# Illustrated Anatomical Segmentectomy for Lung Cancer

Hiroaki Nomori • Morihito Okada

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# Foreword

As stated in the Preface for the original "2011 Japanese Edition" of this book: "I am pleased and enthusiastic to have this opportunity to write an introductory preface to this book." I have yet greater enthusiasm for the opportunity of providing the Introductory Preface to the current English translation, which is provided and published by Springer. The English translation will reach a very much larger audience beyond Japan. Importantly, I believe these original contributions from Japanese thoracic surgeons are not widely known and appreciated throughout many of the pulmonary and thoracic programs throughout the world—including Europe and the Americas. This illustrated textbook contains significant, new, and original information which has worldwide importance and application in the management of primary non-small cell lung cancer (NSCLC). It is the product of a very long experience, carefully organized and planned, critically and impartially assessed, and meticulously documented.

## Background and History

The anatomy and technique of segmental resection were first published by Churchill and Belsey in 1939 [1]. Shortly thereafter, the technique was popularized by the extensive experience of Overholt [2], another contemporary Boston surgeon. In 1959/60, I became a Senior House Officer with Ronald Belsey, then Head of the Regional Thoracic Unit at Frenchay & Bristol in the West of England. There, I was introduced to segmental resection, using the classical "finger tip stripping dissection of the intersegmental plane." This operation was relatively rough and difficult to teach.

In 1972, Noriaki Tsubota, recommended by Professor Nakamura in Kobe, Japan, became a Fellow for one year in our Division of Thoracic Surgery in Toronto, Canada. He learned the "Chamberlain/Belsey" technique of segmentectomy during that time. Following his return to Hyogo, a cancer center near Kobe, in Japan, he continued his experience with this method of anatomic segmental resection. He created important and practical technical modifications and shared this experience with his student, Morihito Okada. Tsubota (now retired) and his student, Okada, ultimately introduced further original modifications, which currently include: video-assisted segmentectomy, radical anatomic segmentectomy, sleeve segmentectomy, and a detailed documentation of local segmental and subsegmental anatomy. This detailed, well-illustrated anatomy is little, if at all known to a majority of thoracic surgeons elsewhere in the world. Their experience, however, has widely educated and influenced many of the leading thoracic surgeons throughout Japan. As a guest at the 51st meeting of the Japanese Association for Lung Cancer in November 2010, I was shown a draft of the Japanese edition of this illustrated

text by two authors: Professor Hiroaki Nomori at Keio University in Tokyo and Morihito Okada of Hyogo, who was an appointed Professor in Hiroshima in 2010.

## Current Japanese Clinical Experience

The Japanese Community of Thoracic Surgeons are now broadly experienced with a reproducible, relatively inexpensive technique of precise, video-assisted, anatomical radical segmentectomy. Morbidity and mortality rates are similar, or less, than those reported for lobectomy, wedge, or any other form of "lesser resection." Innovations include sleeve segmentectomy and subsegmental resection [3–11].

Okada, Tsubota et al. have published their clinical experience with segmentectomy for small (2 cm), NSCLC, and compared results with their experience with lobectomy for the same small, early NSCLC lesion [6–11]. Segmentectomy resulted in improved disease-free survival, improved preservation of pulmonary function, less morbidity, and lower procedural costs. The segmental plane is anatomically preserved—not folded and distorted by the "traditional" stapling used almost universally elsewhere. The segmental surface allows intraoperative smear cytology and is amenable to much improved management by the pathologist (e.g., tumor free margin assessment).

Although they have yet to complete a randomized trial of this comparison, such a trial is underway in multiple Japanese centers (P.I. Asamura and Okada) [12] and is more rapidly accruing patients than a similar American randomized trial (P.I. Altorki).

Other benefits worthy of comment are the absence of staplers for other than the larger vascular structures: using a 4 cm open "access incision," traditional open instruments may be used for "open" scissor dissection, segmental vessel clamping, and the use of old-fashioned ligatures for tying off the vessels. Staplers for small segmental arteries are often awkward and oversized.

## Conclusion

It is probably evident from this appraisal that, in my opinion, thoracic surgeons who are not aware of this information and giving serious consideration for learning these techniques are "missing the boat."

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# Foreword

A new era of less invasive surgery for lung cancer has opened. There are two approaches: one of them is, needless to say, video-assisted thoracic surgery; the other is lesser resection for small, primary lung cancer. The former has already become a standard operation, but the latter is still controversial and has not yet achieved worldwide acceptance.

I started a pilot study on segmentectomy in 1992 and published the results and an improved method to find the intersegmental plane in the *Annals of Thoracic Surgery* (1998;66:1787, 2002;73:1055). During the past 20 years, many papers have been published from Japan on active indication of segmentectomy for early-stage lung cancer. Although many of those studies were retrospective, their results supported segmentectomy, and now that the era of less invasive surgery has arrived, accompanied by a rapid increase in the detection of small tumors, prospective studies are going on in America and Japan. I am thoroughly convinced that it will not take long for segmentectomy to become a standard procedure in the treatment of early-stage lung cancer.

The authors of this book, Dr. Hiroaki Nomori and Dr. Morihito Okada, are quite enthusiastic about the novel technique of segmentectomy for small lung cancer, and they continue to report their results. For many years, they have made a superb effort to develop their approach, which has finally borne fruit in the form of this textbook.

Chest surgeons who read this book will be surprised by its contents—the descriptions are so detailed, and the anatomical naming is so precise. The large, colorful figures will make it easy for them to understand how to accurately perform a segmentectomy and will help lessen their hesitation to tackle such a procedure.

In closing, I would like to point out that the concept of lung-saving surgery and the technique that makes this delicate procedure possible originated with Dr. F.G. Pearson, my mentor, during my fellowship days in Toronto back in 1973.

Enjoy the book. The connective tissue, blood vessels, and airways of the segment await.

Noriaki Tsubota
Kobe, Japan

# Preface

When I was a trainee at the National Cancer Center in Tokyo, my mentors, thoracic surgeons, Drs. Shichiro Ishikawa and Tsuguo Naruke always cautioned me not to think that "I can do everything by myself". With this in mind, I accepted the kind offer of Professor Morihito Okada at the Department of Surgical Oncology, Hiroshima University to share with me his considerable expertise in segmental lung resection to help me produce this textbook. Thanks to his suggestions based on the philosophy of Dr. Noriaki Tsubota and the lessons learned from my mentors, I felt that I could present a balanced view of the current techniques of radical segmentectomy for treating lung cancer. I am grateful to Professor Okada for countless valuable discussions during more than 3 years required to complete this textbook.

My journey towards mastering the techniques of oncologically sound pulmonary segmentectomy started around the year 2000 when the incidence of small peripheral lung cancers started to increase in Japan based on the development of CT screening throughout the country. Despite understanding the radiographic anatomy of pulmonary segments obtained during my residency at the National Cancer Center in Tokyo under the guidance of Dr. Shigeto Ikeda, I discovered that the correct identification of the segmental anatomy of pulmonary arteries, veins, and bronchi during surgery was not as easy as I expected. In fact, I generally needed almost 5 hours to complete an anatomical segmentectomy during the beginning stages of acquiring the surgical techniques!

This textbook contains numerous color figures which are from among the 4,000 or so illustrations of the pulmonary anatomy that I sketched during more than 450 segmental lung resections over the past 7 years at Kumamoto and Keio Universities. I believe that this textbook addresses the technical details of all types of pulmonary segmentectomy. Although the techniques described herein will be modified and improved as surgical techniques evolve, I believe that this book will continue to help thoracic surgeons to understand the specific details of lung segmental anatomy that will always remain unchanged.

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# Preface

I find surgery fascinating, so a fateful encounter with surgery is a notable event in my life. The goal of surgery is to achieve maximal treatment effects with minimal invasiveness and to preserve more function for patients. In that sense, radical hybrid VATS segmentectomy is considered an ideal approach for treating small lung cancers, the rate of which has recently increased worldwide.

The art of surgery is absolutely sharp dissection. Dr. Ronald H.R. Belsey (Frenchay Hospital, Bristol, England), Dr. F. Griffith Pearson (University of Toronto, Toronto, Canada), and Dr. Noriaki Tsubota (Emeritus President of Hyogo Cancer Center, Japan) developed specialized techniques for sharp dissection in the depths of the thorax using long, heavy Allison scissors in the "upside down" position, with the thumb and index or middle finger through the loops. Their greatest impact on surgery for lung disease has been the increased competence of a legion of trainees from all over the globe. Dr. Pearson told me in 2005 that he had just attended the 22nd meeting of the Japanese Association for Chest Surgery in Kyoto, where he had witnessed a detailed presentation of the indications, clinical experience, and results of radical anatomical segmentectomy. He explained that the presentations had included a summary of an already large body of clinical experience, including indications and detailed results, that the illustrations and videos of my procedures were crystal clear and that he would try to persuade his North American colleagues to review and try this approach and technology. That remark stimulated my enthusiasm for the development of segmentectomy for lung cancer.

I am eternally grateful to Drs. Belsey, Pearson, Tsubota, and my co-editor, Dr. Hiroaki Nomori for encouraging me to write this book. I look forward to continuing to serve present and future generations of thoracic surgeons as a renewable resource.

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# Contents