Sriwijaya Journal of Otorhinolaryngology e-ISSN 2987-131X
https://phlox.or.id/index.php/sjorl Vol. 4 No. 2 (2026): pp. 63–89

Case Report

Middle-Ear Pressure Normalised Before the Ear Symptom Score Did: Eight Weeks of Serial Tympanometry, Reflux Symptom Index, Reflux Finding Score and Eustachian Tube Dysfunction Questionnaire-7 in an Adult with Laryngopharyngeal Reflux

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ARTICLE INFO

Article history:
Received: *July 15, 2026*
Revised: *August 10, 2026*
Accepted: *August 29, 2026*
Available online: *September 1, 2026*
Published: *September 5, 2026*

Keywords:
ETDQ-7
Eustachian tube dysfunction
Laryngopharyngeal reflux
Reflux Finding Score
Tympanometry

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DOI:
https://doi.org/10.59345/sjorl.v4i2.340

ABSTRACT

Background: Laryngopharyngeal reflux may inflame the mucosa around the pharyngeal orifice of the Eustachian tube, yet few reports follow both domains on one timetable.

Objective: This report scores both domains on the same three-visit schedule to establish whether they recover together.

Methods: A 34-year-old man presented with three to four weeks of bilateral ear fullness and tinnitus and no heartburn. Fibreoptic laryngoscopy showed mucoid secretion around the torus tubarius, arytenoid erythema and thick endolaryngeal mucus. Saline irrigation, lansoprazole, alginate, oral acetylcysteine and dietary advice were given for eight weeks, and the Reflux Symptom Index, Reflux Finding Score, ETDQ-7 and tympanometry were scored at three visits.

Results: At presentation the Reflux Symptom Index was 24, the Reflux Finding Score 11 and the ETDQ-7 28; tympanometric peak pressure was −185 and −165 daPa, with normal static compliance and canal volumes. All five measures improved, but only four were ever abnormal and they did not cross their boundaries together. By week 4 both peak pressures had crossed the −100 daPa boundary (−95 and −85 daPa), while the ETDQ-7 stayed above its threshold at 16 and the Reflux Symptom Index sat exactly on its own at 13. Only by week 8 was the patient's own ear score within range.

Conclusion: Middle-ear pressure crossed its conventional boundary before the patient-reported ear score did, in an order the visit schedule fixes but a magnitude it does not. Five interventions began on the same day, so no improvement can be attributed to treatment, and no audiogram was taken.

The author has reviewed and approved the final version of the manuscript.

1. Introduction

Laryngopharyngeal reflux is the retrograde movement of gastroduodenal content above the upper oesophageal sphincter into the pharynx and larynx, and it behaves differently from gastro-oesophageal reflux disease. The refluxate reaching the laryngopharynx is often gaseous or weakly acidic rather than frankly acid, the exposure is brief and upright rather than prolonged and supine, and the mucosa it meets has none of the defences of the oesophageal epithelium. The clinical consequence is that a patient may have well-documented laryngopharyngeal reflux and no dyspeptic complaint at all. In 437 patients investigated with simultaneous 24-hour hypopharyngeal multichannel intraluminal impedance–pH monitoring, 248 (56.75%) were positive for laryngopharyngeal reflux while negative for gastro-oesophageal reflux disease, against 98 (22.43%) with both, 23 (5.26%) with gastro-oesophageal reflux disease alone and 68 (15.56%) negative for both[1]. In a prospective series of 128 patients with persistent laryngeal symptoms, heartburn was recorded in 52 patients (40.63%) in that paper's symptom-prevalence table, although its running text gives 72 (56.25%) for the same item, an unresolved 20-patient contradiction within the source[2]. The corollary for the otolaryngologist is uncomfortable: the absence of heartburn is close to useless as a rule-out, and the diagnosis has to be built from throat and airway complaints, from laryngoscopic signs, or from an objective reflux measurement that most clinics cannot obtain.

The two instruments in general use were designed for exactly this problem. The Reflux Symptom Index is a nine-item self-report scale scored 0 to 5 per item, and in its validation cohort of 25 patients with reflux the mean score fell from 21.2 (±10.7) before treatment to

12.8 (±10.0) after six months of twice-daily proton pump inhibition, against a normative control mean of 11.6[3]. The Reflux Finding Score assembles eight laryngoscopic signs into a 0 to 26 total; in its own validation cohort of 40 patients with reflux confirmed on double-probe pH monitoring, the mean fell from 11.5 (±5.2) at entry to 9.3 (±4.7) at two months, 7.3 (±5.5) at four months and 6.1 (±5.2) at six months, with interobserver correlation of 0.90[4]. Cut-offs of more than 13 for the Reflux Symptom Index and more than 7 for the Reflux Finding Score, or the inclusive variants of 13 or above and 7 or above used by other series — which are not equivalent, since a score of exactly 13 is normal under the first convention and abnormal under the second — are between them what recent trials of reflux therapy use to define eligibility; both forms are in current use and the choice between them is not a settled matter, as Section 3.6 sets out[5-7]. Their diagnostic performance against an objective reference standard is nonetheless modest. In a prospective multicentre study of 542 patients with reflux confirmed on 24-hour hypopharyngeal–oesophageal impedance–pH monitoring and 204 asymptomatic controls, a Reflux Symptom Index above 13 had a sensitivity of 59.7% and a specificity of 94.4% (area under the curve 0.936), while a Reflux Finding Score above 7 reached a sensitivity of only 31.3% and a specificity of 66.2% (area under the curve 0.617, 95% confidence interval 0.560 to 0.674)[8]. Those two operating points do not behave alike, and the difference is easy to miss. A Reflux Symptom Index above 13 carries a positive likelihood ratio of 10.7, so it argues strongly for reflux while a score below it argues for very little. A Reflux Finding Score above 7, on the figures above, carries a positive likelihood ratio of 0.93 and a Youden index of −2.5%; that operating point sits marginally below the chance diagonal, so a positive result at that cut-off adds nothing, even though the score read as a continuum discriminates weakly (area under the curve 0.617). The published cut-off is evidently not the optimal operating point on that curve, and the laryngoscopic score should be read as a description of the larynx rather than as a test for reflux.

Eustachian tube dysfunction is assessed with a comparable pair of tools and runs into a comparable difficulty. The Eustachian Tube Dysfunction Questionnaire-7 asks seven questions about pressure, pain, blockage, symptoms with a cold, crackling, tinnitus and muffled hearing, each on a 1 to 7 Likert scale, giving a total of 7 to 49; in the derivation cohort of 50 patients and 25 controls the mean item score was 4.0 (1.1) against 1.3 (0.3), and a total of 14.5 or a mean item score of 2.1 separated the groups completely[9]. That perfect separation was obtained in the same sample used to choose the cut-point, in a design that had deliberately excluded intermediate presentations, and later work in unselected populations has not reproduced it. A systematic review of 12 studies found sensitivities of 91% to 100% and specificities of 67% to 100% where the cohort had already been sorted by tympanometry, but sensitivities of 49% to 80% and specificities of 24% to 78% in the four studies that applied the questionnaire before any objective testing[10]. A retrospective analysis of 300 audiology-clinic patients found low sensitivity and specificity against a modified impedance-audiometric definition of dysfunction, and found that in patients reporting tinnitus the total score tracked the bothersomeness of that tinnitus rather than tubal function, a correlation that persisted even after the ringing-in-the-ears item had been removed from the total[11]. Objective and subjective measures of the Eustachian tube diverge repeatedly: among 85 patients with chronic rhinosinusitis assessed before sinus surgery, 36.5% — 31 of 85, as that percentage implies — scored 14 or more on the questionnaire, that study's own cut-off rather than the 14.5 applied throughout this report, yet the nine-step inflation–deflation maximal peak-pressure difference did not differ between the high-score and low-score groups (median 7.50 against 9.25 daPa, P = 0.187) and correlated with the questionnaire at r = −0.08[12]. In 107 ears assessed by video nasopharyngoscopy, questionnaire score and tympanogram type were not significantly associated (P = 0.058)[13].

Tympanometry is the one bedside measurement of middle-ear physiology available in almost every clinic, and it is habitually reduced to a letter. The convention classifies a curve as type C when the tympanometric peak pressure falls below −100 daPa, and this threshold is arbitrary, large, and — as has been argued directly — likely to be insensitive to precisely the milder obstructive dysfunction that a reflux-associated case presents with; reporting the absolute peak pressure has been proposed instead[14]. The letter also discards static compliance, although published objective definitions of obstructive Eustachian tube dysfunction use a peak compliance below 0.2 mL or a middle-ear pressure below −100 daPa as alternative criteria[10]. Peak pressure alone can also mislead in the opposite direction, in a cohort selected for having normal peak pressures throughout: the figures are given in Section 3.3[15].

The mechanistic case for connecting the two conditions is reasonably well developed, and is set out with its denominators in Section 3.2. In outline: pepsin and trypsin are recoverable from middle-ear effusion in a substantial minority of patients with chronic otitis media with effusion, at a neutral effusion pH that favours trypsin as the enzyme likely to be active there[16]; both enzymes are measurable in the effusion of children with adenoid hypertrophy, though adenoid tissue concentrations do not distinguish those with effusion from those without[17]; and pepsin, trypsin and mucin 5B have been proposed as risk factors for hearing impairment in reflux-related chronic secretory otitis media[18]. Clinically, a quantified endoscopic score of nasopharyngeal inflammation predicts tubal symptoms and a diagnosis of laryngopharyngeal reflux, while failing to predict tympanometric peak pressure in the same cohort[19],

and reflux symptom burden tracks tubal function in adults with effusion by an association that is statistically robust and quantitatively very small[20]. Two limits on that evidence are worth flagging at the outset, because they matter for the case that follows: almost all of it was obtained in ears that contained an effusion, and none of it was obtained serially through treatment.

What is much less developed is the temporal question. One single-arm series has followed the middle ear tympanometrically through antireflux treatment in adults; three further series bear on it, one of them a randomised comparison that selected patients by middle-ear pepsin or trypsin and reported a hearing outcome rather than a tympanometric one, discussed in Section 3.11. In a matched case–control study of 73 patients with reflux and no otological complaints against 73 controls, and with no treatment given, pure-tone audiometry showed impairment in 45 of 73 cases (61.64%) against 13 of 73 controls (17.81%, P < 0.001), and impedance audiometry was deranged in 40 of 73 (54.79%) against 5 of 73 (6.85%, P < 0.001)[21]. In 50 patients with reflux and asymptomatic middle-ear dysfunction treated for eight weeks, 72% of affected ears showed improved audiometric thresholds (P = 0.003), tympanograms reverted to normal in 38% of cases, and compliance increased over each successive visit (P < 0.001)[22]. In 110 analysed patients with both conditions given omeprazole 40 mg twice daily for eight weeks, the questionnaire total fell from 16.20 ± 10.47 to 10.40 ± 5.47 (P < 0.001)[23]. One caution applies to that pair of figures and to several others quoted in this report: these instruments have hard floors — 0 for the Reflux Symptom Index and the Reflux Finding Score, 7 for the Eustachian Tube Dysfunction Questionnaire-7 — and a mean minus one standard deviation frequently falls below them, as it does for both values above. The distributions are right-skewed and bounded, so the standard deviations quoted throughout should not be read as symmetric intervals around their means. All of them report end points. None reports the order in which the domains recovered, because none measured the ear and the laryngopharynx on the same intermediate timetable.

Novelty and aim. This report describes an adult in whom the laryngopharyngeal and the middle-ear domains were scored on the same three-visit schedule, and in whom they did not recover together. Three observations follow, which we have not found reported together for a patient in whom both domains were scored on the same schedule. First, the tympanometric peak pressures crossed the conventional −100 daPa boundary by week 4, while the Eustachian Tube Dysfunction Questionnaire-7 remained above its abnormality threshold and the Reflux Symptom Index sat exactly on its own — that is, the one objective middle-ear measure that was ever abnormal crossed its boundary before the patient's own ear symptom score did. The three-visit schedule establishes the order of those two crossings and not the interval between them: the pressure crossing happened somewhere in the first four weeks and the questionnaire crossing somewhere in the second four, so the lag is greater than zero and less than eight weeks and cannot be narrowed further. Second, the residual Reflux Finding Score at week 8 was not a smaller version of the baseline score but a compositionally different one, every erythema, ventricular-obliteration and mucus point having resolved while every remaining point was oedematous or hypertrophic. Third, we audit this record against the measurements the recent comparator literature uses as its own end points and report what was never obtained — most consequentially, an audiogram, in a man whose presenting complaints were ear fullness and tinnitus and who volunteered that his hearing sometimes felt muffled. The aim is therefore to describe the serial course; to re-express the tympanometric data as absolute peak pressures and static compliances against explicit published boundaries rather than as letters; to test whether the reflux and middle-ear domains moved in step; to state plainly what this single uncontrolled case can and cannot attribute to treatment; and to close with a numbered minimum data set for the next patient who presents this way.

2. Methods

Presenting complaint and history

A 34-year-old man attended the otorhinolaryngology–head and neck surgery outpatient clinic in late January 2026 with bilateral ear fullness and tinnitus that had begun in early January 2026. The symptoms were continuous with day-to-day fluctuation and, although intrusive, did not interrupt his work or sleep. He described a sensation of pressure inside both ears that was worst on swallowing, on waking, and at moments when his throat felt loaded with mucus. He denied severe otalgia, otorrhoea, rotatory vertigo, fever, aural trauma and any history of significant occupational or recreational noise exposure. He did not report frank hearing loss, although he volunteered that his hearing occasionally felt muffled.

He had no history of dyspepsia, epigastric pain, heartburn, acid vomiting or regurgitation, and did not identify himself as a patient with a stomach problem. Directed questioning nonetheless produced a coherent extra-oesophageal history: a persistent sensation of mucus in the throat, frequent throat clearing, and a sense of secretion dripping from the back of the nose. He denied significant hoarseness, odynophagia, dysphagia, dyspnoea, epistaxis, weight loss and neck swelling. There was no history of ear surgery, chronic otitis media, ventilation tube insertion, or prolonged use of topical otic preparations. He was not a smoker, took no regular medication, and had not used a proton pump inhibitor, an antacid or an antihistamine before this presentation.

Examination

Otoscopy showed normal external auditory canals bilaterally. Both tympanic membranes were intact with mild retraction, most evident in the pars tensa. There was no perforation, no acute hyperaemia, and no visible middle-ear effusion or air–fluid level. Anterior rhinoscopy showed mildly oedematous nasal mucosa carrying a small quantity of mucoid secretion; the septum was central and the inferior turbinates were not obstructive. Oropharyngeal examination showed no tonsillar enlargement and no sign of acute infection. Cranial nerve examination and neck palpation were unremarkable.

Fibreoptic laryngoscopy

Fibreoptic laryngoscopy at presentation showed mucoid secretion pooling in the nasopharynx, concentrated on the posterior nasopharyngeal wall and around the torus tubarius on both sides. In the larynx there was erythema confined to the arytenoids, partial ventricular obliteration, mild vocal fold oedema, moderate diffuse laryngeal oedema, moderate posterior commissure hypertrophy and thick endolaryngeal mucus; subglottic oedema and granulation were absent. Both vocal folds moved normally and fully. The narrative record of this examination names arytenoid erythema, posterior commissure oedema, posterior commissure hypertrophy and thick endolaryngeal mucus only; the description given here is the one that corresponds item-for-item to the Reflux Finding Score recorded at that examination, and the divergence between the two is declared in Section 3.10. No mass, ulcer or granulation was seen in the nasopharynx, hypopharynx or larynx. The serial laryngoscopic appearances across the three visits are illustrated in Figure 1, which also carries the Reflux Finding Score total recorded at each examination and its decomposition into inflammatory or secretory and oedematous or hypertrophic components. Taken together with the history, these findings raised laryngopharyngeal reflux with peritubal nasopharyngeal inflammation as the working explanation for the otological complaint.

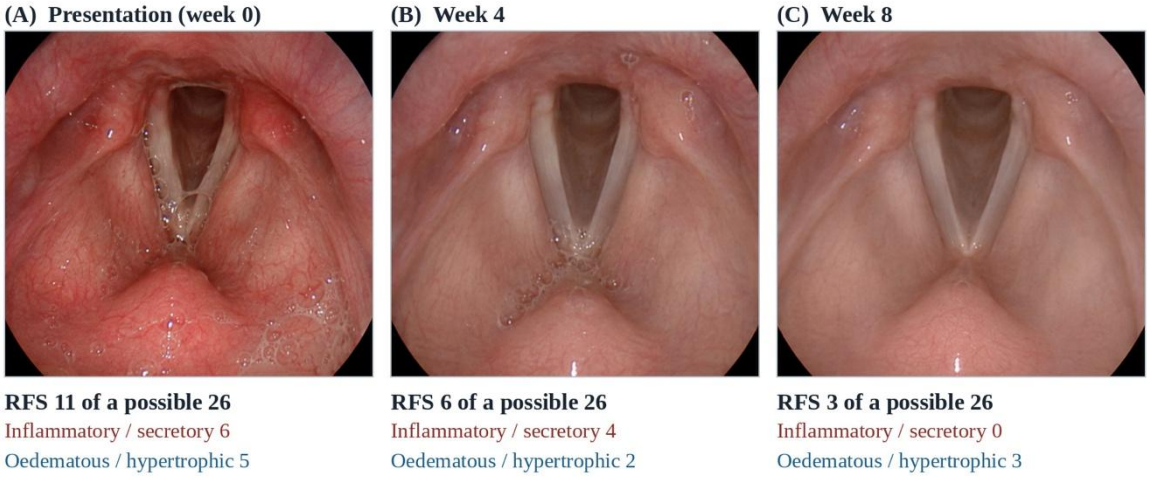

Figure 1. Serial fibreoptic laryngoscopy at presentation (A), week 4 (B) and week 8 (C). The Reflux Finding Score fell from 11 to 6 to 3 of a possible 26. Beneath each panel the total is decomposed into an inflammatory or secretory component (erythema or hyperaemia, ventricular obliteration and thick endolaryngeal mucus) and an oedematous or hypertrophic component (vocal fold oedema, diffuse laryngeal oedema and posterior commissure hypertrophy). The inflammatory component falls 6 → 4 → 0; the oedematous component falls 5 → 2 but then returns to 3, so that every point remaining at week 8 is an oedematous or hypertrophic one. Subglottic oedema and granulation scored zero throughout and are therefore not represented in either component. The images are unretouched apart from cropping; no facial feature is in frame and no patient identifier appears on any panel.

Diagnosis and treatment

The working diagnosis was laryngopharyngeal reflux with peritubal nasopharyngeal inflammation and secondary bilateral obstructive Eustachian tube dysfunction. Treatment was begun on the day of presentation and comprised four pharmacological components and a set of behavioural measures: sodium chloride 0.9% nasal irrigation twice daily; lansoprazole 30 mg once daily taken 30 minutes before breakfast; sodium alginate 10 mL after lunch and again at bedtime; and acetylcysteine 200 mg orally three times daily after meals. He was advised to avoid eating late at night and to leave at least two hours between his last meal and lying down, to reduce spicy, acidic and fatty food, coffee and carbonated drinks, and to increase his fluid intake. Reassessment was arranged at four and eight weeks, with the full instrument battery and tympanometry to be repeated on each occasion. The complete sequence of events from symptom onset to the final assessment, including the composition of this regimen, is shown in Figure 2. The rationale for each component, and what this case can and cannot credit it with, is examined in Section 3.7.

3. Results

Instrument scores at presentation

The Reflux Symptom Index at presentation was 24 of a possible 45. The item-by-item scores are detailed in Table 1, which groups them into the eight extra-oesophageal items and the single gastro-oesophageal item and gives the change across the eight weeks for each. The dominant complaints were excess mucus or postnasal drip and globus sensation, each scoring 5, followed by frequent throat clearing at 4, and coughing after eating or lying down and troublesome cough, each at 3. The ninth item — heartburn, chest pain or regurgitation — scored zero, and it scored zero at every subsequent visit. The entire baseline total was therefore carried by the eight extra-oesophageal items, whose combined maximum is 40; 24 of that 40, or 60.0%, was reached without a single gastro-oesophageal point. This is the pattern the impedance–pH literature would predict, in which isolated laryngopharyngeal reflux is the largest single category among patients tested[1].

Table 1. Reflux Symptom Index at each visit, item by item, grouped into the extra-oesophageal and gastro-oesophageal items, with the change across the eight weeks (each item scored 0 to 5; total range 0 to 45).

Item	Week 0	Week 4	Week 8	Change, week 0 to 8
Extra-oesophageal items (combined maximum 40)				
Hoarseness or a problem with the voice	2	1	0	−2
Clearing the throat	**4**	2	1	−3
Excess throat mucus or postnasal drip	**5**	3	2	−3
Difficulty swallowing food, liquids or tablets	1	0	0	−1
Coughing after eating or after lying down	3	2	1	−2
Breathing difficulty or choking episodes	1	0	0	−1
Troublesome or annoying cough	3	1	0	−3
Sensation of something sticking in the throat	**5**	**4**	2	−3
Gastro-oesophageal item (maximum 5)				
Heartburn, chest pain, indigestion or acid coming up	0	0	0	0
Total Reflux Symptom Index	**24**	**13**	**6**	**−18**

* Values printed in bold are item scores of 4 or 5, that is, the upper third of the 0 to 5 item range, and the total where it exceeds the abnormality cut-off of 13 in general use. The week-4 total of 13 is not printed in red because 13 is not above 13; it lies exactly on the boundary and is discussed as such in Section 3.6. † The gastro-oesophageal item scored zero at all three visits, so the whole of the baseline total of 24 was carried by the eight extra-oesophageal items, whose combined maximum is 40. ‡ The fall of 11 points between week 0 and week 4, and of 18 points between week 0 and week 8, both exceed the minimal clinically important difference of 8 points derived for this instrument in 351 patients with reflux confirmed on impedance–pH monitoring.

The Reflux Finding Score at presentation was 11 of a possible 26, well above the cut-off of 7 in general use. The distribution of those 11 points is set out in Table 2, which also groups six of the eight items into the two components used in Figure 1, the remaining two having scored zero throughout. Six points came from inflammatory or secretory items — ventricular obliteration 2, erythema or hyperaemia 2, and thick endolaryngeal mucus 2 — and five from oedematous or hypertrophic items: vocal fold oedema 1, diffuse laryngeal oedema 2 and posterior commissure hypertrophy 2. Subglottic oedema and granulation or granulation tissue scored zero at every visit.

Table 2. Reflux Finding Score at each visit, item by item, grouped by component (total range 0 to 26).

Item	Item range	Week 0	Week 4	Week 8	Change, 0 to 8
Inflammatory or secretory component					
Erythema or hyperaemia	0, 2 or 4	**2**	**2**	0	−2
Ventricular obliteration	0, 2 or 4	**2**	0	0	−2
Thick endolaryngeal mucus	0 or 2	**2**	**2**	0	−2
Inflammatory / secretory subtotal	**0 to 10**	**6**	**4**	**0**	**−6**
Oedematous or hypertrophic component					
Vocal fold oedema	0 to 4	1	0	1	0
Diffuse laryngeal oedema	0 to 4	**2**	1	1	−1
Posterior commissure hypertrophy	0 to 4	**2**	1	1	−1
Oedematous / hypertrophic subtotal	**0 to 12**	**5**	**2**	**3**	**−2**
Items scoring zero at every visit					
Subglottic oedema	0 or 2	0	0	0	0
Granuloma or granulation tissue	0 or 2	0	0	0	0
Total Reflux Finding Score	**0 to 26**	**11**	**6**	**3**	**−8**

* Values printed in bold are item scores of 2 or more and the total where it exceeds the abnormality cut-off of 7 in general use. The two subtotal rows are never marked, whatever their value, because the components are a grouping used here rather than part of the published instrument and have no published cut-off of their own. † The two components are not part of the published instrument; they are a grouping used here and in Figure 1 to show that the residual score at week 8 is compositionally different from the baseline score rather than a smaller version of it. Every point remaining at week 8 is an oedematous or hypertrophic one. ‡ Vocal fold oedema is the one item that does not fall monotonically: it is scored 1, then 0, then 1. It is reported exactly as recorded and is not smoothed. § Erythema or hyperaemia is scored 2 for change confined to the arytenoids and 4 for diffuse change, so the descriptors 'moderate' at week 0 and 'mild' at week 4 that accompany the endoscopic record both map to the same score of 2.

The Eustachian Tube Dysfunction Questionnaire-7 total was 28 of a possible 49, giving an item mean of 4.00. Both figures were far above the published abnormality thresholds of a total of 14.5 or an item mean of 2.1[9]. The item scores are tabulated in Table 3, which also carries the item mean to two decimal places at each visit. Three items scored 5 — the clogged-ear sensation, ringing in the ears, and the feeling that hearing was muffled or the ear full — with pressure in the ears and crackling, popping or clicking sounds at 4 each. The item mean of 4.00 is, by coincidence, exactly the mean item score of the 50 patients in the questionnaire's own derivation cohort[9].

Table 3. Eustachian Tube Dysfunction Questionnaire-7 at each visit, item by item, with the total and the derived item mean at each visit (each item scored 1 to 7; total range 7 to 49).

Item	Week 0	Week 4	Week 8	Change, week 0 to 8
Pressure in the ears	**4**	2	1	−3
Pain in the ears	2	1	1	−1
A feeling that the ears are clogged or under water	**5**	3	1	−4
Ear symptoms when you have a cold or sinusitis	3	2	1	−2
Crackling, popping or clicking sounds in the ears	**4**	2	1	−3
Ringing in the ears	**5**	3	2	−3
A feeling that hearing is muffled or the ear is full	**5**	3	1	−4
Total score (floor 7, ceiling 49)	**28**	**16**	**8**	**−20**
Item mean (floor 1.00, ceiling 7.00)	**4.00**	**2.29**	**1.14**	**−2.86**

* Values printed in bold are item scores of 4 or more, that is, moderate or worse on the 1 to 7 severity scale, and the total and item mean at any visit at which they remain at or above the published abnormality thresholds of 14.5 and 2.1 respectively. † Both the week-0 and the week-4 totals and item means are therefore abnormal; only at week 8 does the instrument return to the normal range. This is the single measure in the whole battery that was still abnormal at week 4. ‡ Item means are printed here to two decimal places (28/7, 16/7 and 8/7) rather than to the one decimal place used in the source record, so that each is reproducible by division from the item scores printed above it. § A total of 8 at week 8 is one point above the instrument's arithmetic floor of 7, which is reached only when every one of the seven items is answered 'no problem'.

Tympanometric and audiological assessment

Tympanometry at presentation showed a tympanometric peak pressure of −185 daPa in the right ear and −165 daPa in the left. Static peak compliance was 0.42 mL on the right and 0.45 mL on the left, and ear canal volume was 1.1 mL on the right and 1.0 mL on the left. Both curves were reported as type C. The normal canal volumes are worth stating explicitly, because they exclude tympanic membrane perforation and gross canal abnormality as explanations for the tracings, and because they remained identical at all three visits, which makes the serial compliance values directly comparable to one another. The complete serial dataset — otoscopy, nasopharyngeal and laryngeal endoscopy, and all three tympanometric parameters for each ear at each visit — is presented in Table 4.

No pure-tone audiogram was obtained, at this visit or at either follow-up visit. No air–bone gap was therefore measured, no speech audiometry was performed, and the tinnitus was not scored on any validated tinnitus-specific instrument; it was captured only as one of the seven Eustachian Tube Dysfunction Questionnaire-7 items. These omissions are recorded as such in Table 4 rather than left implicit, and they are taken up in the audit of the record in Section 3.11. The combination of bilateral ear fullness and tinnitus, mild pars tensa retraction on otoscopy, an abnormal Eustachian Tube Dysfunction Questionnaire-7 score, and bilateral negative middle-ear pressure with normal canal volumes was taken as sufficient for a working diagnosis of bilateral obstructive Eustachian tube dysfunction.

Reassessment at week 4

At four weeks the patient reported that ear fullness had decreased by approximately 50% to 60%, that tinnitus was less frequent, and that the sensation of mucus in the throat had improved. Fibreoptic laryngoscopy showed reduced nasopharyngeal secretion, improvement in posterior commissure oedema, reduced arytenoid erythema, and less endolaryngeal mucus; the week-4 appearance is the middle panel of Figure 1. The Reflux Symptom Index had fallen from 24 to 13, as the second data column of Table 1 records; the Reflux Finding Score from 11 to 6, tabulated item by item in Table 2; and the Eustachian Tube Dysfunction Questionnaire-7 from 28 to 16 with an item mean of 2.29, recorded in the notes as 2.3; the item-level detail is given in Table 3.

Tympanometry at four weeks gave a peak pressure of −95 daPa on the right and −85 daPa on the left, with static compliance of 0.48 mL and 0.50 mL and unchanged canal volumes; these are the middle points of panels B and C of Figure 3. The source record described these tracings as a mild or borderline type C pattern. Both values in fact lie above the −100 daPa boundary that conventionally separates type C from type A, and would ordinarily be reported as type A[14]; this discrepancy is one of eight issues declared in Section 3.10, and the numerical values rather than the letters are what Table 4 and Figure 3 carry. The

clinically important point is not the letter but the pattern of the four-week visit taken as a whole: both peak pressures had already returned to the normal range and both compliances had risen, while the Eustachian Tube Dysfunction Questionnaire-7 total of 16 and item mean of 2.29 both remained above their abnormality thresholds and the Reflux Symptom Index of 13 sat exactly on its own. Which measures had and had not crossed their thresholds at each visit is tabulated explicitly in Table 5, and the corresponding week-4 values for the comparable published series are presented in Table 6.

Table 4. Complete serial dataset: otoscopy, endoscopy, tympanometry, patient-reported ear symptoms and the audiological measures that were not obtained.

Parameter	Side	Week 0	Week 4	Week 8
Otoscopy and endoscopy				
Tympanic membrane	R + L	Intact, mild pars tensa retraction, no effusion	Intact, retraction less marked	Intact, retraction not described
Nasopharyngeal endoscopy	—	Mucoid secretion on the posterior wall and around the torus tubarius	Reduced secretion; calmer mucosa	Minimal secretion; clean nasopharynx
Laryngeal endoscopy	—	Arytenoid erythema, posterior commissure oedema and hypertrophy, thick endolaryngeal mucus	**Reduced oedema and erythema; endolaryngeal mucus described as minimal, though scored unchanged**	Minimal inflammatory sign; mild residual vocal fold oedema, diffuse laryngeal oedema and posterior commissure hypertrophy, one point each
Tympanometry — right ear				
Peak pressure (daPa)	R	**−185**	−95	−25
Static peak compliance (mL)	R	0.42	0.48	0.62
Ear canal volume (mL)	R	1.1	1.1	1.1
Curve type as recorded	R	Type C	**Mild or borderline type C**	Type A
Tympanometry — left ear				
Peak pressure (daPa)	L	**−165**	−85	−20
Static peak compliance (mL)	L	0.45	0.50	0.60
Ear canal volume (mL)	L	1.0	1.0	1.0
Curve type as recorded	L	Type C	**Mild or borderline type C**	Type A
Audiological measures				
Pure-tone audiometry, air conduction	R + L	Not recorded	Not recorded	Not recorded
Pure-tone audiometry, bone conduction, and air–bone gap	R + L	Not recorded	Not recorded	Not recorded
Speech audiometry	R + L	Not recorded	Not recorded	Not recorded
Validated tinnitus-specific instrument	R + L	Not recorded	Not recorded	Not recorded
Patient-reported ear symptoms				
Ear fullness	R + L	Persistent, intrusive	Decreased by approximately 50% to 60%	Almost absent
Tinnitus	R + L	Frequent	Less frequent	Occasional, not troublesome

* Values printed in bold are peak pressures below the −100 daPa boundary conventionally used to define a type C curve, the recorded curve descriptions that conflict with the measured value, and the week-4 endoscopic descriptor that conflicts with the score recorded at the same examination. The incompleteness of the presenting free-text description relative to its own score is a different matter and is declared separately in Section 3.10. At week 4 the measured peak pressures of −95 daPa and −85 daPa lie above that boundary and would ordinarily be reported as type A; the record's description of them as a mild or borderline type C pattern is therefore printed in red as a declared discrepancy, not as an abnormal measurement.

† Cells shaded grey and marked 'Not recorded' denote measurements that were not obtained at any visit. They are shown rather than omitted, because the absence of an audiogram is itself a finding of this report.

‡ Ear canal volume was identical at all three visits in each ear, which excludes tympanic membrane perforation and makes the serial static compliance values directly comparable within each ear. It does not establish that the same tympanometer, probe-tone frequency or pump rate was used at every visit, none of which the record states; the final item of the minimum data set. R, right ear; L, left ear; R + L, both ears; —, not applicable to a single side; daPa, decapascal; mL, millilitre.

§ 'Decreased by approximately 50% to 60%' is the patient's own global impression as recorded. No visual analogue scale or other quantitative symptom measure was used, and this entry is not treated as a measurement anywhere in this report.

Reassessment at week 8

At eight weeks the patient reported that ear fullness was almost entirely absent, that tinnitus occurred only occasionally and no longer troubled him, and that the sensation of throat mucus had markedly decreased. Fibreoptic laryngoscopy showed a clean nasopharynx with minimal secretion, no thick endolaryngeal mucus and no residual inflammatory sign, with mild residual vocal fold oedema, diffuse laryngeal oedema and posterior commissure hypertrophy scoring one point each; this is the right-hand panel of Figure 1. The Reflux Symptom Index had fallen to 6, the Reflux Finding Score to 3, and the Eustachian Tube Dysfunction Questionnaire-7 to 8 with an item mean of 1.14, recorded in the notes as 1.1 — one point above the instrument's arithmetic floor of 7. The final columns of Tables 1, 2 and 3 give the change in each individual item across the eight weeks, and the end points reached here are placed alongside those of the comparable published series in Table 6.

Tympanometry at eight weeks showed a peak pressure of −25 daPa on the right and −20 daPa on the left, with static compliance of 0.62 mL and 0.60 mL and canal volumes unchanged at 1.1 and 1.0 mL. Both tracings were reported as type A. Across the eight weeks the right-sided peak pressure moved by 160 daPa and the left by 145 daPa, of which 90 daPa (56.3%) and 80 daPa (55.2%) respectively had occurred by week 4. Static compliance rose by 0.20 mL on the right, a relative increase of 47.6%, and by 0.15 mL on the left, a relative increase of 33.3%, against an unchanged enclosed canal volume in each ear. The complete serial course of every measure, with the treatment and both reassessments dated, is illustrated in Figure 2, and the trajectories of the three instrument scores and of both tympanometric parameters against their published boundaries are plotted in Figure 3.

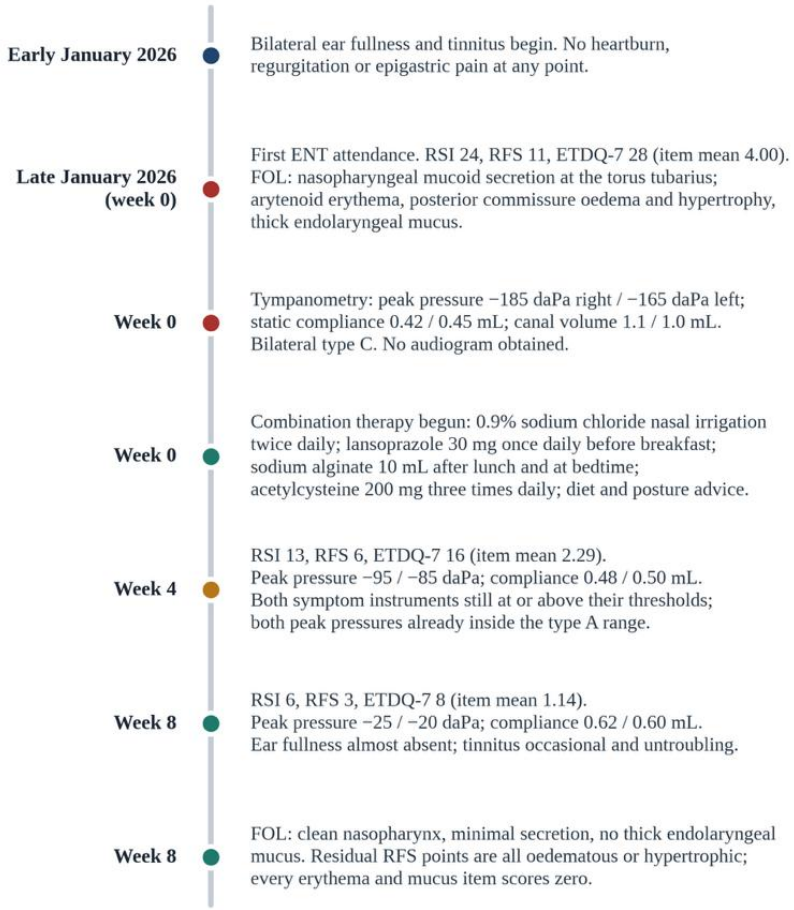

Figure 2. Clinical timeline from symptom onset to the week-8 reassessment. The presentation node carries the three instrument totals with the questionnaire item mean, the fibreoptic laryngoscopic findings in words, and for each ear the tympanometric peak pressure, the static peak compliance, the ear canal volume and the recorded curve type, with an explicit marker that no audiogram was obtained at any visit. The treatment node lists all five components with their doses. The week-4 and week-8 nodes carry the three instrument totals with the item mean and both peak pressures and compliances, and the week-8 node the laryngoscopic findings in words. All week labels are counted from the first otorhinolaryngology attendance in late January 2026, not from symptom onset in early January 2026; the interval between the two is approximately three to four weeks, known only to within about a week either way, and is treated as such throughout. FOL, fibreoptic laryngoscopy; RSI, Reflux Symptom Index; RFS, Reflux Finding Score; ETDQ-7, Eustachian Tube Dysfunction Questionnaire-7. Every other quantity, unit and dosing interval is spelled out inside the figure.

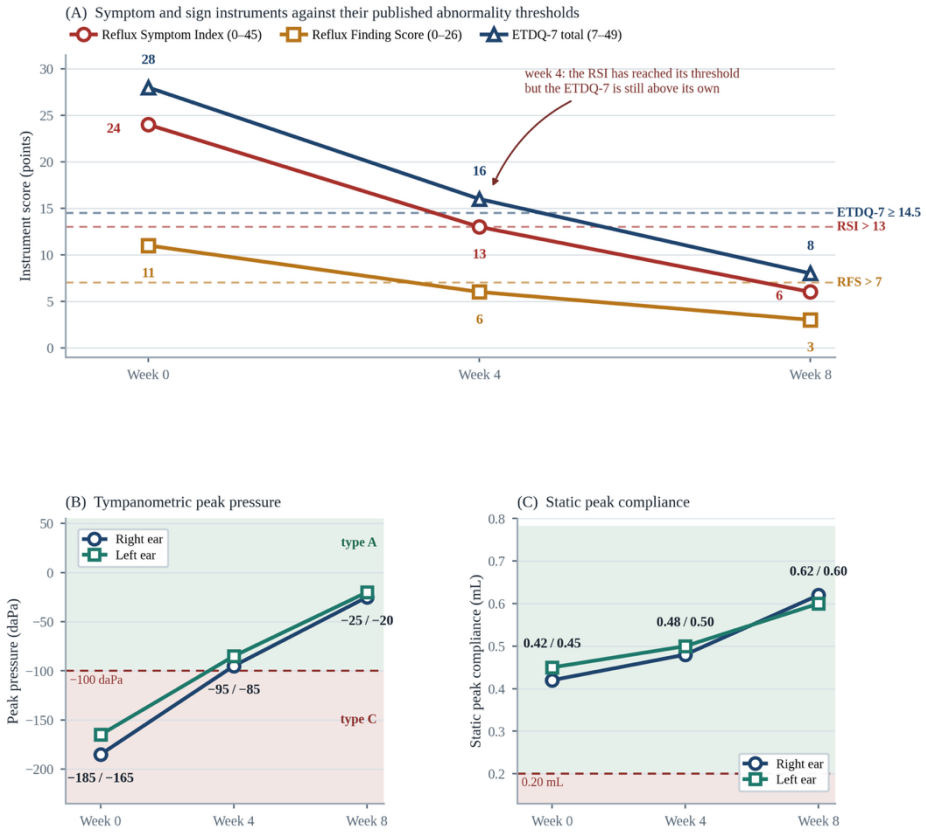

Figure 3. Trajectories of every serial measure against explicit published boundaries. (A) The three instrument totals, each with its own abnormality threshold drawn as a dashed line of the same colour: Reflux Symptom Index above 13, Reflux Finding Score above 7, and Eustachian Tube Dysfunction Questionnaire-7 total of 14.5 or more. At week 4 the Reflux Symptom Index lies exactly on its threshold and the Eustachian Tube Dysfunction Questionnaire-7 remains above its own; only by week 8 are all three below. (B) Tympanometric peak pressure for both ears; the shaded division is the −100 daPa boundary conventionally separating type C from type A, and both ears have crossed it by week 4. (C) Static peak compliance for both ears against a 0.20 mL lower bound, which is the static-compliance criterion offered as an alternative to the −100 daPa pressure criterion in the published objective definition of obstructive Eustachian tube dysfunction; neither ear ever approached it, and both rose steadily. Each week in panels B and C carries a single paired label, drawn beside the upper of the two markers, giving the right-ear value and then the left-ear value separated by a solidus. Ear canal volume, which was unchanged at every visit, is not plotted.

Table 5. Where each measure stood relative to its own published threshold at each visit.

Measure	Threshold applied	Week 0	Week 4	Week 8	First normal
Reflux Symptom Index	Abnormal above 13	**24**	13, exactly on the boundary	6	Week 4 on the exclusive convention; week 8 on the inclusive
Reflux Finding Score	Abnormal above 7	**11**	6	3	Week 4
Eustachian Tube Dysfunction Questionnaire-7, total	Abnormal at 14.5 or above	**28**	**16**	8	Week 8
Eustachian Tube Dysfunction Questionnaire-7, item mean	Abnormal at 2.1 or above	**4.00**	**2.29**	1.14	Week 8
Tympanometric peak pressure, right ear	Type C below −100 daPa	**−185**	−95	−25	Week 4
Tympanometric peak pressure, left ear	Type C below −100 daPa	**−165**	−85	−20	Week 4
Static peak compliance, right ear	Abnormal below 0.2 mL	0.42	0.48	0.62	Week 0
Static peak compliance, left ear	Abnormal below 0.2 mL	0.45	0.50	0.60	Week 0

* Values printed in bold are those beyond the abnormality threshold given in the adjacent column. The two Eustachian Tube Dysfunction Questionnaire-7 thresholds are inclusive, but neither can be met exactly: a total of seven integer items cannot equal 14.5, and an item mean of 2.1 would require a total of 14.7. Every red mark in those two rows is therefore strictly above its threshold. The week-4 Reflux Symptom Index of 13 is not printed in red because the cut-off is 'above 13' and 13 is not above 13; it is nonetheless recorded as lying exactly on the boundary rather than as unambiguously normal.

† The one objective middle-ear measure that was ever abnormal had crossed its boundary by week 4; static compliance never crossed one, because it was never abnormal; and the two patient-reported ear measures are the latest. Every entry in this table is a restatement of Tables 1 to 4; no new value is introduced here.

‡ Static peak compliance never fell below 0.2 mL, which in the published objective definition of obstructive Eustachian tube dysfunction is an alternative criterion to a middle-ear pressure below −100 daPa rather than an additional one; this was true at presentation as well as at both follow-up visits. The finding in this domain is therefore the serial rise in compliance, not the absolute level.

Reconciliation of the recorded data

Every instrument total quoted above was recomputed from its own item scores before use. The Reflux Symptom Index items sum to 24, 13 and 6; the Reflux Finding Score items to 11, 6 and 3; and the Eustachian Tube Dysfunction Questionnaire-7 items to 28, 16 and 8, giving item means of 4.000, 2.286 and 1.143, quoted throughout this report to two decimal places as 4.00, 2.29 and 1.14 and recorded in the notes to one as 4.0, 2.3 and 1.1. All three sets of totals reconcile exactly with the item-level data presented in Tables 1, 2 and 3; the tympanometric and audiological entries in Table 4 are transcribed unchanged from the tympanometry reports; Table 5 and Figure 3 restate those same values against their thresholds and introduce no new ones; and no arithmetic correction was required to any instrument total or item mean. Eight points on which the source record or the sources drawn on are internally inconsistent, ambiguous or imprecise are declared and handled in Section 3.10. The patient gave written informed consent for the publication of this report and of the laryngoscopic images reproduced in Figure 1.

4. Discussion

A diagnosis built entirely on extra-oesophageal evidence

The most striking feature of this presentation is what was absent from it. The patient had no heartburn, no regurgitation, no epigastric pain and no history of dyspepsia, and he scored zero on the ninth item of the Reflux Symptom Index at every one of the three visits, as the gastro-oesophageal row of Table 1 shows. Had the diagnosis been sought through gastro-oesophageal symptoms it would not have been made. This is not an unusual configuration. In 437 patients investigated with simultaneous 24-hour hypopharyngeal impedance–pH monitoring, the largest single category was isolated laryngopharyngeal reflux without gastro-oesophageal reflux disease, accounting for 248 patients (56.75%), against 98 (22.43%) with both conditions, 68 (15.56%) with neither and 23 (5.26%) with gastro-oesophageal reflux disease alone[1]. In a separate prospective series of 128 patients with persistent laryngeal symptoms, heartburn was documented in 52 (40.63%) in that paper's symptom-prevalence table, against 72 (56.25%) in its own running text[2], and in a cohort of 78 treated patients with chronic tonsillitis and reflux the heartburn, chest pain or indigestion item nonetheless fell from a mean of 3.10 to 1.62 with treatment, showing how variably that item behaves between populations[24].

What made the diagnosis available was a directed extra-oesophageal history and a laryngoscopic examination. Excess mucus or postnasal drip and globus each scored 5 of 5 at presentation and throat clearing scored 4, as the red-marked cells of Table 1 show, so that 24 of the 40 points available from the eight extra-oesophageal items — 60.0% — had accrued without a single gastro-oesophageal point as the extra-oesophageal block of Table 1 records. The laryngoscopic findings illustrated in Figure 1 and scored item by item in Table 2 supplied a Reflux Finding Score of 11, well above the cut-off of 7 in general use — a finding whose corroborative weight is slight, for the likelihood-ratio reason given in Section 1, and which is reported here as a description of the larynx rather than as a positive test for reflux. Neither instrument, however, is a strong diagnostic test. In a prospective multicentre accuracy study comparing 542 patients with impedance–pH-confirmed reflux against 204 asymptomatic controls, a Reflux Symptom Index above 13 achieved a sensitivity of 59.7% and a specificity of 94.4%, while a Reflux Finding Score above 7 achieved a sensitivity of only 31.3% and a specificity of 66.2%, with an area under the curve of 0.617 (95% confidence interval 0.560 to 0.674)[8]. Agreement between the Reflux Symptom Index and salivary pepsin testing has been reported as a weighted kappa of 0.03 (P = 0.694) in one small series[25], and in another the Peptest showed a sensitivity of 33% against a reference standard of one or more hypopharyngeal reflux episodes[26]. In practical terms this patient's scores make reflux the most probable explanation but do not establish it, and no objective reflux measurement was ever performed. That limitation is carried explicitly into the minimum data set proposed in Table 7.

Had an objective measurement been wanted, the options are not exotic. Twenty-four-hour hypopharyngeal–oesophageal impedance–pH monitoring remains the reference standard but is invasive and unavailable in most clinics. Salivary pepsin assays are the practical alternative and their performance is now reasonably well characterised, although the published cut-offs vary roughly sevenfold and are assay-specific. No series in Table 6 performed one, although the acid-suppression trial discussed in Section 3.11 selected its patients by Western blot for pepsin or trypsin in middle-ear effusion. A fasting hypopharyngeal salivary pepsin test in 56 patients with confirmed reflux against 47 asymptomatic controls gave an optimal cut-off of 29.62 ng/mL, an area under the curve of 0.767, a sensitivity of 51.8% and a specificity of 93.6%[27]; a smaller study of 40 participants reported an area under the curve of 0.870 and a Cohen's kappa of 0.699 against impedance–pH monitoring at a cut-off of 219.47 ng/mL[28]; and a lateral-flow device applied once to each of 120 patients was positive in 82, printed by the source as 68.1% and recomputing to 68.3%, with 63 of those 82 (76.8%) responding to a four-week trial of acid suppression with a prokinetic[29]. A single fasting sample is a lower bound on positivity, since the same authors note that repeated sampling raises the yield. Only the first of the three reports a specificity at all; the second reports discrimination and agreement, and the third a positivity rate. What the accessible figures support is the sensitivity claim — these assays miss roughly half of confirmed cases at best, and the

Peptest sensitivity of 33% quoted in the preceding paragraph is lower still — while the specificity claim rests on a single study. A positive test would nonetheless have been informative here in a way a negative one would not. In a patient in whom the whole causal argument rests on reflux reaching the nasopharynx, a positive result would have been worth having, and it is item 6 of Table 7 for that reason.

From the laryngopharynx to the torus tubarius: what the mechanism can carry

The proposed pathway is anatomically short. Refluxate reaching the laryngopharynx can reach the nasopharynx, where the pharyngeal orifice of the Eustachian tube lies within the torus tubarius, and the mucosa there has no barrier comparable to the oesophageal epithelium. Inflammation and oedema at that site, together with an increased load of viscid secretion, would be expected to impair the periodic opening on which middle-ear ventilation depends, and the tympanic cavity would then develop the negative pressure that this patient's tympanograms recorded. The endoscopic finding most consistent with that account — mucoid secretion pooling around the torus tubarius specifically — was present at presentation and had cleared by week 8, as the nasopharyngeal endoscopy row of Table 4 records and as the timeline in Figure 2 dates.

Biochemical support is real but qualified. Pepsin and trypsin have been recovered from middle-ear effusion in 107 of 270 patients (39.63%) with chronic otitis media with effusion, and in those 107 the median effusion pH was a neutral 7.4 (interquartile range 7.1 to 7.6 in the 57 children and 7.1 to 7.7 in the 50 adults), which argues that trypsin rather than pepsin is the enzyme likely to be active at that site[16]. In children undergoing adenoidectomy, effusion concentrations of pepsin and trypsin were 157.30 ± 182.59 and 1144.79 ± 1302.85 ng/mL respectively, although adenoid tissue concentrations did not distinguish those with effusion from those without — a negative result that the same authors state plainly[17]. Pepsin, trypsin and mucin 5B have been reported as independent risk factors for hearing impairment in reflux-related chronic secretory otitis media and to correlate with the Eustachian Tube Dysfunction Questionnaire-7, although no quantitative result is recoverable from the accessible record of that study[18]. Clinically, among 414 rhinology patients an endoscopic score of nasopharyngeal inflammation carried an adjusted odds ratio of 1.72 per point (95% confidence interval 1.46 to 2.05) for clinically significant tubal symptoms, and those with such symptoms had an adjusted odds ratio of 2.71 (95% confidence interval 1.24 to 6.18) of carrying a diagnosis of laryngopharyngeal reflux[19].

Two findings should restrain the enthusiasm. In the tympanometry subset of that same 414-patient study the endoscopic inflammation score was **not** associated with tympanometric peak pressure at all[19]. And in 105 adults with otitis media with effusion, each additional Reflux Symptom Index point was associated with a fall of only 0.112 tubomanometry points (standard error 0.03, $P < 0.001$) across 145 affected ears, in a model explaining 8.7% of the variance, in a cohort whose mean Reflux Symptom Index was 5.1 ± 5.8 and therefore far below any diagnostic threshold[20]. The association between reflux burden and tubal function is statistically real and quantitatively small. A third restraint applies to the whole of the biochemical argument and should be stated rather than left for a reader to notice. Every enzyme study cited above sampled middle-ear effusion, and no effusion was ever recorded in this patient: otoscopy showed none at presentation and none was described at either follow-up visit, and static compliance was above its criterion throughout. Those data therefore establish that refluxate constituents can reach the middle ear in patients who have an effusion, and they do not establish that anything had reached this patient's. The mechanistic argument here rests on peritubal inflammation seen endoscopically and on nothing that was measured biochemically, and it should be read at that strength. In this patient the association is temporal and internally consistent, but a single case cannot upgrade a small population-level association into a causal mechanism, and it is not offered as doing so.

Reading the tympanogram as a number rather than as a letter

The convention that classifies a tympanogram as type C when the peak pressure falls below −100 daPa is arbitrary and coarse. It has been argued directly that this threshold, useful to earlier generations for detecting severe chronic middle-ear disease requiring surgery, is likely insensitive to subtle abnormalities including some presentations of obstructive Eustachian tube dysfunction, and that diagnostic accuracy may be improved by reporting the absolute values of tympanometric peak pressure[14]. This case supplies a concrete demonstration of the cost of the letter. At week 4 the recorded peak pressures were −95 daPa and −85 daPa, and the source record described them as a mild or borderline type C pattern. Both values lie on the type A side of the conventional boundary. The boundary itself is not merely a textbook convention: a recent randomised trial of balloon dilation classifies its tympanograms as type A from 100 to −99 daPa, type C1 from −100 to −199 daPa and type C2 at −200 daPa or below[30], which places this patient's baseline tracings of −185 and −165 daPa in type C1 and both week-4 tracings in type A. Under the letter convention the week-4 tracings were ambiguous; under the number they lay on the type A side of the conventional boundary, and the substantive event — the crossing of that boundary — had already happened by week 4, not between weeks 4 and 8. One qualification belongs here and is not comfortable. The boundary being crossed is the same one criticised at the head of this section as insensitive to milder obstructive dysfunction, so this report is in the position of relying on a threshold it does not itself

defend. What is claimed is the crossing, which is an event on a stated scale, and not a finding that the middle ear was physiologically normal at week 4: at −95 daPa against a baseline of −185 and an eventual −25, the right ear had travelled 90 of the 160 daPa it would eventually cover and the left 80 of 145, so a little under half the total distance still remained at the four-week visit, the visit at which the boundary was found to have been crossed. The transition that the case appears at first reading to demonstrate over eight weeks is in fact a transition that occurred within the first four, followed by a further four weeks of movement entirely inside the normal range.

Expressed as numbers, the right ear moved 160 daPa and the left 145 daPa in total, of which 90 daPa (56.3%) and 80 daPa (55.2%) respectively had occurred by week 4. Panel B of Figure 3 plots this directly against the −100 daPa boundary; the underlying values are tabulated in Table 4, and Table 5 states for each measure the visit at which it first entered its normal range. The letter would have recorded a single categorical change somewhere between weeks 0 and 8; the numbers record a continuous recovery that was slightly more than half complete at the halfway visit and that crossed the diagnostic boundary at that same visit. This distinction is not pedantry. A clinician reviewing a borderline type C tracing at four weeks might reasonably consider the treatment to have failed and escalate; a clinician reading −95 daPa against a baseline of −185 daPa would not.

Peak pressure can also mislead in the opposite direction, and it is worth stating that here rather than leaving the impression that a normal number excludes disease. Among 124 patients with unilateral symptomatic Eustachian tube dysfunction who were selected for having type A tympanograms, raw peak pressure did not differ between the affected and the unaffected ear at all; only the pressure shift between the Valsalva and Toynbee manoeuvres separated them, and only within the subgroup that subsequently responded to balloon dilation[15]. A normal peak pressure is compatible with symptomatic tubal dysfunction, which is one reason a direct test of tubal opening appears as item 3 of Table 7.

Static compliance: the parameter that was recorded and never read

The tympanometry report in this case contained three numbers per ear per visit, and only one of them was interpreted. Static peak compliance rose from 0.42 to 0.48 to 0.62 mL on the right and from 0.45 to 0.50 to 0.60 mL on the left — an absolute rise of 0.20 mL and a relative rise of 47.6% on the right, and of 0.15 mL and 33.3% on the left, as the compliance rows of Table 4 set out and as panel C of Figure 3 plots. Ear canal volume was 1.1 mL on the right and 1.0 mL on the left at every visit, so the enclosed volume against which each compliance was measured did not change, and the serial values are directly comparable within each ear. The record notes these figures and makes nothing of them.

They are worth something, and Table 5 records that this was the one domain that was never abnormal at any visit. Static compliance is not a redundant restatement of peak pressure: published objective definitions of obstructive Eustachian tube dysfunction offer a peak compliance below 0.2 mL or a middle-ear pressure below −100 daPa as alternative criteria[10], and this patient met the pressure criterion at presentation while never approaching the compliance criterion, at any visit. The clinically informative fact is therefore not the level but the trajectory: compliance rose steadily and substantially while the pressure recovered. That combination — mounting compliance alongside recovering pressure — is what was reported in the closest comparable series, in which 50 patients with reflux and asymptomatic middle-ear dysfunction treated for eight weeks showed tympanometric reversion to normal in 38% of cases and increasing compliance over each successive visit ($P < 0.001$)[22]. That study expressed its 72% threshold-improvement figure per affected ear and its 38% reversion figure per case, and the number of affected ears is not stated in its accessible record, so neither figure can be restated on a common denominator; the qualitative parallel with the present case, which is tabulated in the first row of Table 6, is nonetheless direct.

The residual score is not a smaller version of the baseline score

The Reflux Finding Score fell from 11 to 6 to 3, which read as a total suggests uniform resolution. The item-level data detailed in Table 2 show something different. As the subtotal rows of Table 2 record, at presentation the 11 points divided into 6 from inflammatory or secretory items — erythema or hyperaemia 2, ventricular obliteration 2, thick endolaryngeal mucus 2 — and 5 from oedematous or hypertrophic items: vocal fold oedema 1, diffuse laryngeal oedema 2, posterior commissure hypertrophy 2. By week 8 the inflammatory component had fallen to zero, every one of its three items scoring nothing, while the oedematous component stood at 3 and accounted for the whole of the residual score. The three points that remained were therefore not a diluted version of the original picture; they were a different picture, in which the acute mucosal and secretory signs had gone and the structural signs had not. The decomposition is presented in Figure 1 beneath each panel so that it can be read against the images themselves, and the three inflammatory subtotals printed in Figure 1 are the same six, four and zero points tabulated in Table 2.

This has a straightforward physiological reading and an important practical one. Erythema and surface mucus are the signs most plausibly generated by ongoing exposure and most plausibly reversible within weeks; oedema and hypertrophy of the posterior commissure represent tissue change that

would be expected to lag, if it resolves at all on this timescale. The Reflux Finding Score's own validation cohort of 40 patients supports the slower course: the mean fell from 11.5 (±5.2) at entry only to 9.3 (±4.7) at two months and 7.3 (±5.5) at four months, reaching 6.1 (±5.2) at six months — that is, the mean remained at or near the abnormal cut-off for four months of treatment[4]. The trajectory does not, however, support a simple fast-inflammatory and slow-structural reading, and it is worth saying so because the temptation is obvious. Over the first four weeks the oedematous component fell proportionally further than the inflammatory one, from 5 to 2 against 6 to 4; the ordering reversed only between weeks 4 and 8, and the week-8 oedematous subtotal of 3 exceeds the week-4 value of 2 solely because of the single non-monotonic vocal fold oedema point discussed below, to which no clinical significance is attached. What these data support is the compositional statement — that every point remaining at week 8 is oedematous or hypertrophic — and not a claim about differential rates of resolution. The practical implication is that a residual score of 3 at eight weeks should not be read as incomplete treatment response calling for escalation. It should be read for what it is composed of. Figure 1 makes the same point visually, since the week-8 panel is the one whose printed inflammatory subtotal is zero. Had the residual 3 points been erythema and mucus rather than oedema and hypertrophy, the interpretation — and the decision about whether to continue acid suppression — would be quite different.

One item does not behave. Vocal fold oedema is scored 1 at week 0, 0 at week 4 and 1 at week 8, the only non-monotonic item in any of the three instruments. It is reported exactly as recorded, is not smoothed, and is declared among the source-record issues in Section 3.10. A single point on an item scored 0 to 4, rated by endoscopic impression, is within the range of observer variation that the instrument's own validation acknowledges: interobserver correlation was 0.90 and intraobserver test–retest correlation 0.95 in the original study[4], and a quadratic weighted kappa of 0.794 ± 0.038 between two blinded otolaryngologists has been reported more recently[5], with an inter-rater correlation coefficient of 0.755 in another[31]. Reliability of that order leaves ample room for a one-point disagreement on a single item, and no clinical significance is attached to it here.

The order in which the measures recovered

The central observation of this report is set out in Table 5 and plotted in Figure 3. Five measures were tracked on the same three-visit schedule, and they did not cross their thresholds together. By week 4 the Reflux Finding Score had fallen to 6, below its cut-off of 7; both tympanometric peak pressures had entered the type A range at −95 and −85 daPa; static compliance had risen in both ears and had never been below its own criterion; and the Reflux Symptom Index stood at exactly 13, on its boundary rather than beyond it. One point of interpretation has to be made explicit here rather than assumed, because the observation turns on it. This report applies the exclusive convention, under which a Reflux Symptom Index of exactly 13 is not abnormal; some series use the inclusive form, under which it is. The exclusive form is used throughout because it is the form in which the cut-off was originally propagated. It is not the only form in the comparator literature, and it would be wrong to imply that it is: one series in Table 6 defines its cases inclusively at 13 or above, and the largest randomised trial in that table treats a Reflux Symptom Index below 12 as its own normal range, a third convention under which this patient's week-4 score of 13 would be plainly abnormal. Under either alternative the Reflux Symptom Index entry in Table 5 moves to week 8, which is why the cell records both readings. It should be said plainly that the central observation does not depend on which convention is chosen: under either, the two tympanometric peak pressures had entered the type A range by week 4 while the Eustachian Tube Dysfunction Questionnaire-7 had not yet fallen below its own threshold, and the Eustachian Tube Dysfunction Questionnaire-7 is among the last measures to normalise under either convention — uniquely last under the exclusive one, and level with the Reflux Symptom Index at week 8 under the inclusive one. The Eustachian Tube Dysfunction Questionnaire-7, alone among the five, remained clearly abnormal, at a total of 16 against a threshold of 14.5 and an item mean of 2.29 against a threshold of 2.1, both of which are marked in red in the summary rows of Table 3. Only by week 8 had that instrument reached 8, one point above its arithmetic floor of 7, the item-by-item course of that fall being detailed in Table 3 and its two summary rows carrying the total and the item mean at each visit. The margin at week 4 must be stated plainly, because the observation rests on it: the total exceeded its threshold by 1.5 points and the item mean by 0.19, so a two-point fall on any one of the three items still scoring 3 at that visit would have brought the total to 14 and the item mean to 2.00, both inside the normal range, and would have abolished the dissociation entirely. One of those three items is item 6, ringing in the ears — an item belonging to the instrument that the audiology-clinic data cited below show tracking tinnitus bother rather than tubal function in patients who report tinnitus. A third reading must therefore be admitted alongside the two that follow: that what lagged was tinnitus bother rather than tubal physiology, in which case the ordering says nothing about the Eustachian tube at all. The observation is fragile in a specific, identifiable and testable way, and is offered at that strength. Static compliance, it should be said, was never abnormal at any visit, so four of the five measures crossed a boundary during the eight weeks and the fifth began and ended inside its own. The patient's own report of his ear symptoms was the last measure to normalise, jointly with the Reflux Symptom Index if the inclusive convention is applied to that instrument. The three-

visit schedule records the order of the crossings and not the size of the gap between them, which lies somewhere between nothing and eight weeks; the 'first normal' column of Table 5 states the visit of first normality for each measure in one place, and panel A of Figure 3 shows the two symptom instruments crossing their thresholds at different visits.

It matters that this was a real improvement and not merely a rearrangement of thresholds. Between week 0 and week 4 the Eustachian Tube Dysfunction Questionnaire-7 fell 12 points, against a minimal clinically important difference of 3.5 points for that instrument as quoted in a recent balloon-dilation series[32], and the Reflux Symptom Index fell 11 points, against a minimal clinically important difference of 8 points derived by anchor-based receiver-operating-characteristic analysis in 351 patients with impedance–pH-confirmed reflux (sensitivity 77.3%, specificity 88.6%)[33]. A clinically important improvement had therefore already occurred in both instruments by week 4; the item-level movement behind the questionnaire's 12-point fall is given in Table 3, where all seven items fell, none by more than two points, and three still stood at 3. The point is not that the patient was unimproved; it is that he was still, on his own account, abnormal at a moment when every objective measure of his middle ear said he was not.

Two readings are possible and the case cannot decide between them. The first is that the patient-reported instrument lags the physiology, either because symptom perception adapts slowly or because the Eustachian Tube Dysfunction Questionnaire-7 measures something that tympanometry does not. There is independent support for that second possibility: in 85 patients assessed before sinus surgery, 36.5% scored 14 or more on the questionnaire on that study's own cut-off, yet the nine-step maximal peak-pressure difference did not differ between the high-scoring and low-scoring groups (median 7.50 against 9.25 daPa, P = 0.187) and correlated with the questionnaire at r = −0.08 (P = 0.450)[12]; in 107 ears, questionnaire score and tympanogram type were not significantly associated (P = 0.058)[13]; and in 300 audiology-clinic patients the questionnaire performed poorly against a modified impedance-audiometric definition, its total score in patients with tinnitus tracking the bothersomeness of that tinnitus rather than tubal function even with the ringing-in-the-ears item excluded[11]. The second reading is that the instrument was right and the tympanogram incomplete — that peak pressure had normalised while dynamic tubal opening had not, a dissociation demonstrated in the 94 of 124 patients (75.8%) who responded to balloon dilation, a subset of a cohort selected throughout for normal raw peak pressures[15]. Only a direct test of tubal opening at week 4 could have distinguished them, and none was performed.

Either way the clinical implication is the same and it is actionable. A four-week tympanogram that has returned to the type A range does not mean the patient will report himself well; a four-week patient-reported score that is still abnormal does not mean the middle ear has failed to recover. Neither observation should on its own trigger a change of plan. This bears directly on the decision that faces the clinician at that visit, because the medical trial is the gateway to intervention: in a randomised trial of balloon dilation, all patients were first treated with a nasal steroid spray and Valsalva manoeuvre daily for two months before randomisation[30], and in a cross-sectional analysis of 154 adults with tubal dysfunction the pharmacological arm of 50 patients had a mean treatment duration of 5.87 weeks and a printed response rate of 87.78%, a figure that cannot be formed from a denominator of 50 and is quoted here only as the source prints it[34]. Where the questionnaire is the trigger for escalation, the timing of the assessment determines the decision. It is also relevant that after balloon dilation the questionnaire improves by a mean of 10.9 points from baseline (95% confidence interval 7.06 to 14.8, P < 0.001) by six weeks and by 11.7 points from baseline by twelve, the increment between the two timepoints being reported by that source as 0.84 points and non-significant (P = 0.625), a figure which is 0.8 if taken from the two rounded means as printed, so that a six-week review captures essentially the whole effect[32]. Those six-and-twelve-week figures come from patients recovering after a mechanical procedure, and the time course of a patient-reported score after balloon dilation need not be its time course under medical treatment; they are quoted to show that the instrument can still be moving long after tympanometry has settled, not as a schedule for medical management. What this case can motivate, and cannot establish, is the separation of the two purposes: measure everything at four weeks, because that is when the domains can be seen to move apart, and treat that visit as a poor one at which to decide on escalation. The tympanogram and the questionnaire should in either case be read as two measurements rather than as one.

The dissociation observed here is not unique to this patient, and it has been seen in a randomised setting pointing the other way, which is the strongest evidence identified for this report that the two kinds of measurement are not interchangeable. In a randomised trial of balloon dilation for mild chronic Eustachian tube dysfunction, in which all patients had first received a nasal steroid spray and daily Valsalva manoeuvres for two months and only those with persisting dysfunction were randomised, the objective outcomes separated clearly and the questionnaire did not: normalisation from retraction or serous otitis media occurred in 9 of 13 dilated patients against 0 of 11 controls (P = 0.0006), and tympanometric improvement from type B to type C or A, or from type C to type A, in 9 of 13 against 3 of 11 (P = 0.04), while the mean Eustachian Tube Dysfunction Questionnaire-7 score did not differ significantly between the groups at all (P = 0.35) and the

audiometric data likewise showed no difference (P = 0.38)[30]. There, tympanometry moved and the questionnaire did not; here, tympanometry moved first and the questionnaire followed. Both observations say that a patient-reported ear score and a static tympanogram are measuring different things, and that treating either as a proxy for the other will mislead. A further contributor on the patient-reported side should be acknowledged: among 45 patients with impedance–pH-confirmed reflux and 29 controls, perceived stress was substantially higher in the patients (21.62 ± 8.1 against 13.90 ± 5.5, P < 0.001), insomnia severity did not differ significantly on Mann–Whitney U testing, which is the comparison that source applied to these scores (8.0 ± 4.5 against 6.14 ± 3.2, medians 7 and 5, P = 0.071) yet carried the strongest correlation of any psychological measure with the Reflux Symptom Index (ρ = 0.480), and the Reflux Finding Score correlated with none of them[35]. Symptom scores carry more than physiology.

What happens if the four-week review does prompt escalation is worth stating, because it frames what is being risked by escalating early. Balloon dilation of the Eustachian tube is effective in selected patients: a retrospective cohort of 35 patients with 50 symptomatic ears reported a normalised tubal function rate of 94% of ears at the last visit and a fall in mean Eustachian Tube Dysfunction Questionnaire-7 item score from 3.7 ± 1.4 to 2.0 ± 0.9, with the greatest improvement in ear fullness and muffled hearing, the first of which was this patient's leading complaint and the second of which he volunteered spontaneously[36]. A multicentre randomised trial comparing navigation-guided balloon tuboplasty with medical management alone in 38 ears of 31 patients found mean questionnaire item scores of 1.99 ± 0.85 against 3.40 ± 1.29 at six weeks (P = 0.001), tympanogram improvement in a reported 36.5% against 15.8% — the latter being exactly 3 of 19 ears, while the former is not formable from either 19 or 38 and is quoted as printed — and a significantly greater reduction in the air–bone gap in the dilated group (P = 0.037)[37]. That last outcome is worth pausing on: the randomised literature on this intervention uses the air–bone gap as an efficacy measure, and the air–bone gap is among the measurements this record does not contain. Two cautions belong alongside. Conservative autoinflation is a real alternative and its physiology is now quantified: in 21 healthy volunteers the Valsalva manoeuvre generated a higher mean maximum nasopharyngeal pressure than a nasal balloon device (597.5 against 482.3 daPa, P < 0.001) but with far poorer repeatability (intraclass correlation 0.572 against 0.872 for plateau pressure, and a between-subject standard deviation of ±144 against ±39.8 daPa), with comparable tubal opening rates[38]. None of the surgical or autoinflation options in this paragraph appears in Table 6, which excludes studies of surgical and balloon treatment. And tubal dysfunction is diagnosed far less often than clinical intuition suggests: among 482 consecutive adults scheduled for surgery for chronic inflammatory middle-ear disease, 350 had no dilatory dysfunction detectable by Valsalva or by the Eustachian tube score — 82% once the 55 patients who declined further testing are excluded, or 72.6% of the full 482 — which the authors take as a reason to question the routine pathophysiological attribution[39]. Escalating a patient whose middle-ear pressures have already normalised, on the strength of a questionnaire alone, is therefore a decision that should be made deliberately rather than by default.

What each component of the regimen can and cannot be credited with

Five interventions were begun on the same day, so no component can be individually credited. The evidence behind each nonetheless differs sharply, and a case report that lists a polypharmacy regimen without saying so is of little use. The regimens used in the comparable published series are set out in Table 6, and the timing of this patient's own regimen is dated in Figure 2. Lansoprazole was given at 30 mg once daily. The largest placebo-controlled trial of that drug identified for this report randomised 346 patients with persistent throat symptoms to lansoprazole 30 mg **twice** daily or placebo for 16 weeks and found the primary estimate 1.9 points **worse** on lansoprazole (95% confidence interval −0.3 to 4.2, adjusted P = 0.096), with the Reflux Symptom Index reaching the normal range in 42 of 102 compliant participants on lansoprazole (41%) against 53 of 118 on placebo (45%)[40]. Twice-daily dosing has not been shown superior to once-daily either: a randomised trial of the same total daily dose in 132 patients randomised and 101 analysed found responder rates of 16 of 50 (32.0%) on the twice-daily schedule against 19 of 51 (37.3%) on the once-daily schedule at 16 weeks (P = 0.541)[31]. A newer potassium-competitive acid blocker was likewise no different from esomeprazole across the whole of a 136-patient randomised trial, the only positive signal being confined to the subgroup with a baseline Reflux Symptom Index of 18 or more (32 against 31 patients) at the four-week timepoint alone[41]. That subgroup deserves flagging rather than burying, because this patient's baseline Reflux Symptom Index of 24 falls inside it and the timepoint at which the signal appeared is the four-week visit on which this whole report turns. A subgroup finding inside a null trial is weak evidence and is not offered as more; but if acid suppression contributed anything here, that is the only trial evidence which would have predicted it. Acid suppression is nonetheless the only component of this regimen that has been tested against placebo at all, in a single trial, and in that trial it failed; the dose used here, 30 mg once daily, is half the dose used in that trial, while the dose-splitting trial quoted above compared ilaprazole 10 mg twice daily against 20 mg once daily and found neither schedule superior.

Sodium alginate has the better case, and the schedule used here — after lunch and at bedtime — targets the

postprandial and nocturnal periods a raft is designed to cover. A randomised study of 100 adults assessed at exactly the timepoints used in this case found that adding alginate 10 mL twice daily to pantoprazole took the Reflux Symptom Index from 19.26 ± 5.37 to 10.18 ± 4.22 at four weeks and 4.52 ± 2.74 at eight, and the Reflux Finding Score from 10.14 ± 2.31 to 5.72 ± 1.21 and 3.00 ± 1.03, against 19.08 ± 5.16 to 15.48 ± 4.92 to 12.60 ± 4.60 and 9.50 ± 2.04 to 8.9 ± 1.84 to 8.66 ± 1.72 on the proton pump inhibitor alone (both between-arm comparisons P < 0.0001); the proton pump inhibitor arm's Reflux Finding Score did not improve significantly at four weeks at all (P = 0.1257)[7]. No comparison of efficacy is drawn between this patient's own trajectory and either arm of that trial, because a single uncontrolled course cannot discriminate between regimens and because the populations and co-interventions differ; the only observation offered, in Section 3.9, is that his values fall inside the descriptive range those arms report. A separate non-inferiority trial compared magnesium alginate against omeprazole in 50 randomised and 40 analysed patients and found a between-arm difference in Reflux Symptom Index change of 1.3 points (95% confidence interval −4.2 to 6.7, P = 0.639); non-inferiority was **not** met at the pre-specified margin of 4 points and holds only at a post-hoc margin of 7, the trial having stopped early because of the coronavirus pandemic and retaining, in its own words, only about 40% power[5]. The honest summary is narrower than it is often stated to be: the one head-to-head trial failed to demonstrate non-inferiority at its own pre-specified margin and was underpowered, so neither superiority nor equivalence is established between the two; and of the two, only acid suppression has ever been tested against placebo, where it failed, while alginate has not been tested against placebo in this indication at all.

Acetylcysteine was given orally at 200 mg three times daily. The single randomised trial of a mucolytic in this condition used **inhaled** N-acetylcysteine added to rabeprazole and found no significant difference in overall outcome between the arms; the Reflux Symptom Index fell from 21.0 to 7.6 on rabeprazole alone and from 19.7 to 4.5 with added inhaled N-acetylcysteine, and the only significant advantage was confined to the subgroup the authors defined as poor early responders, in whom the score at the second follow-up was 4.6 ± 2.0 against 9.5 ± 4.6 (P = 0.019)[42]. The route of administration is not incidental — an inhaled mucolytic is delivered to the airway surface and an oral one is not — so that trial does not transfer to what this patient received. Oral acetylcysteine is the component with no directly applicable supporting evidence at all, as distinct from acid suppression, which has been tested and has failed. If any element were to be dropped in a future protocol, the mucolytic should be the first considered.

Saline nasal irrigation and the dietary measures are the two components whose recent supporting studies report the largest effects, although — and this qualification matters — none of those studies was randomised against no treatment: one allocated its regimens non-randomly, one randomised between three active arms and one had no control group of any kind, whereas the trial that found no benefit from acid suppression was placebo-controlled and randomised. The comparison below is therefore between effect sizes reported under weaker designs and null results established under stronger ones, and it should be read as a reason to test these components properly rather than as a reason to prefer them. In a 100-patient cohort divided by nasal pathology into three treatment groups, the 35 patients with chronic rhinitis received a topical nasal steroid spray together with saline irrigation — the steroid is not named in the report — and their Eustachian Tube Dysfunction Questionnaire-7 fell from 21.98 to 13.93 (P < 0.05) with the tubomanometry R value falling from 1.15 to 0.76 on the right and 1.23 to 0.76 on the left at six months; the other two groups were surgical, there was no untreated control and no arm received saline alone, so the contribution of the irrigation within that combination cannot be separated from that of the steroid[43]. For the dietary component, a retrospective analysis of 145 non-randomly assigned patients with impedance–pH-confirmed reflux found response at three months in 39 of 48 (81.2% as printed; 81.25% exactly) on a strict antireflux diet with stress-reduction activity, against 18 of 32 (56.3%) on proton pump inhibitors, 22 of 38 (57.9%) on alginates and 20 of 27 (74.1%) on antacids, so that all four arms account for the whole cohort. The responder differences against diet recompute from those counts to 25.0 percentage points for the proton pump inhibitor arm, printed by the source as 24.9 (95% confidence interval 4.6 to 45.4), and to 23.4 percentage points for alginates (95% confidence interval 4.2 to 42.5); the difference against antacids, 7.2 percentage points (95% confidence interval −12.7 to 27.1), was not significant, and the change in score over time did not differ between the groups. The responder definition is not stated in the retrievable record[44]. A randomised three-arm study of 48 analysed patients likewise found that diet alone took the Reflux Symptom Index from 19.1 to 9.4 and the Reflux Finding Score from 12.8 to 8.4 in one month[6]. Neither study was randomised against no treatment, and neither can exclude that motivated patients who adopt a diet also change other behaviours; but the ranking they suggest disagrees at most positions with the ranking implied by the prescription this patient received. Two orderings of these five components are therefore possible and they disagree over most of the list. Ranked by the strength of the designs that have addressed each, sodium alginate and acid suppression come first, both having been tested in randomised trials — acid suppression against placebo, where it failed, and alginate against a proton pump inhibitor in an underpowered trial that missed its own non-inferiority margin; dietary modification follows, tested in a randomised three-arm comparison against other active treatments but never against no

treatment; then saline irrigation, assessed only before and after and only in combination with a nasal steroid; and last oral acetylcysteine, for which no directly applicable trial exists. Ranked instead by the size of the effects reported, saline irrigation and dietary modification move to the front and acid suppression to the back, while oral acetylcysteine is last under both. The divergence between the two orderings is itself the reason none of these components can be ranked with confidence, and the single criterion this report will commit to is the one just used: design before effect size.

Table 6. The present case placed against the recent series reporting a middle-ear, Eustachian tube or laryngopharyngeal outcome in adults, with or without antireflux treatment.

Study	Design and population	Regimen and duration	Reflux outcome	Middle-ear or Eustachian tube outcome
Series reporting a middle-ear or Eustachian tube outcome				
Chatterji et al., 2025	Single-arm interventional, 50 patients with reflux and asymptomatic middle-ear dysfunction	Anti-reflux therapy, 8 weeks	Not reported numerically in the retrievable record	72% of affected ears with improved audiometric thresholds (P = 0.003); tympanogram reverted to normal in 38% of cases; static compliance rose across successive visits (P < 0.001)
Mukherjee and Chatterji, 2024	Matched case–control, 73 patients with reflux and no otological complaint against 73 controls; cases defined by that study's own inclusive thresholds of Reflux Symptom Index 13 or above and Reflux Finding Score 7 or above	None (cross-sectional)	Not applicable; no treatment given	Pure-tone audiometric impairment in 45 of 73 cases (61.64%) against 13 of 73 controls (17.81%), P < 0.001; deranged impedance audiometry in 40 of 73 (54.79%) against 5 of 73 (6.85%), P < 0.001
Ahmad et al., 2025	Single-arm prospective, 126 enrolled and 110 analysed with both conditions	Omeprazole 40 mg twice daily, 8 weeks	Reflux Symptom Index 22.56 ± 10.14 to 4.84 ± 2.45 (P < 0.001); Reflux Finding Score 11.42 ± 7.65 to 4.50 ± 2.65 (P = 0.014)	Eustachian Tube Dysfunction Questionnaire-7 16.20 ± 10.47 to 10.40 ± 5.47 (P < 0.001); no tympanometric outcome reported
Anastasiadou et al., 2026 (group A)	Before–after, 35 patients with chronic rhinitis and tubal dysfunction, one of three groups in a 100-patient cohort	Topical nasal steroid and saline irrigation, outcome at 6 months	Not applicable; no reflux measure	Eustachian Tube Dysfunction Questionnaire-7 21.98 to 13.93 (P < 0.05); tubomanometry R value 1.15 to 0.76 right and 1.23 to 0.76 left
Series reporting a laryngopharyngeal outcome only				
Mathew and Shilpa, 2022	Randomised, 100 adults, 50 per arm	Pantoprazole 40 mg twice daily with or without alginate 10 mL twice daily, 8 weeks, assessed at 0, 4 and 8 weeks	Combination arm: Reflux Symptom Index 19.26 ± 5.37 to 10.18 ± 4.22 to 4.52 ± 2.74; Reflux Finding Score 10.14 ± 2.31 to 5.72 ± 1.21 to 3.00 ± 1.03	Not recorded
Fageeh et al., 2025	Single-arm prospective, 78 treated patients with chronic tonsillitis and reflux	Pantoprazole 40 mg once daily with diet and lifestyle measures, 3 months	Reflux Symptom Index 20.55 ± 5.47 to 12.65 ± 6.07 and Reflux Finding Score 11.13 ± 2.98 to 6.40 ± 3.86 (both P < 0.001); complete relief of sore throat in 50 of 78 (64.1%)	Not recorded
Pizzorni et al., 2022	Randomised non-inferiority, 50 randomised and 40 analysed	Magnesium alginate 20 mL three times daily against omeprazole 20 mg once daily, 2 months	Alginate arm 24.6 ± 6.1 to 16.1 ± 7.2; proton pump inhibitor arm 22.5 ± 7.8 to 15.3 ± 8.2; between-arm difference 1.3 (95% CI −4.2 to 6.7, P = 0.639)	Not recorded
Wilson et al., 2021	Double-blind placebo-controlled randomised, 346 participants	Lansoprazole 30 mg twice daily against placebo, 16 weeks	Primary estimate 1.9 points worse on lansoprazole (95% CI −0.3 to 4.2, adjusted P = 0.096); Reflux Symptom Index below 12, that trial's own normal range, in 42 of 102 compliant participants (41%) on	Not recorded

Study	Design and population	Regimen and duration	Reflux outcome	Middle-ear or Eustachian tube outcome
			lansoprazole against 53 of 118 (45%) on placebo	
The present case				
Present case, 2026	Single patient, 34-year-old man with both conditions	Saline irrigation twice daily, lansoprazole 30 mg once daily, sodium alginate 10 mL twice daily, oral acetylcysteine 200 mg three times daily and diet advice, 8 weeks, assessed at 0, 4 and 8 weeks	Reflux Symptom Index 24 to 13 to 6; Reflux Finding Score 11 to 6 to 3	Eustachian Tube Dysfunction Questionnaire-7 28 to 16 to 8; peak pressure −185/−165 to −95/−85 to −25/−20 daPa; static compliance 0.42/0.45 to 0.48/0.50 to 0.62/0.60 mL

* Three conventions are used for a cell that carries no result. 'Not recorded' on a grey shaded cell denotes a domain the study did not measure at all, rather than one it measured and found unchanged; 'Not applicable' denotes a domain that the study's design excludes, whether because no treatment was given or because no measure of that kind was used; and 'Not reported numerically in the retrievable record' denotes a domain the study states it assessed without printing a figure that can be quoted. No cell in this table is marked in red, because no value in it is judged against an abnormality threshold here; every red-marked value in this report is in Tables 1 to 5 and 7. CI, confidence interval.

† The regimens, populations, durations and outcome definitions differ in every row, so no numerical difference between a row and the present case supports any inference about relative efficacy. Where this report observes that a value falls within the range described by a comparator series, it does so only to establish that the present course is not atypical. Four of the eight comparator series are uncontrolled, and only Wilson et al., Mathew and Shilpa, and Pizzorni et al. carry a randomised comparison. The table admits a study only if it reports a serially repeated middle-ear, Eustachian tube or laryngopharyngeal outcome in an adult population alongside a stated treatment schedule, or an explicit untreated comparison; two rows accordingly carry no treatment and no reflux measure respectively, and are labelled as such. Single-timepoint or endpoint-only pharmacological comparisons of a laryngopharyngeal outcome alone, studies of surgical or balloon treatment, and studies of diagnostic accuracy are discussed in the text but are outside it. One further study is deliberately excluded: the randomised comparison of eight weeks of acid suppression against no treatment that reported hearing loss in 3 of 54 against 13 of 53 over a year, was conducted in a mixed adult and paediatric population selected by middle-ear pepsin or trypsin, and its population is therefore not comparable with the rows below; excluding it here rather than silently is the point of saying so. The purpose of the table is to show which domains each admitted study measured and on what schedule, and thereby where the present case adds information.

‡ The Ahmad et al. entry follows the assignment of Reflux Symptom Index and Reflux Finding Score given in the full text of that paper, which is the reverse of the assignment printed in its abstract; the abstract also reports P < 0.001 for all three scores where the table gives P = 0.014 for the Reflux Finding Score. The full-text values are used here.

§ The Pizzorni et al. non-inferiority conclusion was not met at the trial's pre-specified margin of 4 points and holds only at a post-hoc margin of 7; the trial stopped early because of the coronavirus pandemic and retained, in its own words, only about 40% power.

‖ The Chatterji et al. percentages are quoted with the denominators the source uses: 72% is expressed per affected ear and 38% per case, and the number of affected ears is not stated in the retrievable record.

Competing explanations this case cannot exclude

Eustachian tube dysfunction is multifactorial, and five alternative or confounding explanations are live here: allergy, other sinonasal disease, spontaneous resolution, expectation and observer effects on the unblinded components of the battery, and the possibility that the ear symptoms were never related to either the reflux or the tube at all. The first is allergy. This patient's anterior rhinoscopy showed mildly oedematous mucosa with mucoid secretion — a description entirely compatible with allergic rhinitis — and no allergy testing of any kind was performed. In a nationwide survey of 1124 adults screened with the Eustachian Tube Dysfunction Questionnaire-7, the prevalence of dysfunction among the 1114 whose allergy status is tabulated was 186 of the 378 who reported any allergy (49.2%) against 195 of the 736 who reported none (26.5%; P < 0.001), and allergy carried a regression coefficient of 3.19 questionnaire points (95% confidence interval 2.30 to 4.07, P < 0.001)[45]. The relationship in the other direction is less secure: among the 52 of 84 allergy-clinic patients who completed the Reflux Symptom Index the score was not significantly related to allergen sensitisation, with 7 of 36 sensitised patients scoring above 13 against 4 of 16 unsensitised, the mean score being numerically higher in the non-sensitised group, and an odds ratio of 0.72 (95% confidence interval 0.18 to 2.94). The source prints P = 0.329 for that comparison, which is not reconcilable with either the counts or the interval it also prints, both of which imply a value near 0.65, so the interval rather than the P value is relied on here. A different reflux instrument in the separate 32-patient subcohort did reach significance with an odds ratio of 5.6 (95% confidence interval 1.15 to 27.37)[46]. What cannot be escaped is that two components of this regimen — saline irrigation and a mucolytic — would be expected to improve allergic rhinitis, and that an untested allergic contribution would produce exactly the observed pattern of improvement. This is item 5 of Table 7.

The second is other sinonasal disease. No nasal endoscopic grading, acoustic rhinometry or sinus imaging was performed, and the septum was recorded only as central. Both septal deviation and rhinosinusitis have demonstrable effects on tubal function: among 40 patients undergoing septoplasty for unilateral deviation, type C tympanograms fell from 38 of 80 ears (47.5%) preoperatively to 3 of 80 (3.75%) at 12 weeks[47], and among 155 patients with chronic rhinosinusitis with nasal polyps, of whom 70.9% had a type 2 inflammatory profile, the rate of tympanometric abnormality was 12.7% and of conductive hearing loss 17.2% in that group against

4.4% for each in the remainder; the subgroup numerators are not printed in the retrievable record, and 70.9% is not formable from any whole number out of 155, so none of those four percentages can be reproduced exactly[48]. Endoscopic sinus surgery has been shown in a multicentre prospective study to improve tubal function in patients with chronic rhinosinusitis and tubal dysfunction[49], and a prospective case–control study of 35 patients with severe septal deviation and 35 controls found measurable differences in tubal function attributable to the deviation[50]. None of this was excluded in the present case beyond a descriptive rhinoscopy.

The third, and the most difficult to dismiss, is spontaneous resolution. Symptoms began in early January and treatment began in late January, so the total illness duration at the week-8 visit was approximately 11 to 12 weeks — squarely within the interval over which post-viral and post-inflammatory tubal dysfunction commonly settles without intervention. The strongest available quantification of that effect in this clinical territory comes from the placebo arm of the lansoprazole trial, in which the Reflux Symptom Index fell from a mean of 21.7 to 15.6 over 16 weeks on placebo alone — the trial's own mean within-patient change being −6.2 points, which is not identical to the 6.1-point difference of those two group means — and 53 of 118 compliant placebo participants (45%) reached the normal range, a proportion numerically **higher** than the 42 of 102 (41%) who did so on active drug[40]. Any single-patient before-and-after observation must be read against that figure. The fourth is expectation and observer effect: the patient-reported components of this battery are open to expectation in an unblinded, uncontrolled setting, and only the tympanometric numbers are insulated from it, since the endoscopic score, although not self-reported, was rated by the treating clinician without blinding to the visit.

Beyond allergy and sinonasal disease, several ordinary exposures were not documented and would have been worth a line in the notes. In a systematic survey of 1658 otolaryngology outpatients, consumption of carbonated drinks carried an adjusted odds ratio of approximately 1.8 for reflux (95% confidence interval 1.24 to 2.50, P = 0.002) with a dose–response relationship, habitually poor subjective sleep quality an odds ratio of 1.58 (95% confidence interval 1.14 to 2.18), and habitual sleep of three to five hours a night, against more than eight, an odds ratio of 2.29 (95% confidence interval 1.23 to 4.28, P = 0.015)[51]. The dietary advice given to this patient addressed the first of these and nothing addressed the others. Age and sex also shift the presentation in ways that matter for interpreting a single set of scores: among 420 patients investigated with impedance–pH monitoring, of whom 333 (79.3%) were positive, elderly patients had a **lower** mean Reflux Symptom Index than middle-aged and young patients (10.20 ± 4.06 against 12.80 ± 6.58 and 12.24 ± 5.57, P < 0.001) but a **higher** mean Reflux Finding Score (9.37 ± 3.25 against 8.16 ± 3.34 and 8.57 ± 2.58, P < 0.05), so that symptoms and signs move in opposite directions with age[52]. The contrast those figures actually support is between the elderly and everyone else: the young group's mean Reflux Symptom Index (12.24) is itself slightly below the middle-aged group's (12.80) and its mean Reflux Finding Score slightly above (8.57 against 8.16), so no ordering of the two younger bands can be read from them. What can be said of this patient, at 34, is that his own scores stood at 53.3% of the Reflux Symptom Index range and 42.3% of the Reflux Finding Score range at week 0 — the values detailed in Table 1 and Table 2 and plotted in panel A of Figure 3, where each is drawn against its own threshold rather than against the other, the two instruments having different ranges — and that the raw totals of 24 and 11 cannot be compared with one another directly. The fifth is the most consequential of the five for a report whose subject is a temporal relationship between two domains: that the ear symptoms were never related to either the reflux or the tube. Diagnostic labels attach loosely to this condition in both directions. In a general-population survey of 467 adults, 12.2% (57 participants) reported having been diagnosed with Eustachian tube dysfunction, yet 21 of those 57 (36.8%) had minimal or no symptoms on the questionnaire when it was actually administered[53], and in a case–control study of 34 professional navy divers and 35 non-divers a pathological tympanogram was found in 2.9% of each group — roughly one participant per group — with questionnaire scores similarly distributed, so that only post-Valsalva pressure measurements separated them (P = 0.004 right, P = 0.001 left)[54]. A single case in which two labelled conditions improve together cannot exclude that neither label was the right one.

The case placed against the published series

Second, the middle-ear domain is where the literature is thin, and it is thin in a specific way. The one adult series that followed the middle ear tympanometrically through antireflux treatment reported audiometric thresholds and tympanometric reversion at eight weeks, while the case–control study that paired the two conditions compared thresholds and tympanograms cross-sectionally in 73 untreated cases against 73 matched controls[21,22], and the largest series pairing the two conditions reported the Eustachian Tube Dysfunction Questionnaire-7 at eight weeks without any tympanometric outcome at all, its total falling from 16.20 ± 10.47 to 10.40 ± 5.47 in 110 analysed patients on twice-daily omeprazole[23]. None of the three reports an intermediate visit. That is precisely the visit at which the present case is informative, and it is why item 8 of the minimum data set tabulated in Table 7 is a fixed four-week reassessment rather than a longer list of tests. Figure 2 dates that visit within the treatment course.

Third, the comparison with the nasal-treatment literature is instructive because it is closest in

mechanism to what may actually have worked here. A prospective before-and-after series of 35 patients with chronic rhinitis and tubal dysfunction treated with a nasal steroid and saline irrigation reported the Eustachian Tube Dysfunction Questionnaire-7 falling from 21.98 to 13.93 at six months, and the tubomanometry R value from 1.15 to 0.76 on the right[43]. That 35-patient group is one of three arms of a 100-patient cohort, and that study and its companion publication describe the same cohort and report several of the same pre-treatment variables on different scales and with different values, so only the treatment-outcome publication is cited here and the two are not treated as independent corroboration. The present patient reached a questionnaire total of 8 at eight weeks; no inference is drawn from that being a lower absolute value in a shorter time, because he began with a different diagnosis, received five interventions rather than two, and is a single person. The observation to take from the comparison is that a purely nasal regimen produces measurable tubal improvement, which means the saline irrigation in this regimen cannot be assumed inert. How much of that comparator effect the saline itself carried cannot be established, since the comparator gave a steroid spray and saline together and had no saline-only arm.

Inconsistencies in the source record, declared

Eight points on which the primary record or the sources drawn on are inconsistent, ambiguous or imprecise are declared here rather than smoothed away. First, the week-4 tympanograms are described in the record as a mild or borderline type C pattern, while the recorded peak pressures of −95 daPa and −85 daPa lie on the type A side of the −100 daPa boundary in conventional use; this report carries the numerical values throughout and marks the descriptive conflict in Table 4 rather than adopting either label. Second, vocal fold oedema is scored 1, then 0, then 1, the only non-monotonic item in the entire battery; it is reported as recorded in Table 2 and no clinical meaning is attached to it, although it is the reason the oedematous subtotal set out in that table rises between weeks 4 and 8. Third, the endoscopic annotation accompanying the images describes erythema as moderate at week 0 and mild at week 4 while the score is 2 at both visits; the Reflux Finding Score's erythema item is effectively dichotomous between change confined to the arytenoids, scoring 2, and diffuse change, scoring 4, so both descriptors map to the same score, and the descriptor changed where the score could not.

Fourth, the improvement in ear fullness at week 4 is recorded as 'decreased by approximately 50% to 60%'. That is a patient global impression, not a measurement; no visual analogue scale was used, and it is reported verbatim in Table 4 and treated as a measurement nowhere. Fifth, the free-text description of the presenting laryngoscopy and the Reflux Finding Score recorded at the same examination do not correspond item for item. The narrative names arytenoid erythema, posterior commissure oedema, posterior commissure hypertrophy and thick endolaryngeal mucus; the score additionally allots 2 points to ventricular obliteration, 2 to diffuse laryngeal oedema and 1 to vocal fold oedema, which the narrative does not mention, and 'posterior commissure oedema' is not an item of the instrument at all. Five of the eleven baseline points therefore have no counterpart in the free text. This report uses the scored values throughout, because they are the values that were serially repeated, and flags the free text as the less complete record. Sixth, symptom onset is documented as early January 2026 and first attendance as late January 2026, so the interval between onset and presentation is approximately three to four weeks and is known only to within about a week either way. Every week label in this report is therefore counted from the first attendance rather than from symptom onset, as Figure 2 states explicitly, and the estimate of 11 to 12 weeks of total illness duration used in Section 3.8 carries that same uncertainty. Seventh, and of the same kind as the third, the week-4 free text and the week-4 endoscopy row of Table 4 describe the endolaryngeal mucus as reduced or minimal, while the thick-endolaryngeal-mucus item is dichotomous, scoring 0 or 2, and is scored 2 — that is, unchanged — at both week 0 and week 4. As with the erythema descriptor, the words moved where the score could not; the scored value is carried throughout and the descriptive conflict is marked in Table 4. Eighth, and this one belongs to a source rather than to the record: the treatment-outcome publication of the nasal-treatment cohort drawn on in Sections 3.7 and 3.9 and its companion publication describe the same 100 patients and print different baseline tubomanometry values for five of the six group-and-side combinations, without stating which pressure step or summary statistic each table uses. The values quoted here are those printed in the treatment-outcome paper, the companion paper is not cited as independent corroboration, and the discrepancy is stated rather than reconciled, because it cannot be reconciled from the published text. None of the eight materially alters the observations reported here, but each is the kind of detail that a reader is entitled to have rather than to reconstruct.

An audit of the record against the comparator literature

The more useful exercise in a case like this is not to audit the disease but to audit the record: to check it item by item against the measurements the recent primary literature uses as its own end points, and to report which were never made. Done that way, this record has one conspicuous gap and several smaller ones. The conspicuous gap is that no audiogram was ever obtained. A man presented with bilateral ear fullness and tinnitus and volunteered that his hearing sometimes felt muffled; his tympanic membranes were retracted; his middle-ear pressures were −185 and −165 daPa; he was treated for eight weeks specifically to restore middle-ear ventilation; and his

hearing was not measured at presentation, at four weeks, or at eight.

The force of that omission comes from the comparator literature. A matched case–control study of this association found pure-tone audiometric impairment in 45 of 73 patients with reflux (61.64%) against 13 of 73 matched controls (17.81%, P < 0.001) — and those patients had **no otological complaint at all**, whereas this patient did[21]. The one adult interventional series that followed the middle ear through antireflux therapy reported improved audiometric thresholds in 72% of affected ears (P = 0.003) alongside tympanometric reversal to normal in 38% of cases and a rise in compliance across successive visits (P < 0.001, the only P value that source attaches to its tympanometric outcomes); it designates no end-point hierarchy, and a second series randomised pepsin-positive or trypsin-positive patients to eight weeks of acid suppression and reported hearing loss in 3 of 54 treated patients (5.6%) against 13 of 53 untreated (24.5%) over a year[16,22]. Pepsin, trypsin and mucin 5B have been proposed as risk factors specifically for hearing impairment in this setting[18]. The one series in Table 6 that followed the middle ear tympanometrically through treatment, and the randomised trial excluded from that table, both report an audiometric outcome; the audiogram is the measurement this record does not contain. Restoring middle-ear ventilation is not the end in itself; hearing is what the ventilatory function of the tube exists to protect, and the audiogram was the instrument that would have told us whether the negative pressure carried a conductive loss and whether that loss resolved with the pressure.

The smaller gaps are also worth naming. Tinnitus was a presenting complaint and was scored only as one of seven questionnaire items, on an instrument whose total score, tracks tinnitus bother rather than tubal function in exactly such patients; no tinnitus-specific instrument was used. The final state of the tympanic membrane retraction is likewise absent: it is recorded as present at week 0, less marked at week 4 and simply not described at week 8, so the one otoscopic sign that contributed to the diagnosis has no documented endpoint — and reversal of retraction is a secondary outcome of the randomised trial of balloon dilation cited in Section 3.6, whose primary outcomes were tympanometry and the questionnaire, and in which it occurred in 9 of 13 dilated patients against 0 of 11 controls[30]. No direct test of tubal opening was performed, although in a cohort selected for type A tympanograms raw peak pressure did not differ between affected and unaffected ears, and the manoeuvre-induced pressure shift did so only within the 94 of 124 patients (75.8%) who later responded to balloon dilation[15]. No allergy testing was performed, although reported allergy is associated with nearly twice the prevalence of tubal dysfunction[45]. No objective reflux measurement was performed, although the clinical instruments used instead have sensitivities of 59.7% and 31.3% against impedance–pH monitoring[8]. And the peritubal nasopharyngeal finding — the single endoscopic observation on which the whole causal argument rests — was recorded in free text and never scored, although a standardised endoscopic score of that region exists and carries an adjusted odds ratio of 1.72 per point for tubal symptoms[19]. Table 4 shows the audiological omissions in the body of the dataset rather than relegating them to the text, because a blank cell that is displayed is a finding and a blank cell that is omitted is not; each of those omissions is also listed in Table 7 alongside the quantitative reason it matters.

The tinnitus deserves a separate word, because it was one of the two presenting complaints and it is the symptom this record handles least well. It was captured only as item 6 of the Eustachian Tube Dysfunction Questionnaire-7, scoring 5 at week 0, 3 at week 4 and 2 at week 8, the only item in Table 3 still scoring 2 at the final visit as the ringing-in-the-ears row of Table 3 shows — an item that, for the reason given in Section 3.6, carries a specific risk of measuring the wrong thing in a patient who reports tinnitus. The relationship between the middle ear and this symptom cluster is not simple. In a case series of 11 patients referred with tinnitus, hyperacusis, aural fullness or pain in whom, in most cases, routine tests had been negative, findings consistent with Eustachian tube dysfunction were identified in 6, but those findings were slow respiration-synchronised fluctuations in admittance or in ear-canal pressure, that is, a pattern of abnormal tubal patency rather than of obstruction, and the series carried no reflux measurement of any kind[55]. A patient whose tinnitus improves alongside a rising middle-ear pressure may be improving for that reason or for another, and without a tinnitus-specific instrument the change from 'frequent' to 'occasional, not troublesome' recorded in the final row of Table 4 cannot be placed on any scale at all, and Table 7 lists this omission as item 4.

One further limitation of the instrument battery should be recorded, because it bears on whether the thresholds used in Table 5 are the right ones for this patient. The Eustachian Tube Dysfunction Questionnaire-7 was validated in 50 adults and 25 controls at a single North American tertiary centre, and its internal consistency in that final seven-item form was 0.711, with a 95% confidence interval of 0.570 to 0.818 that crosses below the authors' own adequacy threshold[9]. Cross-cultural adaptations reproduce the discrimination but not always the arithmetic: an Italian version in 68 patients and 50 controls reported an internal consistency of 0.838 and a test–retest coefficient of 0.804 in a subgroup of 18, with item-mean scores of 3.55 ± 1.07 against 1.30 ± 0.29, although the reported sensitivity of 99.6% cannot be formed from a denominator of 68 and should not be quoted[56]. A paediatric adaptation required an entirely different cut-off of 10 points rather than 14.5[57]. The reflux instruments behave the same way: a French-Canadian version of the Reflux

Symptom Index in 49 patients and 40 controls achieved an internal consistency of 0.90 and an intraclass correlation of 0.84, but its cases were defined by the index itself together with the Reflux Finding Score, which makes the correlation between the two circular by construction[58], and a Chinese adaptation of a related symptom score reported an internal consistency of 0.772 and a diagnostic coincidence rate of 83.70% against oropharyngeal pH monitoring[59]. No Indonesian-language validation of the Eustachian Tube Dysfunction Questionnaire-7 was used here, and the thresholds applied in the second column of Table 5 are therefore imported ones. This does not undermine the within-patient comparison of each measure against itself over time, but the crossing of a threshold is by definition a comparison against an imported value, and the central observation rests on exactly such crossings. It should therefore be read as an observation about this patient measured against published boundaries, not as a population statement, and the absolute values should not be compared across populations.

A proposed minimum data set

From that audit follows a numbered minimum data set, set out in full in Table 7 with the measurement, its timing, the quantitative justification for it, and its status in the present record. The nine items are numbered for reference rather than ranked by importance, and the status column shows at a glance how much of the list this record satisfies. In brief: pure-tone audiometry with air and bone conduction at every visit at which tympanometry is performed; absolute peak pressure, static compliance and canal volume all reported as numbers rather than reduced to a letter; a direct test of tubal opening at presentation and at the final visit; a validated tinnitus-specific instrument at every visit where tinnitus is a presenting complaint; documented allergy status at presentation; an objective reflux measurement, or at minimum a fasting salivary pepsin assay, at presentation; a structured endoscopic score of the peritubal nasopharynx at every visit; a pre-specified reassessment at four weeks with every domain measured on the same day; and the make, model, probe-tone frequency, pump rate and calibration status of the tympanometer, recorded once and confirmed unchanged at each subsequent visit. Six of the nine were never obtained or never recorded in this case and a seventh was obtained descriptively but never scored. Of the remaining two, the tympanometric numbers were recorded but only partly interpreted, and the fixed four-week reassessment was performed — and it is the reason this report has anything to say.

Table 7. Proposed minimum data set for an adult presenting with otological symptoms attributed to laryngopharyngeal reflux.

Item no.	Measurement	When	Why it is needed	Status in this record
1	Pure-tone audiometry with air and bone conduction, and the air–bone gap	Every visit at which tympanometry is performed	Hearing is the function the ventilatory role of the tube exists to protect. Two of the four comparator series reporting a middle-ear outcome report audiometric thresholds, and a randomised trial of acid suppression uses hearing loss as its outcome; audiometric impairment was found in 45 of 73 patients with reflux (61.64%) who had no otological complaint at all, although none of those series designates a formal end-point hierarchy.	**Never obtained**
2	Absolute tympanometric peak pressure in daPa, static peak compliance and ear canal volume, all reported as numbers	Every visit	The letter classification discards compliance and rests on a threshold that is insensitive to milder obstructive dysfunction. Reporting the numbers avoids the classification conflict this record contains.	Obtained and recorded; peak pressure interpreted, compliance not interpreted
3	A direct test of tubal opening, such as tubomanometry, sonotubometry or the nine-step inflation–deflation test	Presentation and at the final visit	Raw peak pressure did not distinguish affected from unaffected ears in 124 patients with symptomatic dysfunction; only the Valsalva-to-Toynbee pressure shift did.	**Never obtained**
4	A validated tinnitus-specific instrument	Every visit	Tinnitus was a presenting complaint but was scored only as one of seven questionnaire items, on an instrument whose total score has been shown to track tinnitus bother rather than tubal function in patients reporting tinnitus, even when that item is removed from the total.	**Never obtained**
5	Documented allergy status, by skin prick testing or specific immunoglobulin E	Presentation	Reported allergy is associated with nearly twice the prevalence of tubal dysfunction, 186 of 378 (49.2%) against 195 of 736 (26.5%), and two components of this regimen would also treat allergic rhinitis.	**Never obtained**
6	An objective reflux measurement: 24-hour hypopharyngeal–oesophageal impedance–pH	Presentation	Against impedance–pH monitoring the Reflux Symptom Index has a sensitivity	**Never obtained**

Item no.	Measurement	When	Why it is needed	Status in this record
	monitoring, or at minimum a fasting salivary pepsin assay		of 59.7% and the Reflux Finding Score of 31.3%; the clinical diagnosis rests on instruments that miss a large fraction of cases.	
7	A structured endoscopic score of the peritubal nasopharynx	Every visit	A quantified endoscopic score of nasopharyngeal inflammation carries an adjusted odds ratio of 1.72 per point for clinically significant tubal symptoms; this record captured the same region in free text only.	**Recorded descriptively, never scored**
8	A pre-specified reassessment at a fixed early timepoint, with every domain measured on the same day	Week 4	The domains in this case separated at exactly that timepoint. A single end-of-treatment visit would have shown five normal measures and concealed the separation entirely.	Performed, and it is what made the central observation of this report visible
9	Tympanometer make and model, probe-tone frequency, pump rate and direction, and calibration status, with confirmation that the same device and operator were used at each visit	Recorded once at presentation and confirmed at each subsequent visit	Absolute peak pressure in daPa is device- and pump-rate-dependent, and serial differences of 10 to 15 daPa lie within the range those factors alone can produce. A report that argues for absolute values in place of the letter classification cannot leave the instrument that produced them undocumented.	**Never recorded**

* Values printed in bold red mark a measurement that was never obtained, or obtained only in a form that cannot be used quantitatively.

† The list is derived from the determinants of outcome that the recent primary literature quantifies, not from expert opinion; the supporting figure is given in the 'Why it is needed' column.

‡ Items 1 and 8 are the two that would have changed what this report could conclude. Item 1 would have established whether the negative middle-ear pressure carried a measurable conductive loss and whether that loss resolved; item 8 is the reason the separation between the objective and the patient-reported domains is visible at all.

Limitations

This is a single uncontrolled patient followed for eight weeks, and the limitations follow directly. Five interventions began on the same day, so no component can be individually credited, and the two orderings of their evidence bases set out in Section 3.7 are statements about the literature rather than about this patient. There was no control, no blinding and no placebo, and the placebo arm of the largest randomised trial identified for this report improved by a mean of 6.2 Reflux Symptom Index points over 16 weeks, with 53 of 118 compliant participants (45%) reaching that trial's normal range of below 12[40], so spontaneous and expectation-driven improvement cannot be excluded and is not excluded. The diagnosis of reflux rests on two instruments with sensitivities of 59.7% and 31.3% against an objective reference standard[8], and no objective reflux measurement was made. The diagnosis of tubal dysfunction rests on symptoms and static tympanometry, with no direct test of tubal opening at any visit. Allergy, septal and sinus disease were excluded only by descriptive examination.

The central observation itself carries a specific limitation. That the one objective middle-ear measure that was ever abnormal crossed its boundary before the patient-reported ear score did is established here on three time points in one patient, and the separation is therefore ordered by the visit schedule rather than measured: the crossing of the −100 daPa boundary occurred somewhere between weeks 0 and 4 and the crossing of the questionnaire threshold somewhere between weeks 4 and 8, and neither moment is more precisely located than that. A second limitation bears on the same argument. The tympanometer make and model, the probe-tone frequency, the pump rate and direction and the calibration interval were not recorded, and whether the same instrument and the same operator were used at all three visits cannot be verified from the record. Absolute peak pressure in daPa is device- and pump-rate-dependent, and differences of 10 to 15 daPa are within the range those factors can produce; since Section 3.3 argues for reporting absolute values rather than letters, this is a material gap of exactly the kind this report proposes to close, and it appears as item 9 of Table 7. The endoscopic scoring was performed by the treating clinician and was not blinded to the visit, which is a recognised source of drift in serial Reflux Finding Score assessment. No follow-up beyond eight weeks was obtained, so durability is unknown; this matters because the residual Reflux Finding Score of 3 was composed entirely of oedematous and hypertrophic items, which are the items expected to change most slowly. Finally, three of the studies drawn on in this discussion could not be read in full text and are cited from their published abstracts alone, and where a paper's abstract and full text disagree — as they do for the assignment of the reflux instruments in one series[23] — the full-text values have been used and the disagreement stated in Table 6.

5. Conclusion

A 34-year-old man with no dyspeptic symptom whatever presented with bilateral ear fullness and tinnitus and was found, on directed extra-oesophageal questioning and fibreoptic laryngoscopy, to have

laryngopharyngeal reflux with peritubal nasopharyngeal secretion and bilateral obstructive Eustachian tube dysfunction. Eight weeks of saline nasal irrigation, once-daily lansoprazole, sodium alginate, oral acetylcysteine and dietary modification were followed by improvement in every measure taken: the Reflux Symptom Index from 24 to 6, the Reflux Finding Score from 11 to 3, the Eustachian Tube Dysfunction Questionnaire-7 from 28 to 8, tympanometric peak pressure from −185 and −165 daPa to −25 and −20 daPa, and static compliance from 0.42 and 0.45 mL to 0.62 and 0.60 mL.

The measures did not, however, improve together, and that is the report's substantive contribution. By week 4 both peak pressures had already crossed into the type A range and both compliances had risen, while the Eustachian Tube Dysfunction Questionnaire-7 remained above its abnormality threshold at 16 and the Reflux Symptom Index sat exactly on its own at 13. The patient's own report of his ear symptoms was the last of the five measures to normalise, jointly with the Reflux Symptom Index under the inclusive threshold convention. The visit schedule establishes that order and not the size of the interval, which is greater than zero and less than eight weeks. Two further observations follow from reading the record at item level and as absolute numbers rather than by total and by letter. The residual Reflux Finding Score of 3 at week 8 was composed entirely of oedematous and hypertrophic items, every erythema, mucus and ventricular item having reached zero, so that the residual score was compositionally different from the baseline score rather than a smaller version of it. And the tympanometric transition that the case appears at first reading to demonstrate over eight weeks in fact occurred within the first four, a fact that the letter classification conceals and the absolute peak pressure in daPa makes plain.

Three practical points follow. Laryngopharyngeal reflux should be considered in an adult with ear fullness, tinnitus and negative middle-ear pressure even when there is no heartburn at all, because in the 437-patient cohort tested by impedance–pH monitoring that this report draws on, isolated laryngopharyngeal reflux without gastro-oesophageal reflux disease was the largest single category. Tympanometry should be reported as absolute peak pressure, static compliance and canal volume rather than reduced to a letter, because in this case the letter recorded at week 4 conflicts with the peak pressure measured at the same visit, and the number is the entry that can be checked. And a four-week reassessment at which every domain is measured on the same day may be worth more than a longer list of tests performed only at the end — a suggestion this single case can motivate but cannot establish — because a single end-of-treatment visit in this patient would have shown five normal measures and concealed the separation between them entirely.

What this case cannot do is attribute any of it to treatment. Five interventions began simultaneously; there was no control, no blinding and no objective reflux measurement; allergy and sinonasal disease were excluded only descriptively; and spontaneous improvement over the 11 to 12 weeks of total illness duration remains a live and unexcluded explanation, against a placebo arm in the relevant randomised literature in which 53 of 118 compliant participants (45%) reached that trial's own normal range of below 12 without active drug. Most consequentially of all, no audiogram was obtained at any visit, in a patient whose presenting complaints were ear fullness and tinnitus and who volunteered that his hearing sometimes felt muffled and whose comparator literature reports the audiometric threshold among its outcomes, although none of those series designates a formal end-point hierarchy. The nine-item minimum data set proposed in Table 7 is offered as the practical answer to that: not more treatment, but the measurements that would allow the next patient who presents this way to yield a firmer answer than this one can.

Declarations

Ethics approval and consent to participate

The patient gave written informed consent to the publication of this case report and of the clinical images reproduced in Figure 1. No identifying feature appears in any image or in the text. Institutional review board approval is not required for a single de-identified case report at the author's institution.

Consent for publication

Written informed consent for publication was obtained from the patient.

Availability of data and materials

All data generated or analysed during this case are included in this published article, in Tables 1 to 7 and Figures 1 to 3. Every instrument total reported was recomputed from its own item-level scores before use.

Conflict of interest

The author declares no competing interests. No pharmaceutical company or device manufacturer had any role in the care of this patient, in the preparation of this manuscript, or in the decision to submit it.

Funding

This work received no specific grant from any funding agency in the public, commercial or not-for-profit sectors.

Author contributions

The single author was responsible for the clinical care of the patient, for the acquisition and interpretation of all clinical data, for the literature synthesis, and for drafting and revising the manuscript. The author read and approved the final version.

Use of artificial intelligence

No generative artificial intelligence was used in the preparation of this manuscript.

Acknowledgements

The author thanks the patient for consenting to the publication of his clinical course and images.

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