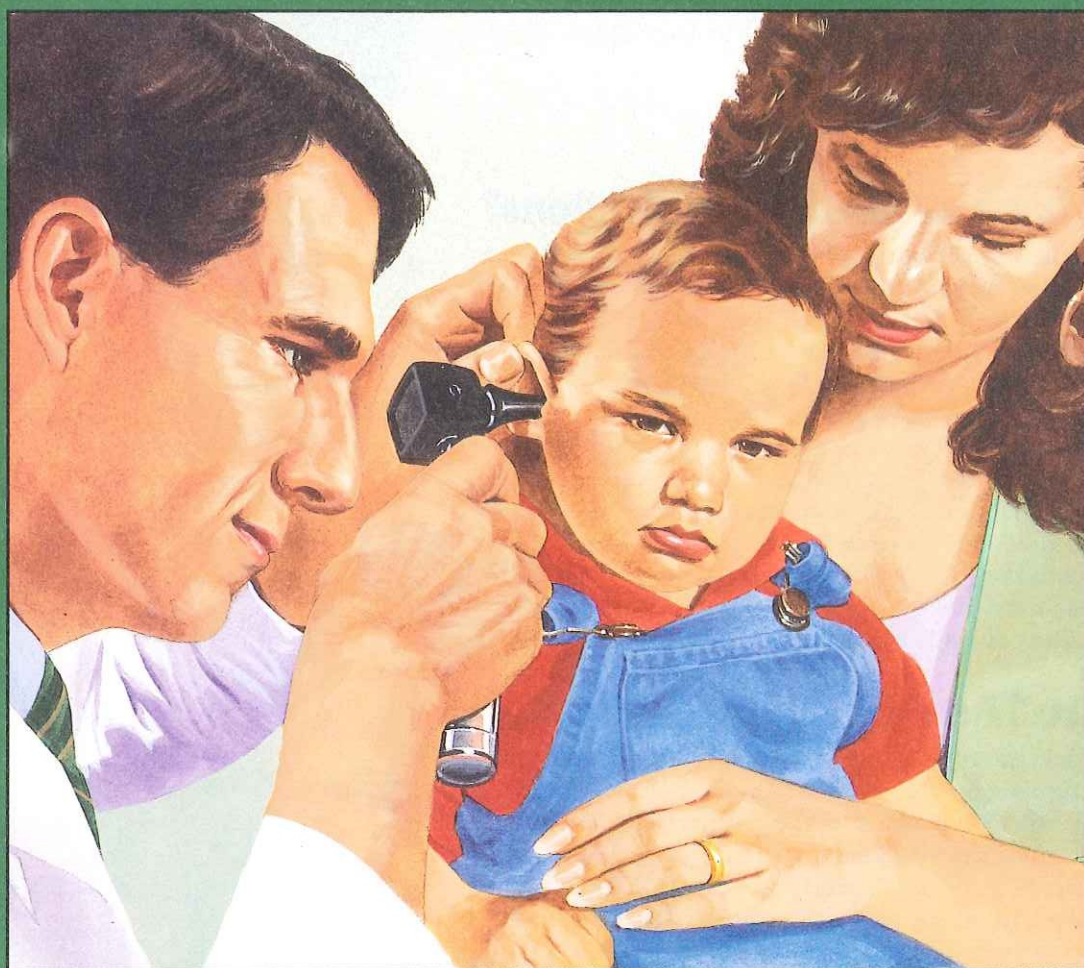


Treating  
**MIDDLE EAR  
INFECTIONS**



To Protect Your Child's  
Health and Hearing



# NOT “JUST AN EARACHE”

A flushed, teary face and cries that go on and on in the middle of the night. Is this your child? Or is your child overly restless or cranky—maybe tugging on an ear or talking about his or her ears “making noises”? These actions may be your child’s way of telling you about a middle ear infection. In the early stages, these infections can be very painful. Sometimes, associated problems linger for months and affect hearing. But, despite their potential severity, middle ear problems respond well to treatment.

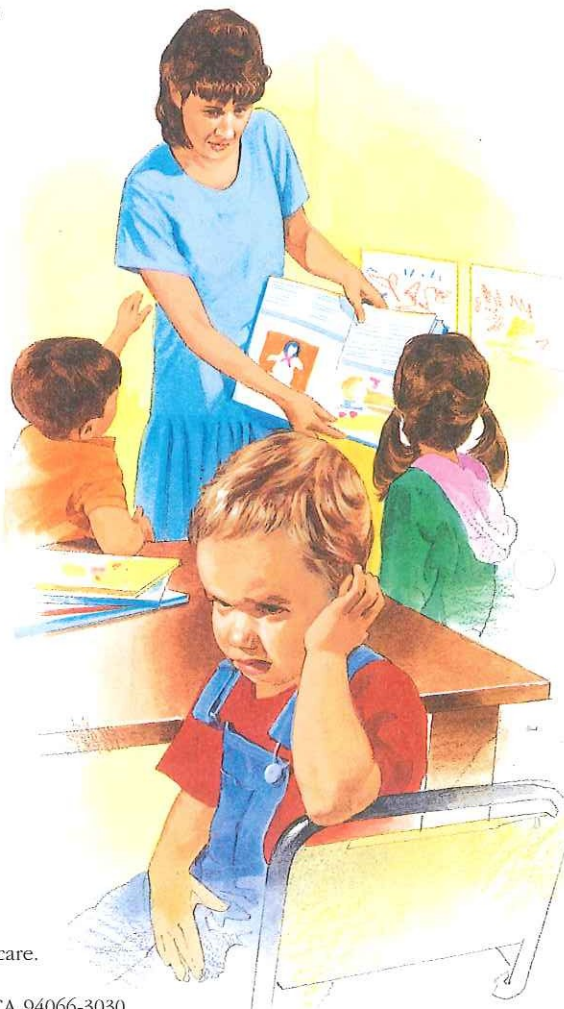


## What Are Middle Ear Infections?

Middle ear infections occur behind the **eardrum** (the thin sheet of tissue that passes sound waves between the outer and middle ear). These infections are usually due to bacteria or viruses, which are often related to a recent cold or allergy problem. In many cases, both ears are affected. Middle ear infections are most common in young children, whose ear anatomy is not yet fully developed. Children under age 5, boys, bottle-fed infants, and children in daycare run the greatest risk of infection. Although much less common, middle ear infections can also occur in older children and adults.

## Are These Infections Serious?

Middle ear infections can be painful and they tend to disrupt sleep—for you as well as for your child. But this isn’t the full extent of the problem. Middle ear infections can also limit the eardrum’s flexibility, reducing your child’s ability to hear. This could make it harder for your child to learn to talk. Depending on when the hearing problem starts and how long it lasts, your child’s learning ability could be affected.



This booklet is not intended as a substitute for professional medical care. Only your doctor can diagnose and treat a medical problem.

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## Treatment Restores Health and Hearing

Middle ear infections can be treated, but over-the-counter remedies aren't the answer. Middle ear problems need a doctor's care. Special medications are often used to cure or prevent infection. In some cases, the doctor may suggest a simple surgical procedure to control future problems.

### Medical Care

The doctor examines your child to diagnose the cause of his or her symptoms. If a middle ear infection is present, your child's age and the number and severity of infections all influence treatment decisions. Your child's treatment plan may include using antibiotics and finding ways to reduce the risk of future infections.

### Surgical Care

If your child has ongoing or frequent middle ear problems, the doctor may recommend surgery to stop discomfort and correct any hearing loss. The procedure used to treat middle ear problems is quick and effective. In fact, children can almost always be treated and released the same day (outpatient surgery).



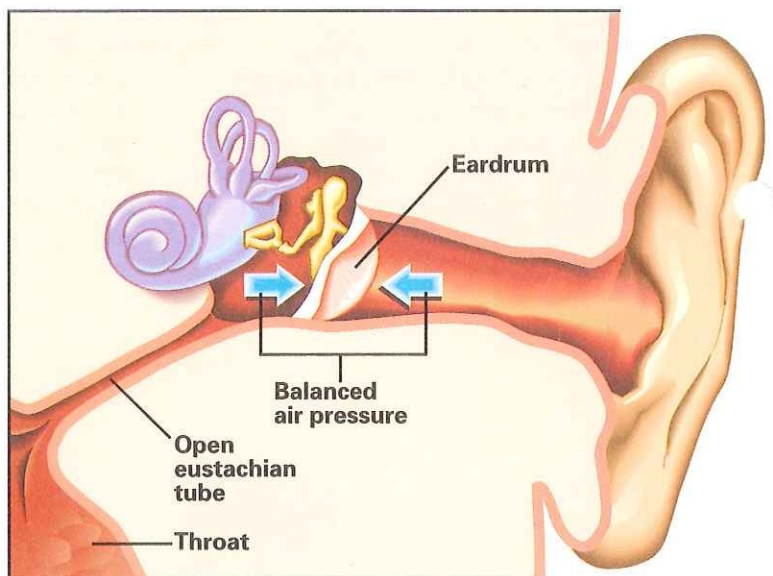


# UNDERSTANDING THE MIDDLE EAR

The middle ear is an air-filled chamber that lies behind the eardrum. Pressure in the middle ear changes to match air pressure outside of the eardrum. When inside and outside pressures are balanced, the eardrum is flexible and normal hearing is more likely. Problems occur when air pressure in the middle ear drops. This is usually due to a block in the **eustachian** (u-STA-shun) **tube**, the narrow channel connecting the ear with the back of the throat.

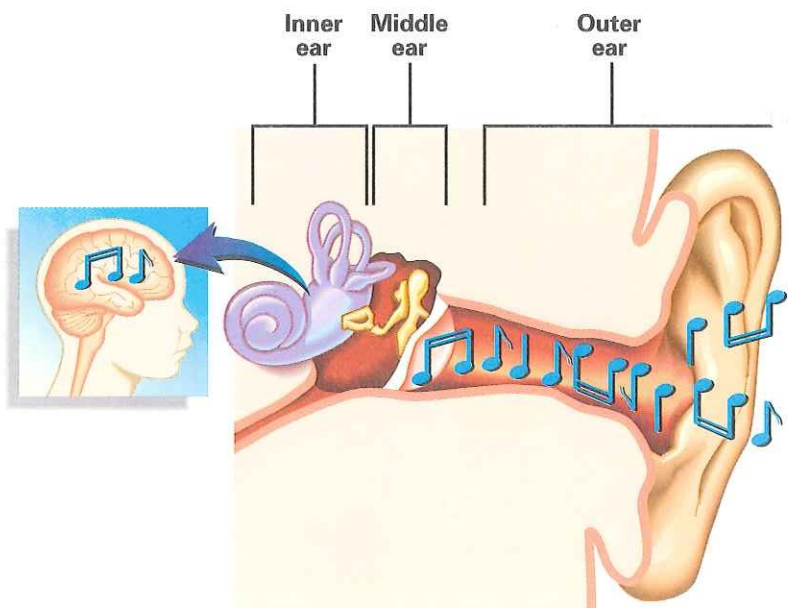
## An Open Tube

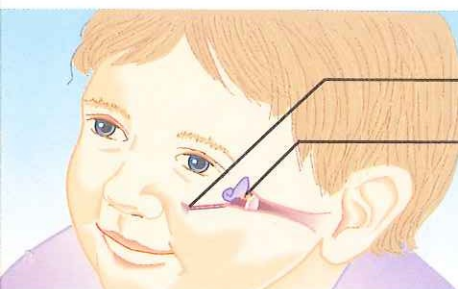
As the link between the middle ear and the throat, the eustachian tube has two roles. It helps drain normal, cleansing moisture from the middle ear. It also controls air pressure inside the middle ear chamber. When you swallow, the eustachian tube opens. This balances the air pressure in the middle ear with the pressure outside the eardrum. In infants and young children, the eustachian tube is short and almost level with the ear canal. By about age 7, however, the eustachian tube has become longer and steeper. This improves how well it works.



## Normal Hearing

The eardrum and middle ear are important to normal hearing. Together, they pass sound from the outer to the inner ear. When sound from the outer ear hits a flexible eardrum, the eardrum vibrates. The small bones in the middle ear pick up these vibrations and pass them along to the inner ear. There, the vibrations become electrical signals, which are sent along nerve pathways to the brain.



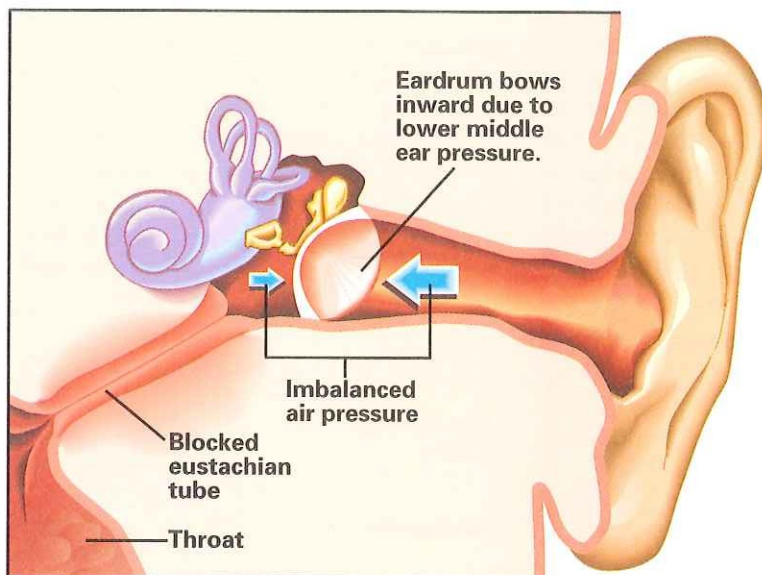


The eustachian tube connects the middle ear with the nose and throat.

Middle ear

## A Blocked Tube

Middle ear infections are usually caused by bacteria or viruses. In young children, these germs probably reach the middle ear by traveling the short length of the eustachian tube from the throat. Once in the middle ear, they multiply and spread. This irritates delicate tissues lining the middle ear and eustachian tube. If the eustachian tube lining swells enough to block off the tube, air pressure drops in the middle ear. This pulls the eardrum inward, making it stiffer and less able to transmit sound.

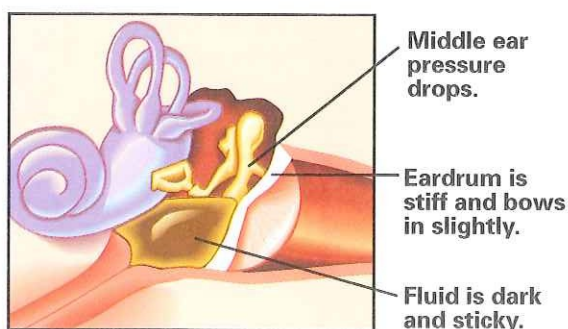
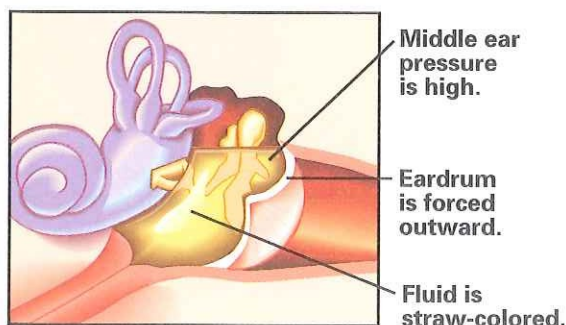


## Fluid Buildup Causes Pain

Once the eustachian tube swells shut, moisture can't drain from the middle ear. Instead, fluid produced to flush out the infection builds up in the chamber. This may raise pressure behind the eardrum, decreasing pain slightly. But if the infection spreads to this fluid, pressure behind the eardrum shoots way up. The eardrum is forced outward, becomes painful, and may break.

## Chronic Fluid Affects Hearing

If the eardrum doesn't break and the tube remains blocked, the fluid becomes **chronic** (an ongoing condition). As the **acute** (immediate) infection passes, the middle ear fluid thickens. It becomes sticky and takes up less space. Pressure drops in the middle ear once more. Inward suction stiffens the eardrum, affecting hearing. If the fluid is not removed, the eardrum may be stretched and damaged.





# MAKING A DIAGNOSIS

If an ear problem seems likely, the doctor will examine your child and view both eardrums. Tests may be done to check the condition of the middle ear or to measure any hearing loss. Treatment recommendations will be based on results of the exam and any tests, as well as your child's health history.

## Examining Your Child

The physical exam helps the doctor determine the specific type of ear problem affecting your child. The exam also helps identify any respiratory illnesses, such as bronchitis, pneumonia, or strep throat. During the exam, the doctor listens to your child's heart and lungs and looks in the ears, nose, and throat. If your child's **tonsils** (masses of tissue near the back of the throat) are greatly enlarged, the doctor may check the **adenoids** (pads of tissue in the upper part of the throat) as well.



## If Adenoids Are Infected

The adenoids are located near the site where the eustachian tube opens into the throat. Their job is to help filter inhaled germs before they reach the lungs. If the adenoids themselves get infected, they may swell. After repeated infections, the adenoids may remain enlarged, blocking the eustachian tube opening. In some cases, germs stopped by the adenoids may enter the eustachian tube and spread to the middle ear. Adenoid-related ear problems happen more often in older children and adults.

## Viewing the Eardrum

If the doctor suspects a middle ear problem, **pneumatic otoscopy** is almost always performed. Using a special device (otoscope) to look down the ear canal, the doctor views the eardrum and any fluid behind it. Once in place, the device can also be used to change the amount of air pressure in the canal, so the doctor can see how flexible the eardrum is. Reduced eardrum flexibility is often linked with fluid buildup. Pneumatic otoscopy takes just seconds and rarely causes discomfort.



**In a normal ear**, the eardrum appears shiny and pearl-gray or pale pink when viewed through an otoscope.

**In an infected ear**, the eardrum may appear bright red when viewed through an otoscope. Fluid, if present, may be seen through the drum.

## Checking the Middle Ear

If your child can sit still for several minutes, the eardrum and middle ear may be tested to learn how well they are working. **Tympanometry** and **acoustic reflex testing** both use a probe to send air and sound through the outer ear. Tympanometry measures the amount of sound passed into the middle ear. It does this by noting air pressure changes in the outer ear. Acoustic reflex testing measures the amount of sound bouncing off the eardrum. The purpose is to evaluate the eardrum's flexibility and its response to loud sounds.



**Tests to evaluate the middle ear** and eardrum are painless and take only a few minutes.

## Identifying Hearing Loss

To learn if a young child has trouble hearing, the doctor or a hearing specialist may talk or play with the youngster. The child's response to changes in the speaker's voice helps identify hearing loss. Older children and adults may be given an **audiometric test**. In some cases, young children with chronic fluid may also be tested. During audiometry, sound waves are sent into the outer ear or vibrations are passed through the bones behind the ear. The listener signals every time he or she hears a tone. Test results are used to identify the types of sounds that can and cannot be heard.



**To identify hearing loss in a young child**, the doctor or hearing specialist talks with the child in a loud, normal, and soft voice. The tone and direction of speech are also varied.

## Other Tests

If the doctor suspects a problem with the structure of your child's ear, a special test may be done. A **computed tomography (CT)** scan shows images of the middle ear bones or bone surrounding the ear. **Magnetic resonance imaging (MRI)** is used to check for soft tissue problems, such as nerve damage or tumors. To identify an inner ear problem, a sophisticated hearing test may be done to pinpoint any problem with the nerve pathways that send signals to the brain. These tests take time to perform, but they do not cause pain.

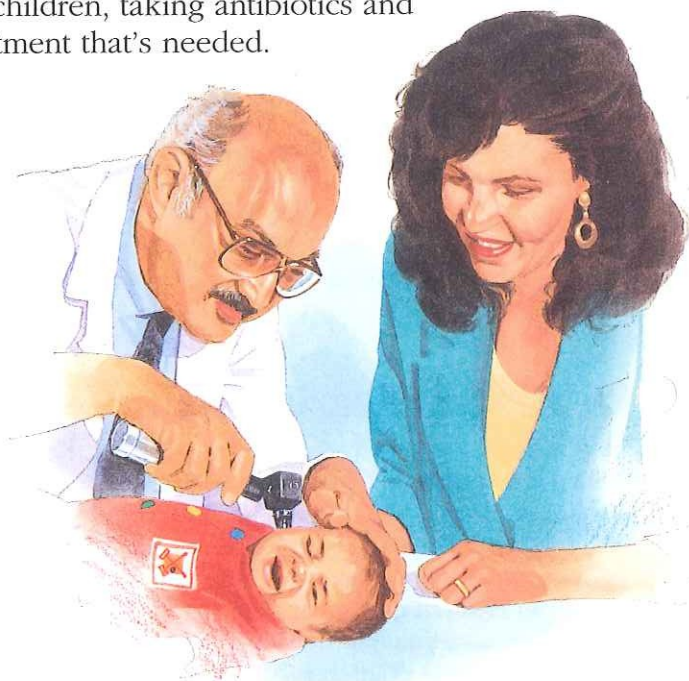


# MEDICAL CARE COMES FIRST

Most children have had at least one middle ear infection by the age of 2. Treatment may depend on whether the problem is acute or chronic, as well as how often it comes back and how long it lasts. The doctor may prescribe medication and then watch to see how healing progresses. For many children, taking antibiotics and reducing risk factors are all the treatment that's needed.

## Watching and Waiting

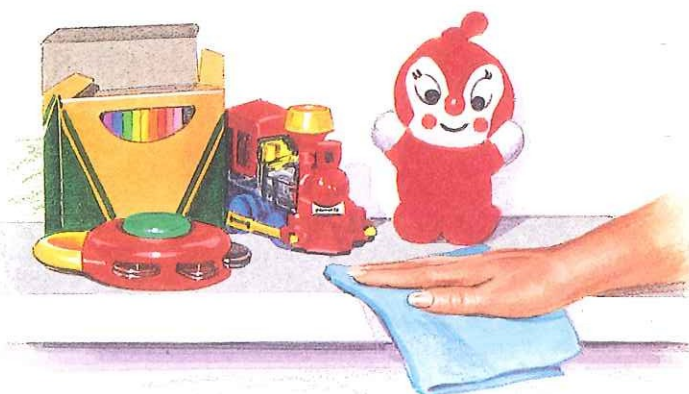
If this is your child's first or second acute infection, the doctor may prescribe antibiotics and suggest a period of "watchful waiting." During this time, your child's ears will probably be retested to look for any eardrum or hearing changes. In most cases, fluid outlasts the acute infection by two to three weeks. If the fluid buildup becomes chronic, however, the doctor may watch your child for up to several months. Why? Because even chronic fluid may go away with time—provided that no new infection occurs.



## Reducing Risk Factors

Some behaviors or surroundings increase your child's risk of ear infection. Reducing such risk factors can be a benefit at any point in treatment. The tips below may help.

- If your child goes to group daycare, he or she runs a greater risk of getting colds or flu. Help prevent these illnesses by teaching your child to wash his or her hands often.
- If your child has nasal allergies, control dust, mold, mildew, and pet hair in the house. Also stop or greatly limit your child's contact with secondhand smoke.
- If food allergies are a problem, identify the food that triggers the reaction and help your child avoid it. In some children, eating or drinking dairy products causes tissues around the eustachian tube to swell. This may make a blockage more likely.





## Using Antibiotics

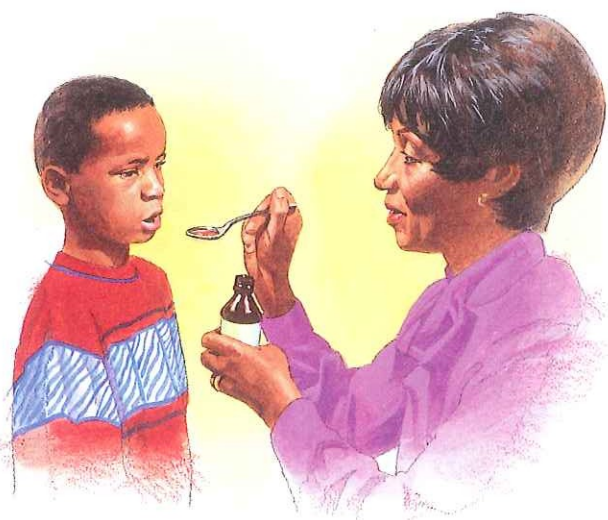
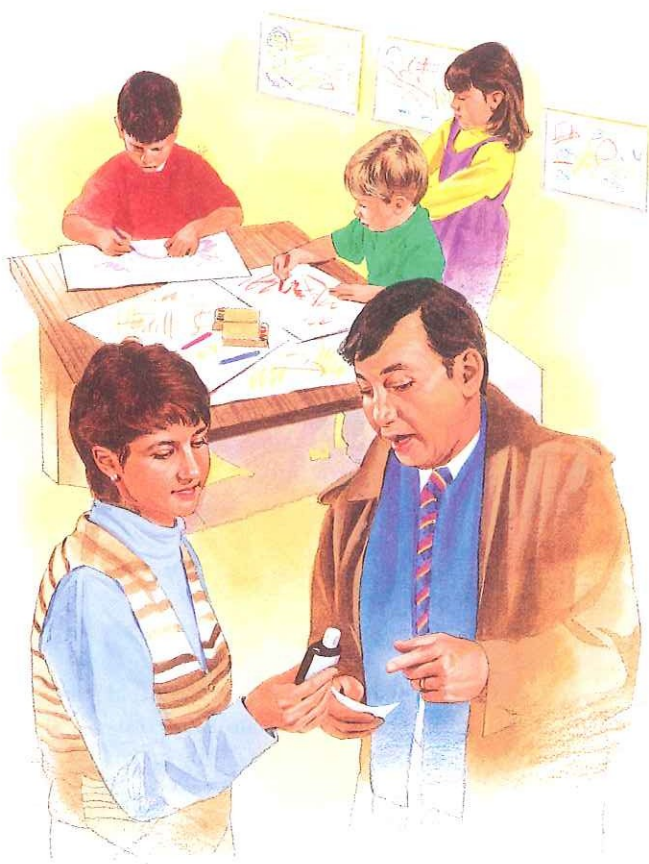
Antibiotics may be used as a short- or long-term treatment, depending on whether the ear problem is acute or chronic. Either way, antibiotics will be effective only in treating bacterial infections. For an acute middle ear infection, the doctor may prescribe 7 to 14 days of antibiotic treatment. In a case of chronic fluid, the doctor may suggest using antibiotics to prevent any new infection while waiting for the fluid to go away. Such antibiotic use may last weeks or months.

Although most children can take antibiotics without problems, side effects can occur. Some children get stomach upset, including vomiting or diarrhea. Some get rashes, hives, puffy eyes, or yeast infections. In rare cases, an allergic reaction may cause breathing problems that require immediate medical care. If your child shows any type of reaction during antibiotic use, call the doctor.

## Tips on Taking Antibiotics

To be effective, antibiotics must be taken correctly. Follow these tips for the best results.

- Ask if your child can be given a prescription that needs to be taken only once or twice a day. This may make life easier for everyone.
- Find out if doses should be given with meals or spaced equally throughout the day. Also, ask if your child should stop eating certain foods while on the antibiotic.
- Be sure your child takes the medication as prescribed while attending daycare or school or while staying in another household. Send a note with instructions to the teacher or other responsible adult.
- Store the antibiotic correctly. The pharmacist can tell you if it needs to be kept out of sunlight or placed in the refrigerator.
- Measure liquid doses carefully, so you won't run out of medication too soon.
- Make sure your child takes the entire prescription.





# IF YOUR CHILD NEEDS SURGERY

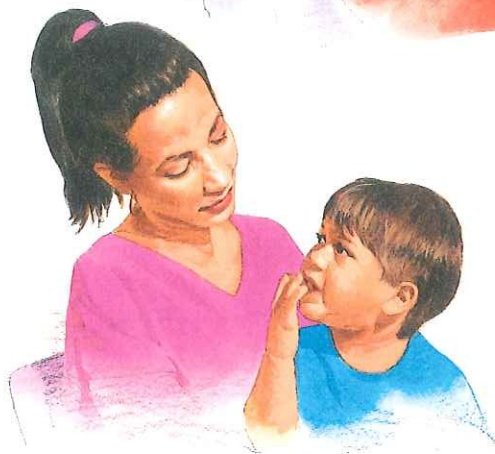
In some cases, medical care alone cannot control middle ear problems. If your child has hearing loss or if fluid still remains after several months, surgery may be recommended to treat the middle ear. An **ENT** (ear, nose, and throat) specialist (also called an **otolaryngologist**) will examine your child and talk with you about the surgical procedure. If you decide on surgery, you'll be told how to prepare your child and you'll be informed about the anesthesia.

## Seeing a Specialist

If your child hasn't already been examined by an ENT specialist, you'll be asked to make an appointment. The ENT specialist will perform an exam focusing on the ear, nose, and throat to make sure surgery can help your child. If it can, the doctor will explain the procedure and answer any questions you may have.

## Making the Decision

As a parent, you may find it difficult to consider surgery for your child. You're not alone. Many parents feel this way, despite knowing that the procedure can improve their child's health. If necessary, give yourself a little time before making a decision. This way, emotions are less likely to affect your judgment. A talk with your child's pediatrician or primary care doctor may help. If you do decide on surgery, you'll work with the specialist's office to set a date. The doctor may want to see your child a day or two before surgery to make sure he or she doesn't have a cold.



## To Reassure Your Child

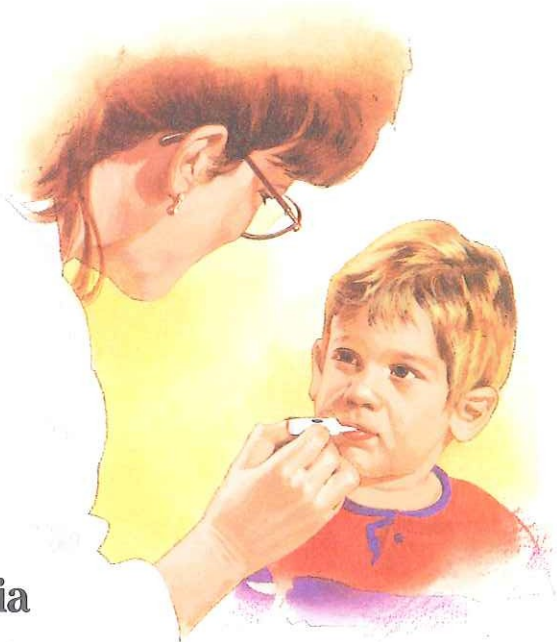
Your child is likely to be scared about having surgery. Help calm any fears by telling your little one what to expect on the day of surgery. Explain that there will be a big building and many new people. Talk about going to sleep, and assure your child that you will be close by when he or she wakes up. You may want to compare the anesthesia mask with the oxygen mask worn by jet pilots. Tell your child the mask fits over the face, just like the ones seen in cartoons or movies. Some children find it helpful to act out the exam or surgery with stuffed animals or dolls.





## Preparing for Surgery

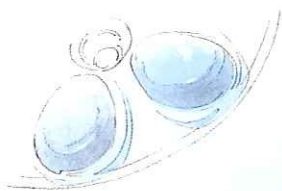
Surgery to control middle ear fluid is a simple outpatient procedure that requires few preoperative instructions. Unless you're told otherwise, stop giving your child food and drink (**NPO**) at least 4 hours before the scheduled arrival time. Depending on the hospital or surgery center, your child may be asked to come in pajamas or to put on a surgery gown at the facility. Your child's temperature will be taken to rule out any active infection, which could require postponing surgery. At some point before the procedure, you—as parent or legal guardian—will be given a consent form to sign. If surgery includes treatment for adenoids or other problems, additional preparation, such as blood tests, may be needed.



## Learning About the Anesthesia

Upon arrival, your child may be given a mild sedative to help him or her relax. Then, right before surgery, your child will breathe a small amount of gas. This light general anesthesia allows children to sleep through the procedure. In most facilities, the anesthesiologist or nurse anesthetist will talk with you before surgery. He or she will explain the possible risks of anesthesia, which include the following:

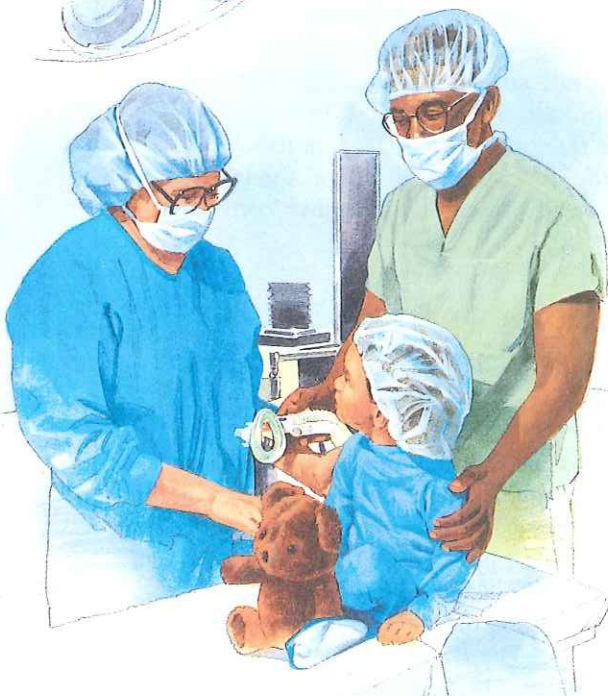
- Sluggish or cranky behavior upon waking
- A short bout of vomiting
- A rare allergic reaction, which may cause breathing problems
- Temporary heart rhythm problems



## Surgery Risks

In the vast majority of cases, surgery to control middle ear fluid is a useful procedure. But, as with any surgery, some risk is involved. Risks include the following:

- Stiffening or other changes in the eardrum
- A tiny hole in the eardrum
- Bleeding, if other procedures are included

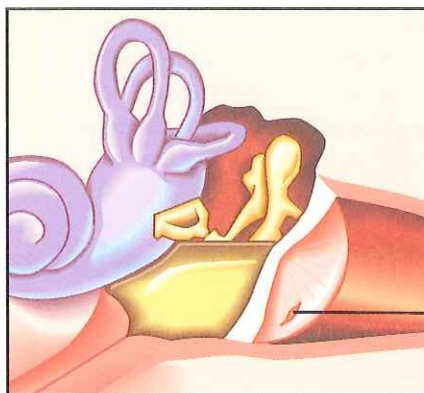


# A SIMPLE PROCEDURE

During surgery, the ENT specialist removes the fluid from your child's middle ear and places a tiny tube in the eardrum. This tube creates a very small tunnel between the outer ear canal and the middle ear. This tunnel balances air pressure on both sides of the eardrum and prevents fluid buildup, even if your child's eustachian tube becomes blocked again. In most cases, surgery can be done on both ears in less than 30 minutes. If adenoid problems are also being treated, surgery takes a little longer.

## Making a Slit

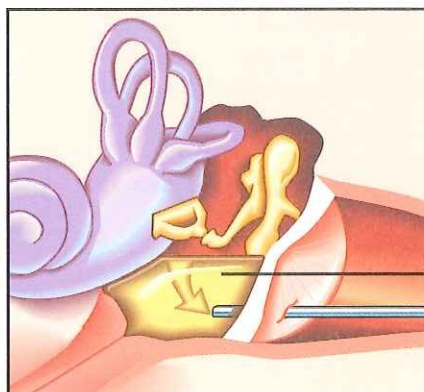
Once your child is asleep, the ear canal is cleaned. Then, using an operating microscope and special surgical instruments, the ENT specialist makes a small slit in the eardrum (**tympanotomy**).



Slit is made in eardrum.

## Removing Any Fluid

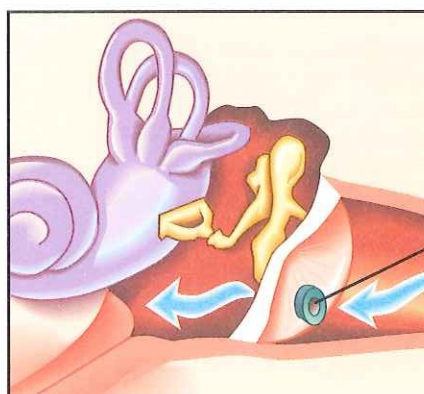
Next, a hollow instrument is passed through the slit in the eardrum. Using gentle suction, the fluid is withdrawn through the instrument. In some cases, a fluid sample may be sent to a lab. If the infection is still active, the lab may identify whether it is viral or bacterial.



Fluid is removed.

## Putting in the Tube

After the fluid is removed, the ENT specialist inserts a tiny tube into the same slit in the eardrum (**tympanostomy**). Once in position, the shape of the tube helps keep it in place. Tubes can be made of plastic or metal, and they vary slightly in size and shape. The ENT specialist chooses the tube most likely to provide the best results for your child.



Actual tube size

Tube is inserted in the eardrum, allowing air pressure to balance.



# A QUICK RECOVERY

After surgery is completed, your child will be taken to a recovery area. There, nurses will monitor your child's condition until the anesthesia wears off. Once fully awake, your child should be able to go home. In fact, even after adenoid surgery, most patients go home the same day. Although your child can soon return to normal activities, be aware of the signs that require calling the doctor.

## Right After Surgery

Following surgery, cotton may be placed in your child's ears, and he or she may be given medication for pain relief. Within a half-hour, your child will wake up. You may be allowed into the recovery room at this time, depending on the facility. When you join your child, don't be alarmed if he or she is upset. Anesthesia may reduce self-control, causing some children to cry or scream. You can help calm your child by acting normally and speaking softly.

## Going Home

Once your child is calm enough to sit up and drink fluids, he or she can go home. Don't worry if your little one acts slightly fearful or overwhelmed. To a small child whose hearing has just improved, the world may seem bigger and suddenly much louder. At home, give your child any antibiotics or eardrops as directed by the doctor. Within a few hours, many children feel good enough to play. Most can go to school or childcare the next day.



## When to Call the Doctor

Although your child is unlikely to have problems after surgery, call the doctor for any of the following:

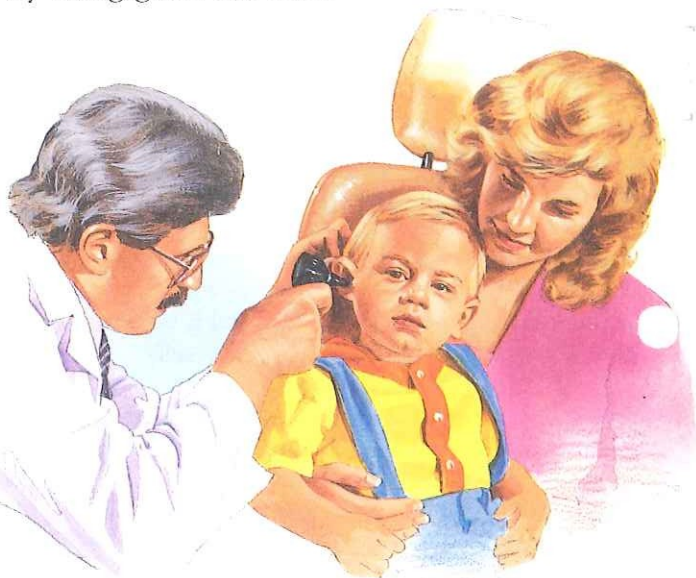
- The ear bleeds heavily or keeps bleeding after the first 48 hours.
- Sticky or discolored fluid drains out of the ear after the first 48 hours.
- Your child has a high fever that does not drop.
- Your child is dizzy, confused, extremely drowsy, or has a change in mental state.

# WITH TUBES IN PLACE

Your child's hearing should improve once the tubes are in place. In addition, if middle ear problems were making it hard for your child to learn to talk, you should soon notice a change for the better. For best results, follow up as instructed by your child's doctor. In some cases, ear problems may continue. However, you can help prevent ear infections by using good ear care.

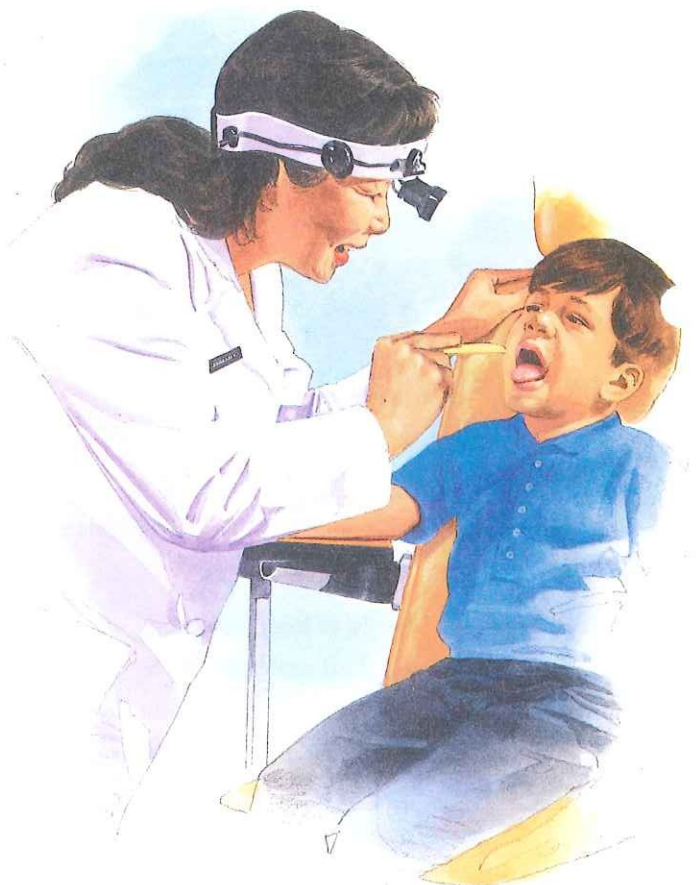
## Follow-up

Shortly after the surgery, the ENT specialist may want to examine your child. This follow-up visit ensures that the tubes are still in place and that your child's ears are healing. In some cases, hearing may be retested to verify improvement. If other middle or inner ear problems exist, they're more likely to be found now. Hearing problems due to allergy-related symptoms may also be easier to identify now. After the initial follow-up, the doctor may want to see your child every 2 to 6 months. Do your best to keep these visits. They're the only way to make sure the tubes remain in place and stay open.



## Fewer Problems

Even with tubes, your child may still get acute infections. Cranky behavior, ear drainage, and fever are all clues that you should be calling the doctor. However, as long as the tubes are working, you can expect fewer problems and a quicker recovery. If an infection does occur, treatment probably will include oral antibiotics and eardrops. Always make sure your child finishes the entire prescription. The medication will not work, otherwise. If a tube becomes clogged, your child's ENT specialist may be able to reopen it.





## Ear Care

Help your child avoid ear infections by teaching good ear care. The tips below are especially helpful for children with tubes.

- Ask the doctor if your child's ears should be protected from contact with water. Some doctors want children with tubes to wear earplugs during swimming and bathing if they put their heads under water.
- Make sure your child doesn't dive into the water or swim far beneath the surface in deep water. Pressure from these activities can be hard on the ears.
- Teach your child not to use cotton swabs. Used carelessly, they can clog tubes with wax or even damage the eardrum.
- Don't worry, neither fingers nor earplugs can push the tubes in or pull them out.



## Tubes Aren't Forever

Tubes can improve hearing, helping to make learning and living easier for your child. But tubes don't last forever. They aren't meant to. Most tubes remain in place for 6 to 12 months. Some last a little longer. The life of the tubes usually depends on your child's growth. As your child gets bigger, the ear and eustachian tube mature. After a growth spurt, one or both of your child's tubes may fall out. The slit in the eardrum usually closes soon after. If tubes remain in place longer than two years, they are less likely to come out on their own. Depending on the situation, your child's ENT specialist may decide to leave the tubes in place or to remove them and close the holes. If ear problems return after the tubes are out, your child may need another set.



# LIMITING FUTURE PROBLEMS

Most children outgrow middle ear problems by about age 8. Until then, however, you can reduce your child's risk of middle ear infections by following these tips:

- Teach your child good habits that help prevent colds, such as washing hands often and using tissues instead of handkerchiefs. Also, teach your child to drink only from his or her own container.
- Keep your child away from secondhand smoke.
- Follow the doctor's advice about keeping your child's ears dry.
- Call the doctor if you suspect your child has an ear problem. Don't wait. Delaying treatment could affect hearing.



  
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