# Forensic Aspects of Tinnitus in Belgium and France

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*Abstract:* In Belgium and in France, tinnitus has to be considered together with the study of hearing loss to determine a degree of disability. *Keywords:* forensic aspects, tinnitus

tolaryngologists can be called on as expert witnesses in a legal case for any number of reasons. They can be nominated by the courts either in common law suits or in other types of cases. They also can be asked to stand for insurance companies as an expert or as a consultant by colleagues who themselves are experts and require an ear, nose, and throat (ENT) specialist's opinion on a particular point.

In France and Belgium, the roles of medical experts differ. Either the case is designed in common law, or the cases involve work accidents or work-related diseases. In common law, victims have to receive restitution integrally to their states before an accident: Experts have to consider the state of victims before an accident and to compare it with the new situation. In social matters (work accident or work-related disease), an important step is to consider the value of a victim in the job market. Experts have to evaluate the loss of physical integrity of function as it relates to the working capacity of the victim.

In our countries, tinnitus must be considered as a symptom linked to a disease or an injury to the auditory system. An appreciation of its importance necessitates first the testing of auditory function. In Belgium, the Royal Society of Otorhinology, Laryngology, Head and Neck Surgery in 1986 proposed recommendations for forensic ENT examination. In France, such types of recommendations do not exist.

## **EXAMINATION IN BELGIUM**

## Subjective Examination and Behavioral Tests

Certain varied tests have been considered important. They include looking at the behavior of the patient. Also used are pure-tone threshold audiograms, defined by increasing or decreasing intensity (or both) of the test tone, and measurement of the impedance and of the threshold of the stapedial reflex. Depending on the case, examiners have access to testing with delayed stimulus (vocal or pure tone), the Azzi test of apparent modulation, a frequency sweep with constant intensity, the Stenger test, vocal audiometry–speech discrimination testing, and Bekesy audiometry. If one suspects exaggeration (or stimulation), the application of several tests is advised to define as closely as possible the real threshold.

The language used by affected patients, their linguistic competence, and intellectual degree are the most crucial impediments to obtaining reliable results in vocal audiometry. Measuring auditory handicap in surrounding noise is difficult. The dichotic test or a test based on integration of speech could be applied. Such tests, however, require specialized equipment.

## **Objective Audiometry**

#### Brainstem Evoked Response Audiometry

Brainstem evoked response audiometry (BERA) examination does not provide evaluation for separate frequencies. In the scope of forensic examinations, what has to be emphasized is that BERA does not permit a definition with exact and reliable thresholds. A BERA threshold obviously better than the threshold of pure-tone audiometry (difference > 15 dB) is an indication for exaggeration without being able to define its degree.

### Late Cortical Auditory Evoked Potentials

The late cortical auditory evoked potentials technique allows one to examine each frequency. From this point of view, this examination is preferable to BERA. However, the threshold can vary as much as 10 dB from one

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examination to another and this depends on the sometimes unclear morphology of the curves at threshold, the experience of the examiner in identifying the curves, and the level of alertness and the fluctuations in the basic electroencephalogram.

Cortical audiometry appears to be an indispensable complement if the classic examinations fail to define an exact threshold. However, the threshold obtained by late cortical evoked potentials has to be brought into correlation with the other data of the examination [2].

## **INVALIDITY**

## **Belgium**

In cases of occupational diseases, a special scale is applied (criteria for indemnification of occupational hearing loss and deafness). This scale has been elaborated by a study group composed of university professors, other otolaryngologists, and medical doctors of the fund itself. The jurisprudence of the labor courts has recognized the validity of these criteria. Tinnitus is not considered by itself.

A common practice in calculating the loss of hearing ability in Belgium is to take the average of loss in excess of 1,000 Hz, 2,000 Hz, and 3,000 Hz, while ignoring the 500-Hz reading, as this can create an error in the evaluation of the level of industrial hearing loss.

$$\frac{\log \sin (1,000 + \log \sin (2,000 + \log \sin (3,000 + \log (3,000) + \log (3,000)))))))} =$$

hearing loss (HL)

The minimum level is fixed at 50 dB ISO in the best ear. In cases of bilateral hearing loss, there is a formula of ponderation:

 $5 \times$  (arithmetic average [in dB HL] of loss at 1, 2 and 3 kHz in the best ear) + 1 × (same calculation on the worst ear/6)

The presbyacusias is not taken into account. The rates of disability are shown in Table 1. However, in certain cases, the subjective evaluation of the degree of deafness proves not to correspond to figures cited in Table 1. In such cases, examining doctors can grant disability

Table 1. Rates of disability

Hearing Loss (dB)	Degree Corresponding to Industrial Disability (%)				
50-55	1–5				
50-65	5-10				
65–75	10-30				
75–85	30–55				
85-100	55-80				

percentages in excess to the established limits, provided they can offer sufficient justification based on more detailed examinations.

A maximum rate of 80% can be allowed, because a patient with total deafness loses virtually all possibility of finding employment in the job market. (In the percentage of excluded jobs, the economic value of the profession is not taken into account. This matter concerns economic evaluation of industrial disability, which is not the concern of the medical evaluation.)

Clearly, in most evaluation scales of industrial disability, the degree of disability varies linearly with that of functional deterioration of the organ; however, in reality, it is not so. This too-schematic simplification should be abandoned.

Disability categories should in fact take into considerations that a simple raising of the voice is sufficient to produce understanding by a patient with 50- to 70-dB hearing loss. On the contrary, a screaming voice is necessary to bring about understanding in a patient with 80- to 100-dB hearing loss.

Evidently our decibel scale does not correspond truly to the progression of the degree of ability for social communion. If affected patients use a well-tolerated hearing aid, the industrial disability rate can be fixed in a category immediately below that obtainable without a hearing aid.

This proposal aims to provide guidelines, not to restrict experts' initiative. In certain cases, experts may apply other guidelines as long as they can provide acceptable medical reasons for doing so. These criteria, which were defined by an organization called *Fonds des Maladies Professionnelles en Belgique*, have been accepted by the forensic committee of the Belgian ENT Society.

In the other cases, an official Belgian disability scale (BOBI) is used legally for certain allowances for handicap people, war victims, and people injured in the military. In other cases, this scale serves as a reference but is not obligatory and usually is questionable. In numerous cases, insurance companies have their own scale and, in assessments concerning railway workers, merchant seamen, and accidents, special scales are used in granting driving license or in military service.

Table 2. Percentage of Disability

Averaged hearing						
loss (dB)	40	50	60	70	80	90
40	0	5	10	15	20	25
50	5	15	20	25	30	35
60	10	20	30	38	45	50
70	15	25	38	46	55	60
80	20	30	45	55	66	70
90	25	35	50	60	70	80

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<i>Voix haute</i> perçue à				4–5 m	3–4 m	1.5–2 m	0.5–1 m	0.25 m	Non perçue
	Voix chuchotée perçue à			0.80 m	0.50 m	0.25 m	Contact	Non perçue	
		Perte en décibels	0–25	25-35	35–45	45–55	55-65	65-80	>80
		0–25	0	0	2	4	6	8	10
4–5 m	0.80	25-35	0	2	4	6	8	10	12
3–4 m	0.50	35-45	2	4	6	8	10	12	15
1.5–2 m	0.25	45-55	4	6	8	10	12	15	20
0.5–1 m	Contact	55-65	6	8	10	12	20	25	30
0.25 m	Non perçue	65-80	8	10	12	15	25	35	40
Non perçue		> 80	10	12	15	20	30	40	50

#### Table 3. French Scale of Auditory Disability Based on Work of Rebattu [3]

Voix haute = Loud Voice, Voix chuchotée = Whispered Voice, Non perçue = unheard, Perte en decibels = Loss in decibels.

The actual aim of the commission of the Belgium Otorhinolaryngology Society is to ask for standardization of these different scales, but doing so necessitates new legislative dispositions that are not the concern of the medical world. The official Belgian disability scale has just been revised, and the commission has put forward certain new criteria for compensation of hearing loss.

#### **Hearing Loss**

The evaluation of disability resulting from a hearing loss is based on pure-tone audiometry by air conduction, carried out in a sound-proofed room with head-phones worn on naked ears and performed by a calibrated audiometer according to the ISO's latest regulations. Other audiological tests complete the evaluation of hearing capacity. They consist of tonal audiometry by bone conduction, supraliminal tests, study of the stapedius reflex, vocal audiometry, electrophysio-logical confirmation tests of threshold, and measurements (evoked response audiometry, electrocochleography). Hearing deficiencies may include voice, speech, and language problems. Articles 712–714, expanded here, are new readings and, as of March 1998, were not yet being officially applied.

According to article 712, the percentage of disability of a hearing deficiency is calculated by transposing the average loss in decibels of each ear (calculated by the following formula) on the x and y axes of the Pythagorean table (Table 2).

$$\frac{1 \times 500 + 1 \times 1,000 + 2 \times 2,000 + 1 \times 3,000}{5}$$

According to article 713, speech audiometry and, more particularly, the auditive capacity index (ACI) can show a social hearing lower than indicated by tonal average loss. The ACI is the mean of speech intelligibility measured at 40, 55, and 70 dB SPL, respectively. In this case, article 712 can be applied after calculating the equivalent loss in decibels: The equivalent loss in dB = 80 - ACI/2. Acquired sudden, irreversible, and incurable deafness is considered 100% disability.

### **Tinnitus**

Article 714 declares that, depending on its intensity and its effects on social life, tinnitus can be a disability, even in its isolated state: isolated tinnitus (1-5%); tinnitus associated with hearing loss (additional rate, 1-10%). The sum of this article with those of articles 712 and 713 should not be greater than a disability rate of 80%.

Perte auditive								
en décibels	0–20	20-30	30-40	40-50	50-60	60-70	70-80	> 80
0–20	0	2	4	6	8	10	12	14
20-30	2	4	6	8	10	12	14	18
30-40	4	6	8	10	12	15	20	25
40-50	6	8	10	12	15	20	25	30
50-60	8	10	12	15	20	25	30	35
60-70	10	12	15	20	25	30	40	45
70-80	12	14	20	25	30	40	50	55
> 80	14	18	25	30	35	45	55	60

**Table 4.** French Scale of Auditory Disability Based on Courtat and Elbaz's Work [4]

In case of tinnitus, rate are enhanced from 1 to 3%. It is a footnote to this table. Perte auditive en décibels = Auditory Loss in dbs.

Special scales are in use for the personnel of the NMBS (Belgian Railway) and for civil flying personnel. Also, for granting a driver's license and for military service, special scales are applied. The BOBI must be applied legally for extra familial allowance.

## France

In case of occupational diseases in France, high-pitched traumatisms are compensated within the framework of industrial accidents. Tinnitus is not a recognized factor. The legal audiometric techniques are tonal audiometry by air and bone conduction and speech audiometry executed by applying lists of disyllabic words in silence. These tests are performed after 12 hours' exposure of the patient to the usual noisy working environment.

The formula for the average hearing loss is

$$\frac{(0.5 \text{ kHz} \times 2) + (1 \text{ kHz} \times 4) + (2 \text{ kHz} \times 3) + (4 \text{ kHz} \times 1)}{10}$$

for which losses taken into account are those of the bone conduction curve. Also, a formula for average hearing loss based on speech audiometry is

$$\frac{d\ 0\% + d\ 50\% + d\ 100\%}{3}$$

where *d* represents the loss (in decibels) of the intelligibility threshold read on the axes of 0%, 50%, and 100% of words understood, as compared with the normal reference curve. No deductions are made for presbyacusias. The double-entry chart of industrial accidents and occupational diseases published in the official journal of the French Republic on December 30, 1982, enables the percentage of disability to be calculated on the basis of average hearing loss in each ear.

Losses are not taken into account unless the average hearing loss of the best ear is equal to or greater than 35 dB. Compensation is evaluated by taking into account not only the physiological disability but the age, the general condition, and the professional qualifications of the individual being evaluated.

In the other cases, scales are numerous. Rebattu [1] makes use of four different compensation scales in his article about medicolegal assessment. He suggests a scale as seen in Table 3. However, actually this scale does not have much authority, and different versions of it are found in different schools. Many books have been published on this subject, among which we mention those of Courtat and Elbaz (Table 4 [2]), Derobert [3], and Melennec [4]. Tinnitus gives a maximum handicap of 5%, with an exception in cases of military injury, for which special evaluation scales give an invalidity percentage up to 30%.

# SUMMARY

In Belgium and France, tinnitus by itself is considered a weakly important symptom of invalidity. Including it in a determination of a degree of invalidity necessitates combining it with the determination of certain hearing loss.

### REFERENCES

- Rebattu JP. L'expertise médico-légale. Réparation du préjudice corporel en ORL. Encyclopédie Médico-Chirurgicale (Paris-France), Otorhinolaryngol 20905, B10, 2-1988, 10 p., Elsevier, Paris, France.
- 2. Courtat PH, Elbaz P. *Réparation du Dommage Corporel en Oto-Rhino-Laryngologie*. Paris: Masson, 1992.
- 3. Boniver R, Norre M. Medico-legal in ORL. Acta Otorhinolaryngol Belg 42:723–770, 1988.
- 4. Melennec L. Evaluation du Handicap et du Dommage Corporel. Paris: Masson, 1991.