Natural Orifice Translumenal Endoscopic Surgery (NOTES)
Companion website

This book is accompanied by a website:

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The website includes:

• 68 videos showing procedures described in the book

• All videos are referenced in the text where you see this logo:
Contents

Contributors, vii

Preface, x

Section 1 Development of the NOTES Concept

1 History of NOTES, 3
   Xavier Dray & Anthony N. Kalloo

2 Endoscopic Platforms for NOTES, 12
   Pankaj J. Pasricha & Homero Rivas

3 Physiology of NOTES, 19
   Juliane Bingener & Angela M. Johnson

4 Infection Control in NOTES, 29
   Peter N. Nau & Jeffrey W. Hazey

5 NOTES Access Techniques, 39
   Eduardo A. Bonin & Christopher J. Gostout

6 NOTES Closure Techniques, 59
   Erwin Rieder & Lee L. Swanstrom

7 Mini-laparoscopy in the Endoscopy Unit, 70
   Arthur Hoffman & Ralf Kiesslich

8 Single-port Surgery, 80
   Ricardo Zorron, Katherine Gash, & Anthony R. Dixon

9 Computer-assisted NOTES: From Augmented Reality to Automation, 94
   Luc Soler, Stéphane Nicolau, Michel de Mathelin, & Jacques Marescaux

Section 2 Current Clinical Applications and Techniques

10 NOTES for Peritoneal Exploration, 107
    Seigo Kitano & Kazuhiro Yasuda

11 NOTES Cholecystectomy, 119
    Bernard Dallemagne & Jacques Marescaux

12 NOTES Appendectomy, 127
    Jörn Bernhardt, Holger Steffen, Sylke Schneider-Koriath, & Kaja Ludvig

13 NOTES Applications in Colorectal Surgery, 141
    Joël Leroy, Michele Diana, James Wall, & Jacques Marescaux

14 NOTES Applied for Rectal Surgery, 151
    Patricia Sylla

15 Bariatric NOTES Procedures, 162
    Michel Vix, Michele Diana, James Wall, & Jacques Marescaux

16 Urologic Applications of NOTES, 172
    Candace F. Granberg, Mitchell R. Humphreys, & Matthew T. Gettman

17 Gynecologic Applications of NOTES, 182
    Antoine Watrelot, Géraldine Chauvin, & Arnaud Wattiez

18 NOTES Thyroidectomy, 188
    Tahar Benhidjeb & Michael Stark

Section 3 Perspectives on NOTES

19 POEM and Emerging NOTES Applications, 199
    Haruhiro Inoue & Ricardo Zorron

20 NOTES Applications in Veterinary Medicine, 215
    Lynetta J. Freeman & Karine Pader

21 NOTES and Pregnancy: Where We Are and Where We Could Go, 232
    Nicolas Bourdel & Janyne Althaus

22 Thoracic Cavity Application of NOTES, 244
    Alex Escalona, Brian G. Turner, & Denise W. Gee

23 Designing the NOTES Procedure Room, 251
    Mouen A. Khashab & Anthony N. Kalloo

24 Evolution and Future Developments of Instrument Technology for NOTES, 256
    D. Nageshwar Reddy, G. V. Rao, & Magnus J. Mansard

25 Training the Gastroenterologist for NOTES, 273
    Nitin Kumar & Christopher C. Thompson
Contents

26 Training the Surgeon for NOTES, 287
   Silvana Perretta, Bernard Dallemagne, & Jacques Marescaux

27 Simulator-based Training of NOTES Procedures, 291
   Kai Matthes, Ganesh Sankaranarayanan, Woojin Ahn,
   & Suvranu De

28 NOTES: Possibilities for the Future, 308
   Alexander Aurora & Jeffrey L. Ponsky

Index, 313

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Contributors

**Woojin Ahn, PhD**
Postdoctoral Research Associate, Center for Modeling, Simulation and Imaging in Medicine (CeMSIM)
Department of Mechanical, Aerospace and Nuclear Engineering
Jonsson Engineering Center 3205
Rensselaer Polytechnic Institute
Troy, NY, USA

**Janyne Althaus, MD**
Assistant Professor
Division of Maternal Fetal Medicine
Department of Gynecology and Obstetrics
Johns Hopkins University
Baltimore, MD, USA

**Alexander Aurora, MD**
MIS General Surgery & Bariatrics
Case & Geauga Medical Centers
University Hospitals
Cleveland, OH, USA

**Tahar Benhidjeb, MD, PhD**
Chairman, Department of Surgery
Chief, Department of General Surgery
Bujiel Hospital, Abu Dhabi, UAE;
Director, The New European Surgical Academy (NESA), Berlin, Germany

**Jörn Bernhardt, MD, PhD**
Head, Department of Diagnostic and Interventional Endoscopy
Klinikum Südstadt
Rostock, Germany;
Department of Surgery
Klinikum Südstadt
Rostock, Germany

**Juliane Bingener, MD**
Associate Professor
Department of Surgery
Division of Gastroenterologic and General Surgery
Division of Gastroenterology and Hepatology
Mayo Clinic
Rochester, MN, USA

**Eduardo A. Bonin, MD, MSc**
Research Fellow
Developmental Endoscopy Unit
Mayo Clinic
Rochester, MN, USA

**Nicolas Bourdel, MD**
Division of Gastroenterology & Hepatology
Johns Hopkins University
Baltimore, MD, USA

**Géraldine Chauvin, MD**
CRES (Centre de Recherche et d’Etude de la Stérilité)
Hôpital NATECIA
Lyon, France

**Bernard Dallemagne, MD**
Department of Digestive and Endocrine Surgery
University Hospital of Strasbourg
IRCAD (Research Institute Against Digestive Cancer)
Strasbourg, France

**Suwarnu De, ScD**
Director, Center for Modeling, Simulation and Imaging in Medicine (CeMSIM)
Professor, Department of Mechanical, Aerospace and Nuclear Engineering (primary appointment)
Department of Biomedical Engineering (joint appointment)
Information Technology and Web Science (joint appointment)
Jonsson Engineering Center 5002
Rensselaer Polytechnic Institute
Troy, NY, USA

**Michel de Mathelin, PhD**
Professor, University of Strasbourg
CNRS (National Center for Scientific Research)
IRCAD (Research Institute Against Digestive Cancer)
Strasbourg, France

**Michele Diana, MD**
Department of Digestive and Endocrine Surgery
University Hospital of Strasbourg
IRCAD (Research Institute Against Digestive Cancer)
Strasbourg, France

**Anthony R. Dixon DM, FRCS, FRCSEd**
Consultant Laparoscopic Colorectal & Pelvic Floor Surgeon
North Bristol (Frenchay) & SPIRE Bristol Hospitals
Bristol, UK

**Xavier Dray, MD, PhD**
Département Médico-Chirurgical de Pathologie Digestive
APHP Hôpital Lariboisière & Université Paris 7
Paris, France;
Division of Gastroenterology & Hepatology
The Johns Hopkins Hospital
Baltimore, MD, USA

**Alex Escalona, MD**
Pontificia Universidad Católica de Chile
Faculty of Medicine
Department of Digestive Surgery
Santiago, Chile

**Lynetta J. Freeman, DVM**
Associate Professor of Small Animal Surgery & Biomedical Engineering
Purdue University
West Lafayette, IN, USA

**Katherine Gash, MBChB, MRCS**
North Bristol NHS Trust
Frenchay Hospital
Bristol, UK

**Denise W. Gee, MD**
Attending Surgeon
Minimally Invasive Surgery
Massachusetts General Hospital
Boston, MA, USA
Michael Stark, MD  
President, The New European Surgical Academy (NESA)  
Berlin, Germany

Holger Steffen, MD  
Department of Diagnostic und Interventional Endoscopy  
Klinikum Suedstadt  
Rostock, Germany;  
Department of Surgery  
Klinikum Suedstadt  
Rostock, Germany

Lee L. Swanstrom, MD  
Division of GI and MIS Surgery  
The Oregon Clinic  
Portland, OR, USA

Patricia Sylla, MD  
Assistant Professor of Surgery, Harvard Medical School;  
Assistant in Surgery, Massachusetts General Hospital  
Boston, MA, USA

Christopher C. Thompson, MD, MSc, FACC, FASGE  
Director of Therapeutic Endoscopy  
Gastroenterology Division  
Brigham and Women’s Hospital  
Assistant Professor of Medicine  
Harvard Medical School  
Boston, MA, USA

Brian G. Turner, MD  
Weil Cornell Medical College  
Division of Gastroenterology and Hepatology  
New York, NY, USA

Michel Vix, MD  
Department of Digestive and Endocrine Surgery  
University Hospital of Strasbourg  
IRCAD (Research Institute Against Digestive Cancer)  
Strasbourg, France

James Wall, MD, MSE  
Department of Digestive and Endocrine Surgery  
University Hospital of Strasbourg  
IRCAD (Research Institute Against Digestive Cancer)  
Strasbourg, France

Antoine Watrelot, MD  
CRES (Centre de Recherche et d’Etude de la Stérilité)  
Hôpital NATECIA  
Lyon, France

Arnaud Wattiez, MD, PhD  
Department of Obstetrics and Gynaecology  
University Hospital of Strasbourg  
IRCAD (Research Institute Against Digestive Cancer)  
Strasbourg, France

Kazuhiro Yasuda, MD, PhD  
Department of Gastroenterological Surgery  
Oita University Faculty of Medicine  
1-1 Idaigaoka, Yufu, Oita, Japan
The use of natural body orifices as the primary portal of entry for peritoneal or thoracic interventions challenges conventional surgical and endoscopic principles. NOTES is the evolutionary merger of endoscopy and surgery, using their basic principles while challenging the dogma of both fields. NOTES evolved because of the quest to seek less invasive surgical interventions and will have the added benefit of improved cosmesis. Both of these benefits will be attractive to patients much like laparoscopic surgery was at its beginning.

NOTES has already impacted our current endoscopic and surgical practices. Procedures such as per-oral endoscopic myotomy (POEM), submucosal endoscopy and single port laparoscopy arose because of NOTES and are addressed in detail in this book. Improved instrumentation, robotization of flexible instruments and new endoscopic platforms are some of the downstream benefits of NOTES research, are also all delineated here.

Since the first human application in 2004, there has been tremendous progress in the understanding of the physiologic mechanisms created by NOTES. As a result of the work of many of our authors and others, we now have a large body of information that is the basis for this textbook. Furthermore, there is an ever-growing arena of clinical applications extending beyond digestive diseases.

This book is intended to be an in-depth resource of information on NOTES. The early chapters focus on basic principles and techniques such as access and closure techniques as well as infection control issues. Later chapters review current clinical applications such as appendectomy and cholecystectomy. The final chapters are dedicated to more up-and-coming and perhaps controversial topics such as veterinarian medicine and spinal interventions. We hope that these later chapters will lay a foundation and stimulate further research into these burgeoning areas. The video library should significantly enhance the knowledge base of this book by augmenting the detailed written descriptions of the various procedures. Our hope is that you will be both excited and inspired by the videos.

We thank our publisher, Wiley-Blackwell, for taking a chance on pioneering a textbook about this emerging field. We would especially like to thank Elisabeth Dodds at Wiley-Blackwell for her gentle persistence, eye for detail and great sense of humor in dealing with three editors from three different continents and authors from all over the world. Most of all, we are grateful to each of our authors who are esteemed experts in their fields and were able to dedicate significant time to this textbook, including the creation of videos, in a short period of time.

Anthony N. Kalloo
Jacques Marescaux
Ricardo Zorron
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1 Development of the NOTES Concept
History of NOTES

Xavier Dray1,2 & Anthony N. Kalloo2
1APHP Hôpital Lariboisière & Université Paris 7, Paris, France
2The Johns Hopkins Hospital, Baltimore, MD, USA

Natural orifice translumenal endoscopic surgery (NOTES) is an endoscopic technique whereby surgical interventions can be performed with a flexible endoscope passed through a natural orifice (mouth, vulva, urethra, anus) then through a translumenal opening of the stomach, vagina, bladder, or colon [1]. NOTES has the potential to provide no scarring, reduced pain, and faster patient recovery compared to open and laparoscopic surgical procedures [1]. We present herein the landmarks in the history of NOTES, from the early stages of endoscopy and laparoscopy to its current development.

Prehistory of NOTES (from ancient times to the late twentieth century)

It is difficult to date when people started to have a look into human bodies, and even harder to credit one individual with the invention of endoscopy. The earliest descriptions of endoscopy are by Hippocrates (460–375 BC), who described a rectal speculum. A three-bladed vaginal speculum was found in the ruins of Pompeii, demonstrating that Roman medicine also involved primitive endoscopic tools. At this time, nothing but ambient light was used, and only rigid instruments were available. Major technological developments leading to modern endoscopy and to modern laparoscopy were born in the nineteenth and twentieth centuries [2].

A brief history of endoscopy [3]
The first issue faced by the pioneers of endoscopy was the illumination problem. The first gastroscopy was reported by Kussmaul in 1868 [4]. Joseph Swan and Thomas Edison invented the incandescent electric light bulb in 1878, but this technology was incorporated into endoscopes only at the beginning of the twentieth century [3].

The second and more challenging problem was flexibility. Articulated lenses and prisms were proposed by Hoffmann in 1911 [5] and improved in 1932 by Wolf and Schindler, who developed a semi-flexible gastroscope [6]. However, the light source consisted of a distal light bulb that provided poor illumination and produced color distortion. In 1930, Lamm showed that bundles of glass fibers could be used as a conduit for a light source, and that this bundle could be bent with no effects on light transmission [7]. “Coherent” bundles, ordered in such a way that the position of a fiber at one end mirrors its position at the other end, provided a real image of internal organs [8]. An external light source transmitted through flexible and coherent fiber bundles could therefore illuminate internal organs.

Flexibility and illumination were combined by Harold Hopkins in 1954: the flexible fiber imaging device he invented was made of a tube of glass with thin lenses of air [9]. In 1958, Larry Curtiss and Basil Hirschowitz improved this system by using a highly transparent optical quality glass to give birth to a flexible fiberoptic endoscope [10].

In the late 1970s, the charge-coupled device (CCD) was incorporated into an endoscope [11]. This development heralded the modern era of endoscopy. The CCD allowed the display of endoscopic images on television screens and the connection of endoscopes and computers. From this major shift started a two-decade period described by Sivak as “the golden era of gastrointestinal endoscopy” [3]. Major achievements, which have since become routine procedures, were reported: endoscopic retrograde pancreatography (1968), colonoscopic polypectomy (1969), endoscopic retrograde cholangiography (1970), endoscopic sphincterotomy with bile duct stone removal (1974), percutaneous endoscopic gastrostomy (1980), endoscopic injection sclerosis therapy (1980), endoscopic ultrasonography (1980), electronic CCD endoscope (1983), endoscopic control of upper