

Patulous Eustachian tube syndrome: The relationship with sensorineural hearing loss Treatment by Eustachian tube diathermy

P. J. ROBINSON, F.R.C.S. and J. W. P. HAZELL, F.R.C.S. (London)

Abstract

The patulous Eustachian tube syndrome has previously been regarded as a troublesome but benign condition. Nine out of 13 patients reported here had evidence of cochlear damage similar to that caused by acoustic trauma. These patients also had vestibular symptoms which improved with treatment of the patulous tube.

It is postulated that abnormal patency of the Eustachian tube may allow excessive middle ear pressure changes to occur which may be transmitted by abnormal ossicular movement to the cochlea.

Eustachian tube diathermy using a ureteric diathermy probe is a safe and effective method of treating this condition.

Introduction

The patulous Eustachian tube syndrome is an under-diagnosed although important condition which may cause very troublesome symptoms. It was first fully described in 1867 by Jago, who himself had autophony and a patulous Eustachian tube. Recently the diagnosis is being made with increasing frequency (Pulec, 1967). It is more common in females than males and classically presents with symptoms of roaring tinnitus in the affected ear, synchronous with nasal respiration and distorted autophony with echoing which is occasionally severe enough to interfere with speech production. There may be a feeling of fullness in the ear. Sometimes the abnormal patency only presents during certain speech utterances and this can create diagnostic difficulties.* Some patients have been noted to have mild vestibular symptoms and low frequency conductive hearing impairment has been reported. Many patients develop neuroses, which improve with treatment of the patulous tube (Crary *et al.*, 1979). Symptoms may relate to cyclical changes occurring in the mucosa of the Eustachian tube, as in the nose (Leclerc *et al.*, 1987). Some patients find relief by the increased mucosal congestion which occurs when lying down, putting the head between their knees or during an upper respiratory tract infection. Sniffing repetitively is used by some patients to close the Eustachian tube and this may lead to long term negative middle ear pressure with the attendant risk of retraction pocket and subsequent cholesteatoma formation (Aschan *et al.*, 1980).

Weight loss and pregnancy (Pulec 1967) have been identified as important predisposing factors. The

patulous Eustachian tube syndrome also occurs in females on the contraceptive pill and males on stilboestrol treatment for carcinoma of the prostate. Neurological disorders which may cause muscle atrophy such as cerebrovascular accidents, multiple sclerosis and motor neuron disease have been implicated. Perlmann (1939) reported the development of a patulous Eustachian tube syndrome following trigeminal nerve section for neuralgia. Adhesion formation in the post nasal space following adenoidectomy or radiotherapy may also predispose to a patulous tube (Bluestone *et al.*, 1975).

Diagnosis

The diagnosis can often be made on the history alone. Careful examination of the tympanic membrane may reveal movement synchronous with nasal respiration. The microscope may be used, with the patient sitting upright to facilitate detection of small movements of the pars flaccida, which disappear when the patient is supine. Similar movements may also be detected on tympanometry. The distorted sounds of nasal respiration and speech may be heard with a microphone placed in the external meatus. Virtanen (1978) has also shown the importance of sonotubometry. The endoscopic appearance of the Eustachian tube orifice does not correlate with its function (Jauman *et al.*, 1980).

Treatment

The different methods fall into five categories.

1. Attempting to narrow the lumen by salicylic acid/-

* The speech utterances in this series which affected the condition were often specific to the individual patient but there was no overall discernible pattern.

boric acid insufflation (Bezold and Sibebenmann, 1908), Eustachian tube diathermy (Halstead, 1926) and silver nitrate cautery (Eisner and Alexander, 1957).

2. Attempts to narrow the lumen by extrinsic compression by paraffin injections (Zollner, 1937), Teflon injection (Pulec, 1967) or Gelatine sponge injection (Ogawa *et al.*, 1976).

3. Attempts to alter the function of palatal muscles (Misurya, 1974; Stroud *et al.*, 1974) with or without pterygoid hamulotomy (Virtanen and Palva, 1982). Bluestone and Cantekin (1981) have recommended occlusion of the bony Eustachian tube by an indwelling layered and occluding catheter combined with a tympanotomy.

4. Myringotomy and insertion of a ventilating tube (Suehs, 1960) may provide temporary relief in some patients.

5. Pregnant patients and those with mild symptoms need reassurance alone. Any lost weight should be regained if possible (Plate *et al.*, 1979).

Material and methods

Thirteen cases of patulous Eustachian tube syndrome presented to one of us (JWPH) between 1984 and 1988. In each case the patient had a full ENT history and examination. The ear was examined under the microscope with $\times 40$ magnification to look for tympanic membrane movement in time with nasal respiration. Auscultation of the ear was performed both with a stethoscope and also with an intrameatal microphone and amplifier (Hazell, 1984).

Pure tone audiometry, tympanometry and acoustic reflex measurements were made. The absolute compliance of the ear was measured with the impedance meter at its most sensitive setting and in several patients impedance changes were noted which were synchronous with nasal respiration. Vestibular tests were only performed in one patient.

After the diagnosis was made, the origin of the symptoms was fully explained to the patients. In some cases, simple reassurance was adequate to relieve the patient's anxiety. Where an obvious predisposing cause was found such as weight loss, regaining lost weight was recommended. One patient who developed symptoms during her pregnancy was reassured that the symptoms would disappear after the delivery and indeed they did, but only to return during the second pregnancy.

Two of the earlier patients were treated with silver nitrate cautery to the Eustachian tube in the standard fashion as described by O'Connor and Shea (1981). One patient declined further treatment and one patient died from cardiac causes prior to treatment. The other patients were all treated by Eustachian tube diathermy.

Method of Eustachian tube diathermy (ETD)

This is performed under general anaesthetic with endotracheal intubation with the patient in the tonsillectomy position. The Eustachian tube orifices are visualized either with a post nasal space mirror or by using a flexible naso-pharyngoscope through the contralateral nasal space. A malleable ureteric diathermy probe (size No. 7), bent to the shape of a Eustachian catheter, is

passed through the ipsilateral nasal space into the lumen of the Eustachian tube and advanced for about 15mm. A diathermy coagulation (setting 4) is then applied for 15 seconds.

Results

Table I documents the 13 patients in this series. There were nine females and four males with an age range of 24 to 79 years. All patients had symptoms of autophony for both nasal respiration and their own voice and all patients experienced a sensation of blockage or fullness in the affected ear. Three patients had bilateral symptoms, six right sided and four left sided symptoms. Nine patients experienced vestibular symptoms which consisted of momentary episodes of feeling unsteady, like being on a boat or a swaying platform. No patient experienced rotational symptoms. In 10 patients the onset of symptoms was preceded by significant weight loss. In one patient the symptoms occurred during pregnancy and in another the symptoms dated from a complete dental clearance. In one patient no predisposing cause was identified.

Pure tone audiometry was carried out in all patients. Only four patients had normal hearing. In five patients there was evidence of a bilateral notched sensorineural hearing loss between 4 and 6KHz, of 25 to 30dB hearing loss with no evidence of noise exposure. In one patient there was a unilateral notch of 30 dB at 6KHz and this corresponded to the side of symptoms. In another patient there was a unilateral sloping sensorineural hearing loss of 50–60dB also corresponding to the side of symptoms. In the remaining two patients there was a profound bilateral symmetrical sensorineural hearing loss which was greater than expected at that age. All patients with vestibular symptoms had evidence of some sensorineural hearing loss whilst no patients with normal hearing had any evidence of vestibular symptoms.

One patient had reassurance alone and was still coping with symptoms eighteen months after presentation. Two patients were improved by weight gain and did not wish further treatment. One patient declined treatment and one died from cardiac causes. Of the remaining eight patients, one patient was treated with silver nitrate alone on one occasion and has remained asymptomatic for three years. One other patient had silver nitrate treatment on three occasions and then underwent ETD on one occasion with prolonged improvement of her symptoms. Five patients (6 ears) were treated by ETD alone on a total of 13 occasions with four ears becoming asymptomatic, one ear improving significantly and in one ear no change despite two treatments. These last two patients were symptom free for one week following treatment before symptoms recurred. One patient is awaiting treatment. In two patients secretory otitis media has developed and necessitated a ventilation tube. No other complications have occurred.

Discussion

The patulous Eustachian tube syndrome has previously been considered as a benign condition (Pulec, 1967; O'Connor and Shea 1981). Only one report sug-

TABLE I

Patient	Age	Sex	Side	Auto phony	Ear fullness	Vestibular symptoms	Weight loss	S/N loss	Treatment	Outcome	F/up
1	RS 55	F	L	+	+	+	+	30 dB Notch at 6 KHz R & L	AgNO ₃ × 3 L ETD × 1	Slight intermittent autophony (acceptable)	3 yrs
2	JC 79	F	R & L	+	+	+	+	65 dB flat loss R & L	R ETD × 4 L ETD × 4	R Asymptomatic L Asymptomatic	R 3 mths L 6 mths
3	EB 58	F	R	+	+	+	+	30 dB Notch at 4 KHz R & L	R ETD × 1	Asymptomatic SOM + grommet	1 year
4	BD 71	F	L	+	+	+	+	40-60 dB sloping loss R & L	L ETD × 1	Asymptomatic SOM + grommet	6 mths
5	RB 39	M	R	+	+	+	+	25 dB Notch at 6KHz R & L	R ETD × 2	Complete relief for 1 week then symptoms returned	9 mths
6	PG 37	F	R	+	+	-	-	No	R ETD × 3	Complete relief for 1 week then less severe symptoms recurred	9 mths
7	JW 50	F	L	+	+	+	+	50-60 dB L sloping loss: R normal	ETD awaited	—	—
8	FH 24	F	R	+	+	+	-	30 dB Notch at 6 KHz R & L	R AgNO ₃ × 1	Asymptomatic	3 yrs
9	MJ 39	M	R & L	+	+	+	+	30 dB Notch at 4 KHz R & L	Reassurance	Symptoms unchanged	18 mths
10	MH 57	F	L	+	+	-	+	No	Weight gain	Improved	6 mths
11	MI 24	F	R	+	+	-	+	No	Weight gain	Improved	18 mths
12	DT 67	M	R & L	+	+	-	-	No	Declined	—	—
13	TG 58	M	R	+	+	+	+	30 dB Notch at 6 KHz R	—	Died from cardiac causes	—

gests that inner ear damage may occur from the patulous Eustachian tube syndrome (Heerman, 1988).

Our results strongly suggest that the presence of a patent Eustachian tube allows excessive pressure changes to occur in the middle ear which may well be transmitted by abnormal ossicular movement to the cochlea. Six patients with vestibular symptoms have been actively treated and in five of these the vestibular symptoms, as well as the other symptoms, have either completely disappeared or have greatly improved. In one patient there has been no change in either the vestibular or auditory symptoms. In only two patients was the sensorineural hearing loss unilateral but in both cases this coincided with the side of the symptoms. Full neuro-otological investigations had excluded any other cause.

In normal individuals closure of the Eustachian tube is maintained by a balance between luminal and extra luminal factors: the intrinsic elasticity of the tube, the surface tension of the moist luminal surface and the extra luminal tissue pressure keep it closed. The muscle tone of the tensor veli palatini dilates the lumen (Cantekin *et al.*, 1980). Loss of weight can lead to abnormal patency due to reduced tissue pressure. It has been shown that pregnancy alters the opening pressures of the Eustachian tube in rats and it has been postulated that this is due to a change in surface tension mediated through oestrogens acting on the prostaglandin E and thus affecting surfactant production (Malm, 1987). Encouraging weight gain or awaiting the completion of pregnancy is therefore appropriate in the relevant patients.

When simple measures have failed, further treatment must be considered to try to alter the patency of the Eustachian tube. ETD was used by Halstead (1926) but

was abandoned because of serious complications, such as trigeminal nerve damage and middle cranial fossa dural burns.

However, with the advance of surgical instrumentation, fine endoscopic ureteric diathermy probes are now available which allow more accurate and controlled delivery of current to the Eustachian tube. The results of ETD compare favourably with those of silver nitrate cautery reported by O'Connor and Shea (1981). ETD appears to be a safe and alternative treatment of the patulous Eustachian tube syndrome where other methods have failed.

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Address for correspondence:
P. J. Robinson, F.R.C.S.,
Royal Ear Hospital,
Huntley Street,
London WC1E 6AU.