Esophageal Manometry in Patients with Clinical Symptoms Mimicking Esophageal Origin: A Hospital-Based Ten-Year Experience

Background. Primary esophageal motility disorder, which can cause chest pain or dysphagia, is seldom reported in Chinese. With the introduction of an easy and less uncomfortable method to perform esophageal manometry by low-compliance perfusion system, we studied symptomatic patients for more than 10 years. These data were analyzed and were compared to Western reports.

Methods. From August 1989 to June 1999, 264 patients with symptoms mimicking esophageal origin, such as chest pain, dysphagia or odynophagia, but without secondary motility disorders were enrolled. Esophageal manometry was performed on each patient.

Results. Among 264 manometric tracings, 142 (54%) were normal and 122 (46%) were abnormal. In patients with abnormal tracings, 73 were non-specific esophageal motility disorder (NEMD), 20 were achalasia, 9 were diffuse esophageal spasm (DES), 8 were nutcracker esophagus, 7 were hypotensive low esophageal sphincter (LES), 3 were abnormal provocative test by edrophonium, and 2 were hypertensive LES. As in Western countries, the most common abnormality was NEMD. However, our series did not find many patients with DES, nutcracker esophagus and hypertensive LES. Similar results were noted in patients with NEMD, that most had increased nontransmitted contractions and low contraction amplitude.

Conclusions. We found that primary esophageal motility disorder is not uncommon in Taiwan. Esophageal manometry should always be considered in patients with symptoms mimicking esophageal origin.

METHODS

From August 1989 to June 1999, a total of 485 esophageal manometries were performed in our hospital.
Most of the patients were seen in our gastroenterology department, some were referred from our cardiologists or rheumatologists, and few were referred from other hospitals in Northern Taiwan. In order to study the patients with primary esophageal motility disorder, we retrospectively analyzed the results of manometric studies in our patients.

Patients with symptoms mimicking esophageal origin, such as chest pain, dysphagia or odynophagia, were recruited. Meanwhile, patients with diabetes, thyroid diseases and collagen diseases that could produce secondary esophageal motility disorder, were excluded (40 cases). Second manometry of the same patient for follow-up was not included (14 cases). If a patient was suspected to have gastroesophageal reflux disease, the manometry, which was usually followed by 24 hour esophageal pH monitoring, was also excluded (167 cases). After exclusion, there were 264 cases enrolled.

Either endoscopy or barium meal study or both was performed for each patient. No definite organic lesion, such as esophagitis or esophageal tumor, could be identified. Some patients had undergone cardiac catheterization or exercise EKG (tread mill) for their cardiac situation before their referral.

Esophageal manometry

During manometry, a 6-lumen polyethylene catheter (ESM6R, Arndorfer Medical Specialties, Inc., Green- dale, WI, USA) is inserted into the patient’s stomach through a nose. The catheter consists of three radial openings at three cm from the distal tip, and each opening is 120° apart. Another three openings are above the radial opening and are five cm apart each. The proximal end of the catheter is introduced deep enough to ensure all the openings are in the stomach. The gasometric base line is recorded for each lead. Then the catheter is pulled back slowly. When the radial lead strikes the low esophageal sphincter (LES), a station pull through method is used to record the LES pressure. Be cause the LES is always oblique in anatomic structure, at least three high est pressure surges (midrespiratory pressure surge, i.e. the pressure from gastric baseline to mid of the measured pressure) be fore pressure surge in version point for each radial lead are measured. An average of nine amplitudes from three radial leads represents the mean LES pressure. The relaxation of the LES is also observed during this period.

The next step of the procedure is to examine the coordination of the esophageal peristalsis and the contraction sequences of the esophagus. The catheter is positioned at such level that three sites of the esophagus are measured, i.e. 3, 8 and 13 cm above the proximal border of LES, respectively. We performed 15 wet swallows for each patient with an interval of 30 seconds between two swallows. At each level, at least 10 effective contraction amplitudes and durations were measured in order to obtain mean values. These measurements encompass the distal smooth muscle part of the esophagus.

In most patients with normal manometric study, edrophonium provocative tests were usually performed. A dosage of 0.008 cc/Kg of edrophonium chloride (Enlon, OHMEDA PPD Inc., Liberty Corner, NJ, USA) was administered intravenously. The same amount of normal saline was injected first to serve as control. If the injection of the drug could while injection of normal saline could not reproduce the same chest symptoms to the patient, a test was considered abnormal.

Diagnostic criteria of manometry

The normal values for the two major esophageal manometric measurements are: (1) mean resting LES pressure is 10 to 34 mmHg with 100% relaxation to gastric base line and a duration of 3 to 10 sec onds; and (2) mean contraction amplitude for the smooth muscle part of the esophagus body is 50 to 150 mmHg in response to
10 effective wet swallows with a contraction duration of 3 to 7 seconds.

Abnormal manometry is categorized into achalasia, hypertensive LES, hypotensive LES, nutcracker esophagus, diffuse esophagus a geal spasm (DES), non-specific esophageal motility disorder (NEMD) and ab nor mal edrophonium provocative test.

Our diagnostic criteria of manometry are based on results of several Western laboratories because their methodologies are similar to ours. They are as follows: 1) achalasia: total aperistalsis of the esophageal body, may be asso ci ated with high LES pressure, in complete LES re laxation, or elevated esophageal base line; 2) hypertensive LES: the mean LES pressure is over 45 mmHg; 3) hypotensive LES: the mean LES pressure is lower than 10 mmHg; 4) nut cracker esophagus: the mean esophageal body contraction amplitude is over 180 mmHg; 5) DES: simultaneous contractions with intermittent normal peristalsis; 6) NEMD: increased non-transmitted contractions (≥20% of total wet swallows), low amplitude contraction with mean pressure lower than 30 mmHg, triple-peaked contractions, retrograde contractions, isolated and in complete LES re laxation, or prolonged duration of peristaltic waves with mean duration over 6 seconds; and 7) abnormal edrophonium test: reproduce patient’s chest symptoms by the drug.

Statistics
Chi-square test, two-tail t test or two-tail Fisher’s exact test were employed. A p value of less than 0.05 was considered statistically significant.

RESULTS
Among 264 studied patients, 142 (53.8%) had normal manometry and 122 (46.2%) had abnormal results. Most of the abnormal patients were of non-specific esophageal motility disorder (73 cases, 60%). Achalasia was the next most common (20 cases, 16%), followed in descending order by diffuse esophagus a geal spasm (9 cases, 7%) and nut cracker esophagus a geal spasm (8 cases, 7%). Only few patients with diffuse LES cases (2 cases, 2%) were noted in our series (Fig. 1). Beside the above, our study also found several patients with hypotensive LES pressure (7 cases, 6%) and few cases (3 cases, 2%) with normal routine manometry but with abnormal edrophonium provocative test. These two situations, which are usually not included in the general diagnostic criteria in Western countries, were included in ours.

In Table 1, the mean age of abnormal and normal manometry groups was not statistically significant by two-tail t test. The gender was also not statistically significant by chi-square test between the two groups. As inclusion criteria, most patients in the two groups had two cardinal symp toms, with chest pain and dysphagia being most common, followed by regurgitation and odynophagia. Heart burn and other non-specific symptoms occurred less frequently. By two-tail Fisher’s exact test, there was statistical significance in chest pain, dysphagia, vomiting and heart burn between the two groups.

About one-tenth of patients (31 cases) underwent cardiovascular workup (cardiac catheterization or treadmill EKG). Most of them (26 cases) had normal cardiovascular study. Three cases in the normal group had minor coronary artery disease diagnosed by cardiac catheterization. However, two ab nor mal manometric patients had major coronary artery disease.

In cases with ab nor mal manometry, chest pain and dysphagia occurred with equal frequency in 7 disease categories but not in achalasia. Among our 20 patients with achalasia, 19 presented with dysphagia and only 1 with chest pain (p < 0.001).

Fig. 1. Percentage of different categories in 122 abnormal manometries. LES = lower esophagus a geal sphincter; DES = diffuse esophagus a geal spasm; NEMD = non-specific esophageal motility disorder.
In patients with non-specific esophageal motility disorder, most had increased nontransmitted contractions and low amplitude contraction of the body. Less frequent diagnostic findings are also listed in Table 2.

### DISCUSSION

The precise prevalence of primary esophageal motility abnormalities is unknown. One large series with over one thousand adult patients referred for evaluation of chest pain or dysphagia found an overall abnormal manometry in 33%. They were more common in patients with dysphagia (53%) than in those with chest pain (28%). However, our series revealed that 46% (122/264) of patients had motility abnormalities. We believe that this difference was the result of our highly clinical speculation of the disease and selection of the patients.

There are four types of functional disorders in primary esophageal motility abnormalities. These are aperistalsis (achalasia), incoordinated motility (diffuse esophageal spasm), hypercontractility (nutcracker esophagus and hypertensive LES), and hypocontractility (non-specific esophageal motility disorder and hypotensive LES). Like Western reports, our series found that non-specific motility disorder was the most common abnormality in manometry (Fig. 1). Although we had many patients with achalasia, we did not find many patients with diffuse esophageal spasm, nutcracker esophagus and hypertensive LES. The latter three diseases are not uncommon in Western countries. The reason for the difference cannot be answered in this study. Perhaps it can be found by further multi-center studies in Taiwan. However, similar results were found in one Italian study, with the frequency of NEMD being 31% and achalasia 13%. We also had several cases with hypotensive LES pressure. We could reproduce the patient’s chest pain by edrophonium test in 3 cases when their individual manometry was totally normal, which indicated that the provocative test was helpful in certain circumstances in patients with unexplained chest pain.

It is not strange that our patients had two major symptoms, chest pain and dysphagia, because those were the inclusion criteria. Most reports suggested that patients with dysphagia had more abnormal manometric results than patients with chest pain.8,10-12 Our study also revealed that abnormal patients had significantly less frequency of chest pain and higher frequency of dysphagia (Table 1). Our achalasia patients had exclusive symptom with dysphagia (19 out of 20 patients). This was consistent with Western studies.
tent with other for eign re ports that nearly all pa tients with achalasia had dysphagia. 8,13,14

About one-tenth of our patients underwent cardio vascular workup, such as exercise treadmill EKG and car diac catheterization. Most of the re sults were nor mal, ex cept 3 in the nor mal group had mi nor one-vessel cor o nary ar tery dis ease and 2 in the ab nor mal group had ma jor cor o nary ar tery dis ease. This meant that our pa tients might have co exist ing cor o nary ar tery dis ease and esophageal motil ity dis or ders with the same present ing symp toms. Caution should be made in differ en ti at ing chest pain of esoph a geal or car diac or i gin. One study found the same pre valence of esophageal motil ity dis or ders in noncardiac chest pain group, in cor o nary ar tery dis ease group, in mi tral valve pro lapse group and in cor o nary by pass or angioplasty group, and also high nor mal mano met ric re sults in all four groups. 15 An other report re vealed con sid er able over lap in motil ity dis tur bances in chest pain pa tients with nor mal and ab nor mal cor o nary angiograms. 16

The cate gory of non spe cific esoph a geal motil ity dis or der has been used to de scribe ab nor mal mano met ric find ings that do not fit in any spe cific di ag nos tic cri te ria. Sim ilar to most West ern re ports, this cate gory was the most com mon ab nor mal ity in our study (60% of 122 ab nor mal pa tients). Leite et al tried toclar ify the NEMD cate gory in 600 con sec u tive pa tients with mano met ric study in a 2.5 year pe riod. 17 They had 61 pa tients with NEMD. A to tal of 599 wet swal lows from 61 trac ings re vealed that 36% were nor mal, 22% were low-amplitude (< 30 mmHg), 40% were nontransamitted, and only 2% triple-peak ed. Again, our find ings (Table 2) were quite sim i lar to this re port. Leite et al sug gested that NEMD should be replaced by the more ac curately de scriptive term: IEM (in eff ec tive esoph a geal motil ity). We did not per form the sec ond mano met ric in such pa tients. How ever, one study re ported that follow-up motil ity study found trac ing pat terns had be come nor mal, be ing per sis tent NEMD, or changed into an o ther cate gory. 18

Clinically, esophageal manometry is help ful in the di ag nosis of pri mary esoph a geal motil ity dis or der. It has been widely applied in the evalua tion of pa tients with chest pain or dysphagia in West ern coun tries. 19-21 There is a trend in clinical guid elines that esophageal mano metry is decreasing in the early evaluation of unex pla ined chest pain be cause of its disillusive re sults. A study con firmed that referral indication de clined in a 10-year pe riod for chest pain but be came more com mon for dysphagia. 22 As dis cussed above, our ab nor mal pa tients pre sented with chest pain less fre quently and dysphagia more fre quently than nor mal pa tients with sta tis ti cal sig ni fic ance (Table 1). The find ings also sup port that pa tients with an in di ca tion of dysphagia for mano met ry may have higher ab nor mal find ings.

In con clu sion, we found that esoph a geal motil ity ab nor mal ity is not un com mon in Tai wan. If our pa tients had symp toms of chest pain or dysphagia, about half of them had manometric ab nor mal ities. We sug gest that esoph a geal mano met ry should be per formed, if pos si ble, for pa tients with symp toms mim icking esophageal or i gin.

REFERENCES