DOWNLOAD PDF V. EFFECT OF FLIGHT ON MIDDLE EAR 26-37

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IV. External and middle ear V. Effect of flight on middle ear VT. Anatomy and physiology of inner ear or labyrinth VII. Vestibular nystagmus 44 4 5 VIII. Vestibular vertigo IX. Vestibular tests X. Blind flying XI. Miscellaneous ear conditions XII. General methods and equipment for eye examination XIII.

While pseudoephedrine hydrochloride is effective in decreasing the risk for earache in adults with recurrent air travelâ€"associated ear pain, such use in children has not been studied. Caregivers noted historical details and the degree of apparent ear pain, drowsiness, and excitability with ascent and descent. Ear pain was not associated with a history of air travelâ€"associated ear pain, recent ear infection, or recent upper airway symptoms. The predeparture use of pseudoephedrine does not decrease the risk for in-flight ear pain in children but is associated with drowsiness. It is a common concern of parents planning airplane travel with their children. Preschool-aged children in particular often appear to be bothered by ear pain during both ascent and descent of commercial air travel. Although frequently confronted with this issue, pediatricians have little data on which to base advice and recommendations. Common suggestions to prevent or alleviate such ear pain include chewing, yawning, and swallowing during ascent and descent, or using a warm, wet towel over the external ear to decrease "ambient" pressure during descent. In a recent study of adults with a history of recurrent ear pain associated with air travel, the administration of oral pseudoephedrine 30 minutes before flight departure significantly reduced the occurrence of ear pain during the flight. The subject population consisted of children aged 6 months to 6 years. All conditions and procedures of the investigation were approved by the institutional review board at the University of Utah, Salt Lake City. After expressing interest in the study, subjects and parents planning commercial air travel met with an investigator and were given a formal explanation of the study. Signed parental consent was obtained, and the subjects were given 2 randomly assigned treatment syringes filled with placebo or pseudoephedrine and 2 business reply questionnaire postcards for the outbound and inbound flights. The syringes were identical in appearance and identified only by a randomly assigned sequential number. The identification key was kept by the pharmacist and was not revealed to the investigators until the time of data analysis. The oral dose from one treatment syringe was administered 30 to 60 minutes prior to departure from Salt Lake City and the other prior to takeoff for the return flight to Salt Lake City. Children with a history of prior ear pain during air travel or who were currently symptomatic for an upper respiratory tract infection were postulated to be at a higher risk for ear pain during the flight, making up the earlier-mentioned "high-risk" group. The Fisher exact test was used to compare categorical data. All tests were 2-tailed andP values less than. Data analyses were performed using Stata statistical software, version 5. Results Fifty children were recruited for this clinical trial. From these participants, there were 91 flights eligible for study, varying in duration from approximately 1 to 4 hours. Three questionnaires were returned with information regarding ascent only. The possibility of a specific association between ear pain and altitude at takeoff and landing was not explored. The use of prophylactic pseudoephedrine was not associated with a decrease in the incidence of ear pain during either ascent or descent. When the data were reanalyzed within this subgroup, there remained no statistically significant difference between groups. Finally, the association of prophylactic oral pseudoephedrine use with the incidence of side effects was analyzed. Comment To our knowledge, this is the first placebo-controlled study evaluating the use of pseudoephedrine for the prevention of air travelâ€"related ear discomfort in children. Oral pseudoephedrine administered 30 to 60 minutes prior to air travel did not significantly affect the incidence of ear pain in children aged 6 months to 6 years. There was, however, a significant increase in the incidence of drowsiness in those receiving pseudoephedrine. Air travelâ€"related ear pain results from the lack of pressure equalization between the external environment and the small volumes of air that exist within the inner ear. Likewise, the gas in the middle ear contracts as the aircraft descends and atmospheric pressure increases, again resulting in aerotitis media. Intentional manipulations such as chewing, swallowing, yawning, or insufflation by the Valsalva maneuver are oftentimes required to open the tubal lumen and allow pressure equilibration. Children may be more prone to aerotitis media due in part to the anatomic differences of their

eustachian tubes as well as their increased frequency of viral upper respiratory tract infections. Adenoids may also fill the nasopharynx, mechanically blocking the eustachian tube orifice or acting as a focus of infection that may contribute to edema of the eustachian tube mucosa and increased tube dysfunction. These findings are consistent with and extend the findings of previous studies showing no clinically significant improvement in upper respiratory tract symptoms 9 or abnormal middle ear pressures 10 with the respective use of an antihistamine-decongestant combination 9 or topical decongestant 10 in infants with common colds. Although the precise reason for this ineffectiveness of decongestants in young children is not known, it has been demonstrated that pseudoephedrine is eliminated much more rapidly in children, with a mean terminal elimination half-life of 3. One might argue that this apparently benign side effect may be beneficial for young children who can be frightened by the transition from ground to air travel. The question as to the appropriateness of medicating a child for such a purpose was not addressed by this study. However, if one does conclude that the side effect of drowsiness is indeed beneficial, other agents such as diphenhydramine may be both more consistent and effective in achieving the desired results. There are some limitations that must be taken into consideration when evaluating these data. However, there is no reason to expect that observer bias would significantly affect the results in this double-blind, placebo-controlled study. In conclusion, despite its reported effectiveness in adults, oral pseudoephedrine does not appear to decrease the incidence of ear pain in children traveling by air. Likewise, among "high-risk" children thought to potentially benefit most from decongestant prophylaxis during air travel, there is no decrease in the incidence of ear pain with pseudoephedrine use. Oral pseudoephedrine ingestion is also associated with a significant side effect, early flight drowsiness, compared with placebo. The results of this study do not support the practice of administering oral pseudoephedrine to prevent air travelâ€”associated ear pain in children. Accepted for publication September 15, The authors gratefully acknowledge Nathan Kuppermann, MD, for his critical review of the manuscript and his helpful guidance in the statistical analysis. Give the child something to stimulate swallowing on ascent and descent, let nature take care of the problem, and throw the medication out the doorâ€”preferably before you take off.

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Chapter 2 : Inner Ear Injury info, Perilymph Fistula precautions | DeShaw Lawyers

The effects of air travel on the middle ear, as a result of changes in air pressure, can include ear-drum pain, vertigo, hearing loss, and ear-drum perforation. Incidence/ Prevalence The prevalence of symptoms depends on the altitude, type of aircraft, and characteristics of the passengers.

Middle ear Middle ear The middle ear includes three small bones â€" the hammer, anvil and stirrup. The middle ear is separated from your external ear by the eardrum and connected to the back of your nose and throat by a narrow passageway called the eustachian tube. Causes of a ruptured, or perforated, eardrum may include: Middle ear infection otitis media. A middle ear infection often results in the accumulation of fluids in your middle ear. Pressure from these fluids can cause the eardrum to rupture. Barotrauma is stress exerted on your eardrum when the air pressure in your middle ear and the air pressure in the environment are out of balance. If the pressure is severe, your eardrum can rupture. Barotrauma is most often caused by air pressure changes associated with air travel. Other events that can cause sudden changes in pressure â€" and possibly a ruptured eardrum â€" include scuba diving and a direct blow to the ear, such as the impact of an automobile air bag. Loud sounds or blasts acoustic trauma. A loud sound or blast, as from an explosion or gunshot â€" essentially an overpowering sound wave â€" can cause a tear in your eardrum. Foreign objects in your ear. Small objects, such as a cotton swab or hairpin, can puncture or tear the eardrum. Severe injury, such as skull fracture, may cause the dislocation or damage to middle and inner ear structures, including your eardrum. Complications Your eardrum tympanic membrane has two primary roles: When sound waves strike it, your eardrum vibrates â€" the first step by which structures of your middle and inner ears translate sound waves into nerve impulses. Your eardrum also acts as a barrier, protecting your middle ear from water, bacteria and other foreign substances. If your eardrum ruptures, complications can occur while your eardrum is healing or if it fails to heal. Usually, hearing loss is temporary, lasting only until the tear or hole in your eardrum has healed. The size and location of the tear can affect the degree of hearing loss. A perforated eardrum can allow bacteria to enter your ear. Middle ear cyst cholesteatoma. A cholesteatoma is a cyst in your middle ear composed of skin cells and other debris. Ear canal debris normally travels to your outer ear with the help of ear-protecting earwax. If your eardrum is ruptured, the skin debris can pass into your middle ear and form a cyst. A cholesteatoma provides a friendly environment for bacteria and contains proteins that can damage bones of your middle ear. Prevention Follow these tips to avoid a ruptured or perforated eardrum: Get treatment for middle ear infections. Be aware of the signs and symptoms of middle ear infection, including earache, fever, nasal congestion and reduced hearing. Children with a middle ear infection often rub or pull on their ears. Seek prompt evaluation from your primary care doctor to prevent potential damage to the eardrum. Protect your ears during flight. During takeoffs and landings, keep your ears clear with pressure-equalizing earplugs, yawning or chewing gum. Or use the Valsalva maneuver â€" gently blowing, as if blowing your nose, while pinching your nostrils and keeping your mouth closed. Keep your ears free of foreign objects. Never attempt to dig out excess or hardened earwax with items such as a cotton swab, paper clip or hairpin. These items can easily tear or puncture your eardrum. Teach your children about the damage that can be done by putting foreign objects in their ears. Guard against excessive noise. Protect your ears from unnecessary damage by wearing protective earplugs or earmuffs in your workplace or during recreational activities if loud noise is present.

Chapter 3 : Ruptured eardrum (perforated eardrum) - Symptoms and causes - Mayo Clinic

When your flight takes off or lands, there is a rapid change in the air pressure. This causes swelling of the membranes, which does not allow the air pressure inside the ear to equalise rapidly, which in turn results in blocked Eustachian tubes and other ear problems.

Ears and air travel Click Image to Enlarge When many people travel by air, their ears may not pop as the altitude changes. It is one of the most common medical complaint of airplane passengers. It is caused by an air pocket in the middle ear that is sensitive to changes in air pressure. The changing altitude as the plane takes off or lands can cause discomfort in the ears. Swallowing or yawning usually can help "pop" the ears. This activates the muscle that open the eustachian tube, which connects the middle ear with the back of the nose. This creates a vacuum that sucks the eardrum in and stretches it. If swallowing or yawning does not relieve the ears, try the following ear-clearing technique: Pinch the nostrils shut. Breathe in through the mouth. Force the air into the back of the nose as if trying to blow your nose. If you hear a pop, the ears are unblocked. After landing, if the ears fail to open and the pain persists, see a healthcare provider who specializes in ear problems. Small children are especially vulnerable to blocked ear canals because their eustachian tubes are narrower. Use of a bottle or pacifier during take-off and landing may help pop their ears. Try to keep small children awake during a descent. Earwax, also called cerumen, is naturally produced by the outer part of the ear canal to keep the ear clean. It does this by trapping dust and sand particles before they reach the eardrum. Wax also coats the fragile skin of the ear canal and acts as a water repellent. A buildup of wax usually moves its way to the ear opening, dries up, and falls out. How should I properly clean my ears? Normally, ears canals are self-cleaning and should not need cleaning with any devices or cotton-tipped swabs. Cleaning the ear can cause problems by pushing the earwax deeper into the ear canal and against the eardrum. However, sometimes wax can accumulate excessively, resulting in a blocked ear canal. In the case of a blocked ear canal, consult your healthcare provider. He or she may be able to do one or more of the following: An irrigation of the ear canal to wash out the wax A vacuuming of the ear canal to remove the wax The use of a special instrument s to remove the wax Prescription eardrops or mineral oil to soften the wax Always consult your healthcare provider for a diagnosis and for more information.

Chapter 4 : Middle Ear and Sinus Problems - SKYbrary Aviation Safety

Dr Desai said, "Air needs to travel up the Eustachian tube into the middle ear to equalise the pressure. It is the ascent and descent of a flight that makes fliers experience pain shooting through the ears for a few agonising minutes.

Prevention Follow these tips to avoid airplane ear: Yawn and swallow during ascent and descent. Yawning and swallowing activate the muscles that open your eustachian tubes. You can suck on candy or chew gum to help you swallow. Use the Valsalva maneuver during ascent and descent. Gently blow, as if blowing your nose, while pinching your nostrils and keeping your mouth closed. Repeat several times, especially during descent, to equalize the pressure between your ears and the airplane cabin. These earplugs slowly equalize the pressure against your eardrum during ascents and descents. You can purchase these at drugstores, airport gift shops or your local hearing clinic. Use an over-the-counter decongestant nasal spray. If you have nasal congestion, use a nasal decongestant about 30 minutes to an hour before takeoff and landing. Avoid overuse, however, because nasal decongestants taken over several days can increase congestion. Use oral decongestant pills cautiously. Oral decongestants may be helpful if taken 30 minutes to an hour before an airplane flight. If you have allergies, take your medication about an hour before your flight. Helping children prevent airplane ear These additional tips can help young children avoid airplane ear: Give a baby or toddler a beverage during ascents and descents to encourage frequent swallowing. A pacifier also may help. Have the child sit up while drinking. Children older than age 4 can try chewing gum, drinking through a straw or blowing bubbles through a straw. Diagnosis Your doctor will likely be able to make a diagnosis based on questions he or she asks and an examination of your ear with a lighted instrument otoscope. Signs of airplane ear might include a slight outward or inward bulging of your eardrum. If your condition is more severe, your doctor may see a tear in the eardrum or a pooling of blood or other fluids behind your eardrum. Your doctor may suggest a hearing test audiometry to determine how well you detect sounds and whether the source of hearing problems is in the inner ear. Treatment For most people, airplane ear usually heals with time. When the symptoms persist, you may need treatments to equalize pressure and relieve symptoms. Medications Your doctor may prescribe medications or direct you to take over-the-counter medications to control conditions that may prevent the eustachian tubes from functioning well. These drugs may include: Decongestant nasal sprays Oral decongestants Oral antihistamines To ease discomfort, you may want to take a nonsteroidal anti-inflammatory drug, such as ibuprofen Advil, Motrin IB, others or naproxen sodium Aleve, others , or an analgesic pain reliever, such as acetaminophen Tylenol, others. Self-care therapies With your drug treatment, your doctor will instruct you to use a self-care method called the Valsalva maneuver. To do this, you pinch your nostrils shut, close your mouth and gently force air into the back of your nose, as if you were blowing your nose. Once the medications have improved the function of the eustachian tubes, use of the Valsalva maneuver may force the tubes open. Surgery Surgical treatment of airplane ear is rarely necessary. However, your doctor may make an incision in your eardrum myringotomy to equalize air pressure and drain fluids. Severe injuries, such as a ruptured eardrum or ruptured membranes of the inner ear, usually will heal on their own. However, in rare cases, surgery may be needed to repair them. You may, however, be referred to an ear, nose and throat ENT specialist. Write down a list of questions to ask your doctor. Preparing a list of questions will help you make the most of your time with your doctor. Are these signs and symptoms likely related to my recent airplane travel? What is the best treatment? Am I likely to have any long-term complications? How will we monitor for possible complications? How can I prevent this from happening again? Should I consider canceling travel plans? Are there brochures or other printed material I can take with me? What websites do you recommend? What to expect from your doctor Your doctor will ask you a number of questions, including: When did your symptoms begin? How severe are your symptoms? Do you have allergies? Have you had a cold, sinus infection or ear infection recently? Have you had airplane ear before? Were your past experiences with airplane ear prolonged or severe? What you can do in the meantime To treat pain, you may take a nonsteroidal anti-inflammatory drug, such as ibuprofen Advil, Motrin IB, others or naproxen sodium Aleve, others , or an analgesic pain reliever, such as acetaminophen Tylenol, others.

Chapter 5 : Ears and Airplane Travel, Ear Wax, and Ear Cleaning | Johns Hopkins Medicine Health Library

Inability to equalized the middle ear pressure in relation to the atmosphere pressure causes significant vacuum effect in the middle ear cleft and its complication as depicted in this video.

Including Perilymph Fistula Injuries Inner Ear Anatomy The inner ear is comprised of two main sections; the vestibular system and the cochlear system. The vestibular system is involved in balance, while the cochlea is involved in hearing. The anatomy of the inner ear is dominated by large fluid-filled spaces. The inner ear consists of a complex series of tubes, running through the temporal bone of the skull. The bony tubes sometimes called the bony labyrinth are filled with a fluid called perilymph. Within this bony labyrinth is a second series of tubes made out of delicate cellular structures called the membranous labyrinth. The fluid inside these membranous structures is called endolymph, The different spaces of both the perilymphatic and endolymphatic compartments are interconnected by a series of ducts. An important feature of the endolymphatic space is that it is completely bounded by tissues and there are normally no ducts or open connections between perilymph and endolymph. These fluids are retained by the round and oval windows at the front wall of the inner ear. The existence of the many ducts connecting different parts of the inner ear has led to the idea that the cochlear fluids are flowing through the ear. However, unlike other body fluids, such as saliva or lachrymal fluid tears , the fluids of the inner ear are not secreted and resorbed in volume. This is a widespread misconception, based on old studies that used poor experimental techniques. Maintenance of the chemical composition of both fluids is dominated by ion transport processes which are localized in each region. Inner Ear Injuries â€" Effects of Trauma In general terms, a perilymph fistula is an abnormal connection between the inner ear fluid spaces and the middle ear air spaces resulting in the leakage of perilymphatic fluid into the middle ear. Perilymph fistulas can be classified into four broad categories: Symptoms of perilymph fistula are variable and include sensorineural hearing loss, vertigo, dysequilibrium, unsteadiness, motion intolerance, and aural fullness. Many patients also have noise sensitivity hyperacusis , tinnitus, memory loss, confusion, visual sensitivity and fatigue. Due to the several overlapping symptoms between perilymph fistula and Post Concussion Syndrome, a consultation with a neurologist, and then either a neuropsychologist or a neuro-otologist or both, may prove helpful in differentiating the conditions. While advocates of both conditions believe their particular favorite is the cause of many of the similar symptoms, both camps seem to ignore that you could very well have both after trauma. A full evaluation of both conditions will help determine the truth. Left untreated, these symptoms can be very dangerous. Some very good doctors who can also work with perilymph fistula injuries using conservative methods. Inner Ear Membrane Breaks Simmons in first postulated that sensorineural hearing loss could result from intracochlear membrane breaks. In Goodhill stated that the labyrinth is hydrostatically loaded with intimate relations to hydrodynamic forces in the carotid arterial system, intracranial venous-sinus systems and the CSF pressure gradients in the subarachnoid space. In this theory he postulated that the second membrane break was the result of a pressure gradient created by the first break. He went on to note that profound sensorineural hearing loss resulted from the mixing of perilymph and endolymph, and that healing of intracochlear breaks halts the mixing of fluid. With this healing of the round and oval windows, the widespread hearing loss disappears resulting in hearing loss at the specific site where local tissue damage occurred along the membrane. Clinically, the rupture of the oval or round window allows for the spilling of the inner ear fluid into the inner ear, where it either remains to irritate the patient, or goes down the Eustacian tube causing an itching sensation in the throat. The force created from an impact such as an auto accident even a low speed car crash is more than sufficient to cause a tear in either the oval or round window. What few people know, or consider, is that the inner ear is connected to the subarachnoid space by the cochlear aqueduct. If the round window or oval window of the inner ear is perforated due to trauma, then perilymph escapes, driven by the hydrostatic pressure of Cerebral Spinal Fluid. The escaping perilymph and endolymph is replaced by CSF entering the cochlea through the cochlear aqueduct. In this condition a longitudinal flow will exist between the cochlear aqueduct and the site of the perforation. This condition is what is technically known as a perilymphatic fistula.

This will also result in lower than normal CSF fluid levels in the brain and spinal cord. The most common repercussion of this is a low grade headache, but it can certainly become more serious than this. Practitioners of some chiropractic techniques would suggest that proper CSF flow and volume is crucial to proper nervous system function. The leak from the inner ear may be holding you back from chiropractic success with your patient. The tie between whiplash injuries, equilibrium problems and posture changes was noted in a study from Italy. This would result in an attempt to vary the physiology from an ankle to a hip strategy; incomplete manifestation of this new posture would cause the feeling of instability mentioned by the patients and documented by posturography. Acta Otorhinolaryngol Ital 17 6 , , In short, cervical subluxations and perilymph fistulas together cause significant long term postural problems, and it is unlikely that either can be properly corrected without correction of the other. Inner Ear Injury Neurological Effects In mentioning this, I must also mention the substantial neurological effect this problem can cause. Due to abnormal signals coming from the inner ear, the brain is constantly dealing with feedback to fundamental responses. This places the basics for survival obtaining oxygen and water over all other functions. When these things are satisfied it goes on to prioritize things like the ability to stay upright, digest food etc. The more significant repercussions of inner ear injuries, is that people can not normally place themselves in space, leaving them susceptible to falls, bumping into objects, crashing into objects while driving in a car, and drowning if disoriented while underwater. Even more problematic though, is the potential for meningitis to spread from the inner ear during a routine upper respiratory infection. We know that communication of bacteria through the cochlear aqueduct is possible, as it also occurs in the reverse flow with a condition called Purulent Labyrinthitis. In Purulent Labyrinthitis CSF tainted by Menigitis flows through the cochlear aqueduct into the inner ear causing complete hearing loss, and facial paralysis. If it is re-ruptured by new trauma you start over again. Once it heals over at one cell thin, the connective tissue starts to move in. This is vastly different from other parts of the body where collagen comes in early after an injury. This means that collagen fibers do not lay down for approximately eight weeks of uninterrupted healing. Once the connective tissue starts to lay down, it does not fully rehab for months. Consider the following about perilymph fistulas: Precautions for Healing Following an Inner Ear Injury As a result of the very serious problems resulting from even a low speed impact, one should take what precautions are available to help the inner ear heal. These precautions are taken directly from Dr. The goal of fistula precautions is to minimize any movement, pressure changes or trauma that keeps the fistula open or re-opens the fistula. Activities that are exertional in nature may increase the pressure in your head, chest or abdomen, resulting in increased cerebrospinal fluid pressure, causing your fistula to leak or recur if it is sealed. Sharp jerking motions e. Rapid air pressure changes e. Keep your head above the level of your heart at all times. When reclining, keep your head elevated 30 to 45 degrees. You must NOT lie flat. To sit up roll to one side, move your legs over the side of the bed and use your hands and arms to slowly push yourself up. When not in bed you may recline on a couch, sit in a well padded easy chair or sit in a high-backed chair to rest your head. Eat a well balanced diet and drink plenty of fluids six to eight 8 oz glasses per day. Keep in mind that these are only a few examples. We cannot list each and every activity that might violate fistula precautions. You must use your common sense to decide whether or not a situation or activity is appropriate for you. Do not lift anything over five pounds unless otherwise instructed by your doctor. Do not bend over or squat down. Do not strain or bear down-avoid constipation. Do not blow your nose. When you cough or sneeze, do so as gently as possible with your mouth wide open. No housework or yard work. Do not blow up balloons or bubble gum. Do not sing or yell loudly. Do not use straws or waterbottles that create suction in your ear. Do not try to open tightly sealed jars. Be careful when putting on shoes and socks. Do not bend over and do not tug hard on them. It is best to avoid wearing any kind of boots, as tugging them on and off will cause too much pressure in your head. Avoid strenuous activity and sexual relations unless otherwise instructed by your physician. Do not throw things, cast a fishing line, etc. It is preferable that you not go higher than five floors on an elevator. Do not travel by plane for at least one year following fistula closure, and never travel by plane if you have a cold upper respiratory infection. That is a success rate for a conservative treatment which we could only pray existed for other serious conditions. So, for those who could possibly do this, and do have a confirmed perilymph fistula, it would be worth the time. In cases where the ear does not

heal with the above protocol, there is the option of surgery. There are several large studies reporting the results of surgical treatment of perilymphatic fistulas. Hearing loss responded much less favorably except in fluctuating or progressive sensorineural hearing loss in which case surgery would often stabilize or slightly improve the hearing. Postoperative management consists of bed rest, head elevation and no straining for the first 5 days, followed by 4 to 6 weeks of light, non-strenuous activity. Insurance defense doctors will sometimes testify that an injured person would have to have a massive head blow like a baseball bat to the head in order to sustain an inner ear injury. Contrary to what the insurance doctors will say, hundreds of medical research papers confirm that inner ear injuries are caused by less severe head trauma, including trauma caused by motor vehicle collisions. Insurance doctors will also say that the symptoms of an inner ear injury will be immediate. But secondary endolymph hydrops is known to be caused by trauma, including trauma from a motor vehicle collision. Unless the lawyer understands this distinction and makes it very clear to the judge, jury or arbitrators, you can and likely will, lose your traumatic inner ear injury case.

Chapter 6 : 5 tips to protect your ears from in-flight pain while taking off or landing - Travel News

To determine the effect of flight and low humidity on the tympanic membrane and middle ear system, we have carried out an observational study on an aircraft using tympanometry. Tympanometry enables measurement of the acoustic admittance of the ear canal, tympanic membrane and more medial middle ear system.

Ear problems are surprisingly common among travellers on aeroplanes. While they can be mildly annoying sometimes, at other times, there can be more serious effects, including acute pain in the ears, ear discharge and even temporary loss of hearing. Understanding why it happens as well as taking a few precautions can ensure that your journey is pleasant from take-off to landing! Understanding Blocked Ears The Eustachian tube is a membrane-lined tube, about the thickness of a pencil lead, which connects the back of the nose to the ears. On one side the ear , we have a space surrounded by bone and closed off from the outside world by the eardrum, and on the other side, a space that is open to the outside through the nose and mouth. The closed space in the ear is lined by a membrane which constantly absorbs air and this air is replaced from the Eustachian tube. Thus air pressure outside the eardrum and inside the space remains equal. When there is a difference in pressures, the ear feels blocked. This is because if the air in the middle ear is absorbed but not replaced, a vacuum forms which pulls the eardrum inwards, causing a block as it cannot vibrate. It is the stretching of the eardrum that causes pain. This vacuum also pulls fluid into the space from the membrane, filling the middle ear with fluid. This can be dangerous as when the fluid builds up, it punctures the ear drum leading to discharge from the ear. Common Causes Of Eustachian Block Common cold, nasal allergies and infection in the tonsils or throat. How Flying Causes Ear Block When your flight takes off or lands, there is a rapid change in the air pressure. This causes swelling of the membranes, which does not allow the air pressure inside the ear to equalise rapidly, which in turn results in blocked Eustachian tubes and other ear problems. Chewing gum or sucking on hard candies can help. If the pain and block persists, see a doctor immediately to get decongestant nasal drops and sprays to open the Eustachian tubes before fluid builds up in the ears. In rare cases, if the build-up of fluid in the ear is too much, the doctor may make a tiny puncture in the eardrum to release it. If the problem is recurrent, tiny plastic or metal tubes are inserted into the eardrum to equalise the pressure. These are called grommets-they fall out when the Eustachian tube function recovers. For Babies Sucking on a pacifier or feeding bottle during take-off or landing of the flight works. It is a good idea to feed the baby during the flight. Use it approximately an hour before the descent to help the ears pop.

Chapter 7 : Dealing With The Side Effects Of Flying - www.nxgvision.com

Delayed barotitis middle ear symptoms caused by absorption of O2 from the middle ear following a flight where O2 was used TRUE The higher O2 tension in the middle ear following breathing O2-rich mixture causes the O2 to metabolize into the tissues.

What happened to the Lear 35? So, what could have happened to that Lear? Did it have any inherent weaknesses? Again, we may never know, although the NTSB has some powerful forensic talent and resources. Usually less than half will have taken advantage of this valuable opportunity. We spend many hours in our carefully conditioned cockpits, only inches from an environment that is incompatible with life. We sit in shirtsleeves, comfortably oblivious to the frigid and rare atmosphere through which our fragile shell moves. Rarely do we think about the temperature outside or the time available to react should our carefully maintained environment fail. Jet aircraft are designed to operate efficiently at high altitudes but the human body is not. Humans are land animals, evolved to exist comfortably close to sea level at a maximum speed and that for only very short sprints of little more than 15 miles per hour. Anything else is a foreign, and potentially lethal, environment. Any time we operate above the altitude of acclimatization the altitude where we normally live , risks exist. No matter how you perceive your performance and despite all the bravado and tough war stories the body will still respond to the atmosphere in which it is operating and be affected by gas concentrations and ambient pressures. The atmosphere is an envelope of air that surrounds and rotates with the earth to an altitude of about 25, miles. This envelope is constantly changing, as each weather briefing will reaffirm, and temperatures and pressures fluctuate from day to day and from region to region. From a biological point of view, however, the atmosphere can be considered a constant in relation to its effect on the human physiology. Although it is often said that the air is "thin" at altitude and lacks the oxygen necessary to sustain life, the actual composition of the atmosphere remains constant throughout the altitude range. The percentage of oxygen in the air is constant at 21 percent, but the actual number of oxygen molecules per unit volume of air decreases with pressure and consequently with altitude. The percentage is the same but the value is vastly different. Physical Characteristics of the Atmosphere How atmospheric pressure changes with altitude. Click for larger image. Atmospheric pressure is really just the weight of all the air molecules in the atmosphere above the point where the measurement is made. Since there are fewer molecules in the column above the measurement point at higher altitudes, you can see that atmospheric pressure decreases with increasing altitude. Since air is compressible, the atmosphere will be denser near the surface the bottom of the column and increases of pressure are greater nearer the surface. Conversely, the pressure decreases less rapidly the higher in the atmospheric column one rises. The greatest density change occurs between sea level and 5, feet; therefore, the problems associated with pressure and density change must be considered even in pressurized aircraft. There are a variety of properties of the atmosphere that will change this pressure besides its weight. Seasonal temperature changes, weather systems, latitude and longitude, and time of day all effect atmospheric pressure. We all learned this in private pilot ground school. This standard establishes a mean atmospheric pressure of This is also expressed as The surface of the earth is warmed by solar radiation that is then reflected back into the atmosphere. This direct and reflected solar radiation does little to heat the atmosphere directly. Instead, the air is heated by the warmth of the earth, and consequently the temperature of the atmosphere decreases with increasing altitude After this point the temperature remains relatively constant. The decrease in temperature, or lapse rate, is for dry air and is 3. Gas Laws The mixture of gases in the atmosphere is subject to several laws of physics governing the behavior of gases. An understanding of these laws will help in the understanding of the effects of altitude and these gases in the body. The partial pressure of oxygen and to a lesser extent other gases available in the surrounding air is important in determining the onset and severity of hypoxia. When the bottle is uncapped, the carbon dioxide CO2 in the mixture will slowly diffuse to the atmosphere until the pressure of CO2 in the liquid equals the pressure of CO2 in the surrounding air. The soda will then be "flat. The opposite will happen with soda opened at pressures greater than one atmosphere. A gas will expand when the pressure on it is decreased. This law holds true for all gases, even those trapped in body

cavities. A volume of gas at sea level pressure will expand to approximately twice its original volume at 18, feet, nearly nine times its original volume at 50, feet. This will continue until the pressure of the gas is equal, or nearly equal, on both sides of the membrane. Okay, so much for the physics lesson. How does this all affect me? When we talk about the effects of altitude upon the human body and altitude sicknesses we tend to think in terms of "high altitude" and classify that as somewhere in the flight levels. A resident of coastal California will not perform nearly as efficiently at any task in Denver, where the ground is a mile high, as will a native Denverite, but most would not consider being on the ground at Denver as being at "high altitude. The discussion that follows applies to all pilots -- jet jocks, helicopter pilots, recreational pilots and hang-glider aficionados. The importance of all those gas laws should become clearer. It is necessary in the human body for the same reasons -- to support the oxidation of fuels needed to provide energy for life. Very little of the oxygen carried by the blood is carried in dissolved form in the plasma. The ability of hemoglobin to combine with and transport oxygen is dependent upon the pressure of oxygen in the surrounding environment. Higher pressures of oxygen enable the hemoglobin to take up larger quantities of oxygen. Lower oxygen pressures will result in an increasing tendency by the hemoglobin to give up oxygen. This variable combining characteristic is what allows the blood to acquire oxygen in the lungs and transport it to the tissues where it is used in metabolism. This characteristic of the hemoglobin also results in what is known as the oxygen dissociation curve see graph below. The oxygen dissociation curve. Air entering the lungs at sea level enters at a pressure of mm Hg. This results in a partial pressure of oxygen in sea level air of about mm Hg. This is because of the addition of water vapor to the air you breath in plus the carbon dioxide that has diffused from the blood returning from the tissues. Carbon dioxide, which is 5. The hemoglobin in the blood returning from the tissues carries oxygen at a pressure of about 40 mm Hg. The opposite transfer takes place when the oxygen rich blood reaches the tissues which carry oxygen at an average pressure of 20 mm Hg. This lower pressure will allow the hemoglobin to release oxygen which will then diffuse into the tissues. At the same time, carbon dioxide is diffusing from the tissues into the blood. An average pressure for CO in the tissues is 50 mm Hg. Getting hypoxic yet from all this high altitude discussion?? A pulse oximeter measures the oxygen saturation of your blood non-invasively. Many people, if left in this rarefied air for some period, will develop mountain or altitude sickness: Which way do you think the oxygen will diffuse at altitudes above 25, feet? Nowadays, altitude-savvy pilots are starting to carry a tiny instrument called a pulse oximeter that clips on the finger and, by passing a light beam through the vascular bed of the fingertip, measures the oxygen saturation of the blood and displays it on a digital readout. Think of it as a "hypoxia meter" that allows you to see precisely how hypoxic you are at any given time. Types of Hypoxia The effects of hypoxia upon flying skills and the symptoms of its onset are the same no matter what the cause of the hypoxia. It is useful, however, to look at some varying causes of this condition so we can be alert to its poossible onset when of one or more of these factors is present. Hypoxic hypoxia is also referred to by aviators as "altitude hypoxia. This is the type hypoxia experienced when flying in an unpressurized cabin or when flying at altitude in a jet with a cabin pressurized to a cabin altitude above feet. Although strictly speaking, we are somewhat hypoxic when operating even a few hundred feet above the altitude of acclimatization, this becomes most evident when flying unpressurized aircraft. In reality, the symptoms of hypoxic hypoxia do not, in the absence of other contributing factors, become significant until about feet. The three kinds of hypoxia. Hypoxic hypoxia occurs because there is a smaller and smaller pressure differential between the pressure of oxygen in the inspired air in the lungs and the pressure of the oxygen in the blood and tissues. Remember that the combining power of hemoglobin and oxygen is influenced by this pressure differential. The greater the differential, the more efficient the hemoglobin becomes. As this pressure differential lessens, it becomes harder and harder for the hemoglobin to pick up and transport the oxygen. There are a variety of conditions that can cause this to happen. Any condition that would cause a reduction in the number of healthy, functioning red blood cells anemia or reduced production of red blood cells, blood loss, deformed blood cells, disease, etc. Remember the old advertisements warning about "iron poor blood? In addition to a reduction in the number of red blood cells available, anything that would interfere with the ability of hemoglobin to transport oxygen or anything that would displace the oxygen that is bound to the hemoglobin will affect the oxygen available to the cells. The

most common impairment to oxygen transport by the hemoglobin is carbon monoxide. Carbon monoxide combines with hemoglobin times more readily than does oxygen and once bound is extremely hard to eliminate. Smokers will find that the carbon monoxide bound to their hemoglobin will lower their altitude for onset of hypoxic symptoms by feet. This effect is not limited to smokers, however. Anyone exposed to a smoky atmosphere will suffer somewhat. Remember this next time you volunteer to go along as a designated driver for a group of drinkers. Just sitting in that smoky bar for several hours is going to affect your performance the next day, even without alcohol and fatigue! Other chemicals, among them sulfa drugs and nitrites found in food preservatives can have an adverse effect on the ability of hemoglobin to combine with and transport oxygen. Histotoxic hypoxia is a disruption of cellular respiration.

Chapter 8 : Ears Clogged From Flying? How to Clear That Up

When your flight takes off, outside pressure decreases, and this results in outward pressure on your eardrum. When the aircraft lands, the opposite effect occurs. When you are descending, the atmospheric pressure increases, resulting in a lessening of pressure in the middle ear pressure and inward.

Barotrauma refers to injuries caused by increased air or water pressure, such as during airplane flights or scuba diving. Barotrauma of the ear is common. Generalized barotraumas, also called decompression sickness, affects the entire body. Your middle ear includes the eardrum and the space behind it. The only connection between your middle ear and the "outside world" is a thin canal called the Eustachian tube. This connects your ear with the back of your mouth. When you swallow, you may notice a small click in your ears. This is a bubble of air being moved through the Eustachian tube. Ear barotrauma can occur when these tubes become blocked or partially blocked. On an airplane, barotrauma to the ear â€" also called aero-otitis or barotitis â€" can happen as the plane descends for landing. Barotrauma of the ear also can happen when scuba divers descend. The pressure change can create a differential between the outer and middle ear that pushes the eardrum inward. This can cause pain and can muffle sounds. Your ear will feel stuffed and you may feel as if you need to "pop" it. In more severe cases of barotrauma, the middle ear can fill with clear fluid as the body tries to equalize the pressure on both sides of the eardrum. This fluid is drawn out of blood vessels in the lining of the inner ear, and can only drain if the Eustachian tube is open. Fluid behind the eardrum is called serous otitis media. It can create pain and hearing difficulty similar to a middle ear infection. The eardrum can rupture break in severe cases of ear barotrauma, causing bleeding or leaking of fluid from the ear. A ruptured eardrum can result in hearing loss. In severe cases, it is possible for the pressure to create a leak between the deepest structures of the ear the fluid-filled bony canals called the cochlea and semicircular canals and the inner ear space. This deep leak is known as a fistula. If this occurs, the balance center can be affected, resulting in a sensation of spinning or falling called vertigo. This complication may require emergency surgery. Barotrauma is the most common medical problem reported by air travelers. It is much more likely to happen to people who have colds, allergies or infections when they are flying. It is common in children because their Eustachian tubes are narrower than those of adults and become blocked more easily. Barotrauma in the lungs also can occur, but this is not seen in air travelers. It occurs, rarely, in divers who hold their breath, when the diaphragm moves abruptly in a "gasping" effort. The diaphragm is the main muscle used in breathing. This form of barotrauma creates a vacuum in the lungs and can result in bleeding into the lung tissue. A more common form of barotrauma in the lungs is caused by the mechanical ventilation systems used in hospital intensive care units to help patients breathe. In this case, air sacks alveoli in the lungs may be ruptured or scarred due to high air pressure within the lungs. Ventilator-associated barotrauma is a complex medical concern. Symptoms Common symptoms of ear barotrauma include: Ear pain A sensation that the ears are stuffed A need to "pop" your ears by swallowing, yawning or chewing gum More severe signs include: Extreme pain in the ear Dizziness vertigo Bleeding or fluid coming from the ear, which can mean you have a ruptured eardrum Hearing loss Barotrauma of the lungs associated with scuba diving can result in coughing up blood after diving, although this is rare. Diagnosis You can diagnose a mild case of ear barotrauma yourself, and you do not need to see a doctor. If you are uncertain about your symptoms or if your symptoms last a long time, a doctor can examine your middle ear with a lighted magnifying tool called an otoscope to see if the eardrum is pulled inward. Clear fluid behind the eardrum sometimes can be difficult to see. If a collection of fluid is not visible, your doctor may squeeze a puff of air into your ear canal. If the eardrum does not move well, you probably have fluid behind the eardrum. A perforated eardrum can be diagnosed by looking at the ear with an otoscope. Expected Duration Symptoms usually occur only during the change in pressure, and perhaps for a short time afterward. More severe cases, including serous otitis media, can last longer, perhaps weeks or months. Perforations of the eardrum often heal on their own, but this can take weeks. You may not be able to hear as well until the ear is fully healed. If your perforation has not healed after two months, you may need surgery to prevent permanent hearing loss. Prevention To prevent barotrauma, your Eustachian

tubes must stay open. If you have a cold, ear infection or allergy, you may want to reschedule airplane travel until you are better. If you or your child must fly with a cold, infection or allergy, take a decongestant about one hour before your flight. Continue taking the medication during the flight according to the package directions. You also can use a decongestant nasal spray. Antihistamines may also be helpful. Ear plugs have been developed that can slow down the pressure change that affects the ear. These might give your ears some additional time to adjust to pressure changes. These plugs can be used for air travel but they are not useful for diving. During a flight, make sure you are awake for the landing so you can "pop" your ears if necessary. If you ask, a flight attendant will wake you. Keep the child upright as the plane descends. Treatment If you experience the symptoms of barotrauma during a flight, there are several things you can do: Chew gum or suck on hard candy. If you blow too hard, you can tear your eardrums, so do it carefully. Most cases of persistent barotrauma of the ear can be treated with decongestants. In unusually persistent cases, an ear, nose and throat doctor may have to make a small incision in the eardrum to equalize the pressure and drain the fluid. If you have a ruptured eardrum, you need to keep water out of your ear to prevent infection. A perforation of the eardrum that has not healed after two months may need to be repaired surgically. When To Call a Professional If you experience dizziness that includes a feeling of spinning or falling vertigo and your symptoms occur right after flying or diving, you need to be evaluated by a doctor immediately because there is a small chance you may need emergency ear surgery. If you have severe pain, bleeding or drainage of fluid from your ears, see a doctor within several days because you may have a ruptured eardrum. If you have mild ear pain or hearing difficulty that continues after flying or diving, you should see a doctor for help if your symptoms are slow to go away.

Chapter 9 : Barotrauma Guide: Causes, Symptoms and Treatment Options

One of these areas is the effects of pressure change on the middle ear, parasinuses, gastrointestinal tract, and the teeth. These areas can withstand enormous changes in barometric pressure as long as the air pressures within these body cavities are equalized with the pressure surrounding them.

July 26, Reuters Airplane rides are generally pleasant experiences, the calm demeanour of the air hostesses and the fragrant air-conditioned interiors are enough to send one into a peaceful state of mind. But then there are some issues that do crop up with the mounting height. While some people throw up due to a height phobia, there are others who end up having major ear pressure difference leading to intolerable pain. This happens due to the unequal pressures that develop on either side of the eardrum as the plane ascends or descends. The pain may get worse when the plane is about to land or take-off. The pain usually goes away soon after landing or when the plane has levelled-off. Dr Desai said, "Air needs to travel up the Eustachian tube into the middle ear to equalise the pressure. It is the ascent and descent of a flight that makes fliers experience pain shooting through the ears for a few agonising minutes. The Eustachian tube, a thin opening between the middle ear and the nose is the culprit behind this uncomfortable sensation. The Eustachian tube must re-adjust itself to accommodate the change in air pressure and this process is more troublesome for some people than others, especially those suffering from allergies and a sinus problem. In order to help the tubes open up or close more smoothly, there are certain tried and tested techniques that one could follow to ease the pain. Practice the Valsava manoeuvre: Valsava manoeuvre is a simple technique that involves blowing through the nose as the nostrils are pinched. One must repeat the process a few times to discover relief from ear pain. In this way, no air is blown out but one is gently pushing air into the Eustachian tube. This often cures the problem. This allows the pressure in the inner ear to equalise with the atmosphere around the person. Yawn and swallow frequently: The act of yawning and swallowing also stimulates muscles that help unblock the Eustachian tube especially during landings. Some airlines offer candies to their passengers before a flight to help tackle the same issue. Next time, wait for the flight to take-off before popping those sweet treats into the mouth. For babies, it is a good idea to nurse them or give them a drink at the time of take-off and descent to encourage them to swallow. One must consult a doctor or a pharmacist before investing in decongestants such as nasal sprays, drops or pills. Nasal sprays are usually sprayed after every 15 minutes before the flight takes off and 15 minutes before landing to help clear the nose. Oral decongestants are generally not recommended for people in the older age bracket. Do not sleep when the plane is taking off or descending to land: People believe that sleeping during take-offs and landings will help them pass through the phase pain-free, but it is to better to stay awake and practice the above mentioned techniques to avoid suddenly waking up in the middle of the flight with severe ear pain. Devote a few minutes to help the ears adjust to the air pressure, and then you could sit back and enjoy the rest of your flight. You could also ask the aircraft staff to wake you up when the plane starts to descend. Taking a deep breath in the style of breathing in before a yawn is also effective in this case. Take any pain killers half an hour before take-off or landing. Acetaminophen or ibuprofen are both available; avoid any pain killers that contain caffeine as it can lead to dehydration. An over-the-counter nasal decongestant may also help to unclog the ear and nasal passages. Instead of chewing gum, the classic cure is to opt for a throat lozenge or suck on a piece of hard candy. When asked if the same tips could be used by frequent fliers, Dr Ashim added, "Ear pain due to fluctuations in air pressure is very common in a healthy body therefore it is only natural that in a body battling a cold, nasal, sinus or ear infection, it becomes twice as hard for the ears to cope. In such situations, one must make sure that they plan in advance for the flight if not avoid flying altogether until the body recovers. An ear infection might be worsened in the flight and in some severe cases may even lead to ruptured eardrums and consequent hearing loss. It is advisable that frequent fliers suffering from frequent pressure changes in the ears be evaluated for allergies and disorders.