Introduction

The Chicago classification (CC) version 3.0 is the classification of esophageal motility disorders currently most in use. This classification standardized not only parameters based on high-resolution manometry but also re-classified motility disorders nomenclature and definition, and clearly impacted the management of patients with esophageal motility disorders. There are, however, few pitfalls for the correct interpretation of the tests. This technique review illustrates some difficult cases that may lead to misinterpretation of the results.

Esophagogastric Junction Morphology or Lower Esophageal Sphincter Excursion

CC divided esophagogastric junction morphology (EGJ) in 3 subtypes based on the overlap or disjunction of the 2 contractile elements of the EGJ: the lower esophageal sphincter (LES) and the crural diaphragm. Type II esophagogastric morphology is characterized by a separation (double-peaked pressure zone) of the LES and the diaphragm pressures more than 1 cm and less than 2 cm. High-resolution manometry allowed a clear distinction of these 2 components, but it also allowed a clear view of the LES excursion during respiration that may be misinterpreted as a Type II EGJ morphology (Fig. 1).
Intrabolus Pressure Pattern or Common Cavity

CC defines the presence of intrabolus pressure as an abnormal pressurization of the esophagus above 30 mmHg. It may be pan-esophageal, compartmentalized or limited to the EGJ. Intrabolus pressure may be misunderstood as a common cavity (Fig. 2). Common cavity is a phenomenon characterized by the rise of intravesophageal pressure to the level of the gastric pressure. It occurs during LES opening, and it may be a marker for gastroesophageal reflux or a transient relaxation of the LES. Artifacts due to air entrapment in the protective plastic shield may lead to a high pressure at the end of peristalsis, not before as in the previous situations.

Hypercontractile Esophagus (Jackhammer) or Achalasia Type III

Hypercontractile esophagus is defined by ≥ 20% of swallows with a distal contractile integral > 8000 mmHg/sec/cm. Type III achalasia is described as spastic contractions with distal contractile integral > 450 mmHg/sec/cm with ≥ 20% of swallows. Both diseases present with hypertonic contractions making their distinction sometimes quite difficult (Fig. 3). LES relaxation may not discriminate between the 2 diseases. Achalasia is characterized by an elevated integrated relaxation pressure (IRP), but a “normal” IRP may be noticed in some cases of achalasia since a LES basal pressure below 15 mmHg is seen in a percentage of cases and relaxation pressure cannot be higher than basal pressure. In addition, the LES may be intentionally destroyed by treatment such as laparoscopic myotomy, pneumatic dilatation, and per oral endoscopic myotomy. On the other hand, jackhammer esophagus can coexist or be secondary to EGJ outflow obstruction, and thus present with an abnormal IRP. Distinction between diseases may be based solely on contraction patterns based on the distal latency since achalasia waves must be premature (Fig. 3).

Absent Contractility or Severe Ineffective Esophageal Motility or Achalasia Type I

Hypomotility diseases (absent contractility, severe ineffective esophageal motility, and achalasia type I) may present with almost inexistent waves (Fig. 4). While an altered IRP is characteristic of achalasia, not all cases may present with an elevated IRP as men-
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Esophageal pressurization is characteristic of achalasia; however, pressurization may be minimal in some cases of type I. A residual subtle peristalsis may be noticed in ineffective esophageal motility and absent peristalsis if the causative disease (e.g., connective tissue diseases) did not lead to complete absent peristalsis yet. Often, distinction among these diseases may be possible solely based on clinical grounds, such as the history of connective tissue diseases, long-term gastroesophageal reflux disease symptoms, origin from endemic areas of Chagas’ disease, etc.

Distal Esophageal Spasm or Ineffective Esophageal Motility

The manometric diagnosis of distal esophageal spasm and ineffective esophageal motility is easily achieved. There are, however, some patients that may overlap these diagnoses as having more than 20% of premature waves and more than 50% of ineffective swallows (Fig. 5). One must remember in these cases that there is a hierarchization of diagnosis (Fig. 6). Thus, major disorders of peristalsis precede the diagnosis of minor disorders. Although not

Figure 3. Distinction between hypercontractile esophagus (jackhammer; A) and achalasia type III (B) may be based on contraction pattern. Hypercontractile swallows must be premature in achalasia but with a normal distal latency (arrows) in jackhammer cases. Jackhammer waves are frequently multipeaked. Also, they may be discerned by the non-hypercontractile swallows that will show an altered peristalsis in achalasia (aperistalsis) but not in jackhammer cases.

Figure 4. Absent contractility (scleroderma; A), severe ineffective esophageal motility (gastroesophageal reflux disease; B) and achalasia type I (post-myotomy; C) may have almost undetectable waves. Distinction among diseases may sometimes be possible solely based on clinical grounds.
expressed by the CC, non-confictive diagnosis may be simultane-
ously reported such as EGJ outflow obstruction in a patient with
hypercontractile esophagus (but not with achalasia).

Conclusions

Although the Chicago classification in his 3.0 version simplified
previous classification, there are still several cases that may be very
difficult to interpret. A careful analysis following the definitions and
hierarchization proposed is often sufficient to reach a correct diag-
nosis. In some difficult cases, such as for the differentiation among
achalasia type I, absent peristalsis and severe ineffective esophageal
motility, parameters may be similar but high-resolution manometry
also allows a visual interpretation of the motility. The distinction be-
tween type II EGJ morphology and simply LES excursion is based
solely on visual judgment.

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Figure 5. Individual with 50% of ineffective swallows and 20% of
premature waves is diagnosed as distal esophageal spasm and not inef-
factive esophageal motility due to a hierarchization of diagnosis.

Figure 6. Hierarchization of diagnosis according to the Chicago classification version 3.0. Reproduced with permission from Kahrilas et al.\textsuperscript{1} IRP, integrated relaxation pressure; ULN, upper limit of normal; PEP, panesophageal pressurization; DL, distal latency; EGJ, esophagogastric junction morphology; DCI, distal contractile integral; IEM, ineffective esophageal motility.
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