Performance of High-Resolution Oesophageal Manometry in Adults and Paediatrics

Target Audience	Professionals certified in the performance of High Resolution Oesophageal Manometry
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AGIP Guidance for the performance of High Resolution Oesophageal Manometry

The member of staff performing the procedure must be either fully trained and accredited by AGIP in this procedure or supervised by a fully trained and accredited practitioner.

HRM is a dynamic evaluation of oesophageal function, making it essential that practitioners understand the nuances of all metrics informing a Chicago Classification outcome. Experienced practitioners may deviate from conventional procedures, reflecting the assessment's adaptive nature, which may not always produce a strict, formal Chicago Classification diagnosis.

Patient Selection and Preparation in Advance of Procedure:

- Unless contraindicated, patients should always undergo an endoscopy with appropriate oesophageal biopsies (within 2 years) prior to referral for oesophageal physiology studies, especially when presenting with symptoms of dysphagia, regurgitation or chest pain. This allows for the assessment of any disorders that could account for patient symptoms; malignancy, structural abnormalities (e.g. stricture, oesophageal diverticulum, pharyngeal pouch or varices) and mucosal pathology with biopsies (e.g. eosinophilic oesophagitis, candida).
- Patients referred for cough or throat symptoms, who do not have heartburn, acid regurgitation, chest pain or dysphagia, do not necessarily require endoscopy as long as no additional symptoms develop. They may instead require direct visualisation, e.g. with laryngoscopy.
- Fluoroscopy with video recording (e.g. barium swallow) reported by an experienced GI radiologist can provide complementary information and might also detect abnormalities not appreciated by endoscopy, but mucosal disease cannot be excluded.
- Patients should be informed of the date of their tests well in advance, to allow for any relevant medication known to affect oesophageal motor function (e.g., nitrates, calcium channel blockers, opiates, anticholinergic drugs and prokinetics) and anti-secretory medications (should pH monitoring be planned at the same appointment) to be stopped (as per local SOP and in line with BSG guidelines). Opiates and certain other medications cannot always be terminated unless they have been newly commenced. In some cases, if they have been taken for prolonged periods, they might be the causative agent. Therefore, tests may be performed whilst on certain medications to assess the cause of presenting symptoms. Whether to perform the test on or off opiate medication should be determined as per local protocol and in agreement with clinical leads.
- Patients should fast for 4 hours prior to the test (water is acceptable up until 2 hours prior). If achalasia is suspected, a more prolonged fast is advisable. However, in certain circumstances, fasting may be waived, particularly if the test is being performed to target the post-prandial period.

Patient Preparation on Attendance:

AGIP recommend a Local Safety Standards for Invasive Procedures (LocSSIP)) be developed detailing the actions required for the procedure to ensure safe care for patients undergoing the procedure.

- Check patient details prior to starting the procedure as per local policy.
- Take a history from the patient. Assess and document any relevant symptoms, confirm and document that all relevant medications (if necessary) have been stopped and document other ongoing medicines.
- Explain in detail the procedure to the patient to allow full co-operation during the test.
- Patients must be given an opportunity to allow any questions or concerns be answered to their satisfaction before the procedure begins.
- Informed patient consent (in accordance with local policy) must be obtained prior to the start of the procedure.
- If local anaesthesia is to be used, this must be given in line with local policy.

Equipment Preparation:

The AGIP committee recommends using a solid-state HRM catheter with less than 2 cm sensor spacing preferably with impedance sensors.

- If a reusable solid-state catheter is used, these must be decontaminated prior to first use and after each use, as per local and manufacturer requirements.
- Prepare the room with required consumables prior to testing.
- Verify and zero the catheter in accordance with manufacturer's guidelines.

Performance of the Procedure:

- Staff should wear appropriate personal protective equipment in line with local SOP.
- Explain each step of the procedure to the patient to ensure compliance.
- If local anaesthesia is being used, apply this to the nose and or throat and allow time for it to take effect. Alternatively, anaesthetic gel can be used.
- Apply lubrication gel to the tip of the catheter to improve patient comfort.
- Insert the catheter into the nares and gently advance the catheter through the nasal cavity to the back of the throat (approx. 15cm).
- Ask the patient to tilt their head slightly down towards the chest and to start taking very small continuous sips of water through a straw to help the natural progression of the catheter and reduce retching/vomiting.
- Gradually intubate until the visual display indicates the correct positioning of the catheter; ideally with both the UOS and at least 3 cm beyond the LOS in view. Occasionally this is not possible in tall patients - in which case, visualisation of the UOS sphincter can be sacrificed in favour of positioning the LOS in the correct place with enough sensors in the stomach. If clinically indicated, this could be performed after the standard protocol by withdrawing the catheter several centimetres to visualise the UOS and repeating appropriate measurements.
- Secure the catheter in place with hypoallergenic tape.
- Ask the patient to take 3 deep breaths to visualise diaphragmatic pinch and confirm correct positioning of catheter.
- Document on the trace the depth of the catheter by referring to its markings at the start of recording.

Test Protocol:

- We recommend the protocol outlined in table 1. This is an amendment on the standardised protocol as outlined in the Chicago Classification v4.0[1] and accompanying protocol technical review[2] . We strongly recommend that solid swallows are used for all patients.
- In addition, AGIP recommend the following areas of good practice regarding testing:

- The landmark setting of 20-30 seconds is most representative when the patient is acclimated and calm; although normally defaulted by the software to the beginning, this may be shifted anywhere during the analysis where the LOS is at rest for 30 seconds (i.e. after the initial 10 x water swallows). During this time, the patient should be asked not to hold their breath, rather to breath normally, rhythmically and comfortably without swallowing, belching or speaking. The landmark can be shifted anywhere within the trace during the analysis phase as long as the period of rest is in place. Indeed, it is recommended that a new landmark is used for every position change so a 30second period of rest should be applied at the start of every position change or catheter shift.
- Give the patient 5ml of room temperature water or saline (if the HROM catheter has the addition of impedance) from a syringe and ask the patient to swallow all of it in one go. Ask the patient not to swallow again, talk, cough, retch, move or belch. Wait for 20-30 seconds from the onset of the last swallow before administering the next 5ml bolus.
- It is important that the LOS hypercontraction of the previous swallow does not overlap with the start of the next swallow. Repeat this process to ensure 10 individual swallows are assessed.
- Solid bolus – AGIP recommend bread (with or without butter). Do not use marshmallows for solids, this liquifies. A viscous bolus may not reproduce an equivalent response to a solid bolus.
- Test meal – AGIP recommend a meal such as a 200g bowl of room temperature rice, a sandwich, or a culprit meal brought in by the patient, particularly if symptoms occur whilst eating and symptoms have not been reproduced with all other swallow manoeuvres.

Table 1. The Chicago Classification protocol technical review recommendations for required and optional tests dependant on starting position

HRM Protocol	Test
Primary position 5ml water x10	Required
Alternative position 5ml water x5-10	Optional
Multiple rapid swallow x1-3	Required
Rapid Drink Challenge x1	Required
Single Solid Swallows x10	Required
Solid Test Meal +/- Post prandial observation	Required if rumination suspected
200mL carbonated drink challenge	Required if retrograde cricopharyngeal dysfunction suspected

Post Procedure:

- Extubate the catheter. Ask the patient to blow air through the nose into a tissue, and gently but quickly remove the catheter.
- If a solid-state catheter is used, hold it still for a few seconds, ensuring sensors are not touching anything to allow for thermal compensation (if recommended by the manufacturer).
- Save the recording and disconnect the catheter.
- If using a reusable solid state HRM catheter, this needs to be immediately decontaminated as per local and manufacturer's protocol (e.g. Tristel Trio Wipe system). The relevant details should then be entered into the appropriate cleaning log.
- If a single use water-perfused catheter has been used, then dispose into the appropriately.
- The patient may go home or progress onto a 24-hour pH (+/-impedance) study as required.

Reporting:

- Manual analysis of the recording and subsequent reporting should be in line with the most recent 'Chicago Classification' (currently Version 4.0 and accompanying technical review). It is important to recognise the limitations of the current iteration of the Chicago Classification and to ensure that interpretation takes these limitations into account (e.g. current algorithmic outcomes are based solely on water swallows).
- Published system-specific normal values should always be used; however, emphasis on 'function' rather than simply what falls outside of the normal range is crucial, as well as to recognise that there may be plenty of variation with regard to how to translate the findings.
- Reports should follow the standards outlined in the 'AGIP essential elements of a report' document.
- We recommend that unusual results/ tracings are discussed in an appropriate MDT.

References

1.Yadlapati R, Kahrilas PJ, Fox MR, Bredenoord AJ, Prakash Gyawali C, Roman S, et al. Esophageal motility disorders on high-resolution manometry: Chicago classification version 4.0©. Neurogastroenterology & Motility 2021;33(1):e14058.

2.Fox MR, Sweis R, Yadlapati R, Pandolfino J, Hani A, Defilippi C, et al. Chicago classification version 4.0© technical review: Update on standard high-resolution manometry protocol for the assessment of esophageal motility. Neurogastroenterology & Motility 2021;33(4):e14120.