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The Chicago Classification of esophageal motility

A comparison
of v3.0 and v4.0



The Chicago Classification (CC) categorizes motility disorders utilizing high-resolution manometry (HRM).

The Chicago Classification[®] is an evolving process. The 2014 Chicago Classification[®] v3.0 update, developed by the International HRM Working Group, takes into account the rapidly increased clinical applications of HRM as well as the increased number of relevant clinical and investigational publications since the prior (2011) Version.

In 2020, Chicago Classification v4.0[®] was released. The key updates of Chicago Classification v4.0[®] include a defined protocol for both supine and upright swallows, provocative swallows, a new definition of EGJ (esophagogastric junction) Outflow Obstruction, stricter criteria for ineffective motility and a description of EGJ metrics¹.

If no conclusive evidence of a major motility disorder is identified, if results from the standard esophageal HRM protocol are not fully consistent with clinical presentation and/or if findings do not explain patient symptoms, additional HRM supportive measures can be considered including solid test swallows and solid test meal to assess for EGJ outflow obstruction, and/or post-prandial observation for rumination and/or belching disorder. Pharmacologic provocation, if available, can also be performed to help support a diagnosis of a true disorder of EGJ obstruction. Additionally, if equivocal results are identified and/or there is a suspicion for an EGJ outflow obstruction that does not fulfill the criteria for achalasia, a timed barium esophagram (TBE), preferably in conjunction with a barium tablet swallow, and/or endoluminal functional lumen imaging probe (FLIP) should be obtained as independent supportive tests to assess for EGJ obstruction.

The updated metrics, compared to the previous version, are summarized below:

Manometry protocol

Version 4.0*

10 supine wet (5mL) swallows
1 multiple rapid swallow
>5 upright wet swallows
1 rapid drink challenge

Version 3.0

10 supine wet swallows

*Please refer to the standardized protocol on page 7 of this document

Esophageal pressure topography metrics

Metric	Version 4.0	Version 3.0
Integrated Relaxation Pressure (IRP) (mmHg)	No change	Mean of the 4 s of maximal deglutitive relaxation in the 10-s window beginning at UES relaxation. Contributing times can be contiguous or non-contiguous (e.g., interrupted by diaphragmatic contraction). Referenced to gastric pressure.
Distal Contractile Integral (DCI) (mmHg)	No change	Amplitude x duration x length (mmHg-s-cm) of the distal esophageal contraction exceeding 20 mmHg from the transition zone to the proximal margin of the LES (Clouse, 2nd and 3rd contractile segments) <i>***In instances of suspected hypercontractility involving the LES, or even restricted to the LES, the DCI box should include the LES (Clouse, 4th contractile segment) as well.</i>
Contractile Deceleration Point (CDP) (time, position)	No change	Inflection point along the 30 mmHg isobaric contour (or pressure greater than intrabolus pressure in instances of compartmentalized pressurization) at which propagation velocity slows, demarcating peristalsis from ampullary emptying. The CDP must be localized within 3 cm of the proximal margin of the LES
Distal Latency (DL) (s)	No change	Interval between UES relaxation and the CDP
EGJ-CI	EGJ -CI (Contractile Integral) referenced to intragastric pressure and expressed in units of mmHg cm. Suggested a value of <25 mmHg cm be considered hypotensive EGJ <i>Using Manoview 3.xx EGJ-CI is calculated by using the Smart Mouse tool. The calculation is then: 3 respirations, DIVIDED by time: so DCI of EGJ region (mmHg-cm-s) / time (s) = EGJ-CI mmHg-cm</i>	Not applicable

Scoring of individual swallows

Contraction vigor **Version 4.0**

Version 3.0

Failed

No change

DCI <100 mmHg-s-cm

Weak

No change

DCI > 100 mmHg-s-cm,
but < 450 mmHg-s-cm

Ineffective

No change

Failed or Weak (see criteria for Failed/Weak contraction above)

Normal

No change

DCI > 450 mmHg-s-cm
< 8,000 mmHg-s-cm

Hypercontractile

No change

DCI > 8,000 mmHg-s-cm

Contraction pattern

Version 4.0

Version 3.0

Premature

No change

DL < 4.5 s

***A premature contraction must have both a DL <4.5 s and a DCI >450 mmHg-s-cm to qualify; otherwise, it would be considered failed and fall under the category of 'ineffective contractions'.

Fragmented

No change

Large break (> 5 cm length) in the 20-mmHg isobaric contour with DCI > 450 mmHg-s-cm

***small breaks (<3 cm) in the 20-mmHg isobaric contour are frequently encountered in normal subjects and are therefore omitted in v3.0 as defining characteristics.

Intact

No change

Not achieving the above diagnostic criteria

Scoring of individual swallows

Intrabolus pressure pattern (30 mmHg isobaric contour referenced to atmospheric)

Version 4.0

Version 3.0

Panesophageal pressurization

The cutoff for panesophageal pressurization is set at 30mmHg using the isobaric contour tool

Uniform pressurization of > 30 mmHg extending from the UES to the EGJ

Compartmentalized esophageal pressurization

Omitted from v4.0

Pressurization of > 30 mmHg extending from the contractile front to the EGJ

EGJ pressurization

Omitted from v4.0

Pressurization restricted to zone between the LES and CD in conjunction with LES-CD separation (hiatal hernia)

Normal pressurization

Omitted from v4.0

No bolus pressurization > 30 mmHg

Intrabolus pressurization

The intrabolus threshold for supine wet swallows is 20mmHg using the isobaric contour tool

Not applicable

Chicago Classification of esophageal motility

Disorders of EGJ Outflow

Version 4.0 criteria

Version 3.0 criteria

Type I achalasia (classic achalasia)

Abnormal median IRP in the primary position* and 100% failed peristalsis

**following the Chicago v4.0 standardized protocol.*

Elevated median IRP (>15 mmHg*), 100% failed peristalsis (DCI <100 mmHg-s-cm)

Premature contractions with DCI values less than 450 mmHg-s-cm satisfy criteria for failed peristalsis

Working Group observation: A qualifier was added to the diagnosis of absent contractility: A diagnosis of achalasia should be considered if there is a borderline median IRP value or if there is evidence of esophageal pressurization.

Type II achalasia (with esophageal compression)

Abnormal median IRP in the primary position, 100% failed peristalsis, panesophageal pressurization with ≥20% of swallows

Elevated median IRP (>15 mmHg*), 100% failed peristalsis, panesophageal pressurization with ≥20% of swallows

Type III achalasia (spastic achalasia)

Abnormal median IRP in the primary position, and ≥20% swallows with premature/spastic contraction and no evidence of peristalsis

Elevated median IRP (>15 mmHg*), no normal peristalsis, premature (spastic) contractions with DCI >450 mmHg-s-cm with ≥20% of swallows

May be mixed with panesophageal pressurization

Working group observation: After treatment with pneumatic dilation or Heller myotomy, peristalsis that was not observed prior to treatment can be observed.

EGJ outflow obstruction

Abnormal median IRP (supine and upright), ≥20% swallows intrabolus pressure (supine) and not meeting criteria for achalasia

Elevated median IRP (>15 mmHg*), sufficient evidence of peristalsis such that criteria for types I-III achalasia are not met

Working group observation: Potential etiologies including incompletely expressed achalasia, early achalasia, wall stiffness consequent from an infiltrative disease or cancer, vascular obstruction of the distal esophagus, or a manifestation of a sliding or paraesophageal hiatal hernia.

EGJ outflow obstruction should prompt further investigation such as with endoscopic ultrasound or CT to clarify etiology.

Chicago Classification of esophageal motility

Disorders of peristalsis	Version 4.0 criteria	Version 3.0 criteria
Absent contractility	Normal median IRP (supine and upright) and 100% failed peristalsis	Normal median IRP, 100% failed peristalsis <i>Achalasia should be considered when IRP values are borderline and when there is evidence of esophageal pressurization</i> <i>Premature contractions with DCI values less than 450 mmHg-s-cm meet criteria for failed peristalsis.</i>
Distal esophageal spasm	Normal median IRP, $\geq 20\%$ premature contractions/spastic contraction	Normal median IRP, $\geq 20\%$ premature contractions with DCI > 450 mmHg-s-cm* Some normal peristalsis may be present
Hypercontractile esophagus	Normal median IRP, $\geq 20\%$ hypercontractile swallows	At least two swallows with DCI > 8000 mmHg-s-cm* <i>Hypercontractility may involve, or even be localized to, the LES.</i>
Ineffective esophageal motility (IEM)	Normal median IRP, with $> 70\%$ ineffective swallows or $\geq 50\%$ failed peristalsis	$\geq 50\%$ ineffective swallows <i>Ineffective swallows can be failed or weak (DCI < 450 mmHg-s-cm)</i> <i>Multiple repetitive swallow assessment may be helpful in determining peristaltic reserve</i>
Fragmented peristalsis	Omitted from v4.0	$\geq 50\%$ fragmented contractions with DCI > 450 mmHg-s-cm

High resolution esophageal manometry standard protocol Chicago classification version 4.0

Study procedure

Study begins in supine position [use supine normative values]

- ≥60 second adaptation period
- Document position with at least 3 deep inspirations
- ≥30 second baseline period
- 10 supine wet (5mL) swallows
- 1 multiple rapid swallow (MRS) sequence (MRS may be repeated up to 3 sequences if failed attempt or abnormal response)

Change position to upright [use upright normative values]

- ≥60 second adaptation period
- Document position with at least 3 deep inspirations
- ≥30 second baseline period
- ≥5 upright wet (5mL) swallows
- 1 rapid drink challenge

If no major motility disorder is found consider the following manometric evaluations

- For high probability of a missed EGJ outflow obstruction: Solid test swallows, solid test meal, and/or pharmacologic provocation
- For suspected rumination/belching disorder: Post-prandial high-resolution impedance observation

If equivocal results are found and/or there is suspicion for an obstruction that does not fulfill criteria for achalasia, consider the following supportive tests

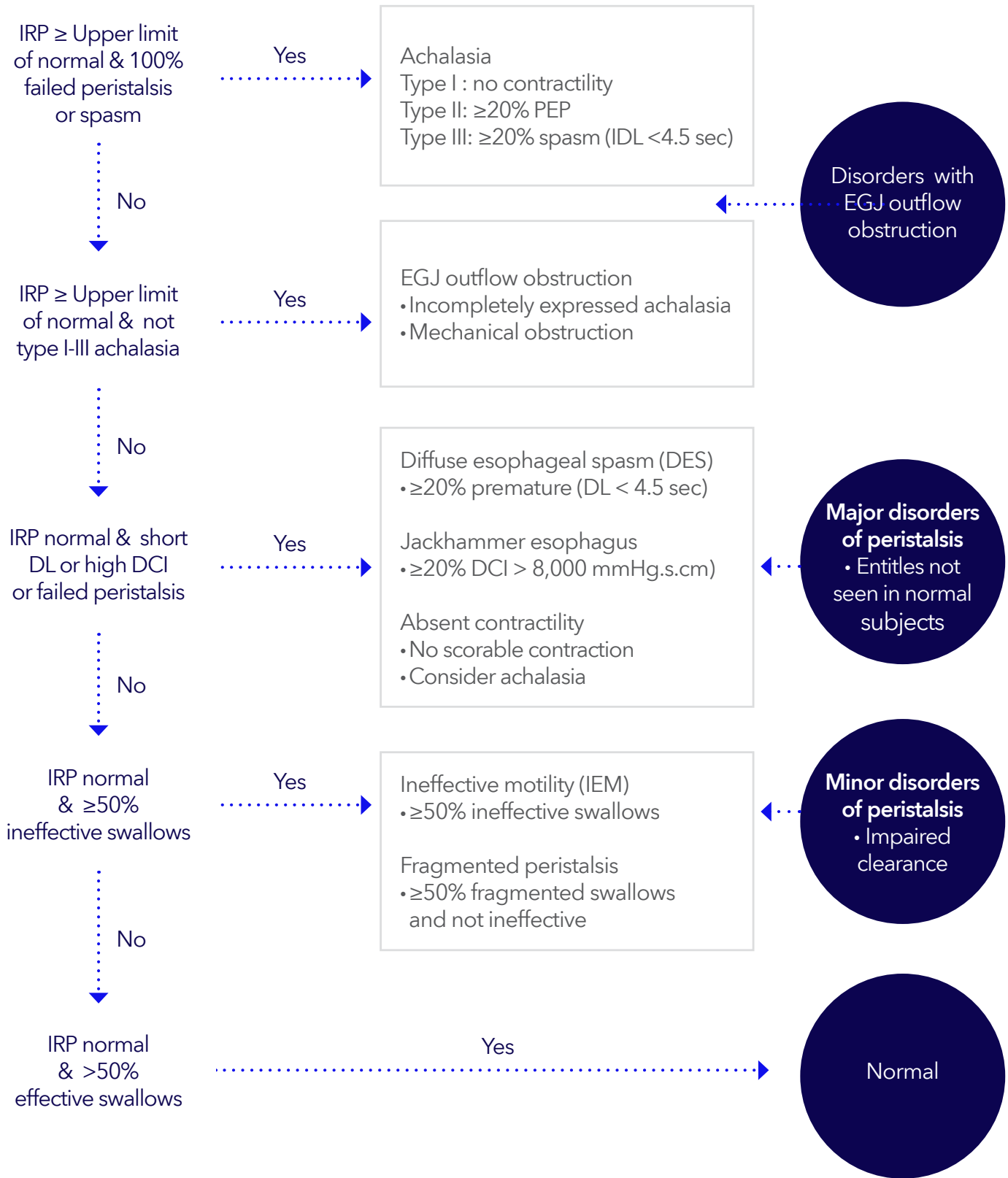
- Timed barium esophagram, preferably with tablet
- Endoluminal functional lumen imaging planimetry (FLIP)

Considerations:

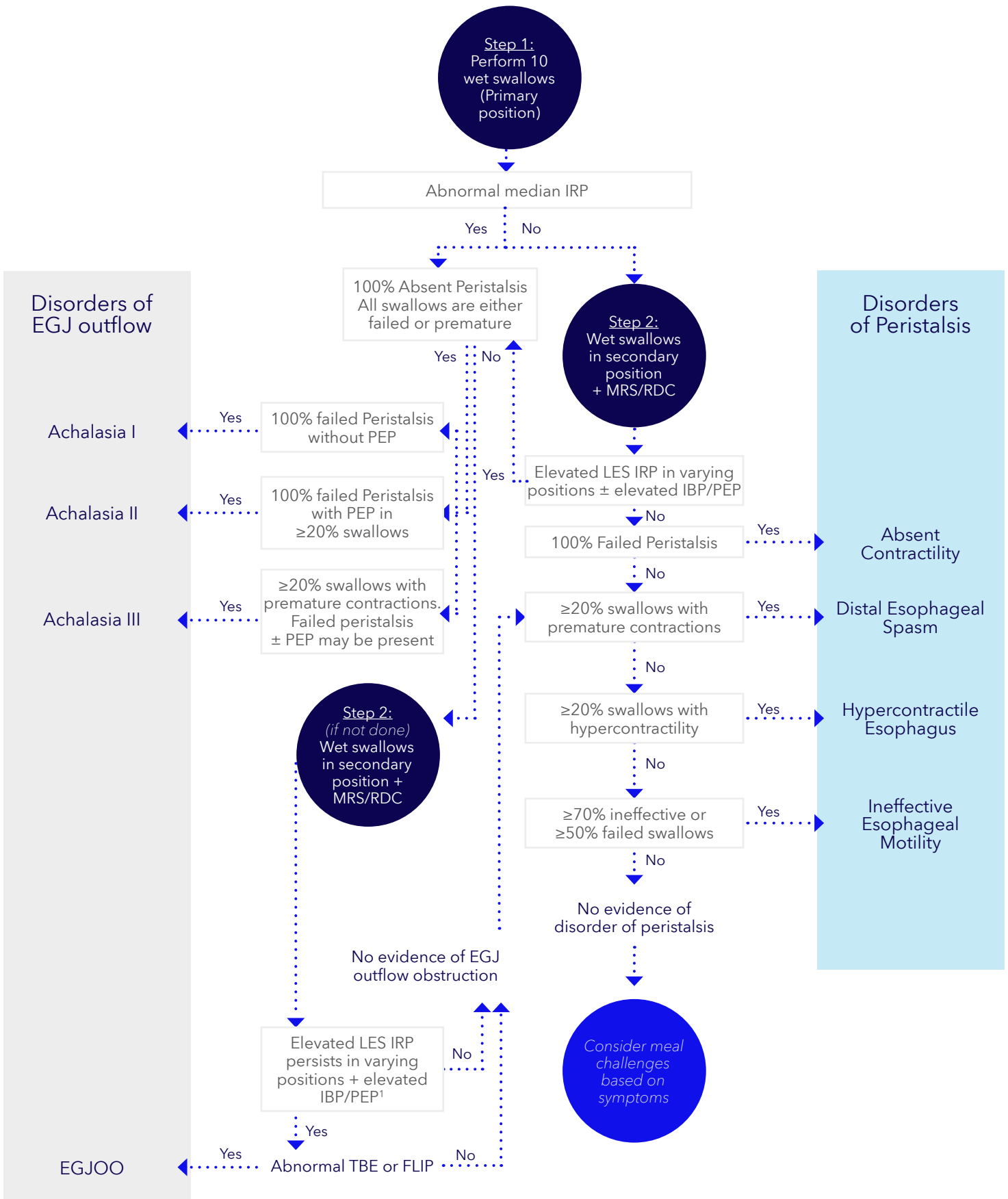
Prior to procedure patients should fast for at least 4 hours and informed consent should be obtained. The CCv4.0 working group recommends using a solid state high-resolution manometry catheter with less than 2cm sensor spacing with combined impedance sensors. However, the protocol and classification can be performed with water perfused catheters if appropriate normative values are used. Although the protocol designed by the CCv4.0 Working Group is considered to be the optimal protocol, clinicians can modify this protocol based on limited resources and time as long as normative values are applied and other positions and provocative tests are used appropriately. Physicians choosing to begin the study in the upright position should consider performing 10 upright swallows. **Classification is based on the primary position in which 10 wet swallows are performed, either supine or upright. Assessment of swallows in the secondary position and with provocation provide supportive data.**

In addition to Chicago Classification v4.0 metrics, final report should include baseline measurement of the esophagogastric junction (EGJ) and symptoms experienced during the study and within 15 seconds of a motility dysfunction.

Chicago classification v3.0 hierarchical algorithm



Chicago classification v4.0 hierarchical algorithm



References:

- 1 Rena Yadlapati, et al. Esophageal motility disorders on high-resolution manometry: Chicago classification version 4.0[®]. Neurogastroenterology & Motility. 2020;33:e14058. wileyonlinelibrary.com/journal/nmo | 1 of 21 <https://doi.org/10.1111/nmo.14058>
- 2 Kahrilas et al. The Chicago Classification of esophageal motility disorders, v3.0. Neurogastroenterol Motil 2014; 27(2): 160-174

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Important: Always refer to the Instructions For Use (IFU) packaged with the product for complete instructions, indications, contraindications, warnings and precautions.

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