**Eardrum Retractions**

In this tutorial you will learn about retractions of the eardrum. These behave differently to perforations although their origins are very similar. The tutorial will take you through causes, natural history, symptoms and management of retraction pockets. The quiz at the end will, once again, ask you to imagine that you are a surgeon and you will decide which operations, if any, could be performed.

The next tutorial will be on cholesteatoma but it is important to understand retractions first. Some will become cholesteatomas although most will not.

**OVERVIEW OF TERMINOLOGY**

There are a number of terms that surgeons use when they describe retractions. Here are the common ones:

1. Retraction
2. Retraction pocket
3. Pocket
4. Atelectasis

They all describe the same thing: an area of the eardrum that has become medialisied. This means that the drum has been drawn towards the middle ear space and lies more medially than a normal eardrum should. Retractions may be small or very large. There can be a small area of retraction in an otherwise perfectly normal drum or there can be total collapse of the drum.

Not only does their size vary but so does the amount or depth of retraction. Some drums have a mild retraction (one that is only very shallow) while others have very deep retractions (where the drum is lying on the promontory or even down towards the Eustachian tube.

This eardrum has an atrophic segment in the posterio-superior segment. It is being pulled into the middle ear and is resting on the long process of the incus (blue arrow). Look at the perforation tutorial for a description of atrophy.

Another way of describing this is as a shallow retraction.

http://www.dallasear.com/conditions-eardrum-retraction.html
In this ear the atrophic segment is much larger and includes the posterior and inferior parts of the drum. Only the anterosuperior quadrant is normal.

The atrophic segment has retracted into the middle ear and is stuck to the round window niche, the incus, the stapedius and the pyramid.

This is a deep and extensive retraction which is shown again in the diagram below.

http://www.drtbalu.com/ret_pock.html

The whole of the posterior part of the drum has become retracted and is resting upon the round window niche, incus, stapes, stapedius tendon and pyramid. The green line surrounds the retraction. The anterior drum is aerated and normal.

In this diagram: RWN is the round window niche.

So why do retractions develop?
PATHOLOGY

They probably develop following long-term negative ear pressure caused by Eustachian tube dysfunction. The low pressure in the middle ear space sucks the eardrum inwards. Often the eardrum will be weak because of previous glue ear, acute otitis media or surgery and this will make the retractions develop more easily. The middle layer of the drum can disappear in these conditions and the drum becomes atrophic. You will remember from the perforations tutorial that atrophic parts of the drum may perforate as well.

NATURAL HISTORY

One of the great worries about drum retractions is whether they turn into cholesteatomas. Not all of them will; in fact most of them won't. They just stay as they are and don't develop further. Sometimes they resolve. This means that the drum moves back into its normal position and the retraction disappears.

Surgeons will usually observe a retraction for some time before they know whether a cholesteatoma is forming. If it is not causing problems it can safely be left alone but if it is becoming a cholesteatoma an operation will be required.

Some surgeons will operate on retractions to stop them becoming cholesteatoma in the future.

TYPES OF RETRACTION

Retractions come in a variety of sizes and depths. Some are very small and hardly noticeable while others are huge and develop into cholesteatoma. The sequence of pictures below shows them in the form of a line drawing so that you can understand how they get bigger. Following that there are some clinical pictures so that you can see what they look like in life.

This picture shows the normal structures of the middle ear and drum.

The drum is in its normal position and it is strong with its three layers healthy and intact.

The pink line is the skin, the green line is the middle ear mucosa and the brown line is the middle fibrous layer of the drum.
Minor retraction.

In this picture the fibrous layer has gone – perhaps due to long term negative middle ear pressure or recurring infection.

The drum is, therefore, weaker and starts to fall into the middle ear.

In this picture it is resting upon the long process of the incus.

Compare this image with the diagram above.

It shows a very shallow posterior drum retraction. The retraction is resting on the long process of the incus and the incus can be seen very clearly.

This would cause a minor amount of hearing loss only or none at all.

The retraction is deeper in this picture and we can now see the head of the stapes as well.

The incudostapedial joint is still intact and this will cause a minor hearing loss only (unless there is other disease in the ear as well).
Moderate retraction.

The retraction in this picture is more severe. The long process of the incus has been eroded away and the retraction is in direct contact with the stapes head.

In addition to this the retraction is starting to enter the epitympanum (see tutorial one for a reminder of where the epitympanum starts).

In this slide we can see the usual posterior retraction but the long process of the incus has gone and the drum is resting directly on top of the stapes head just like in the diagram above.

This has a number of different names. It is sometimes called a type 3 mechanism (after the classification of Wullenstein that you read about in the tutorial on perforations). It also has a longer and harder name: myringo-stapediopexy

Severe retraction

In this picture the retraction has eroded the stapes suprastructure so that it is now resting on the footplate of the stapes within the oval window.

The retraction has clearly entered the epitympanum.

The Eustachian tube has become isolated. This means that air coming up from the nasopharynx can only get as far as the anterior mesotympanum. It cannot reach the rest of the middle ear at all.
This looks like a perforation but it isn't. The posterior drum has fallen inwards and formed a very deep pocket.

The long process of the incus and the stapes suprastucture have gone. The eardrum is resting directly onto the footplate of the stapes.

The line drawing below shows the anatomy.

This bigger image shows the same ear but enlarged and with annotations. Make special note of the course of the facial nerve as it passes through the ear. Its position makes it very vulnerable to the effects of cholesteatoma and infection.
The stapes footplate lies in the oval window but the retraction has destroyed the suprastructure (arches and head). Anteriorly we can see that the middle ear is aerated by the Eustachian tube. The rest of the middle ear has little or no air in it.

**ARE ALL RETRACTIONS BAD?**

It is easy to believe that, if a patient has a retraction of their eardrum, they will at some time in the future develop a cholesteatoma. Luckily, this is not true for most patients, as the next sections will show.

**Grades of retraction.**

Because of the importance of retractions a number of surgeons have created grading schemes to help describe retractions easily and to allow surgeons to predict what will happen to the retraction in the future.

There are many schemes and each has its own advantage so I have simply presented the most commonly used schemes: Sade and Tos.

Jacob Sade developed a scheme to describe pars tensa retractions. It is described in the following table.

<table>
<thead>
<tr>
<th>Grade</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>Grade1</td>
<td>The eardrum is slightly retracted but is not touching the incus</td>
</tr>
<tr>
<td>Grade 2</td>
<td>The eardrum is touching the incus or the stapes or is adherent (stuck) to them</td>
</tr>
<tr>
<td>Grade 3</td>
<td>The eardrum is touching the promontory</td>
</tr>
<tr>
<td>Grade 4</td>
<td>The eardrum is adherent to the promontory</td>
</tr>
</tbody>
</table>

You can see that Sade makes a distinction between drums that are touching the promontory and those that are adherent (stuck) to the promontory. It can be difficult to tell if the drum is stuck down like this. One way to tell is by using the pneumatic speculum to move the drum.

Grade 1 retractions usually do not develop into anything and will either stay as they are or get better. We don’t need to watch these in our patients.

Grade 2 and 3 retractions may get better, stay the same or get worse. About 1 in 7 will get worse and it is worth watching these for a few years to see what will happen. If after 5 years there is no change then you can stop watching them.

Grade 4 retractions, however, do not get better. Often they are unchanging but sometimes they will perforate so that the patient has a posterior perforation or they will start to collect skin and become cholesteatomas. These are definitely worth watching for long periods to see if cholesteatoma develops and surgery is
required. In the UK I will usually operate on these to remove the retraction and prevent future cholesteatoma formation.

Mirko Tos developed a different scheme and this is used for pars flaccida retractions.

<table>
<thead>
<tr>
<th>Stage</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stage 1</td>
<td>Mild retraction with air present between the pocket and the malleus neck</td>
</tr>
<tr>
<td>Stage 2</td>
<td>Pocket touches malleus neck with or without erosion of the neck</td>
</tr>
<tr>
<td>Stage 3</td>
<td>Pocket begins to expand with a small amount or erosion of the outer attic wall (scutum)</td>
</tr>
<tr>
<td>Stage 4</td>
<td>More severe erosion of the scutum with pocket attached to the malleus head or incus body</td>
</tr>
</tbody>
</table>

Stage 3 diseases should be watched and Stage 4 disease is likely to require surgery.

Treatments for retraction.

As can be seen above many retractions do not need any treatment and will either get better or stay as they are. It is the ones that become cholesteatomas that are the problem.

In your practice in Cambodia I suggest the following:

1. When you diagnose a retraction make a clinical note of it and draw it. Try to assess what grade it is by using Sade and Tos grading systems if you can.

2. If the grade is low (Sade 1 and 2; Tos 1 and 2) then you should not worry about it too much. Simply treat the patient’s infection if present.

3. For intermediate retractions (Sade 3 and Tos 3 you may want to observe the patient for a year or so to see if the retraction is getting worse. If it is you should refer.

4. If there is a Grade 4 Sade pars tensa retraction or a Stage 4 Tos pars flaccida retraction the patient should be referred for surgery.