



SANDHILL SOLUTIONS

Sandhill Scientific, Inc.
9150 Commerce Center Circle
Suite 500
Highlands Ranch, CO, USA 80129

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Children are our most valuable natural resource. (Herbert Hoover) Jean Osborn

Sandhill would like to dedicate this issue to customers involved in pediatrics. Caring for our future generations can be rewarding and challenging. It takes a special individual to care for our children. And for that we take off our hats and salute you!

This issue is targeted toward providing

THE SATURDAY EVENING POST



comprehensive information for health care providers caring for infants, children, and adolescents who are undergoing GI diagnostic procedures. It is our hope to provide you with support for you to better care for your pediatric patients.

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Pediatric Multichannel Intraluminal Impedance Testing

by William "Bill" Campbell, Children's Hospital, Cincinnati, Ohio

Cincinnati Children's Hospital Medical Center continues to be a leader in utilization of technological innovations and state of the art testing. In 2006, Children's Hospital completely transitioned from the traditional pH (acid only) testing for reflux to multichannel intraluminal impedance: the new gold standard procedure for diagnosing gastroesophageal reflux disorder (GERD). In the past, traditional pH would offer physicians data on acid reflux only. Now, with impedance/pH, physicians can not only determine how often reflux is occurring, but also the proximal extent of reflux, the length of time the bolus remains in the

esophagus and whether the contents are acidic or non-acidic. The patient can also stay on all current medications unlike traditional pH where the acid suppression medications need to be discontinued. Integrating this technology with our currently available diagnostic armamentarium has opened the door for more precise data collection, aiding in diagnosis and treatment to provide optimal care for our population. We have not encountered any major obstacles in transitioning to this new modality of testing. Over the past year, referring physicians have been increasingly utilizing our services as they feel they are obtaining clinically relevant information.

The indications for performing impedance studies have been myriad, including recurrent pneumonias, desaturations, apneic spells, chest pain, respiratory distress, and g-tube/fundoplication work-ups—to mention a few. Depending on time and family preference, we currently uses three different placement methods. Our fluoroscopy department is utilized to aid with insertion of the probe, giving us the ability for immediate placement verification. (cont'd on page 2)



Upcoming Events

September 29th and 30th, 2006, CCHMC and the AERODigestive division will be hosting the bi-annual nationwide seminar series at the Kingsgate Marriot Conference Center in Cincinnati on Pediatric Dysphagia, "Exploring the brain and gut feeding connection".

A full listing of all impedance related publications can be accessed at <http://www.sandhillsci.com>. To access the bibliography, click on the "Literature Library" link, select either impedance-pH monitoring or impedance manometry and select "Publication Bibliography".



Pediatric Multichannel Intraluminal Impedance Testing

(cont'd from page 1)

Probes are also placed while the child is under anesthesia for other procedures such as EGDs, flexible bronchoscopies, microlaryngoscopies, etc. as well as bedside placement, which has become our most popular mode of placement. We make sure the child is fasting for at least 4 hours prior to insertion and, depending on their age and/or functioning level, we rely on our holistic approach to minimize discomfort and anxiety surrounding the insertion process.

Over the past twelve months, Children's

Hospital has performed over 350 impedance studies which have resulted in positive outcomes in patient management. Children are admitted overnight for a 23 hour short stay and to date have not needed prior authorization from insurance companies for billing and/or collecting purposes. We currently bill under the 91038 code which is for prolonged gastro esophageal reflux testing. The use of multichannel intraluminal impedance testing has exceeded our expectations among the pediatric

population and we foresee it continuing to grow.

This diagnostic modality has aided our clinicians in being able to make precise decisions regarding our patients' diagnoses and management plans.

William "Bill" Campbell,
Impedance Coordinator

Children's Hospital Medical Center

3333 Burnet Ave

Cincinnati, Ohio 45229

2006 Schedule

Denver Training Courses held at the Sandhill Training Center:

Basic Esophageal Course

Sep 13-17* *Registration closed*

Oct 11-13

Nov 8-11*

Meet the professor: Dr. Castell will be present during the program during selected months (*) to provide sessions specifically geared to understanding the use of these diagnostic tests: manometry, pH, and the role of impedance. Dr. Castell will discuss issues most concerning the practicing clinician charged with providing diagnoses and treatment of the patient with esophageal abnormalities. These sessions will be held in conjunction with Friday of the basic workshop during those selected (*) months.

Course tuition: \$1600

Basic Anorectal Course

Sep 18-19 *Registration closed*

Nov 13-14

Course tuition: \$1100

Esophageal Interpretation

Seminars:

Aug 24 Kansas, MO

Sep 7 London, UK

Oct 19 Chicago, IL

Nov 16 Miami, FL*

Months with (*) : Advanced Editing Workshop held the following day

NEW Anorectal Interpretation Seminar: Oct 20 Chicago, IL

Please contact Kristy Williams at 800-468-4556 ext. 1003, if you are interested in attending.

Tips on Placing Probes in Pediatric Patients

Corinne Pavesic, RN, CGRN

Endoscopy/Manometry/pH Nurse, Carle Hospital, Urbana, IL

Clinical Coordinator, Sandhill, Scientific

Tips on placing pH probes in Pediatrics:

Doing procedures on children (esp. if they are not sedated) can be very challenging!!

Here are some tips and information to help the procedure go smoothly.

With any procedure, performed on adults or children, PREPARATION is the key to success.

It is so important to be prepared with children.

**ALLOW PLENTY OF TIME
DONT "LOOK " RUSHED**

Having everything ready and at your reach is less frightening to a child than scrambling around when they are present.

Know your equipment: The age and size of the patient will determine the type of probe

you use. There are many types of probes. Choose the one for the age/size of the patient.

Know your protocol: If you are using impedance-pH probes, make sure to choose the correct protocol during the Sleuth set up on the computer.

Know your physician's protocol.

Know your patient's history, diagnosis, symptoms. Interviewing the parent, caregiver, floor nurse will help to provide this information.

Communication with the parents/ caregiver/ and patient (*when appropriate*) and an explanation of the procedure is key, such as instruction on when to push

the buttons will decrease fears and provide cooperation.

Measurement and Placement: Strobel's formula: (0.252 x length in cm(of baby) + 5) and radiology confirmation of placement . Confirmation by a person experienced in interpreting this. Usually 2-3 vertebral bodes above diaphragm. Placement needs to be confirmed this way until child is old enough to have confirmation using LES Locator, or if a manometry was performed.

I have always had success measuring from the tip of the nose to the ear and then nipple line, and x-ray confirmation

Calibration:

The patient's finger needs submerged in the bufferto complete the calibration process when using

(cont'd on page 5)



EF/GER

Adding esophageal function to reflux monitoring

By Donald O. Castell, MD and Amine Hila, MD

What is it? EF/GER is the acronym for “esophageal function/gastroesophageal reflux”. This is a fast and simple way to evaluate esophageal function (motility) at the start of an ambulatory reflux study by giving the patient 10 saline swallows (or Gatorade, if preferred, for children) immediately after probe intubation.

EF/GER combines bolus transit with impedance-pH reflux monitoring in one test, with one probe. Since impedance shows bolus transit, regardless of direction, we use this feature to record and measure 10 swallows. The analysis software has been enhanced by adding the ability to analyze these swallows for bolus transit (esophageal function).

With the impedance stations on a standard adult impedance-pH probe located at 3,5,7,9,15, and 17 cm above the LES, this affords the capability of utilizing the 5,9 and 15 cm stations to mirror the sites typically used during an esophageal function test while using the 17cm station to verify the initiation of the swallow.

Technique for performing the study: Once the probe is accurately placed for the reflux study and the study has been initiated, the clinician administers 10 saline swallows timed at 20-30 second intervals and documented on the recorder by pressing an event key to indicate the swallow. The patient is then sent home to complete the reflux portion of the study. During the editing process, a measurement area is created for each of the 10 saline swallows and is then measured by the software as MII swallows. The reflux study is then edited as usual. The report generated includes both bolus transit and reflux data.

Clinical Indications for EF/GER: Performing esophageal function screening at the beginning of a reflux study affords the clinician the ability to assess function on every patient who is to undergo reflux monitoring. The clinician can then more easily identify those patients requiring further complete motility testing.

Supportive Data: Recent studies in our laboratory indicate that 10 quick swallows at 20-30 second intervals prior to beginning the ambulatory phase of MII-pH monitoring can accurately measure esophageal transit function.

We studied 100 consecutive patients and blindly compared bolus transit by this technique with the previously interpreted standard MII-EM Study. The MII-pH swallows gave identical transit diagnosis (incomplete or complete) to the MII-EM in 93% of the patients. Sixty-four (64%) of these patients had complete transit by both techniques (Figure 1) and twenty nine 29% had incomplete transit by both techniques (Figure 2). There were five patients with complete transit on the MII-EM study who showed incomplete transit on the MII-pH study; i.e., a false positive result. Only two patients with incomplete transit on the MII-EM study were interpreted as showing complete transit by MII-pH; false negative results.

Our studies indicate that a simple study with 10 saline swallows using the MII-pH catheter prior to ambulatory reflux monitoring can identify which patients should be considered for a more complete MII-EM analysis. A bolus transit abnormality identified by MII-EM was missed in only two patients out of 100 studies using the MII-pH swallow analysis. (Hila et al: Gastroenterology 2006; 130: A-162)

Conclusion: Abnormal bolus transit, as found on EF/GER studies, is a good indicator to determine which patients require follow up with complete impedance-manometry testing.

Figure 1: Complete Transit

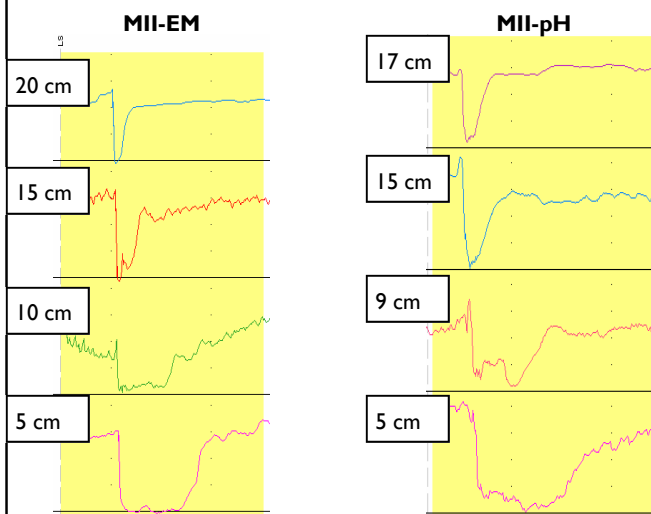
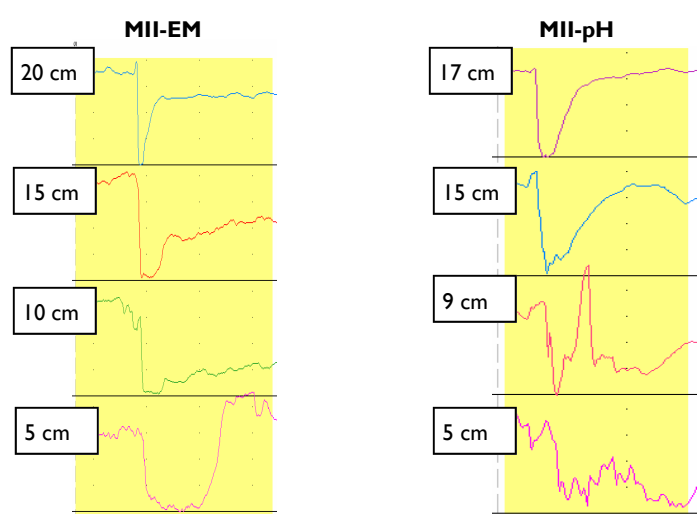


Figure 2: Incomplete Transit



Pediatric Anorectal Manometry

Linda Knight, BSN, CGRN

Clinical Coordinator, Sandhill Scientific

Anorectal manometry (ARM) is used in pediatrics in the evaluation of constipation to rule out Hirschsprung's Disease (HD) and in the evaluation of fecal incontinence with the purpose of identifying any underlying pathophysiology.

HD is caused by the absence of ganglion cells in the distal colon. The anal sphincter is in a tonic uninhibited contraction, the internal anal sphincter (IAS) fails to relax, there is a loss of rectal compliance, low pain threshold to rectal distention, and often there are high resting anal pressures. HD occurs in 1/5,000 births. In the newborn, HD presents with signs of abdominal distension and failure to pass meconium stool during the first 48-72 hours after birth. The older child is evaluated for HD when presenting with symptoms of intractable constipation and failed laxative treatment, and the presence of a large abdominal fecal mass.

The manometric finding is failure of the IAS to relax in response to rectal distension (absence of the recto-anal inhibitory reflex). A crying patient, probe movement, or probe positioned in an area where there is little IAS (too close to rectum or anal verge) can make demonstrating RAIR very difficult. Attempt to calm the patient, inflate the rectal stimulation balloon during a period without crying or movement, and positioning the probe in the high pressure zone will improve the demonstration of RAIR. Inflate the stimulation balloon with a small volume of 5 cc, increasing to a maximum of 30 cc to prevent discomfort from a poorly compliant rectum. A volume of

5-15 cc will elicit RAIR in the newborn and 2-10 cc in the premature infant.

Encopresis or withholding stool is a condition with a psychological component where the child actively withholds stool resulting in a large fecal mass with new liquid stool seeping around the mass and out the anal canal. ARM is performed to rule out any pathophysiology causing the fecal incontinence and constipation. Manometric findings which are a result of the condition, not the cause, often include increased sensation and RAIR threshold because of the enlarged rectum, and paradoxical response to pushing.

Tips to improve the pediatric manometry study include:

- Decrease crying artifact
- Give bottle or pacifier
- Parent present to comfort
- Distract with reading, singing, a game
- Decrease probe movement

Tape probe to buttock with sensors in high pressure zone.

Inflate rectal stimulation balloon during a quiet time, free of crying.

Recommended Reading

Jerry Mabary, VP

Evaluation of Gastroesophageal Reflux Events in Children Using Multichannel Intraluminal Electrical Impedance; T. Wenzl; The American Journal of Medicine; Volume 115 (3A) 161S-165S;2003

The Importance of MultiChannel Intraluminal Impedance in The Evaluation of Children with Persistent Respiratory Symptoms; Rosen R. & Nurko S.; American Journal of Gastroenterology; 2004;99:1-7

If we don't stand up for children, then we don't stand for much. Marie Wright Edelman



TIPS ON PLACING PROBES IN THE PEDIATRIC PATIENT

(cont'd from page 2)

External Reference pH probes. Make sure the electrode is secured on the patient.

AGE GROUPS:

NEONATES AND INFANTS:

Placement can be done with one person but if there is help, use them to help hold the baby's head. Another alternative is to "swaddle" the baby with a blanket. Have the baby lying down, pass the lubricated probe in the nares straight back. If the baby uses a pacifier, sucking on it helps to get the probe down. If it passes without resistance, pass it down to a few cms beyond the calculated probe depth. Make you are sure that you are in the stomach by acid pH drop below 4 (if on PPI's, the pH may not drop). Make sure probe is not coiled. Pull up to the determined number. Temporarily tape probe while getting x-ray. May need to use "NO-NO's", arm restraints or hand mitts (per-protocol) to prevent "unwanted" probe removal. Recorder should not be under x-ray machine.

When placement is confirmed, tape probe and electrode well (good place for electrode on a baby is on the upper back, with the wires going down

back). **START RECORDING.** Holding, and giving a bottle after the procedure usually helps calm the baby quickly .

TODDLERS:

The hard age!! You **WILL** most likely need an extra hand! Involve parent/caregiver (if they want). Allow patient to hold favorite toy and/or blanket. Give stickers or some treat/toy before and/or after the procedure.

Be **PREPARED** and place the probe **ASAP**, using a pacifier if they use one. Confirm probe placement with the same techniques as with an infant.

After, may like to have recorder in a backpack . Give lots of praise after the procedure.

PRESCHOOLERS:

They can become more involved with the procedure; Make a game out of calibration steps. Show them how they will "help" to push the buttons during the study. Again use "rewards" such as coloring books, etc. They usually can sip on the water during placement. Tell them that the procedure is easier if they help you by drinking. Use a small amount of Lidocaine jelly on probe. Always involve parents if **THEY** want to - or if appropriate. Same technique for passing probe, with x-ray confirmation. After, they may like to see they x-

ray too. They probably won't need arm restraints - but be prepared just in case. Use a backpack, or belly bag. Give lots of praise after.

SCHOOL-AGED

This age can be easier or more difficult depending on the child. They want to be brave, but they are scared. Involve them as much or as little as needed. They may even help with passing the probe (some). Have the patient help with calibration and with drinking the water. If they are older and of good height, they may be able to use the sphincter locator to confirm placement.

They need to know when and how to use the recorder and to understand that it is not a "game" to press buttons. They are old enough to understand some explanation of what the results are. They can use the regular strap, backpack, belly bag - whatever they want . They still like rewards, even if they don't "act" like it.

OLDER SCHOOLAGED - ADOLESCENTS:

Place like adult, with extra TLC!!

Pediatric Probe Placement requires patience, preparation, understanding, and flexibility!

I hope these tips help!



When I approach a child, he inspires in me two sentiments; tenderness for what he is, and respect for what he may become. Louis Pasteur