44,628	59,032	59,032	

male : female = 43% : 57%

The laryngeal diseases detected are shown on Table 5. Vocal cord cancer was discovered in 8 persons and hypopharyngeal cancer is one person. The principal other diseases were chronic inflammation, vocal cord polyp, and polypoid degeneration. There were also 3 persons with supra-glottic cancer discovered by laryngoscopy. The larynx was preserved in all 8 persons with vocal cord cancer and their disease was T1- T2. They were treated by irradiation or partial laryngectomy. A patient of hypopharyngeal cancer was performed total laryngo - pharyngo esophagectomy and reconstructed by jejunum. 3 supra- glottic cancer were found by indirect laryngoscopy.

1 pt. was treated by radiation
 1 pt. was performed total laryngectomy
 1 pt. refused any treatment.

Abnormal findings were judged to be present in a total of 2,637 persons, and 1,552 of them were re - examined. Abnormal finding was observed in the larynx of 1,011 of them. The false positive rate was rather high, 34%.

8 glottic cancer and 1 hypolaryngeal cancer were discovered in 12,963 people. I think these results are satisfactory.

Table 5. Laryngeal Diseases of re examined pt

	'84	'85	'86	'87	'88	'89	'90	'91	'92	'93	'94	total
Glottic ca	1	2		1	1		1	1	1			8
hypopharynx ca											1	1
polyp	18	13	23	23	5	13	17	19	14	16	6	167
polypoid	11	14	15	12	10	7	11	13	13	16	7	129
chronic inflammation	37	51	56	83	57	34	24	33	21	47	23	466
R.N.P.	1	3	1	2	1		2	4	7	1	4	26
Others	19	11	15	9	2	7	9	16	15	45	36	184
Normal	55	42	66	39	38	36	59	54	56	70	26	541
non re examined	84	58	54	63	72	34	213	202	111	134	90	1,115
total	226	194	230	232	186	131	336	342	238	329	193	2,637

※ Supra gl. ca : 3

Conclusion

Laryngeal cancer has a low rate of occurrence, and it was not thought to be suitable for mass screening examinations. Nevertheless, we were able to draw the following conclusions from the results of survey we conducted.

- i) How uncomfortable is it for the subject?
 Since the subject only phonates, hardly anyone experiences any discomfort at all.
- ii) Is the screening method simple? Yes.
 The examiner simply records the subjects'

voice, a simple operation that can be performed by anyone.

- iii) How long dose the examination take?
 The subject only phonate the vowel (e) 5 times, something that can be done in 2-3 minutes.
- iv) What dose it cost? The cost of the recording tape, tape deck, monitor and analysis fee. Prof. Kasuya referred to the cost for computer analysis about 4500\$. per year. The voice analysis system is on the Japanese market.

Moreover we can get it at a low price.
 The above findings show that this is an effective method. It is especially useful in regions where there is no ENT specialist.

Fig 4 shows the number of persons whose larynx was preserved during initial treatment of laryngeal cancer in the ENT Department of Asahikawa Medical College. Asahikawa Medical College Hospital is the center hospital of northern Hokkaido. The percentage whose larynx was preserved, increased every year.

In addition to screening examinees, we educate them about head and neck cancer including laryngeal cancer. We hope that our efforts have in

some way contributed to these results. As a results of our education, they had understanding of the cancer. And now, they consult a doctor on early opportunity. Therefore fortunately for them, unfortunately for us, we find no laryngeal cancer for these few years. When I opened my ENT office 17 years ago, I was surprised at discovering many advanced laryngeal cancer patients who should be performed total laryngectomy. Now we have little chance to discover such a serious cases. I suppose mass screening will have two effects. One is to discover patients in early stage, and one is to educate the examinees. As a matter of facts, the examinees are always interested in their results and cancer itself.

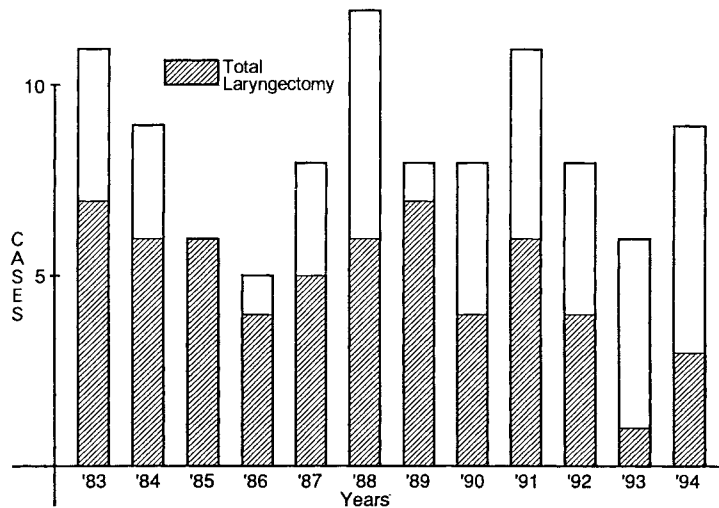


Fig 4. Initial Treatment of Laryngeal Cancer : Asahikawa Medical College

この論文は

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において口演した。