

Pressure Equalization Tube Placement

It has been recommended that your child undergo pressure equalization tube placement. This is also known as "ear tube," "ventilation tube," "tympanostomy tube" or "PE tube" placement.

How do ear tubes work? Understanding the middle ear and the Eustachian tube.

To understand how ear tubes work, you must first know about the middle ear and Eustachian tube. The ear has three parts: the outer ear, the middle ear, and the inner ear. The eardrum is a very thin membrane that separates the outer ear from the middle ear. The middle ear is an air chamber. It is connected to the back of the nose and throat via a narrow tube called the Eustachian tube. The Eustachian tube is a pressure-equalizing valve and a drainage tube. Normally, the Eustachian tube opens with swallowing and yawning. In infants and young children, the Eustachian tube is narrow and flat. By age 7 or so, the Eustachian tube is larger and more upright which improves its ability to function.

Many problems within the middle ear space are related to the Eustachian tube. Blockage of the Eustachian tube creates negative pressure in the middle ear and over time can pull the eardrum inward. If this occurs, clear fluid may be drawn from mucous membranes into the middle ear space causing a fluid buildup. This frequently occurs in children with upper respiratory infections or allergic symptoms. Sometimes the fluid can last a long time. When it does it is called "chronic" fluid, or "chronic otitis media with effusion."

If bacteria or a virus enters the middle ear fluid through the Eustachian tube, a pus infection can accumulate behind the ear drum. This is called "acute otitis media" and is often accompanied by symptoms of fever, ear pain, irritability and sometimes drainage (if the infection ruptured the eardrum.) If not treated, both recurrent episodes of acute otitis media as well as chronic otitis media with effusion can have potentially serious complications. These include permanent hearing loss, middle ear and eardrum scarring, middle ear skin cyst formation, or even (at the extreme) meningitis.

I have heard about "adenoids". How are they important?

The "adenoid" is tonsil-like tissue that is located in the back of the nose, next to the opening of the Eustachian tube. Even though there is only one adenoid, we often call it "adenoids." Children approximately 3 years of age and older are likely to have enlarged adenoids. Adenoids can be large because of allergies or just the normal germs to which children are exposed. The adenoids can physically block the opening of the Eustachian tube. Also, the adenoids can be chronically inflamed ("chronic adenoiditis") and can seed germs up into the middle ear.

In children less than 3 years old, the adenoids are usually less of a concern. The doctor would have discussed with you if the adenoids were felt to be an important surgical issue for your child.

What are pressure equalization tubes?

Since it is not possible to surgically alter the actual Eustachian tube, a PE tube is placed within the eardrum to serve as an artificial Eustachian tube. It is a small, usually round piece of specialized plastic with a tiny hole in the center. PE tubes stay in place about 6 months to two years before they fall out on their own into the ear canal. Some children require a longer tube which can stay in much longer.

Although PE tubes greatly decrease the frequency of middle ear infections, it is still possible to get one. A tube will allow the infection to drain out into the ear canal so that pain, fever, and the possibility of hearing loss are minimized.

What are potential reasons for pressure equalization tube placement?

- A substantial hearing loss in patients with any type of otitis media
- Poor response to antibiotics
- Chronic otitis media with fluid for more than 3 months
- Recurrent episodes of acute otitis media
- Chronic retraction of the eardrum

What happens during the procedure?

The surgery is performed under a microscope. Wax is removed and a small incision ("myringotomy") is made in the front part of the ear drum. Fluid, pus, and/or debris are suctioned from the middle ear space and a tiny pressure equalization tube is placed in the ear drum.

What happens on the day of surgery?

This is one of the most common surgical procedures and is usually performed in an outpatient surgical center. The anesthesiologist, operating room nurse, and doctor will see you in the pre-operation holding area. Children usually do not have an I.V. placed. Your child is then taken to the operating room.

Your child is placed under general anesthesia by breathing a light anesthesia medicine through a mask. The procedure is then performed. It usually takes 5 to 15 minutes. The doctor will talk to you right away after the surgery but you will not be able to see your child for about 10 minutes more.

Your child may be fussy or calm, fully awake or still asleep. These are all normal variations of recovery from anesthesia. There will be EKG (heart monitor) wires, an oxygen probe on the fingertip or toe, a blood pressure cuff, a tube blowing humidified oxygen near the pillow, and a lot of nurses, technicians, beeping, and buzzing. All of this is normal! It is also normal to see blood-tinged fluid on the cotton balls in the ears. The cotton balls may even fall out in the recovery room. Very rarely a child may be nauseous and vomit.

Does my child stay the night?

This is an outpatient procedure. Most children go home within one hour of surgery.

What do I expect the first few days?

Your child may be irritable and tired the first 24 to 48 hours after surgery. More commonly, they will be feeling normal by the early evening. You can expect a small amount of thin, blood-tinged drainage from the ears (more if there was active infection at the time of surgery) for about 2-3 days.

When should my child return to school/daycare/sports?

This is at your discretion. Generally, children return to school/daycare and may resume normal activity and sports the following day. However, swimming should be avoided for one week.

What should my child eat?

Lighter foods and plenty of liquids are encouraged during the first 24 hours. A normal diet may be resumed the following morning.

When will my child follow-up in clinic?

The office will provide you a follow-up for anywhere from 2 to 3 weeks after surgery. The timing is not critical.

Do I need to keep water out of my children's ears?

What are the benefits of surgery?

1) 90% reduction in acute middle ear infections - As the number of middle ear infections declines after surgery, the need for antibiotics is also reduced, and decreases the likelihood of developing antibiotic-resistant bacterial ear infections.

2) Resolution of conductive hearing loss - The most common type of hearing loss related to chronic otitis media with effusion (chronic fluid) and acute otitis media is a "conductive" hearing loss. After removal of fluid from the middle ear space during PE tube placement, the conductive hearing loss is usually resolved. (Of note, most children will have a few decibels of "inconsequential" very low frequency conductive hearing loss just because of the biomechanics of having an ear tube in the ear drum. It might show up if a post-operative audiogram was performed.)

3) Minimize or prevent the longer term complications of chronic ear disease including:

- Permanent, irregular holes in the eardrum
- Severe scarring within and between the eardrum and tiny middle ear bones
- Bone deterioration
- Cholesteatoma (middle ear cyst of dead skin cells)
- Development of eardrum retraction pockets
- Permanent conductive hearing loss

4) Improve speech development - As ear tubes help correct conductive hearing losses that occur with fluid behind the eardrum, they can also help improve speech development. Some aspects of

development are especially vulnerable to the intermittent hearing losses caused by even brief episodes of fluid behind the eardrum.

What are the risks of surgery?

- 1) Bleeding – There is a very minimal risk of bleeding and, when it does happen, is usually associated with a severe ear infection at the time of surgery.
- 2) Infection* – Without antibiotic ear drops after surgery, there may be as much as a 50% chance of a draining infection of the tubes in the first 2 weeks after surgery. The ear drops should be used as directed. If there was an active middle ear infection at the time of tube placement, the ear drops will be prescribed for a longer period and I may also prescribe an oral antibiotic.
- 3) Pain* – Pain from the ear tubes themselves is not expected. However, your child may continue to tug at the ears or say the ears feel funny because they are getting used to normal sounds and normal ear pressures after having clogged ears for so long. Irritability in the first 24 hours after surgery is usually because of the anesthesia.
- 4) Draining ear episodes* – 15-25% of children will have green-yellow drainage from the ear at least once during the duration that the tubes are in. This may, rarely, be a middle ear infection draining through the open ear tubes (the ear tubes are doing their job). More likely, it is infected “granulation tissue” around the tube which is a temporary body reaction to the tubes. There may be blood if it is granulation tissue. This is easily treated with appropriate antibiotic ear drops. Very rarely a tube may itself become permanently infected and cause recalcitrant drainage requiring tube removal.
- 5) Hearing loss* – There is a <1% incidence of nerve hearing loss following PE tube placement.
- 6) Tube blockage - 7% of ear tubes become blocked by wax, granulation tissue, or dried mucous. Drops are usually successful in unblocking them and only rarely would a tube need to be removed because it remained non-functional.
- 7) Eardrum scarring* - Also known as "tympanosclerosis" or "myringosclerosis." There is a 15% incidence of this. It is a "cosmetic" problem in that it only very rarely stiffens the eardrum enough to decrease sound wave transmission.
- 8) Localized eardrum weakness* - 2% of eardrum holes will heal with a weak ("atrophic") area at the site of the prior tube. It is a "cosmetic" problem in that it only very rarely collapses enough to decrease sound wave transmission.
- 9) Need for another set of PE tubes - This is not a risk of the procedure, per se, but rather a potential risk of the underlying disease process. In other words, after the ear tubes fall out and the ear drum heals closed, the original middle ear problems and Eustachian tube problems may come back. 5 to 10 % of children require at least one repeat set of tubes.
- 10) Cholesteatoma (middle ear cyst of dead skin cells)* - There is a 1% chance that the margins of the eardrum at the site of the prior PE tube will invaginate into the middle ear space and cause a skin cyst. This is very severe and usually requires surgery.

11) Retained PE tube - Less than 5% of tubes stay in longer than 3 years at which time a brief anesthesia may be required to remove the tube.

12) Early PE tube extrusion - 4% of ear tubes fall out before 6 months. This is usually in younger children and is usually associated with a middle ear infection that generates enough pus to push the tube out.

13) Persistent hole in eardrum* - There is a 2% chance that a hole will remain in the eardrum after the tubes falls out. Some of these holes will require a patch procedure or graft surgery to close the hole.

*Much more likely to occur if PE tube is not placed and the chronic ear issues allowed to progress.

Please let us know if you have any questions.

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