

24 Hour Oesophageal PH Impedance Monitoring Full Clinical guideline – Joint Derby and Burton

Reference no.: CH CLIN G 165/Oct 21/v001

1. Introduction

24 hour oesophageal Impedance-pH (Z/pH) monitoring is one of the diagnostic tools to assess the degree of gastro-oesophageal reflux (GOR) and correlate reflux episodes to symptom events. It has the advantage over conventional pH only monitoring of being able to detect and differentiate between acid and non-acid reflux into the oesophagus. The Z/pH probe has 6 impedance rings spaced at equal intervals apart and a single pH channel usually located between the distal 2 impedance rings.

2. Aim and Purpose

To provide guidance on indications, the technique, instructions and implementation of 24 hour oesophageal Impedance-pH (Z/pH) monitoring.

3. Indications and implementation

24 hour oesophageal Impedance-pH (Z/pH) monitoring is one of the diagnostic tools to assess the degree of gastro-oesophageal reflux (GOR) and correlate reflux episodes to symptom events. It has the advantage over conventional pH only monitoring of being able to detect and differentiate between acid and non-acid reflux into the oesophagus. The Z/pH probe has 6 impedance rings spaced at equal intervals apart and a single pH channel usually located between the distal 2 impedance rings.

The technique of oesophageal Impedance-pH monitoring has a significant influence on the accuracy of results. It is important to ensure that following points are observed before Z/pH study is conducted.

1. Anti-reflux medication (especially H₂ receptor antagonists and Proton Pump Inhibitors) should be discontinued ~ 7 days before the procedure.
2. A new battery should be used for every recording.
3. The probe must be calibrated before the recording
4. All sensors must be submerged fully in buffer solutions.
5. The probe must be accurately positioned.
6. A strict and detailed event diary is necessary and parents should be instructed to fill in all the details including feeding, vomiting, regurgitation, crying episodes, sleeping etc.
7. There must be no interruption in the electrical contact of the ZepHr recorder and the probe during the recording.

Indications:

1. Symptoms clinically suggestive of acid gastro-oesophageal reflux, who fail to respond during a high dose therapeutic trial of a proton pump inhibitor
2. Symptoms clinically suggestive of acid gastro-oesophageal reflux without oesophagitis or with an unsatisfactory response to a high dose proton pump inhibitor in whom anti-reflux surgery is contemplated
3. Persistent acid gastro-oesophageal reflux symptoms despite anti-reflux surgery
4. It may be useful to correlate symptoms (e.g. cough, chest pain) with acid reflux episodes and to select those infants in whom GOR is an aggravating factor.

Medication:

Stop these medications prior to the study for accurate results.

Omeprazole	Seven days before study
Gaviscon	Two days before study
Peptac	Two days before study
Ranitidine	Two days before study
Domperidone	Two days before study

Fasting

Parents should be instructed that their child is starved 2 hours for both solids and liquids prior to the insertion of the probe

Implementation

The child is usually an in-patient on Paediatric Ward. The pH monitoring should be commenced ideally between 10.00 – 10.30 am.

The test is organised through the Consultant's secretaries. The respective secretary will arrange for the patients admission to the paediatric ward either on a Monday or Wednesday and liaise with the clinical measurements team to check whether this date is feasible for them. Clinical measurement physiologist - extension 85262. (For Derby)

An appointment letter (Appendix 1) is sent to the patients with a copy to the clinical measurements department and the wards. This letter should include fasting instructions and also advise on stopping the anti-reflux medication along with Patient information leaflet (Appendix 2).

On the day of the appointment the clinical measurements technician will liaise with the ward so that the equipment can be ready.

Once the patient is admitted, a quick clerking need to be done and then the pH probe needs to be inserted by the Nursing team or a doctor. Patient should be fasted 2 hours for solids and liquids prior to the insertion of the probe.

Please ensure that the patient's registration number is inputted onto the pH probe prior to testing. Please take special care with the tip containing the electrode

Instructions for Impedance-pH monitoring: use of ZepHr recorder

1. Always insert new batteries before each recording.
2. Check (or set) current time and date.
3. Insert configured Memory Card into ZepHr recorder.
4. Select appropriate Z/pH probe: ZIN-BS-51 (<15cm oesophageal length) for infants under 12 months and ZIN-BS-46 (15-18cm oesophageal length) for children over 12 months.
5. Soak single use Z/pH probe in pH 4 or tap water for 10minutes prior to calibration.
6. Connect the Z/pH probe to ZepHr recorder.
7. Now calibrate first using pH 4 and then pH 7 calibration buffer solutions before intubation. Submerge all probe sensors completely in the buffer solutions
8. Make sure you rinse the probe thoroughly in the tap water and pat dry before placing in each buffer solution.
9. At this stage, the probe is passed nasally into the distal oesophagus. The distance from the anterior nares to the lower oesophagus is found by the Strobel formula:

Oesophageal length = (0.252 x patients height in centimetres) + 5 = A

The length of the probe = A x 0.87. This is the middle third of the oesophagus.

9. The exact location of the probe should be confirmed by plain x-ray chest. **The most distal point that the pH sensor on the probe reaches at the end of expiration should not be lower than the inferior limit of 2-3 vertebral bodies above the lower oesophageal sphincter (= diaphragm on x-ray).**

10. If necessary adjust the position of the probe and commence recording by pressing the key.

11. After correct positioning of the probe is confirmed, put a marker at the level of nostril (on the probe) and record the length in the notes. The probe should be re-passed immediately to the correct level without further x-rays in case it comes out any time during the period of recording.

12. Event recording and period switches: To mark events/symptoms or periods, press the designated event button or appropriate period button. (see Z/pH diary sheet)

13. Ask the nurse or parents to record all the events (**including start and finish time of meals**) in the events diary as well.

14. At the end of the recording period (24hrs), stop the Recorder by pressing and holding down the light button and the key simultaneously. Select stop recording and with recorder in standby mode remove batteries.

15. Disconnect the Z/pH probe from the device and gently withdraw it from the patient's nose and dispose.

For Burton : Leave ZepHr recorder with memory card in-situ and event diary in Dr Muogbo's office for uploading the data on the computer.

For Derby: Send the ZepHr recorder with memory card in-situ and event diary to clinical measurements for upload.

Troubleshooting

If the probe gets stuck at the cricopharyngeal level, give the child dummy or a small drink. In older children with cerebral palsy the probe often winds around itself due to distorted anatomy and abnormal muscle tone and occasionally you need to sedate such children and pass the probe under screening.

Please refer to ZepHr user guide for other technical problems. A copy is kept in the box with the ZepHr recorder.

References:

1. Gastroesophageal reflux disease in children and young people: Diagnosis and management. <https://www.nice.org.uk/guidance/ng1/resources/gastroesophageal-reflux-disease-in-children-and-young-people-diagnosis-and-management-pdf-51035086789>
2. Pediatric Gastroesophageal Reflux Clinical Practice Guidelines: Joint recommendations of the North American Society for Pediatric Gastroenterology, Hepatology, and Nutrition and the European Society for Pediatric Gastroenterology, Hepatology and Nutrition. https://www.naspgan.org/files/Pediatric_Gastroesophageal_Reflux_Clinical.33.pdf
3. BSPGHAN Motility Working Group position statement: paediatric multichannel intraluminal pH impedance monitoring—indications, methods and interpretation <https://fg.bmj.com/content/8/3/156>

Documentation Controls (these go at the end of the document but before any appendices)

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Appendix 1

Patient diary –pH Impedence monitoring.

Date:**Dear Parents of****Patients Name / Addressograph**

We have booked your child's pH impedance study on _____ in _____ ward

Please you could call the corresponding ward, on the phone numbers below at 8am on the day of the study, to ensure that there is a bed available and arrive by 10 am. Your child will be admitted for 24 hours, until the test is complete. Your child will ideally need to be starved 2 hours for both solids and liquids.

Once the pH impedance probe is inserted, an x-ray will be organised to check that it is in the right position to commence the study. You will be given instructions and symptom diary to document symptoms.

If your child is on anti-reflux medication, they should be discontinued to ensure that we obtain an accurate result.

Omeprazole or Lansoprazole	Stop Seven days before study
Gaviscon	Stop two days before study
Peptac	Stop two days before study
Ranitidine	Stop two days before study
Domperidone	Stop two days before study

Once the test results are available you will be contacted by your child's Consultant. A detailed leaflet is attached for your information.

For Royal derby Hospital

Dolphin ward 01332786852, 01332786853, **Puffin ward** 01332786854, 01332786855

For Queens Hospital burton

Ward 1 Paediatrics 01283593233

Please do not hesitate to contact us if you have any queries.

Yours sincerely

University Hospital Derby and Burton

Appendix 2 - Patient information leaflet

What is a pH impedance study?

A pH impedance study measures movement of liquid and air up and down the oesophagus (the food pipe between the mouth and the stomach). The main purpose of the study is to enable the doctors to see whether your child has reflux. Reflux is where acid from the stomach can travel back up the oesophagus causing discomfort and sometimes vomiting or choking. This information will help us decide on how to manage your child's condition.

At home or before the test

Your child should stop taking certain medicines before the test – the Consultant may have provided you with this information in the appointment letter.

Your child should be nil by mouth for two hours before the test. This means that they should not eat or drink anything (including water) for two hours before the test.

Your child should not eat or drink anything until an X-ray has confirmed that the probe has been inserted correctly and the recording device attached – there is more information about this below.

At the hospital

Your admission letter will inform you which ward to go to. Once you have been admitted we will carry out some tests to ensure your child is fit for the procedure. These tests include checking their weight, blood pressure, and heart rate.

The doctor or nurse will explain the procedure a final time and will answer any further questions.

Starting the test

The nurse will pass a thin tube containing the PH probe into your child's nostril, down the back of their throat and into the oesophagus. It is normal for the probe to cause a slight irritation once inserted, but this usually resolves shortly after the probe is in place. Some children may have a nosebleed when the tube is inserted into their nostril - if this does happen it will stop quickly.

Your child should not eat or drink anything until an X-ray has confirmed that the probe has been inserted correctly and the recording device attached. The nurse will ask you to attend the X-Ray Department where a radiographer will take an X-ray to confirm that the probe has been inserted correctly. After the X-Ray you will return to the ward and be asked to wait while the X-ray is reviewed to confirm that the probe is fitted correctly. If the X-ray shows that the probe is not fitted correctly, the probe may need to be slightly adjusted. It is very uncommon for the probe to be completely removed and re-fitted. Once the probe is confirmed to be fitted correctly, the nurse will connect the other end of the probe to a recording box which is worn in a shoulder bag. The test has now started and your child can eat and drink following the instructions below.

During the test

Your child should avoid the following foods and drinks during the test:

- Foods and drinks that are very hot
- Foods and drinks that are very cold
- Drinks that include caffeine (such as tea, coffee and energy drinks)
- Fizzy drinks
- Fruit juices

These foods can affect the accuracy of the test – we may have to repeat the test at a later date if your child eats or drinks any of them.

Your nurse will give you a diary to complete over the next 24 hours. You will need to record everything your child eats and drinks and the times that you give your child medications.

You may be asked to record additional information such as the times your child is sleeping, their body position and any physical activity.

After 24 hours, the nurse to disconnect the recorder and remove the tube. Once this is done, you will be able to go home. Please note that the result of this test will be sent to the requesting Consultant and you will be informed at your next outpatient appointment.

When you are back home after the test

Please re-start your child's medicines as before. If the pH Impedance study was requested by a consultant in a speciality other than Gastroenterology, the results of the test will be forwarded to that department who will then contact you.