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Practical Gastrointestinal Endoscopy

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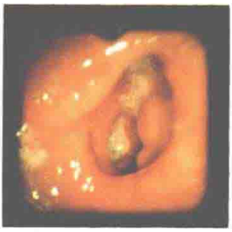

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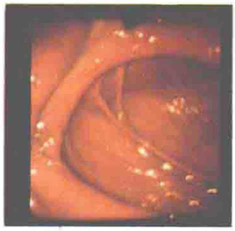

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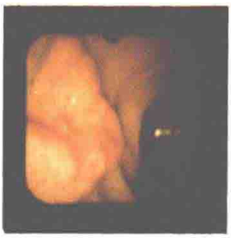
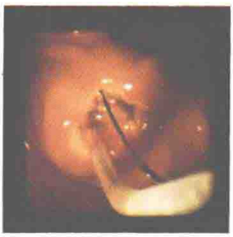


9 Cancer of the papilla



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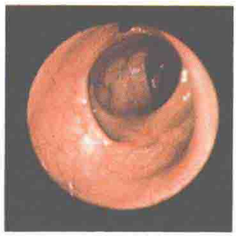

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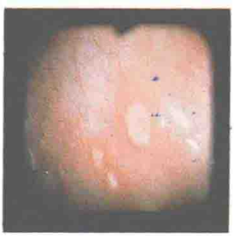

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Foreword

I look upon it as a sign of the close liaison between the UK and the USA in gastroenterology to have been asked by Drs Cotton and Williams to introduce this fine new volume, *Practical Gastrointestinal Endoscopy*. Although not personally involved in endoscopy, I have maintained a close watch on developments, particularly in our own units in the University of California in San Francisco. I hope therefore that I can step back and take an objective view.

Flexible instruments have started a revolution in diagnostic gastroenterology, one which will continue to evolve as we assess their real indications and usefulness. The time is ripe for this most complete volume devoted mainly to technique. It encompasses every worthwhile detail with which endoscopists must become closely familiar, ranging from the type and choice of instrument to discussions of the more recent endoscopic-therapeutic procedures, e.g. removal of common bile duct stones. Being intelligent physicians, the authors also discuss indications and the significance of these procedures to both patient and referring physician.

The information on the diagnostic usefulness of upper intestinal endoscopy goes beyond technique; it includes important points of differential diagnosis and indications for biopsy. The discussion of upper alimentary bleeding correctly assumes that endoscopy is now usually the first diagnostic procedure. The authors introduce us to the most modern endoscopic techniques for dealing with bleeding lesions but are wisely circumspect about assigning degrees of definitiveness to them at present.

The chapters on ERCP and endoscopic sphincterotomy are compact and complete. The technique is particularly useful in the diagnosis and management of common duct stones; the authors wisely emphasise the potential dangers in attempting to remove the largest stones — and in the use of pancreatography in patients with pancreatic pseudocysts. I also admire their cautious stand on the role of sphincterotomy for patients with so-called 'stenosing papillitis'. Endoscopy of the colon has also developed rapidly and the reader is provided with full details of technique, indications and hazards. Of particular interest these days is the usefulness of the procedure in the diagnosis and management of colonic polyps. The authors assume that all polyps should be removed, including those less than 5 mm in diameter which have heretofore been considered to be 'hyperplastic'. Whilst the efficacy of prophylactic polypectomy in reducing the problems of colonic carcinoma remains to be proven, the practice of polypectomy is rapidly increasing. The guidelines for safe colonoscopy and polypectomy are explicit and detailed.

There are other fine features of this book, including discussions of the establishment and maintenance of a proper endoscopy suite, of the role of the endoscopy nurse/assistant, the repeated and appropriate emphasis on endoscopy as part of a group effort, and much useful information on good endoscopic housekeeping. Throughout the book, the illustrations are appropriate, clear and informative.

The ultimate indications and usefulness of endoscopic procedures will be defined, perhaps in the next decade. Long-term studies of this question launched by the American Gastroenterology Association and the American Society for Gastrointestinal Endoscopy may help resolve some of the important questions. In the meanwhile, enough evidence is at hand to warrant these procedures in a large number of circumstances, and we are indebted to Drs Cotton and Williams for their illuminating exposition. This book will be of great use to all those who are interested in gastrointestinal endoscopy.

Marvin H. Sleisenger

Preface

This book is concerned with endoscopic techniques and says little about their clinical relevance. It does so unashamedly because no comparable manual was available at the time of its conception and because the explosive growth of endoscopy has far outstripped facilities for individual training in endoscopic technique. For the same reason we have made no mention of rigid endoscopes (oesophagoscopes, sigmoidoscopes and laparoscopes) which rightly remain popular tools in gastroenterology, nor have we discussed the great potential of the flexible endoscope in gastrointestinal research.

Our concentration on techniques should not be taken to denote a lack of interest in results and real indications. As gastroenterologists we believe that procedures can only be useful if they improve our clinical management; clever techniques are not indicated simply because they are possible, and some endoscopic procedures will become obsolete with improvements in less invasive methods. Indeed we are moving into a self-critical phase in which the main interest in gastrointestinal endoscopy is in the assessment of its real role and cost-effectiveness.

Gastrointestinal endoscopy should be only one of the tools of specialists trained in gastrointestinal disease — whether they are primarily physicians, surgeons or radiologists. Only with broad training and knowledge is it possible to place obscure endoscopic findings in their relevant clinical perspective, to make realistic judgements in the selection of complex investigations from different disciplines, and to balance the benefits and risks of new therapeutic applications. Some specialists will become more expert and committed than others, but we do not favour the widespread development of pure endoscopists or of endoscopy as a sub-specialty.

Skilful endoscopy can often provide a definitive diagnosis and lead quickly to correct management, which may save patients from months or years of unnecessary illness or anxiety. We hope that this little book may help to make that process easier and safer.

April 1979 P.B.C., C.B.W.

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We would like to thank our colleagues for their helpful comments on the manuscript, Dorcas Sharpe for her secretarial skills, and Mary Jo Drew for the artwork. In a broader context it is a pleasure and privilege to acknowledge the support and encouragement of many friends, and the forbearance of numerous patients, who have contributed to our experience over the years.

Contents

Chapter 1
Introduction

The human gut is long and tortuous. Diagnosis and localization of its afflictions has relied for many decades on barium radiology, which provides indirect data in black and white. Man is by nature inquisitive and direct information in colour is preferable. Rigid open-ended instruments have long allowed direct visual examination of the proximal 40 cm and distal 25 cm of the gut, and the removal of tissue specimens for histological analysis. Semi-flexible lens gastroscopes were introduced in the 1930's and 1940's and used by a few experts; examinations were often uncomfortable and incomplete, and biopsy facilities were poor. Preoccupation with their gastric cancer problem led the Japanese to develop the blind gastro-camera in the 1950's. This instrument remains in widespread use in Japan, but has found little acceptance elsewhere.

The diagnostic situation has changed dramatically since the late 1960's. With the introduction of fibre-optics, instruments have become highly flexible and manoeuvrable. Oesophago-gastro-duodenoscopy is a routine outpatient procedure, which in many contexts is challenging the barium meal as the prime diagnostic tool. Deep duodenoscopy allows direct cannulation of the papilla of Vater for cholangiography and pancreatography. The whole colon can be examined using long fibrescopes passed via the anus. Tissue specimens can be removed from all these areas under direct vision, using biopsy forceps, cytology brushes, and snare loops.

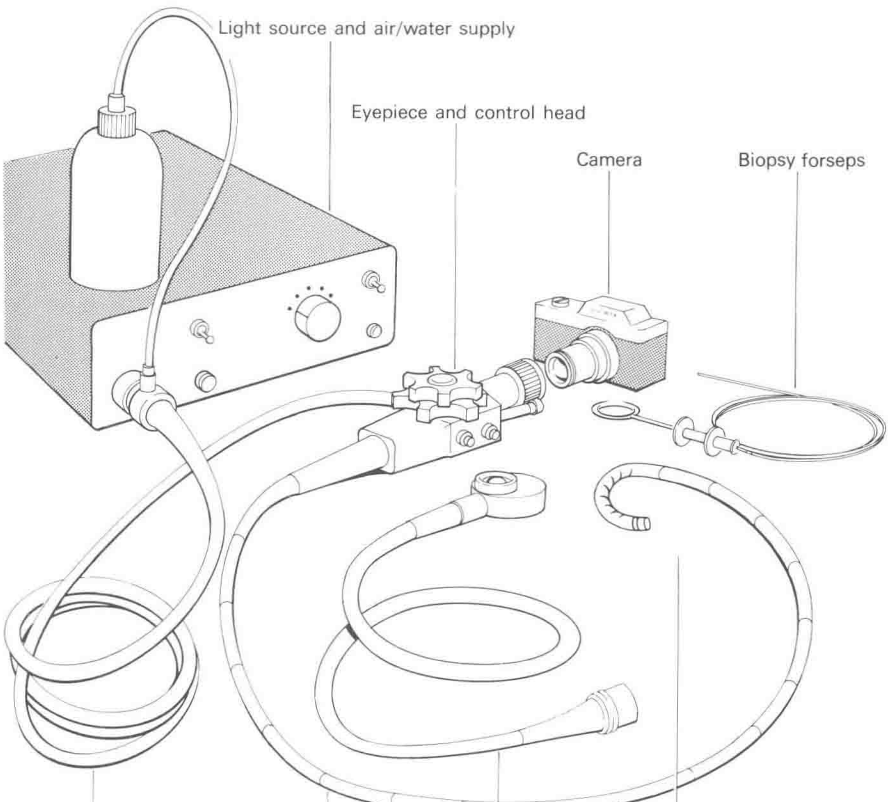
Gastrointestinal fibrescopes are not only used for diagnosis. Transendoscopic snare diathermy has revolutionised the management of colonic polyps. Polyps are rarer in the upper gut, but fibrescopes allow removal of foreign bodies, sphincterotomy for common duct stones, dilatation of oesophageal strictures, and a direct attack on bleeding lesions by diathermy or laser photocoagulation.

Endoscopy requires motivation, dexterity and experience. Patients may suffer when examinations are not optimally performed, and the techniques themselves may fall into disrepute. The speed of development of techniques and the consequent clinical demand has far outstripped the evolution of training facilities. Many present 'expert' endoscopists were self-trained, and have little opportunity to offer serious training to others; this unsatisfactory situation is likely to continue in the foreseeable future.

The present endoscopy literature is mainly of interest to those already skilled, or to the consumers; it has little teaching content. This volume attempts to provide a basic framework for learning practical endoscopic procedures.

Chapter 2
Basic Fibreoptic Instrumentation

The modern gastrointestinal fibrescope is a complex tool (2.1). It consists basically of a head with eyepiece and controls, and a flexible shaft which has a manoeuvrable tip. The head is connected to a light source via a connecting 'umbilical' cord, through which pass other tubes transmitting air and suction etc. Accessories include flexible biopsy forceps for passage through the instrument, a side arm for assistant's viewing, and a camera.



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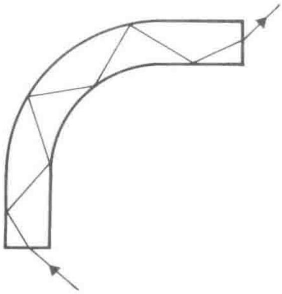

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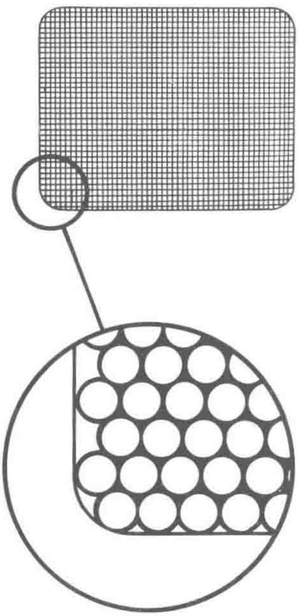


2.3

Fibreoptics

At the heart of any fibreoptic instrument are the viewing and light carrying bundles, well described as 'highly flexible pieces of illuminated spaghetti'. The viewing bundle of a standard endoscope is around 4 mm in diameter, and contains many thousands of fine glass fibres, each close to 10 μ in diameter. Light entering the face of each fibre is transmitted by repeated internal reflections (2.2). Faithful transmission of an image depends upon the spatial orientation of the individual fibres being the same at both ends of the bundle (a 'coherent' bundle). Each individual glass fibre is coated with glass of a lower optical density, to prevent leakage of light from within the fibre; since this coating does not transmit light, it constitutes a dark 'packing fraction', which is responsible for the fine mesh frequently apparent in the fibreoptic image (2.3). For this reason, the image quality, though excellent, can never equal that of a rigid lens system. However, the fibreoptic image carrying system is extremely flexible, and an image can be transmitted even when the bundle is tied in a knot.

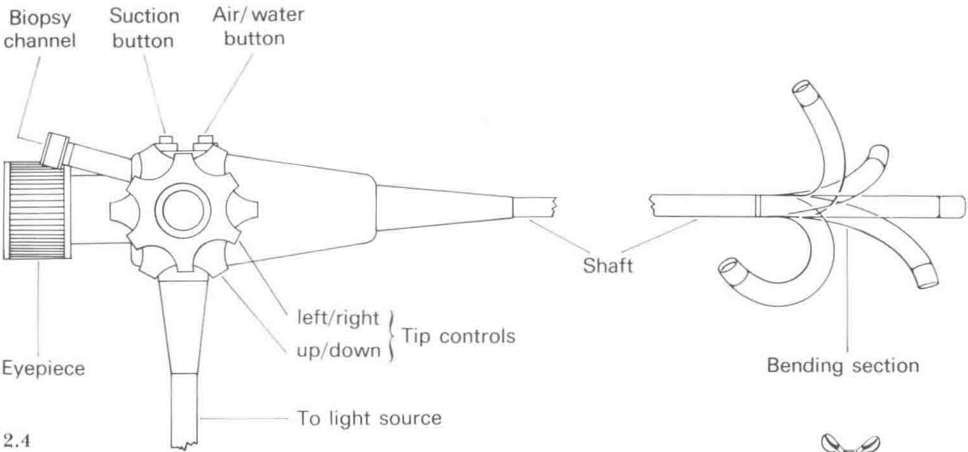
In most instruments the distal lens which focuses the image onto the bundle is fixed, and a small aperture gives a depth of focus down to about 1 cm; some instruments have controllable focus of the distal lens which allows a more detailed view of the mucosa. The image reconstructed at the top of the bundle is transmitted to the eye via a focussing lens which provides correction for individual differences in refraction.

No image is observed unless the area is illuminated. Some early instruments utilised distal bulbs; now all rely on cold light transmitted from an external high intensity source through one or more light carrying bundles. Since this bundle does not transmit a spatial image, the fibres within it need not be 'coherent' and are randomly arranged. Because light intensity is reduced at any optical interface, the light bundle runs uninterruptedly from the tip of the instrument through its connecting 'umbilical' cord directly to the lamp.

Control of the instrument tip

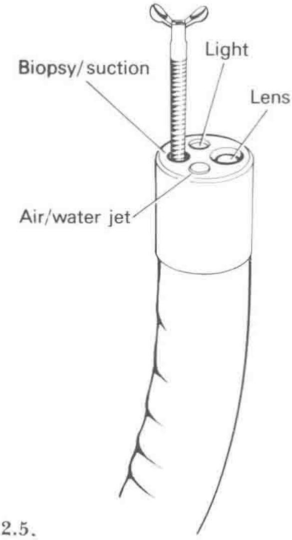
The flexibility of fibreoptic bundles allows the instrument shaft to be bent, and its tip to be angled acutely. In earlier fibrescopes, tip deflection was possible in only one plane, and often to no more than 90°; now most instruments allow both up and down and right to left deflection, often in excess of 180° (2.4).

Tip movement depends upon pull wires attached at the tip just beneath its outer protective shaft, and



2.4

passing back through the length of the instrument to the control wheels (2.4). In some instruments the two wheels (for up/down and right/left movement) have been replaced by a single joystick. These controls incorporate a braking or ratchet system, so that the tip can be fixed temporarily in any desired position. The instrument shaft is relatively torque stable so that rotatory movements applied to the head are transmitted to the tip.

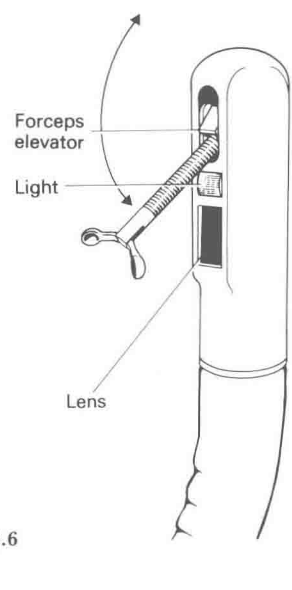


2.5.

Instrument channels

In addition to the fibre bundles and the control wires for tip movement (and distal lens focussing when present) the instrument shaft also contains two or more channels. The larger 'operating' channel (usually 2 – 3 mm in diameter) allows the passage of fine flexible instruments (e.g. biopsy forceps, cytology brushes, diathermy snares) from a port in the fibrescope head (2.4) through to the tip and out into the field of view (2.5). In instruments with a lateral viewing lens system (and in some forward viewing instruments) the tip of the channel incorporates a small deflectable elevator, which permits some directional control of the forceps independent of the instrument tip (2.6); this elevator is controlled by a further lever or wheel on the instrument head. The operating channel is also used for aspiration; an external suction pump is connected to the 'umbilical' cord of the instrument near the light source and suction is diverted into the instrument channel by pressing the suction button (2.4).

The second small channel transmits air to distend the organ being examined; the air is supplied from a pump in the light box and is controlled by another button (2.4). The air system usually incorporates a water bottle so that a jet of water can also be squirted across the distal lens to clean it.



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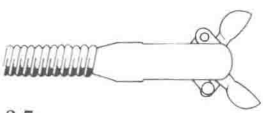
Different instruments

The above basic design principles apply to most fibrescopes, but specific instruments differ in length, size, sophistication and distal lens orientation. Most gastrointestinal endoscopy is performed with instruments providing direct forward vision (2.4), via a 80-105° wide angle lens. However there are circumstances in which it is preferable to view laterally (2.6); see Chapter 4 for details. The overall diameter of an endoscope is a compromise between engineering ideals and patient tolerance. The shaft must contain and protect many bundles, wires, and tubes, all of which are stronger and more efficient when larger. A colonoscope can reasonably approach 15 mm in diameter, but this size is rarely acceptable in the upper gut, and most routine instruments are between 10 and 12 mm in diameter. Smaller fibrescopes are more acceptable to all patients, and have specific application in children and in smaller tubes such as the bile duct. However smaller instruments inevitably involve some compromise in durability, image quality and the biopsy size.

Biopsy forceps, cytology brushes etc.



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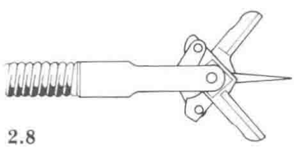

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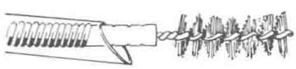

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The ability to take target tissue specimens is a crucial part of modern fibreoptic endoscopy. Biopsy forceps consist of a pair of sharpened cups (2.7) controlled by a flexible cable. Their maximum diameter is limited by the size of the operating channel of the specific instrument and the length of the cups is limited by the radius of curvature through which they must pass in the instrument tip. In side viewing instruments with a forceps elevator, this curvature is acute. When it is necessary to take biopsy specimens from a lesion which can only be approached tangentially (e.g. the wall of the oesophagus), forceps with a central spike may be helpful (2.8). Cytology brushes have a covering plastic sleeve to protect the specimen during withdrawal (2.9). A simple teflon tube can be passed down the instrument channel to clear mucus or blood from areas of interest with a jet of water or to highlight mucosal detail by 'dye spraying'. Many other diagnostic and therapeutic devices will be described in the relevant sections.

Light sources

Illumination is usually provided by an arc or halogen lamp, focussed by a parabolic mirror onto the face of the bundle; the transmitted intensity is controlled by filters and a diaphragm. The light source is housed in a light box with a cooling system, the air pump and water supply, and a suction attachment. The light boxes