

WHEN A CHILD ASPIRATES

The ability to swallow safely is the primary prerequisite for becoming an oral feeder. When a child aspirates, oral feedings are often discontinued, and the child is given a feeding tube for eating. Many professionals recommend stopping the use of food at home and in therapy programs until the child swallows without aspirating on a modified barium swallow study. This leaves parents and therapists with many questions, and implies a wait-and-see approach.

The Swallowing Study

It is important to know what a swallowing study does and does not tell us about the child's physical safety for swallowing. A modified barium swallow study is held in the radiology suite of a hospital. The child is seated in a special chair that is placed next to the radiographic equipment that will take the pictures as the child swallows. The child is given food and liquid that has been mixed with barium to make it show up on the moving x-ray picture. This videofluoroscopic study is videotaped so that the results can be reviewed and analyzed in slow-motion at a later time. The radiology suite is usually a busy place. A team of 2-3 professionals is usually present to observe the study in progress. This includes the radiologist, the speech-language pathologist, and often a radiology technician. The swallowing study has many different names, depending on the facility and the preferences of the professionals conducting the study. The most common terms are modified barium swallow, and videofluoroscopic swallowing study. Other types of swallowing studies may be recommended such as swallowing ultrasound or cervical auscultation. These are conducted in a different manner, and will not be discussed in this paper.

A radiology suite can be very frightening for an infant or young child. The unfriendly looking equipment, adults with lead aprons and gloves, and expectations that the child will be willing to eat and drink, contributes to major upsets for some children. When children are asked to suck and swallow liquid or food that tastes unusual because of the barium, they may become confused or resistant. Some children are tested when they are crying and actively protesting. Others are evaluated when they are tipping or pushing their heads back into extension, making it more difficult to swallow safely. In some hospitals parents are not allowed in the room, and the child is fed by a stranger. Swallowing studies are frequently scheduled when the child is ill or recovering from a pneumonia.

The resulting physical and emotional tension can cause some children to become less coordinated in their ability to swallow. Aspiration may result that is atypical for the child who may swallow very safely when

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fed during a period of wellness, at home, or in a supportive therapy setting. This type of stress generally does not affect the swallowing safety of a child who has good swallowing abilities. It may, however, bias the results toward aspiration of the child has a more vulnerable system.

If the child is prepared physically and supported emotionally, a swallowing study can provide invaluable information.

A swallowing study can identify aspiration that occurs during the study. When a child aspirates during a swallowing study, it can be observed through videofluoroscopy. This indicates that the child has a vulnerable swallow, and has aspirated during this specific swallowing study. The vulnerability of the swallow is an important consideration, because it suggests that the child may aspirate at other times when there is physical or emotional stress.

A swallowing study can identify children who have silent aspiration. When food or liquid enters the airway, a protective reflex triggers a cough to propel the food upward and prevent it from entering the lungs. Children who cough and choke during feeding are at high risk for aspiration because we know clinically that a part of the meal has entered the top of the airway. Coughing is a good sign, but it does not tell us that the child always protects the airway and does not aspirate. A swallowing study can tell us whether the child coughs out everything that goes astray, or whether some enters the lungs in spite of the cough. Many children do not cough when they aspirate. Low sensory awareness or difficulty controlling movement of the vocal folds can allow food or liquid to pass through the airway and make a silent journey to the lungs. The feeder doesn't have immediate feedback of the times when the liquid goes into the airway. A modified barium swallow study is the only way to verify aspiration. Many parents are surprised to find that their child is experiencing aspiration, because the child shows no indication through coughing.

A swallowing study can identify the consistency of food or liquid which the child can handle safely. Liquids and foods of different consistencies can be used and compared during the study. Some children do well with one or more consistencies, yet aspirate with other consistencies. Although we often do a swallowing study to identify or rule out aspiration, its primary clinical value is to identify situations in which swallowing is more or less safe for the child. There are many young children, for example, who aspirate on thin liquids who swallow well when the liquids are thickened. These children are able to remain oral feeders if thin liquids are eliminated from their diet.

A swallowing study can identify risk factors for aspiration. Children who do not aspirate during the brief period of the swallowing study, may still be at high risk for aspiration in other circumstances. A child who does not clear the final swallow of liquid out of the small pocket between the base of the tongue and the epiglottis (the valleculae), may experience an overflow of the liquid into an open airway when he moves. Food residue may cling to the walls of the pharynx when pharyngeal movement is inadequate. When the child changes position or in other ways loosens the residue, it can fall directly into the airway and result in aspiration.

The swallowing study is extremely limited in telling us all we want to know about a child's swallowing ability. It is important to recognize that the study cannot do.

A swallowing study cannot tell us that the child does not aspirate. In order to limit the child's exposure to radiation, a modified barium swallow study observes a very small set of the child's swallows. If the child's swallowing ability varies under different conditions, aspiration may not occur during the swallows that are filmed. Some children, for example, swallow well at the beginning of a meal, but tire after 10-15 minutes. When they are fatigued, their swallow may deteriorate and cause aspiration. Other children have a great deal of difficulty getting themselves organized to eat. They may do poorly at the beginning of a meal, but do well once they have established a comfortable suck-swallow rhythm. It is critically important to integrate clinical observations of the child's eating a full meal with information from the swallowing study.

A swallowing study cannot tell us how often or in what circumstances a child will aspirate. The study tells us only that the child aspirated during the swallowing study. This is a very small sample of the child's abilities. Under more ideal circumstances, the child may be able to swallow more safely.

A swallowing study cannot tell us whether oral feeding should be discontinued. The information from a swallowing study is integrated with other knowledge about the child and family. It is only one part of the objective and subjective data that is taken into consideration in making a decision about oral feeding. It is very important to talk to parents about what they want and what their child wants. There are always ways of improving the safety of a child's oral feeding skills. If the parents want to continue feeding the child orally, it is important for therapists to support their decision, and work together to find easier, more effective ways of eating.

A swallowing study cannot predict whether the child will be able to eat safely in the future. A swallowing study tells us about the present moment. With maturation and therapy many children who once aspirated are able to eat and drink safely. Other children who did not show aspiration when younger, may begin to aspirate during periods of illness or if their overall coordination deteriorates.

The Impact of Aspiration on the Lungs

All instances of aspiration are not equal. The effect of aspiration on the lungs and on health depends upon at least 5 different features.

Acid: When a child aspirates refluxed food that has been mixed with stomach acid (i.e., aspirated coming up) it is more likely to cause an aspiration pneumonia or damage the lungs than food or formula that is more alkaline (i.e., aspirated going down).

Fat: Food or liquid containing fat molecules (i.e. milk, yogurt, meat broth) is more dangerous to the lungs, and may trigger pneumonia faster, than food or liquid that has is composed primarily of water (i.e. fruits, vegetables, grains). This is because the lungs are used to handling water in the air we breathe and can release it more easily than a fat which is foreign to the lungs.

Amount: There are estimates that our lungs can handle aspiration of 10-20% of what we swallow. Children often aspirate small amounts when they are learning to eat by mouth. If this is a very small amount of a safe food, the aspiration is less likely to trigger an aspiration pneumonia. If larger amounts are aspirated, or if smaller amounts are aspirated every time the child swallows, it is more dangerous.

Bacteria: The mouth itself plays host to colonies of bacteria. The number and type of bacteria depend a great deal on dental health and oral hygiene. When the mouth is kept clean through regular brushing of the teeth or wiping of the gums, bacterial growth is kept to a minimum. When a child resists oral care, bacterial growth multiplies. Children can develop cavities and gum inflammation which further increase bacterial growth. If the child is on medication to reduce mucous and other secretions, the bacteria in the existing saliva becomes more concentrated. If the child aspirates saliva, alone or mixed with small amounts of food or liquid, the bacteria will be carried into the lungs. An aspiration pneumonia can result from a bacterial infection.

Health: The overall state of the child's health and wellness, and specifically the health of the lungs plays a major role. This is the guiding principle we use in

understanding who gets sick when a group of people are exposed to a virus. Our bodies are full of bacteria and viruses that float around the environment we live in. We tend to get sick when our overall health is poor, when we are fatigued, under stress, or lack control over our lives. Many young children have very healthy lungs. Aspiration may not initially cause a pneumonia. However, with constant aspiration, the lungs may become weaker or more vulnerable. At some point aspiration begins to cause a severe pneumonia because the lungs are no longer strong enough to stay well. Chronic aspiration pneumonia may result. Infants and children who have already experienced lung damage because of prematurity, respiratory distress syndrome, or broncho-pulmonary dysplasia are more vulnerable to aspiration than children who start out with strong, healthy lungs. Some parents are told that they shouldn't worry about coughing during a meal because children aren't aspirating unless they have gotten a pneumonia. This simply isn't true. Even if slight aspiration isn't causing a pneumonia today, we need to think about the potential impact in the future. It is important for many children who aren't eating or children who cough and choke at lot at mealtimes to have a modified barium swallow study done to rule out aspiration.

Time as an Ally

There are children whose swallow improves over time without direct intervention. Maturation plays a big role for children who do not have neurological impairment. For example, an infant with severe respiratory problems may have an absent swallow reflex. Any liquid sucked or placed in the mouth would be aspirated because there is no swallow, and the airway remains open. A major portion of the pathway through the pharynx (throat) for swallowing is shared by both breathing and swallowing. When we swallow, the airway is protected by a series of movements and closures that directs the food toward the esophagus and the stomach and prevents it from entering the airway. Children with respiratory difficulties are at higher risk of aspiration because they have more trouble coordinating swallowing and breathing. As their ability to breathe improves, respiration slows down and the coordination for swallowing improves. The swallow reflex emerges, and child gradually is able to suck and swallow safely.

Struggling to Eat

The struggle to eat contributes to aspiration and to feeding aversion. The ability to suck and swallow safely is build on a foundation of sensory skills, motor skills, and comfortable coordination of swallowing and breathing. When one or more of these skills is

missing or compromised, eating can be frightening, uncomfortable, or take an excessive amount of effort. Premature infants, for example, do not have a mature suck-swallow system until they are 37 weeks post-conceptual age. Attempts to teach the baby to take the bottle or breast prior to 37 weeks creates added stress because the suck-swallow-breathe coordination is immature. Stress and struggle often convinces an infant that eating is dangerous and uncomfortable. Feeding aversion often has its roots in the child's early memories of panic and inability to breathe that are associated with early feeding attempts. Many long-lasting feeding problems can be prevented by waiting until the disorganized premature infant has a more mature feeding system.

If a child is already taking some food and liquid orally, look carefully for signs of aversion or physical struggle. Know that when the child must struggle to eat, the risk of aspiration increases. Prior to scheduling a swallowing study look carefully at specific foods that the child is eating. List foods that are easiest, and those that are the most difficult. Look at the texture, thickness, and taste of these foods. Try to find patterns in the foods and liquids the child handles well, and those that cause trouble. Eliminate all foods from oral feedings that have caused difficulty. Increase the types of foods that the child handles more easily.

Identify the point in the meal where swallowing abilities deteriorate, and trouble begins. Is it after a certain amount or volume of food? Is it after a specific time has elapsed that is unrelated to the amount eaten? Offer food only during the time that the child can handle it well. Helping a child stay in the safe range can also provide the opportunity to practice the coordination needed to eat safely. This may improve over time if the child is not having to struggle to eat.

Oral-Motor Treatment

Oral-motor treatment helps children develop the appropriate use of their oral, breathing, and voicing systems. Opportunities are created for exploration, sound play, and as the exploration of sensorimotor skills required for oral feeding. An oral-motor treatment program emphasizes the development of sensory awareness, perception and discrimination within the mouth, and the use of oral movement to explore and understand the world of toys, clothing, body, parts, and sounds. Small amounts of food and liquid may be introduced to provide smells, tastes, and temperatures, and to elicit specific oral movements when the child is medically able to handle them. Since the goals of oral-motor development can be met in many ways, food and liquid are not essential to the program (especially in the initial stages), and may not be included if the child has a severe swallowing disorder. When children

are in love with their mouths, and feel comfortable and competent, learning to eat is a gentle journey.

Oral-Motor treatment can also emphasize the child's acceptance of cleaning the mouth with a washcloth, swab, or toothbrush. Regular cleaning reduces the amount of bacteria carried in the saliva, and lowers the risk of pneumonia if the child aspirates saliva.

A positive oral-motor treatment program emphasizes the underlying sensory and motor prerequisites for developing feeding skills. This builds the foundation of comfort and skill, that enables the child to learn to eat without a struggle. We don't have to feed children to help them develop the skills they will need. For this reason, we can give infants and children time to develop what they need to eat safely without stressing the health of their lungs through constant aspiration. We can prevent the negative associations with eating that arise when a child is uncomfortable and frightened by feeding challenges for which his body and emotions are not prepared.

Preparing for a Swallowing Study

Selecting a Hospital

Parents and therapists are consumers of medical services. The selection of a hospital and physician for a swallowing study is an important purchase. Parents and referring therapists should discuss the following questions with their doctor and with the staff of the hospital.

Is a speech-language pathologist with a background in swallowing (i.e. dysphagia) part of the evaluation team? Physicians often ask only whether the child is aspirating or not. When a therapist is involved in the evaluation, a stronger focus is placed on therapeutic questions related to the child's positioning, food amount and consistency. This provides more information that will help develop an appropriate therapy program for the child.

Does the swallowing team do a modified barium swallow procedure? Standard barium swallow studies use a large amount of food or liquid. If the child aspirates, the study is often discontinued immediately. A modified barium procedure uses only a small amount of food or liquid, and the evaluation usually compares different consistencies of liquid and puree. This is important because some children have trouble with some consistencies but not others. A child may be able to swallow very small amounts at a time, but aspirate on larger amounts.

Does the radiology suite have a special chair or seating system so that a baby or young child can be carefully positioned in sitting? Some hospitals don't have appropriate equipment for infants and children who cannot sit unsupported. They may choose to do a swallowing study with the child lying down, or the child may be strapped into an adult chair. When a child is not positioned well for a swallowing study, information on the swallow is useless. We want to know how the child swallows in supported sitting with good alignment of the body, neck, and head.

How does the radiologist handle the situation if the child is upset and starts to cry or scream? We hope that children will cooperate during the test, but sometimes the equipment and strange situation is frightening. Children often cry or protest about eating under these conditions. It is important to look for a radiologist who is willing to take time with children, and will stop the study if the child continues to cry. Some physicians feel that the study is more important than the child. They use an open mouth as an opportunity to pour liquid into the mouth of a screaming child. The child may struggle and be forcibly held down as the mouth is pried open to take a squirt of liquid. Any information gotten from this type of study is totally useless and meaningless! No parent or therapist would feed children when they were screaming. When children are evaluated in this negative environment, they may lose their trust in adults who feed them, and increase their aversion to eating.

Identifying the Child's Readiness

It is important to know when a child is ready for a swallowing study. Swallowing studies are often done with children who have had no prior experience with swallowing food or liquid. This can identify any structural problems that influence swallowing. It may show a normal swallow for children without neurological impairment. However, if the child has difficulty with coordination or has a stressed respiratory system, the swallowing study may be meaningless when the child has had no prior experience swallowing food or liquid. This approach is similar to promising adults a place in the beginners ski school if they can ski down the advanced ski slope without falling.

Therapists can work on the following general goals before referring a child for a swallow study. Each of them can be worked on safely in therapy without information from a swallowing study. Each of them prepares the child so that therapeutically meaningful information can be derived from the study.

The child likes the feeling of fingers and toys in the mouth. This makes it easier to accept the feeling of feeding utensils and food.

The child moves the mouth with a good rhythm and backward-forward tongue movement when small tastes are placed on the lips. This allows food to be transported to the back of the mouth for the swallow with good coordination.

The child accepts small tastes of food or juice placed on the lips or on the front of a moving tongue. This tells us that when sensory input from food is introduced, the child will begin to draw it into the mouth.

The child swallows his own secretions and doesn't choke on saliva or mucous. Children who choke on their own secretions or never swallow saliva, are not skilled with the most basic swallowing tasks. The addition of food is rarely appropriate for children who cannot handle their own secretions. If a child has a tracheostomy and can be suctioned, the stronger sensory input from tastes may be stimulate greater activity in the mouth and a more consistent swallow. Adding food tastes offers a greater risk if suctioning of food from the airway is not possible.

The child swallows the additional saliva produced by tastes of food without choking. Some children can swallow small amounts of saliva, but their system is overwhelmed if the volume of saliva is increased. Food tastes and smells naturally increase the flow of saliva.

The child takes 3 or 4 consecutive small spoonfuls (1/3 teaspoon) of a pureed consistency and a liquid consistency. Children must be able to take at least 1/3 teaspoon of food or liquid at a time for a swallowing study. Smaller amounts will not stimulate the swallows needed to provide meaningful information.

Providing Physical and Emotional Support During the Swallowing Study

Quiet, organizing music can be played for the child before and during the study to assist with calming. A favorite toy can accompany the child, and parents can be present to do the actual feeding. A child-size chair with appropriate head supports should be used for positioning. Soft pillows or rolled towels can be added to make sure that the child is comfortable and seated with good head support with the chin tucked slightly down toward the chest. In many settings parents can bring the child's favorite liquid and food. When a child is resistant to changes in taste, familiarization with the taste of barium in the food can be done in therapy prior to scheduling a study. Small amounts of thin liquid, thickened liquid, and puree consistency food can be offered to compare ability to swallow different consistencies.

Asking the Right Questions

A swallowing study can tell us so much more than simply whether the child is aspirating or not. Each study should be centered around a set of questions that have been prioritized. In order to reduce a **child's exposure to radiation, there may not be time to address all of the questions. . What are the most important questions for this child, at this time?**

Is there a delay in the swallow with any consistency?

A delayed swallow indicates that the child may be at risk for aspiration even when aspiration does not occur during the swallowing study.

Is swallowing ability influenced by the consistency of the food or liquid? Are there differences between thin vs. thicker liquids? Are there differences between thick liquids and pureed consistency? This information can help identify the consistency that promotes the coordinated and safe swallow.

Is swallowing ability influenced by the amount of the food or liquid? Is there a difference in swallowing skill when a single swallow of food or liquid is compared with 2 or 3 consecutive swallows? Some children are very safe when they take a few swallows and then have a short pause. A child can do very well with small sips, but may aspirate when drinking multiple consecutive suck-swallows.

Is swallowing ability influenced by the timing of the meal? Is there a difference between the beginning of a feeding and the end? Some children do very well at the beginning of a meal, but the swallow deteriorates as they get tired. If the child typically does better at the beginning of a meal, and begins to have more trouble after 20 minutes, you can ask the therapist and radiologist to set up the swallowing study in two parts. They would evaluate the swallow at the beginning of a meal, and would then stop filming as the parent continued to feed the child a regular meal for another 20 minutes. At the time when the child begins to fatigue with eating, they would again video the swallow. Other children are poorly coordinated at the beginning of a meal, but improve their eating abilities as the rhythm of the meal continues. These children also benefit from testing at two different points in the meal.

Guidelines for Introducing Food

Use the following guidelines for selecting the food you offer to a child in the early stages of therapy. These suggestions reduce the risk of damaging the lungs if food or liquid is aspirated.

A child who develops aspiration pneumonia should always be checked for gastroesophageal reflux. Remember that reflux does not automatically result in vomiting or spitting up. Many children reflux enough acid stomach contents to enter the lungs without any external sign that this is happening.

A young man with cerebral palsy who always had been an oral feeder had a swallowing study that showed some aspiration during swallowing. He had been very ill from repeated pneumonia for a year, and was told that if he stopped eating for 6 months, the aspiration would stop and his lungs would get well. He could then receive more therapy to improve his swallowing skills. He cooperated and a gastrostomy tube was put in. However, he continued to have pneumonia, and the lungs got worse. Everyone assumed that he was sneaking food by mouth, and they told him he would probably never be able to eat orally. He was very angry and felt betrayed. No one had checked for gastroesophageal reflux. It was the aspiration of acid reflux that was causing the pneumonia, not the small amount that he aspirated when he swallowed. When he was given a feeding pump, and fed at a slow rate, the aspiration chronic pneumonia stopped.

Until the child is swallowing well and safely, use primarily water, fruits, vegetables, and grains. If aspirated, these foods will do less damage to the lungs. Begin with a low-acid fruit or vegetable such as bananas or carrots. Introduce small amounts of a more-acid fruit such as peaches or applesauce later. Avoid any food that has a high fat content. This includes most meat and dairy products. Many children enjoy foods like milk, ice cream, yogurt, and chicken broth. Because of their fat content, they should not be given to a child with poor swallowing who has had a history of coughing, choking, or aspiration. If the child doesn't drool and seems to be handling secretions, you can begin with tiny drops of water on a cotton swab or dropper. This builds on the swallowing of small amounts of thin liquid that the child is already doing safely.

Brush the child's teeth or clean the mouth before offering food or liquid. Remember that the mouth contains bacteria. These bacteria can increase the risk of aspiration if they are mixed with the food or liquid that the child swallows. A clean mouth reduces the risk of illness if there is some aspiration during this learning period.

Give very small amounts of food at times when the child's coordination is the best. Children who have poor coordination for eating often do well at the beginning of a meal. As they fatigue, their coordination gets worse, and they may begin to aspirate. Do not push

children to eat more when they want to stop. Some children are very aware of their vulnerability for aspiration. They know that if they eat more, they are uncomfortable, or don't feel well. Trust the child, and appreciate the small amounts that are taken easily and happily. When you schedule a swallowing study, ask the therapist and radiologist to look at both the beginning and end of a meal.

Look carefully at the child's state of health and wellness. Seek alternatives that increase the child's overall wellness. Wellness is quite different from not being sick. Talk to physicians, dietitians, and health care providers who use complementary medicine approaches. Explore alternatives that can increase the child's overall health and wellness. Use food to work on feeding skills only when the child is healthy. Do not give food orally if the child is sick, or during periods when there is greater vulnerability to becoming ill. Be especially cautious about working with food if the child has a chronic lung problem, especially if this is combined with poor coordination.

A little girl with variable swallowing problems participated in an oral-motor treatment program for several years. An emphasis was placed on a wide variety of oral-motor activities and the development of a strong non-nutritive suck on a pacifier that didn't require food. She had a pattern of developing frequent colds and flu during the winter months. Food tastes were never offered between October and March. However, during the spring and summer she was very healthy. Between April and September she and her therapist worked very aggressively with tastes and small spoonfuls of food. Even if she aspirated small amounts while learning to suck and swallow more efficient, that her lungs could handle it when she was healthy.

If the child has had a swallowing study that showed aspiration, look carefully at alternatives with the physician, therapist, and parents. If there has been more than one instance of aspiration pneumonia, you already know that the aspiration is causing problems. If the child has not had pneumonia, it does not automatically mean that he can continue to aspirate without later consequences. Continued aspiration may lead to chronic problems later as the lungs become gradually weakened from constant aspiration. Remember, however, that a swallowing study shows a very small number of swallows. These videofluoroscopic studies are often stressful for children, and the added stress can reduce coordination and contribute to aspiration for some children. This is especially true when the child has a vulnerable swallow that is sometimes safe, and sometimes not. Don't use food that could be aspirated when the child's lungs are still unhealthy from the pneumonia. However, taking a child off of all oral feedings may not be necessary. You may be able to develop a plan to continue with tastes or very small amounts of food as you work to improve the child's feeding skills. Develop a plan to improve a child's physical and sensory abilities and oral-motor skills before repeating the swallowing study. Maturation helps many children, but other children need special therapy to develop improved sucking and swallowing coordination.