

AUDIOMETRIC ASSESSMENT IN PATIENTS WITH CARCINOMA OF THE LARYNX

by

O. S. OSOWOLE*,

and

O. G. B. NWAORGU**

ABSTRACT

Audiometric assessment was carried out on twelve patients with advanced carcinoma of the larynx who were on admission on the Ear, Nose and Throat Ward of the University College Hospital, Ibadan, Nigeria between October 1995 and June 1996. The sharp dropping curve was the most common type of audiograph observed. Fifty percent of the patients had very sharp dropping curve at 200Hz, 33.3% had mild dropping curve at 4000Hz and 8000Hz while 16.7% had a flat curve within the social adequacy range. Implications of this in the treatment and rehabilitation of such patients is discussed.

INTRODUCTION

The head and neck is an anatomically and neurologically complex region and it is not surprising that pain arising from this part of the body is often misunderstood, misdiagnosed and mistreated.

Cancer of the larynx is one of the common head and neck tumors whose clinical detection is based on persistent hoarseness, pain, referred otalgia, dyspnea and stridor. This cancer can be classified into three depending on site of origin, namely: supraglottic, glottic or subglottic.

Supraglottic cancer of the larynx represents 40% of laryngeal tumors, glottic 55% and subglottic 5% (Rubin *et al.* 1993). Supraglottic cancers present with sore throat, feeling of lump in the neck, dysphagia and less often hoarseness. Glottic cancers present with hoarseness and stridor while subglottic cancers which is very rare present with referred otalgia. Thus otalgia may be a very early symptom of laryngeal cancer.

Otalgia is pain in the ear which is a symptom not a diagnosis. It may be primary, that is, otological in origin or secondary, that is, referred. This happens because the skin, perichondrium and periosteum of the external ear, tympanic membrane, lining of the middle ear and

mastoid periosteum all possess rich sensory innervation (Warwick and Williams 1973a). The nerves that contribute to this complex innervation originate from several segments of the brain and spinal cord and include the trigeminal, facial, glossopharyngeal, vagus and spinal accessory. The ear shares sensory innervation with the larynx. The sensory fibres of the vagus nerve supply a portion of the cavum conchae, posterior wall of the external auditory canal and posterior portion of the external surface of the drum head. The vagus nerve also supplies the sensory innervation of the entire larynx, oesophagus, trachea and thyroid (Warwick and William 1973b).

According to the principles of referred pain, disorders like laryngeal injuries, foreign body in the larynx, ulceration and cancer of the larynx may be a source of pain that is referred to the ear. This reference of pain is through the superior laryngeal branch of the vague nerve.

In this study, the disorder is laryngeal cancer and because of this shared innervation, patients with cancer of the larynx sometimes present with otalgia. This can be an important clinical detection symptom in the diagnosis of carcinoma of the larynx especially the supraglottic type.

The focus of this study was to examine the hearing pattern with which 12 histopathologically confirmed carcinoma of larynx patients present.

METHODOLOGY

All the patients with histopathologically confirmed carcinoma of the larynx admitted to the Ear, Nose and Throat Ward of the University College Hospital, Ibadan between October 1995 and June 1996 formed the subjects of this study. They were 12 in number. All these patients had otoscopy, indirect laryngoscopy, biopsy and pure tone audiometry. Amplivox 2150 portable audiometer was used for pure tone audiometry. The test was carried out in an acoustically treated room (sound proof booth).

*Dr. O. S. Osowole, B.Ed., M.Ed., MPH, Ph.D., the Speech Therapist and Audiologist

**Dr. O. G. B. Nwaorgu, M.B.B.S., F.W.A.C.S., a Consultant ENT Surgeon are of the Department of Otorhinolaryngology, University College Hospital, Ibadan, Nigeria.

N.B. All Correspondence should be addressed to Dr. O. S. Osowole

RESULTS

Demographic Characteristics

The subjects comprised 9 (75%) males and 3 (25%) females. Their ages ranged from 28 years to 65 years with a mean age at 50.3 years. Four (33.3% presented in the sixth decade of life.

All the patients had premorbid social history of tobacco with alcohol ingestion. Their profession varied from catering, business, armed forces (military and police) to teaching.

Clinical Findings

At otoscopy, all the 12 patients had intact tympanic membrane. Two (16.7%) of them complained of left otalgia and one of the two had dull tympanic membrane in the affected ear. All the 12 patients came in at presentation with advanced carcinoma of the larynx characterised by hoarseness, stridor, dyspnea, pain, neck swelling and fungating stoma. Using the TNM tumour staging 7 (58.3%) came in with T₃ tumour, 4 (33.3%) with T₄ tumour and 1 (8.3%) with T₂ tumour, with all having nodal involvement while 1 (8.3%) had metastasis to the chest (Table 2). In all the cases, it was difficult to identify with precision the primary side of tumour because of the advanced stage at presentation.

Histopathology result of the 12 patients following biopsy showed they all had squamous cell carcinoma. The

Table 1: Age Distribution of Ca Larynx Patients Studied

Age (Years)	Number	Percentage
20-29	1	8.3
30-39	2	16.7
40-49	2	16.7
50-59	3	25.0
60-69	4	33.3
Total	12	100.0

Table 2: Tumour Staging of the 12 Ca Larynx Patients Studied

Tumour Staging	Number	Percentage
T ₂ N ₂ M _x	1	8.3
T ₃ N ₂ M _x	6	50.0
T ₃ N ₂ M ₀	1	8.3
T ₄ N _{2a} M _x	2	16.7
T ₄ N ₂ M ₁	1	8.3
T ₄ with metastasis to chest	1	8.3

patient with metastasis to the chest had only chemotherapy mode of treatment. All the remaining 11 patients had a combination of surgery, radiotherapy, chemotherapy and speech therapy.

Audiometric findings

Three basic types of curve were identified in the 12 patients after audiometry. These are:

1. Sharp dropping curve at 2000Hz (Fig. 1) 6 patients
2. Mild dropping curve (Fig. 2) 4 patients
3. Flat curve (Fig. 3) 2 patients

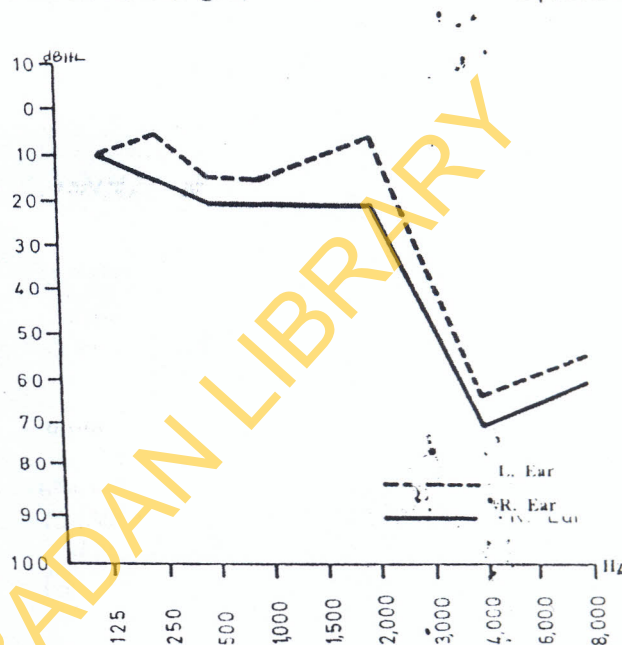


Fig. 1: Sharp dropping curve at 2000 Hz

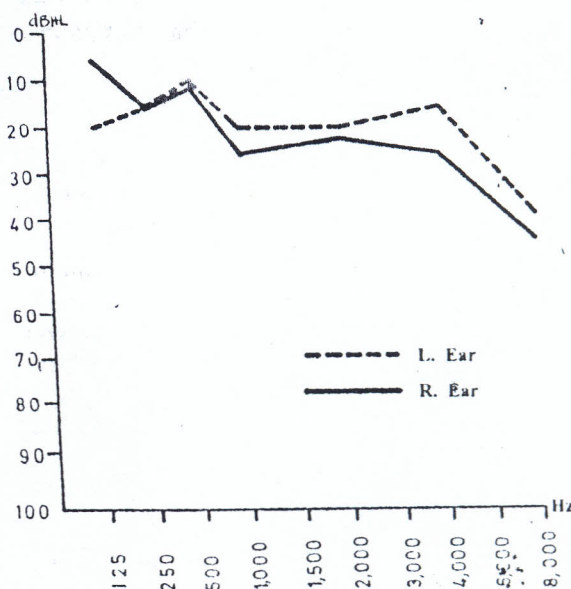


Fig. 2: Mild dropping curve

The degree of deafness arising from these curves was assessed using the National Acoustic Laboratories four frequency averaging formula i.e. average hearing loss equals $1/6 \times [HL 5000H_z + (2 \times HL 1000H_z) + (2 \times HL 2000H_z) + HL 4000H_z]$.

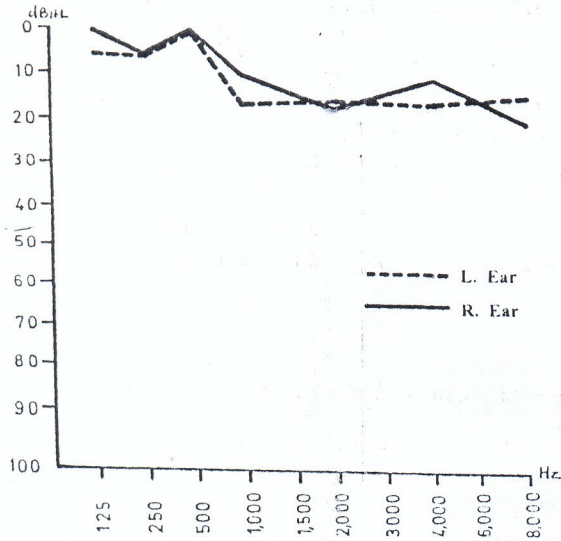


Fig. 3: Flat curve

On this scale hearing loss is graded into:

- Category 1 – Normal Loss not exceeding 25dB
- Category 2 – Mild Loss between 26 and 40dB
- Category 3 – Moderate/Sever Loss more than 41dB

Seven (58.3%) of the patients studied had losses not exceeding 25dB in both ears while another 1 (8.3%) had loss more than 41dB in the left ear and loss between 26dB and 40dB in the right ear. In other words 7 patients had normal hearing bilaterally, 1 mild hearing loss bilaterally, 1 moderate to severe loss bilaterally and 3 had a combination of normal hearing and mild hearing loss (Table 3).

Table 3: Degree of Deafness Recorded in 12 Ca Larynx Patients Studied

Degree of Deafness	Both Ears	Right Ear	Left Ear
Normal (not >25dB)	7 (58.3)	-	3 (25.0)
Mild (b/w 26dB & 40dB)	1 (8.3)	3 (25.0)	-
Moderate/Severe (41dB)	1 (8.3)	-	-

One of the 2 patients that complained of otalgia in the left ear had mild hearing loss in that ear while the other had normal hearing in that ear.

DISCUSSION

The study showed a male preponderance, with a male to female ratio of 3:1 which is in agreement with the findings of Roland *et al* (1995) and Maran *et al* (1993). Though the study population is small it was also found that the incidence of carcinoma of the larynx increased with age, with a peak age of presentation in the sixth decade. This is comparable to the works of Roland *et al* (1995). The cause of cancer of the larynx is unknown but persons who smoke tobacco and drink alcohol are said to be predisposed to the disease. All the patients had premorbid history of tobacco smoking, kolarut and alcohol ingestion. It is important to note that alcohol alone is not a cause of laryngeal cancer but it is highly synergistic with smok-

ing. Moore (1971) reported a similar finding. The commonest histology type squamous cell is well-documented (Moore 1971, Gnepp 1988).

The clinical staging of cancer of the larynx is based on the number of sites affected and the mobility of the vocal cord. It is slightly different from each site. But because of late presentation and difficulty in identifying with precision the primary site, the general TNM classification is used, where

- T indicates the primary tumour
- N indicates the status of regional lymph nodes
- M indicates distant metastasis

The extent of primary tumour is indicated by the suffixes 1,2,3 or 4 which represents a progressively more advanced disease. Increasing size is usually the sole criterion for categories 1, 2 and 3 while 4 often indicates direct extension out with the primary area or invasion of underlying bone or cartilage.

For carcinoma of the larynx it can be described in summary as either:

- T_{1a} – limited to one site
- T_{1b} – in two sites but within one region
- T₂ – affecting 2 or more regions but vocal cords mobile
- T₃ – confined to the larynx with a fixed cord
- T₄ – spread outside the larynx.

For lymph node involvement, the suffix depends on the size of the involved lymph node.

- N₁ – single ipsilateral lymph node 3cm or less
- N_{2a} – single ipsilateral Ln > 3cm but not more than 6cm
- N_{2b} – multiple ipsilateral Ln > 6cm
- N_{2c} – bilateral or contralateral Ln > 6cm
- N₃ – disease in any lymphatic spread > 6cm
- N₀ – no evidence of regional Ln involvement
- N_x – nodes cannot be assessed.

For distant metastasis

- M₀ – absence of distant metastasis
- M₁ – presence of distant metastasis
- M_x – presence of metastasis cannot be assessed.

Audiometrically, age appears to be positively related to hearing loss as all the patients in the 6th decade had mild and moderate/severe hearing losses. This is important in that an aged person presenting with cancer of the larynx might have hearing loss as well and this aspect has to be taken care of in the total care of the patient. The hearing loss observed does not seem to be related to the profession of the patients. Despite the history of having participated actively in war (Liberian war as member of ECOMOG), the 2 patients who belonged to the army and police force had normal hearing.

The presence of referred otalgia confirms the effect that shared innervation can have and this has implications for early diagnosis. People with otalgia should present early so that proper investigation leading to early defini-

tive diagnosis can be done. Such investigations should include adequate clinical history, physical examination and examination under anaesthesia (EUA) and biopsy (Ijaduola 1982). The last two are mandatory so that malignancies can be detected in time thereby making prompt treatment possible with high cure rate. General medical practitioners and others alike who see patients with otalgia should be enjoined to refer such to Ear, Nose and Throat specialists promptly.

As cigarette smoking and alcohol ingestion are aetiologically related to carcinoma the primary mode of prevention should include:

- Restraint on the part of those who indulge in their use; and
- Health education programmes to enlighten the public on the dangers that lie with their indulgence. The cost of such educational programmes will be less than the treatment. This will reduce the incidence of cancer of the larynx.

In conclusion, hearing assessment should be included as part of investigations to be done in cancer of the larynx patients both as a baseline for medicolegal reasons and to give total Ear, Nose and Throat care to the patients.

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