Journal of Neuroradiology (2009) **36**, 98—101

Available online at ScienceDirect www.sciencedirect.com

Elsevier Masson France EM|consulte www.em-consulte.com

ORIGINAL ARTICLE

Leptomeningeal carcinomatosis and sensorineural hearing loss: Correlation of labyrinthine enhancement patterns with symptoms

Carcinomatose leptoméningée et perte d'audition : corrélation du rehaussement labyrinthique avec la symptomatologie clinique

G. Goyault[a,*], S. Kremer[a], E. Martin[b], S. Riehm[a], J.-L. Dietemann[a], F. Veillon[a]

[a] *Department of Radiology, hôpital de Hautepierre, 1, avenue Molière, 67098 Strasbourg, France*
[b] *Department of Surgery, hôpital de Hautepierre, Strasbourg, cedex, France*

Available online 13 January 2009

KEYWORDS
Leptomeningeal carcinomatosis;
Hearing loss;
MRI;
CISS

Summary
Objectives. — The purpose of this study was to investigate the correlation between hearing loss and inner ear enhancement in patients suffering from leptomeningeal carcinomatosis (LC) involving the internal acoustic canal (IAC). Previous studies have only reported an association between IAC enhancement and sensorineural deafness.
Material and methods. — In a prospective study conducted from 2005 to 2007, 14 patients with LC involving the IAC underwent high-resolution MRI and otolaryngology examination. MRI images were analyzed by two experienced radiologists who were blinded to audiologic investigation results.
Results. — Three (21%) patients had IAC and inner ear enhancement on gadolinium-weighted MRI. All three had a sensorineural hearing loss. Eleven (79%) patients had IAC enhancement without inner ear enhancement. Nine of these 11 patients were free of sensorineural hearing loss. Only two of them had sensorineural deafness.
Conclusion. — These findings are suggestive of a relation between hearing loss and inner ear enhancement in leptomeningeal carcinomatosis, as previously reported for bacterial meningitis. However, further investigations, including radiopathological correlation and a larger number of patients, are warranted to confirm these preliminary results.

* Corresponding author.
E-mail address: gilles.goyault@chru-strasbourg.fr (G. Goyault).

0150-9861/$ - see front matter © 2008 Elsevier Masson SAS. All rights reserved.
doi:10.1016/j.neurad.2008.11.003

Introduction

Leptomeningeal carcinomatosis (LC) is a rare complication of diffuse metastatic neoplasia (approximately 5% of patients with cancer). Neoplastic cells disseminate to the central neurological system through the cerebrospinal fluid from a hematogenous spread or a direct contamination from a preexisting lesion. LC can involve any part of the brain, spinal cord or cranial nerves, such as cochleovestibular nerves [1]. Previous reports showed that acoustic nerves or internal acoustic canal (IAC) enhancement on contrast-weighted MRI are associated with hearing loss [2—5]. Several pathophysiological mechanisms have been discussed such as direct nerve infiltration, nerve ischemia induced by IAC vessel compression and labyrinth infiltration [6]. This last hypothesis has also been proposed to explain cochlear dysfunction in bacterial meningitis, with Dichgans et al. demonstrating a correlation between inner ear abnormalities on MRI and the extent of cochlear dysfunction [7]. However, the analysis of inner ear abnormalities requires high-resolution MRI with thin contrast-enhanced T1-weighted sequences associated with heavily T2-weighted sequences focused on the IAC [7].

Moreover, acoustic nerves or ICA enhancement are often detected on contrast-weighted MRI, without cochlear dysfunction.

These mismatched results led us to hypothesize that the hearing loss observed in LC is related to inner ear abnormalities rather than to IAC contrast enhancement.

The purpose of our study was to investigate inner ear contrast enhancement in patients suffering from LC involving the IAC and to assess the correlation between sensorineural deafness and labyrinthine enhancement.

Material and methods

Patients

In a prospective conducted from early 2005 to mid-2007, 14 patients with LC involving the IAC (seven females, seven males; age range, 20—84 years; mean age, 60 years) underwent high-resolution MRI and otolaryngology investigation. Inclusion criteria were leptomeningeal and IAC enhancement on high-resolution MRI of inner ear or gadolinium-enhanced brain MRI, without ongoing infection. Patients underwent MRI exams in the follow-up of a pre-existing cancer or in case of headache, deafness, vertigo or alteration of general condition, with or without a history of cancer. All subjects gave informed consent (Table 1).

Otologic examinations

All patients underwent an audiologic examination and a pure-tone audiometry (PTA) was performed on seven of the 14 patients. The other seven patients did not undergo a PTA because the clinical examination was negative (no clinical hearing loss) or the performance status was poor (the

Table 1 Patients characteristics and results.

	Sex	Age	Initial pathology	Sensorineural deafness	Side of deafness	Inner ear enhancement (T1 FS G)	Side of enhancement
1	F	61	Unknown	+	R and L	−	−
2	M	55	Lymphoma	−	−	−	−
3	M	71	Larynx cancer	− (PTA)	−	−	−
4	M	79	Oesophagus cancer	− (PTA)	−	−	−
5	F	20	Pilocytic astrocytoma	− (PTA)	−	−	−
6	F	62	Lymphoma	+ (PTA)	R and L	+	R and L
7	M	70	Pancreas cancer	−	−	−	−
8	M	84	Parotid cancer	+	L	+	L
9	F	58	Skull base tumor	−	−	−	−
10	F	40	Breast cancer	+ (PTA)	R and L	−	−
11	M	63	Glioblastoma	− (PTA)	−	−	−
12	F	49	Lymphoma	+ (PTA)	R and L	+	R and L
13	M	57	Lung cancer	−	−	−	−
14	F	68	Unknown	−	−	−	−

F: female; M: male; PTA: pure tone audiometry; R: right; L: left; T1 FS G: T1-weighted Fat Sat sequence after gadolinium injection.