

# Progress in Gastro-intestinal Motility

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## SUMMARY

Manometric studies are important in the elucidation of the physiopathology of diseases of the gastro-intestinal tract from the oesophagus to the anus.

They are of particular importance in the diagnosis and treatment of the benign lesions of the oesophagus.

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It is most appropriate that the progress in gastro-intestinal motility be reviewed in 1971. These studies in gastro-intestinal motility go back as far as 1803 but balloon kymography of the oesophagus specifically is over 80 years old. We owe much of the original work to Cannon. Compared with some other fields of medicine, knowledge of the gastro-intestinal motor functions and dysfunctions have accumulated slowly.

Interest in the motility of the alimentary tract has increased since World War II, mainly because of the development of new techniques and the appreciation of new concepts. 'On no subject in physiology do we meet with so many discrepancies of fact and opinion as in that of physiology of the intestinal movement.' This statement by Bayliss and Starling was made in 1899 and is unfortunately still true today. The whole question of gastro-intestinal motility has been plagued with problems of methodology and semantics.

There is no doubt, however, that manometry is an investigative tool of diagnostic service to gastro-enterology.

## METHODS OF INVESTIGATION

Various techniques have been used over the years, each with its own possible limitations. Balloon studies provide a gross measure of motor activity; the disadvantage is that this method is dependent on balloon geometry (i.e. the size and strength of the balloon) and on the stimulating effect of the balloon, whereas the open-tip method records intraluminal pressure *per se*. The fidelity of the strain-gauge systems used decreases with increasing length of the catheter, hence the site and techniques of recording are both important.

### Variety of Tubes Used

The tube used for oesophageal manometry is a 4-lumen tube (Portex) 3 of which are used for pressure recording and 1 for potential difference. Attached to this 4-lumen tube is the pH meter. These tubes are attached to a dynamograph recording machine (Beckman) through a system of external transducers and amplifiers as well as writing pens. The Millhon tube is a new modification for measuring pressures in the oesophagus but is at the moment much too expensive to be found in common use in motility clinics.

For motility of the stomach open-tip tubes or a Sawyer balloon of 20 ml capacity may be used. These are attached to a similar machine used for oesophageal motility. The tube system utilized in performing these studies in the colon, rectum and anal canal is a tandem system of small balloons. These may be water- or air-filled and give very good repetitive results.

A more sophisticated method of studying intraluminal motility of parts relatively inaccessible is the use of a radio-telemetering capsule (irreverently called Gutnik). This is a transistorized, pressure-sensitive transducer associated with a special external pick-up. This method is a harmless one and does not distress the patient at all. Unfortunately, it is also not inexpensive.

### The Oesophagus

This organ is not just a conduit for the conduction of liquids and solids, but is a dynamic organ peculiar in its anatomical structure and physiology and very liable to dysfunction.

The data obtainable from manometric studies refer to the function and reaction of the cricopharyngeal and inferior oesophageal sphincters as well as to that of the body of the oesophagus. It is of great importance in many conditions such as hiatal hernia, diverticular disease, spasm, inco-ordination and collagen diseases.

Oesophageal motility studies are the most valuable supplement to other procedures and are essential in the diagnosis of all dysphagia cases. It can be categorically stated that these studies are the most important means of making specific diagnoses in benign diseases of the oesophagus. They readily indicate the normal pattern throughout the oesophagus. In our experience, in cases of oesophageal hiatal hernia they will indicate the presence or absence of the hernia, in addition they will reveal the capacity of the sphincter and the normality or otherwise of peristalsis in the body of the oesophagus.

Achalasia, a not unimportant condition involving the oesophagus, can be diagnosed from motility studies utilizing the specific drug Mecholyl, which produces a positive response in case of achalasia.

### The Stomach

Although the muscle coat of the stomach is continuous, the motor activity of the proximal half differs markedly from that of the distal half. Peristaltic movement of the fundus and the body is slight — the muscle of these areas enables the stomach to receive bulky meals without a rise in gastric pressure.

The muscle of the antrum is responsible for the emptying of the stomach. Propulsive contraction occurs at a frequency of 3 per minute and increases in vigour as this approaches the pylorus. Evacuation of liquids is complete in 19 minutes. However, with solids the emptying is complete in 4 hours with 35% of the emptying taking place in the first hour.

The knowledge gained from a study of gastric motility is chiefly physiological, but can be important in the elucidation of post-vagotomy and dumping syndromes. Motility studies in the antrum will reveal the following types of movement:

- Type I:* These are phasic waves of 18-22 seconds duration and an amplitude of 5 cm of water.
- Type II:* These are similar to type I, but the amplitude is much higher than 5 cm of water.
- Type III:* These are complex waves where there is a prolonged rise of the baseline on which are superimposed type I and II waves.

### Small Intestine

The predominant waves in the small intestine are rhythmic segmenting waves. The amplitude is higher and the activity more rapid in the proximal small intestine than in the distal part.

The telemetering capsule is the method used for these studies. These studies do not appreciably assist in the precise diagnosis, but are important in the understanding of the underlying abnormal physiology.

### Colon

The motility of the large bowel has been relatively little studied until recently. Connell, in 1967 and 1970, stated that the main contribution of studies of colon motility to clinical medicine has been in the area of concepts rather than diagnostic procedures. This is still true today.

Various techniques have been used, giving rise to difficulties when interpreting the results. An important aspect is the assessment of the so-called physiological sigmoid sphincter.

In the colon there are bursts of rhythmical type I waves under normal conditions. Classical type II waves are usually seen in the transverse colon. Type IV contractions are large, simple waves rarely seen in the fasting colon, but noted specifically in cases of ulcerative colitis. However, measurement of colonic motility is important in the understanding of the pathophysiology of aganglionosis of the bowel and, more recently, in colonic diverticular disease.

The efficacy of various drugs acting on the colon can also be assessed by means of manometric studies. It is interesting to note the paradox that in diarrhoea there is usually less colonic activity than in the normal; whereas in constipation the activity is greater. This is due to the fact that diarrhoea is caused by loss of normal segmental contractions which delay the transport of the stools.

### Rectum and Anus

The rectum is most interesting manometrically as it exhibits its own characteristic activity. The mechanism of defaecation and the state of continence has been completely assessed by means of manometry studies.

The normal pattern of rectal movement can be assessed quite clearly. It is of particular value in the diagnosis of aganglionic segments associated with megacolon. It is also important in the post-operative assessment of these cases. The use of parasympathomimetic drugs in this condition is also important and the changes which occur are shown clearly on manometric investigation.

### CONCLUSION

In conclusion, there is still much to learn as far as gastro-intestinal motility is concerned and it can be stated categorically that from a physiological and clinical point of view progress has been made. The most important field for manometric studies, however, is in benign oesophageal diseases.