Pathology of Chronic Constipation in Pediatric and Adult Coloproctology

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Drug Dosage
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This book is based on 40 years’ experience in rectocolic biopsy diagnosis of motility disorders with enzyme histochemical techniques. This particular technique provides important information on functional abnormalities of colon motility. Owing to the use of enzyme histochemical techniques since 1960, the reliability in the diagnostic of Hirschsprung’s disease has greatly improved. However, a series of new gut dysmotilities has been observed since that time.

This is the first book devoted to motility disorders of the gut, often a frustrating subject with classical histological staining techniques.

Both authors are experts in the diagnosis of biopsies taken from the mucosa of the rectosigmoid or laparoscopic biopsies of muscularis propria from different gut areas. The series of characteristic photomicrographs will be of great help to the diagnostic pathologist. These illustrations will also be very useful to trainees in pathology. The book sets a new standard in pediatric and gastroenterologic pathology.

Not only pathologists but also gastroenterologists, pediatricians and colorectal surgeons will profit from this book because it helps to better interpret histopathological findings in the gastrointestinal tract. This volume is, therefore, not only an important reference book for pathologists, but also useful to clinicians working in the field of gastroenterology. This wide audience will guarantee the success of this unique monograph.

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This book aims to improve the often frustrating histopathological work done in gut dysmotility and chronic constipation.

To avoid the character of a journal publication, no references are given in the text, but the key literature is cited at the end of each chapter. The number of references to the different colon diseases reflects how much is known about the specific diseases.

Each chapter is divided into three different sections. The first section outlines and illustrates the pathological aspects. The Diagnostic Criteria section provides a summary of the most important histopathological characteristics. The third part gives information on clinical pathology. The authors have organized the book in a clearly arranged didactic form which allows the pathologist, clinician or gastroenterologist to quickly obtain information on a topic of particular interest.

The chapter on methodology will be helpful to the technician, clinician or scientist in obtaining information on biopsy taking, sending the biopsy to the pathologist, and the enzyme histochemical techniques and reactions which are routinely used. The book supplies the practicing pathologist with a maximum of diagnostic information on rectal mucosa and colon biopsies of muscularis propria. Many of the statements made are based on personal experience and may change over time.

We hope that the different chapters will help towards a better insight into motility disorders of the gut, which are often considered to be a functional abnormality without any morphological substrate.

This book will help towards improving insight into gut motility disorders and their diagnostic possibilities for gastroenterologists, pediatricians, pediatric surgeons, coloproctological surgeons and pathologists.
Introduction: Advantages and Disadvantages of Enzyme Histochemistry

In comparison to the success of immunohistochemistry, enzyme histochemistry seems old-fashioned. So, what about the old-fashioned histological staining techniques such as haematoxylin-eosin (HE) and van Gieson? Perhaps the term ‘old-fashioned’ is incorrect, because what is in fact of importance is the practical value of each technique, regardless of the year in which it was introduced.

Classical histological techniques, which are static stainings, at best give the opportunity to make an indirect conclusion about the function of a particular tissue. In contrast, enzyme histochemistry is a functional technique. Enzyme histochemistry permits the evaluation, by the intensity of, for example, an acetylcholinesterase (AChE) reaction, of the parasympathicotonus of a tissue such as the muscularis propria of the colon. A dehydrogenase reaction using enzymes of the glycolytic pathway gives information about the effectiveness of the cellular performance.

Immunohistochemistry offers fundamental insights into the protein chemistry of a particular tissue; however, it is, like classical histological staining techniques, a static method.

In the following, the practical results of enzyme histochemistry in coloproctological motility disorders are outlined. A final section provides information on the enzyme histochemical techniques used routinely in a histopathological laboratory.

This manual shows that enzyme histochemistry is a useful technique in colon motility disorders. To obtain a reliable diagnosis of Hirschsprung’s disease in rectal mucosal biopsies using an HE staining requires considerable experience. False conclusions may be drawn if the cause of the motility disorder is hypoganglionosis or an ultrashort Hirschsprung segment.

By using an AChE reaction on 15-µm-thick cryostat sections, the diagnosis of Hirschsprung’s disease is made much more reliably. The 15-µm thickness of the cryostat section is necessary because the section loses 70% of its thickness by being thawed, spread and dried on the microscopic slide. Therefore, the final section is about 4.7 µm thick (fig. 211–213). The 15 µm thickness of the cryostat section is necessary in order to ensure a sufficient amount of enzyme and intensity of enzyme activity for arrival at a reliable diagnosis.

With an AChE reaction, the diagnosis of Hirschsprung’s disease is absolutely reliable. The increase in AChE activity in parasympathetic nerves in lamina propria mucosae, muscularis mucosae and muscularis propria (fig. 7) explains the functional consequence of high spasticity of the aganglionic segment of the rectosigmoid.

Similarly, an AChE reaction permits the diagnosis of an ultrashort Hirschsprung segment (fig. 51, 54), which cannot be diagnosed with any other technique. Also, aganglionosis of the musculus corrugator cutis ani (fig. 57, 58) or aganglionosis of the internal sphincter (fig. 61, 63) can be reliably diagnosed with an AChE reaction.

By means of a dehydrogenase reaction in the rectum mucosa, immaturity of the enteric nervous system can be recognized (fig. 66–72). A succinic dehydrogenase reaction, representing a mitochondrial enzyme, provides information on the degree of maturity of a nerve cell. An immature nerve cell contains a small number of mitochondria, and, therefore, shows very low succinic dehydrogenase activity. Maturation of a nerve cell can be recognized by the increase in succinic dehydrogenase activity, which develops an enzyme activity similar to that of lactic dehydrogenase.

Nerve cell hypoplasia can also be reliably diagnosed with a lactic dehydrogenase or nitrooxide synthase reaction (fig. 76–80). This manual demonstrates that enzyme histochemistry in motility disorders of the colon gives information which is difficult to find with HE, van Gieson or trichrome staining. Not even immunohistochemical reactions are able to show all these functional changes.
Abstract

In colonic motility disorders, a pathohistological diagnosis based solely on formalin-fixed gut is often inconclusive. Classical histological techniques or immunohistochemistry represent a static staining. In contrast, native tissue submitted to enzyme histochemistry provides functional information about the effectiveness of the cellular performance. Routinely, a complementary set of reactions is performed and includes acetylcholinesterase (AChE), lactic and succinic dehydrogenase, as well as nitroxide synthase reactions.

In this monograph, the whole spectrum of different anomalies of the colonic wall is illustrated in a systematic fashion:

Hirschsprung’s disease is characterized by an increase in AChE activity of parasympathetic nerve fibers of the rectosigmoid. In ultrashort Hirschsprung’s disease, only enzyme histochemistry renders a reliable diagnosis possible in biopsies of the anal ring.

Aganglionosis of the musculus corrugator cutis ani shows a localized increase of AChE activity in nerve fibers, similar to Hirschsprung’s disease, not detectable in conventional histology.

Immaturity, hypoganglionosis and neuronal dysganglionosis can be clearly recognized in dehydrogenase reactions.

Enzyme histochemical reactions are complemented by picrosirius red staining for assessment of the collagen texture of the muscularis propria. Absence or intertenial interruption of the continuous connective tissue layer between circular and longitudinal muscle of the muscularis propria has been termed aplastic or atrophic desmosis, respectively.

Many of the entities described are also observed in adults. Atrophic hypoganglionosis or atrophic desmosis with loss of the myenteric plexus connective tissue fascia is implied as a frequent cause of chronic constipation in adults.

The essential contribution of a functional histopathological technique towards a reliable diagnosis of gut dysfunction in native tissue is extensively demonstrated in great detail in more than two hundred figures.

Key Words

Constipation
Gastroenterology
Coloproctology
Gut
Colon
Enteric nervous system
Hirschsprung’s disease