

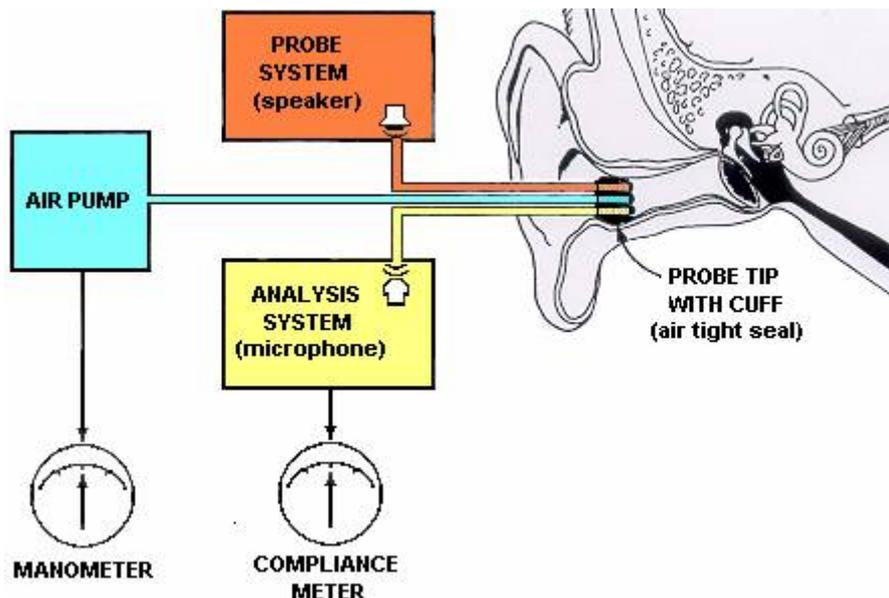
# Tympanometry

## What is tympanometry?

Tympanometry is a technique used to look at the function of the middle ear. It is NOT a hearing test. It is a test used together with otoscopy (looking into the ears) and audiometry (testing the hearing) and is useful in helping to determine how the middle ear is functioning.

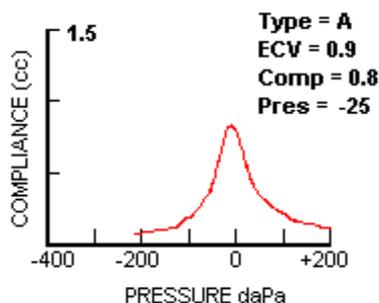
## How does a tympanometer work?

The procedure of tympanometry involves inserting a probe into the outer ear canal and creating an air-tight seal. The probe contains a tiny speaker, a microphone and an air pump. The air pump changes the air pressure range (typically +200 daPa to -400 daPa) in the ear canal. The speaker introduces a calibrated tone into the ear canal, which changes in frequency and loudness. Some of the sound produced by the speaker will be passed through the middle ear, while some of the sound will be reflected back off of the tympanic membrane. The microphone measures the amount of reflected sound in the ear canal. The “compliance” of the eardrum and middle ear (i.e. how well this system responds to sound) is then determined by the tympanometer as the air pressure changes.



## What is a tympanogram?

A tympanogram is a chart which can tell us how well the middle ear is functioning.



### What does a tympanogram tell us?

Tympanograms are classified into types according to the shape of the tympanometric trace (“peak”), which is dependent upon the middle ear pressure, and the middle ear compliance.

A tympanogram can provide three helpful pieces of information:

#### Middle ear pressure

This is the air pressure of the air contained within the middle ear. It is shown by where the “peak” of the tympanometric trace falls along the pressure axis.

Middle ear pressure values ranging from +50 daPa to –200 daPa for children, and +50 daPa to –50 daPa for adults is generally considered normal.

#### Compliance

The compliance of the middle ear system is a measure of how well the system responds to sound. This is shown by the height of the “peak”.

Middle ear compliance values from 0.3 to 1.5 cc are usually considered normal.

#### Equivalent volume of the ear canal

Normative ear canal volumes vary as a function of age. Typically for children a volume range of 0.5 to 1.5 cc is typically considered normal, while for adults the range is 0.5 to 2.00 cc. This value is reported by the tympanometer, but not shown on the tympanogram graph.

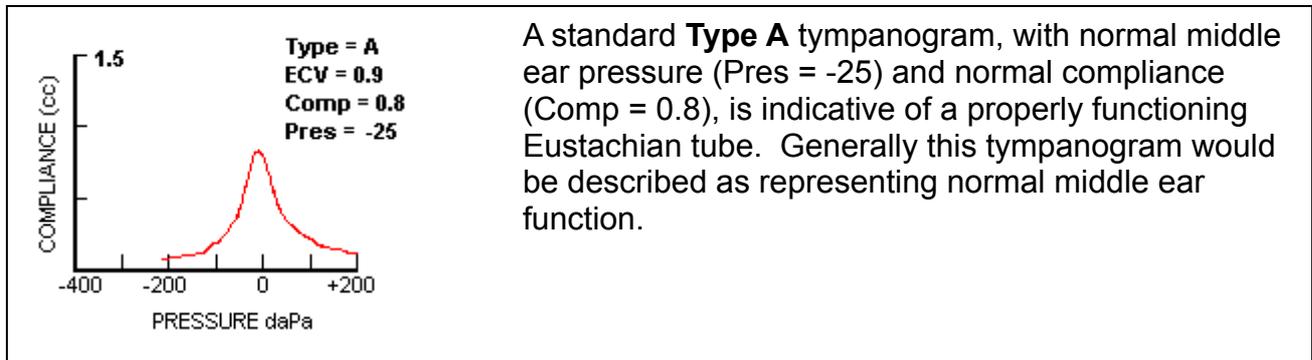
In general, classification of tympanograms is as follows:

- |                     |   |
|---------------------|---|
| Type A tympanograms | normal middle ear pressure<br>Peak between +50 daPa to –200 daPa for children |
| Type C tympanograms | abnormally low middle ear pressure<br>Peak less than –200daPa for children    |
| Type B tympanograms | no pressure peak  |

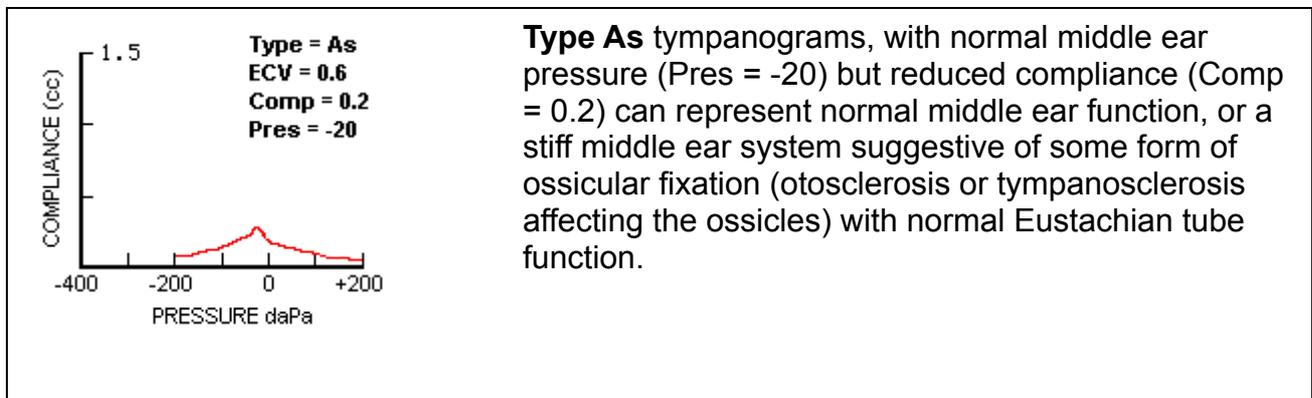
Compliance values and equivalent ear volume allow classification into subtypes, and provide valuable information for diagnosis.

## Type A:

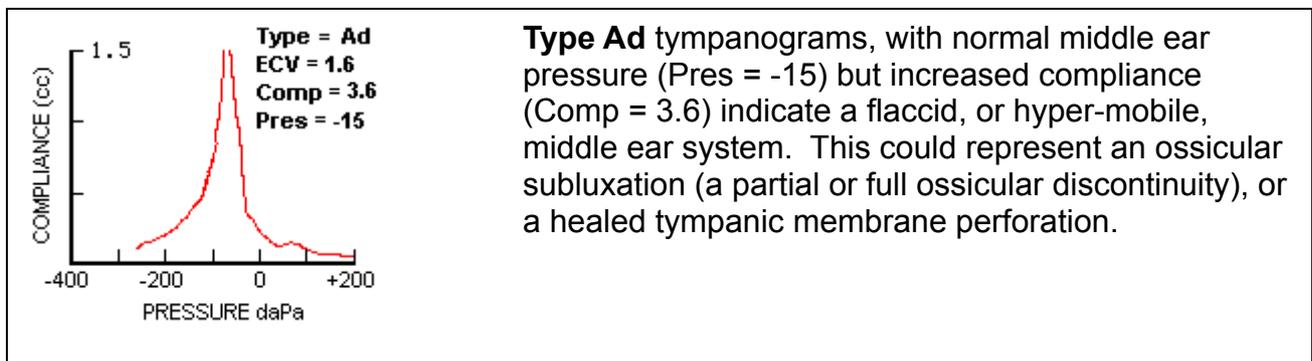
There are three sub-types of Type A tympanograms, A, As and Ad. All Type A tympanograms have normal middle ear pressure peaks. Following are illustrations of the Type A sub-types:



A standard **Type A** tympanogram, with normal middle ear pressure (Pres = -25) and normal compliance (Comp = 0.8), is indicative of a properly functioning Eustachian tube. Generally this tympanogram would be described as representing normal middle ear function.



**Type As** tympanograms, with normal middle ear pressure (Pres = -20) but reduced compliance (Comp = 0.2) can represent normal middle ear function, or a stiff middle ear system suggestive of some form of ossicular fixation (otosclerosis or tympanosclerosis affecting the ossicles) with normal Eustachian tube function.



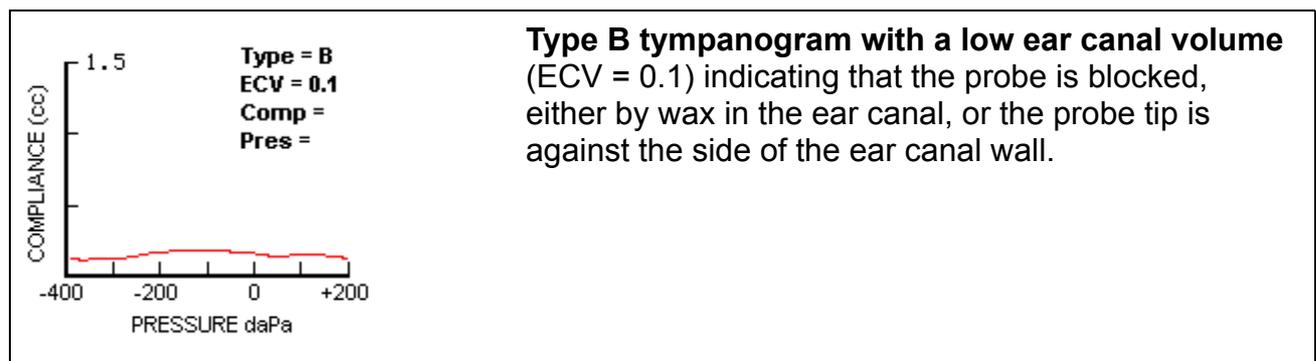
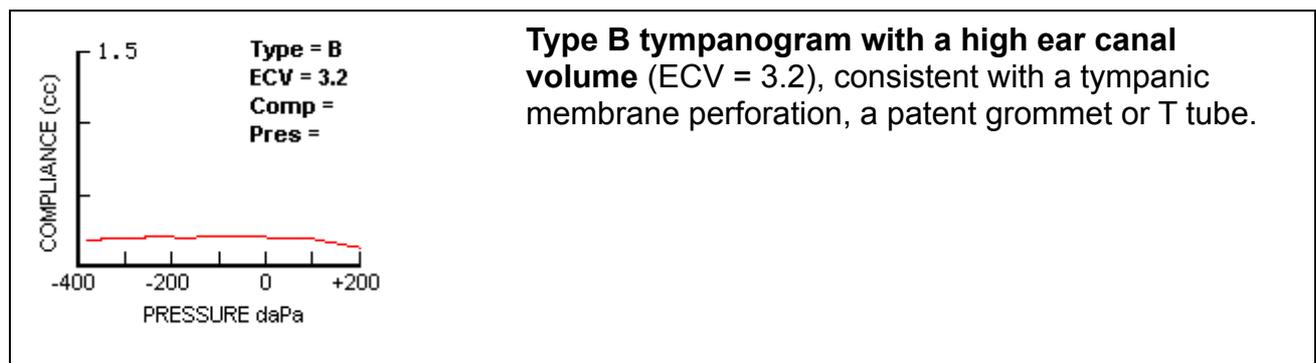
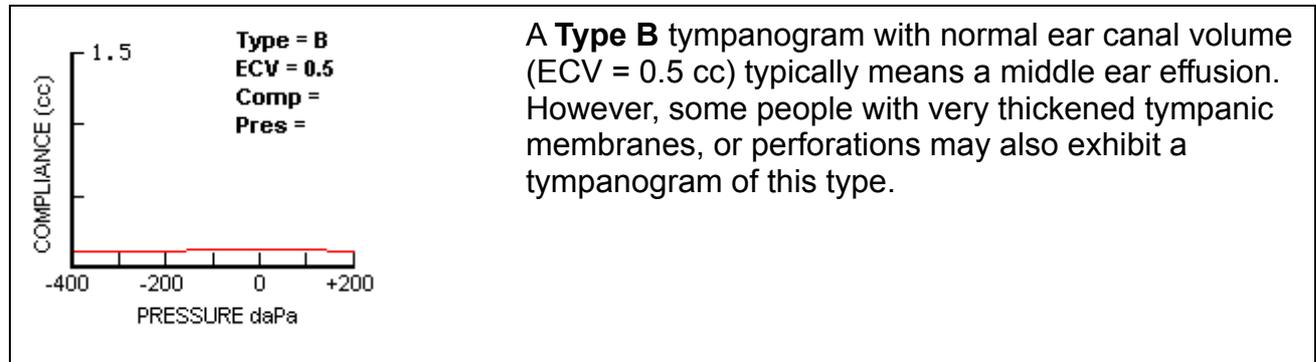
**Type Ad** tympanograms, with normal middle ear pressure (Pres = -15) but increased compliance (Comp = 3.6) indicate a flaccid, or hyper-mobile, middle ear system. This could represent an ossicular subluxation (a partial or full ossicular discontinuity), or a healed tympanic membrane perforation.

## Type B:

Type B tympanograms exhibit no air pressure peaks and are generally described as “flat” tympanograms. There are several middle ear conditions, which can result in Type B tympanograms.

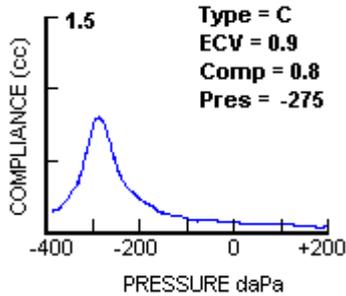
Type B subtypes are

- those with normal equivalent ear canal volume
- those with high equivalent ear canal volume
- those with low equivalent ear canal volume.

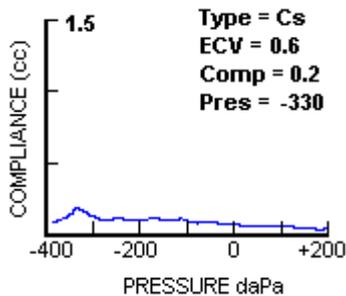


## Type C:

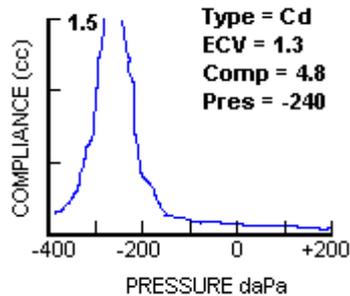
Type C tympanograms generally have similar compliance values and shapes as Type A tympanograms. What sets them aside from Type A tympanograms is that the middle ear pressure is abnormally low indicating Eustachian tube dysfunction.



This **Type C** tympanogram, with normal compliance (Comp = 0.8) but low middle ear pressure (Pres = -275) typically means a Eustachian tube dysfunction without the presence of middle ear effusion.



This **Type Cs** tympanogram, with reduced compliance (Comp = 0.2) and low middle ear pressure (Pres = -330), in addition to indicating a Eustachian tube dysfunction, most likely also means there is some fluid in the middle ear as well as some air.



This **Type Cd** tympanogram, with increased compliance (Comp = 4.8) and low middle ear pressure (Pres = -240), also suggests either an ossicular subluxation, or healed tympanic membrane perforation (similar to Type Ad) with Eustachian tube dysfunction.