

ABSTRACT

FORTY TWO ears with chronic suppurative otitis media had a radiological study to assess the patency of Eustachian tube.

The technique presented is simple and reproducible, and is without side effects. It requires no special apparatus or sophisticated equipment.

The result showed that more patients with dry chronic suppurative otitis media have patent Eustachian tubes than those with wet chronic suppurative otitis media. This supports the clinical observations of a better success rate in reconstructive ear surgery if it is done while the ear is dry.

PATIENTS AND METHOD

Thirty three patients with chronic suppurative otitis media were selected for the study with an age range of 12 - 50 years, but most patients were in their late teens or early twenties and were fairly equally distributed among males and females.

Prior to the examination standard views of both mastoid bones were obtained. These consisted of oblique lateral, slit Townes and S.M.V. views.

With the patient in the sitting position, a fine plastic cannula attached to a syringe containing ultra fluid lipiodol (oily contrast medium) was introduced by the E.N.T. Senior residents, for 2 - 3 mm through the perforation in the tympanic membrane, 0.2 to 0.5 cc of contrast medium being injected. If both sides were to be examined, the same is done the other side immediately afterwards, the whole procedure taking an average of three minutes.

Contrast Media Study of Eustachian Tube

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With the patients sitting, half axial (Townes) and S.M.V., slit view of the skull were obtained. The patient was allowed to sit outside the room for a repeat similar filming at 15 minutes. The films were reviewed by the radiologist and the following screening was followed.

1. Localisation of contrast medium in the middle ear indicating complete blockage of Eustachian Tube, Fig. 1, Fig. 2, Fig. 3.
2. Partial or complete outline of the Eustachian tube without flow in the post nasal space indicating partial blockage, Fig. 4, Fig. 5, Fig. 6.
3. Flow of contrast medium into post nasal space immediately or at 15 minutes indicating patency. Fig. 7, Fig. 8, Fig. 9.

RESULT

The total number of patients is thirty three, forty two ears of those patients have been studied, among them were twenty three right ears and nineteen left ears (Table 1).

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TABLE No. 1
Number of Patients and Ears

Total Number of Patients	33
Total Number of Ears	42
Right Ear	23
Left Ear	19

No clinical details in reference to size, safety, dry, wet status of perforation are available in six of thirty three patients.

Among those studied there were eighteen wet perforation (54.5%) and fifteen dry perforations (45.5%) (Table 2).

TABLE No. 2
The Condition of the Perforation
at the time of the study

Wet perforation	18 - 54.5%
Dry perforation	15 - 45.5%

The age of the patients studied ranges from twelve to fifty years old (Table 3), eighteen males 54.5%, and fifteen females 45.5% (Table 4).

TABLE No. 3
Age Distribution

12 To 50 Years.

TABLE No. 4
Distribution according to Sex

Male	18 - 54.5%
Female	15 - 45.5%

The size of the perforation showed nine small perforations 27.3%, thirteen medium perforations 39.4% and eleven large perforations 33.3% (Table 5). All the perforations studied were safe.

TABLE No. 5
Distribution according to Size

Small	9 - 27.3%
Medium	13 - 39.4%
Large	11 - 33.3%

The contrast study showed twenty Eustachian tubes were patent, (47.5%), eighteen ears with partial blockage of the Eustachian Tube, (42.8%) and four with complete blockage of Eustachian tube (9.6%) (Table 6).

TABLE No. 6
Patency of the Eustachian tube as evidence by the flow of the Radio Opaque Material down to the P.N.S.

Patent	20 - 47.5%
Partial blockage	18 - 42.8%
Complete blockage	4 - 9.6%

Our studies have shown that the Eustachian tube is patent in a higher percentage of dry ears rather than wet ears (Table 7). This supports the basic teaching in otology which says not to operate on ears for reconstructive surgery except after being dry for a minimum of six months. Although some surgeons would operate on wet ears. However the majority prefers to perform reconstructive surgery on dry ears only.

TABLE No. 7
Patency Vs. dry/wet perforation

	Total	Dry	Wet
1. Complete blockage	5	1	4
2. Partial blockage	11	4	7
3. Patent	17	10	7

Table 7 demonstrates more patent tubes accompanied by dry perforation, and wet perforation will be associated with some degree of blockage.

TABLE No. 8

	Result of Surgery Vs Patency			Result of Surgery Vs the Condition of Perforation				
	Patent	Partial blockage	Complete blockage	Wet	Dry	Size of the Perforation		
						S	M	L
Successful Surgery	3	1	1	1	4	2	2	1
Unsuccessful Surgery	1	1	—	1	1	1	—	1

A conclusion can not be drawn from comparative study between patency and success of surgery (Table 8), because the number of cases (seven) was small and we hope further study will clarify this point.

DISCUSSION

The Eustachian tube is clearly seen as a relatively direct extension from the primitive pharynx at the end of the second fetal month.

Bartolomeus Eustachius was the first anatomist to describe in detail the pharyngotympanic tube. In his book of anatomy he described it as consisting of two parts, bony which is connected with the tympanic cavity and measuring 12mm and cartilagenous connected to the

nasopharynx measuring 24mm. It is 25mm behind the posterior end of the inferior turbinate, it is directed upwards, backwards and outwards from its lower opening in the lateral wall of the tympanic cavity. It is wider and more horizontal as well as shorter in infants and children. It is widest at its entrance into the tympanic cavity narrowest at the isthmus where the bony and the cartilagenous parts join together here the diameter is only about 2mm. Contrary to the view often stated, there is very little indeed if any lymphoid tissue on the pharyngeal end of the tube.

The muscles in relation to the Eustachian tube are Tensor Tympani, Levator Palati and Tensor Palati. The majority view is in

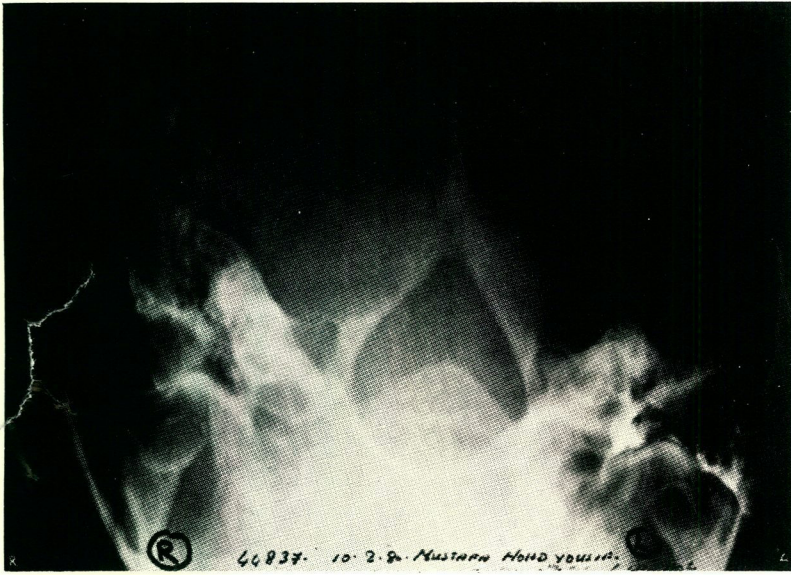


Fig. 1 — *Left Ear Localisation.*
The dye is localised in the Left Middle Ear.

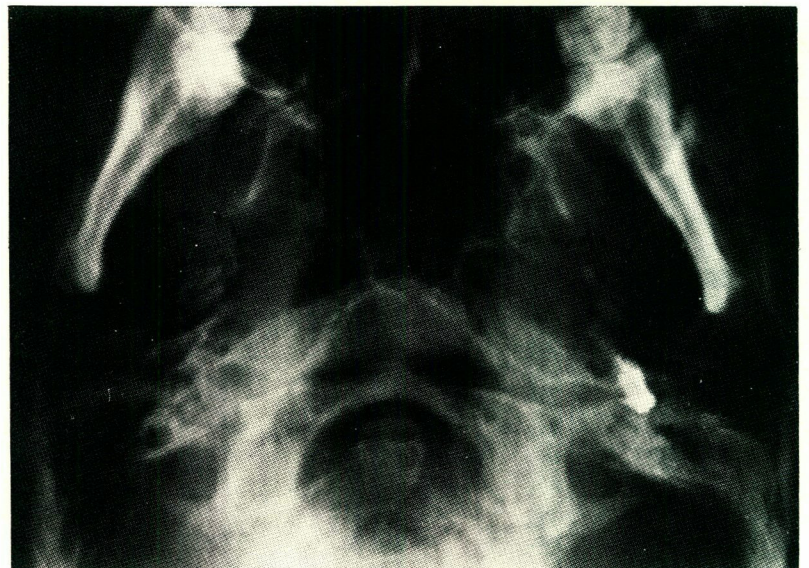


Fig. 2 — *Left Ear Localisation.*
The dye is localised in the Left Middle Ear.

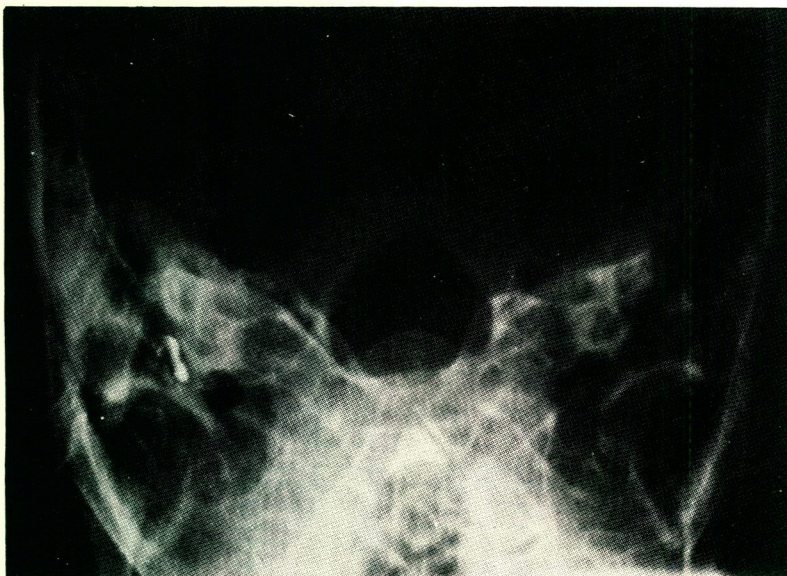


Fig. 3 — *Right Ear Localisation.*
The dye is localised in the Middle Ear on the right side.

Fig. 4 — *Partial blockage of both sides. The dye is localised in the Middle Ear and most of the Eustachian tube on both sides.*

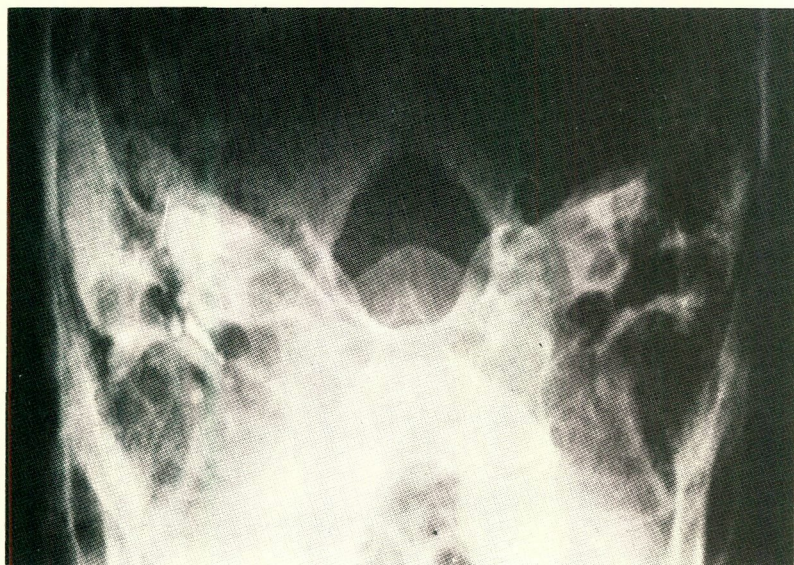
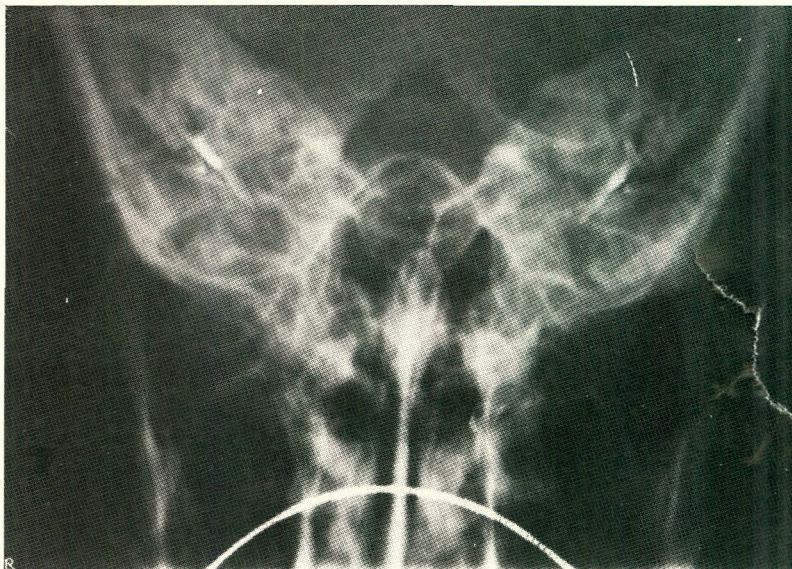
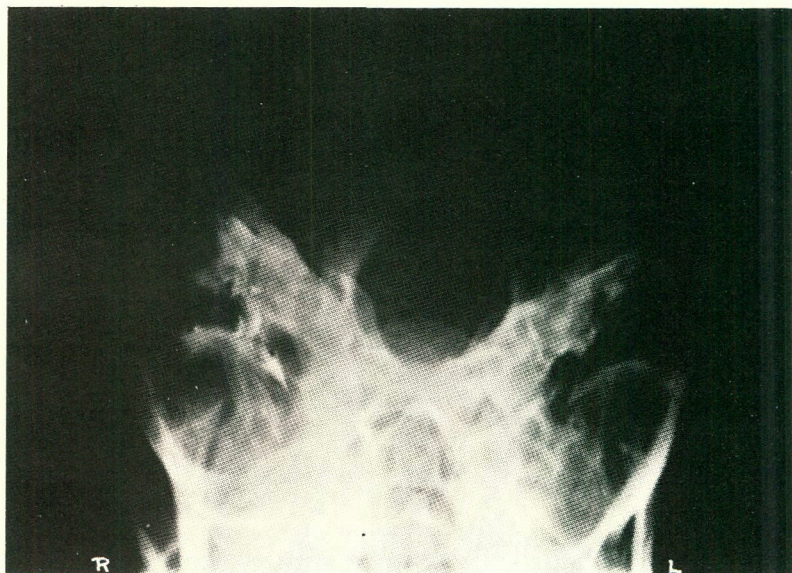


Fig. 5 — *Partial blockage of the Right Ear. The dye is seen in the Middle Ear and outlining most of the Eustachian tube on the right side.*

Fig. 6 — *Partial blockage of the Right Ear. The dye is seen in the Middle Ear and proximal part of the Eustachian tube on the right side.*



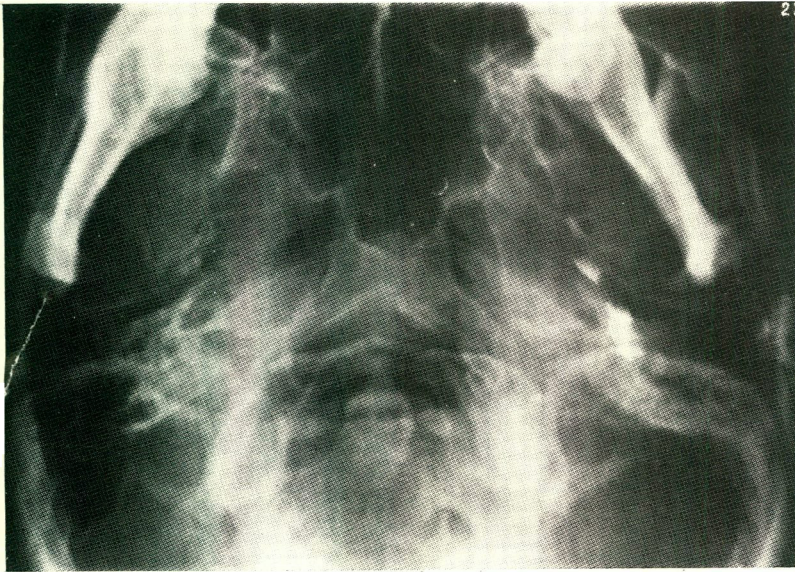


Fig. 7 — *Patent Left Ear – S.M.V.*
The dye is seen in the P.N.S. on the left side.

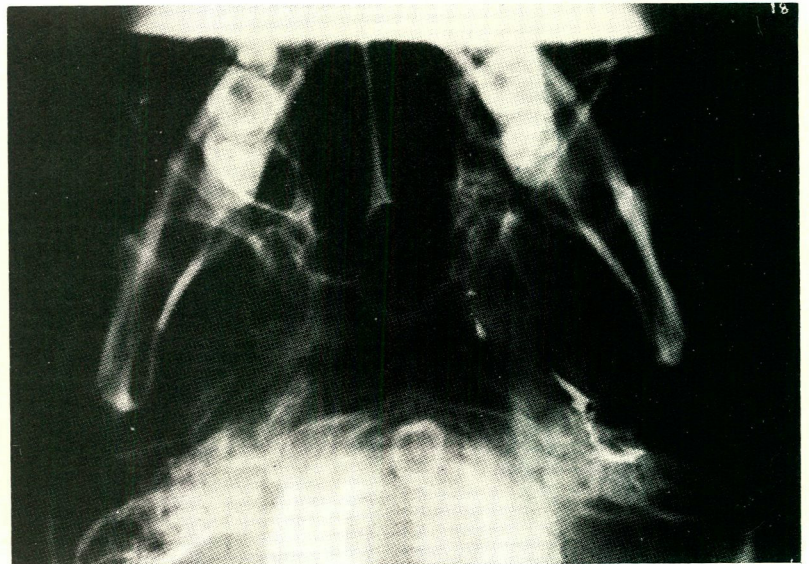


Fig. 8 — *Patent Left Ear.* *The dye is seen at the pharyngeal end of the Eustachian tube and P.N.S. on the left side.*

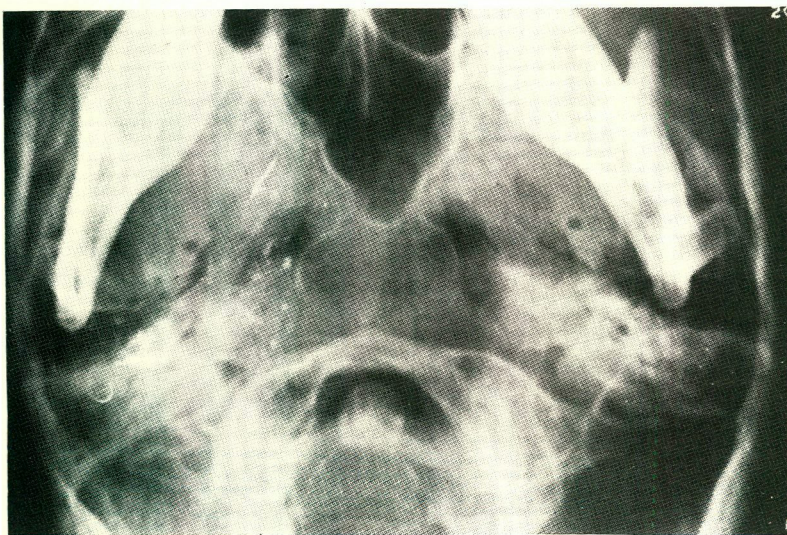


Fig. 9 — *Patent Right Ear – S.M.V.*
The dye is seen in the P.N.S. on the right side.

favour of the opinion that the only muscle that has any function with Eustachian tube is the Tensor Palati.

The functions of the Eustachian Tube (Holmquist 3) are :

1. To equalise the pressure between the inside of tympanic membrane and outside it. Armstrong and Holm (1973) found that the muscle which normally opens the Eustachian tube is unable to do so when the pressure differential exceeds 90mm Hg, that is locking occurs at this critical pressure differential, 'Locking' occurs at lower pressure differential when the tubal lining is oedematous, it is prevented by perforation of the drum head.
2. Through Ciliary action it clears the mucous from the middle ear cavity to the nasopharynx. (Holmquist 5).
3. It protects the middle ear cavity from sound pressure changes and nasopharyngeal air.

A patent Eustachian Tube is an important pre-requisite for tympanoplastic procedures (Holmquist 1). Controversy exist when it comes to measuring the function of the tube, the methods and their clinical interpretations (Sharp 1970, Andreasson and Harris 1979, 2).

The literature is full of non radiological tests of the patency of Eustachian tube, but very scanty in the studies of this important aspect of its patency by radiological means.

The method used by Farber and Holmquist is not thoroughly described and it seems rather elaborate. We doubt if it can be universally applied.

Most of the clinical studies of Eustachian tube patency are time consuming. A single clinical measurement of Eustachian tube patency has not yet been developed.

METHOD OF TESTING (Holmquist 7).

- a. Pressure change during tympanometric measurement (Holmquist 6).
- b. Sonotubometry is a measure of sound transport through the Eustachian tube.
- c. Valsalva's and toynbee.
- d. Testing drainage function of the Eustachian tube by using technetium marked albumin installed in the middle ear cavity (Decollogny 4).

They are time consuming, difficult to interpret, some are not widely available (Sono and drainage). Besides that none of them gives a direct anatomical localisation of Eustachian tube. The method we are proposing is simple and has no side effects, not much expertise is required to perform or interpret the result and the information obtained is highly valuable in choosing patients for tympanoplastic procedure. We advocate its use in preoperative assessment of patients with chronic suppurative otitis media.

CONCLUSION

We present a simple radiological technique that can be carried out in

even the smallest radiological department in the remotest parts of the world. This study has shown that a dry perforation will be more often associated with a patent Eustachian tube, while a wet perforation is very likely to be associated with some degree of blockage of Eustachian tube. This is in accordance with the clinical impression that reconstructive surgery has a higher success rate if performed on a dry perforation.

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