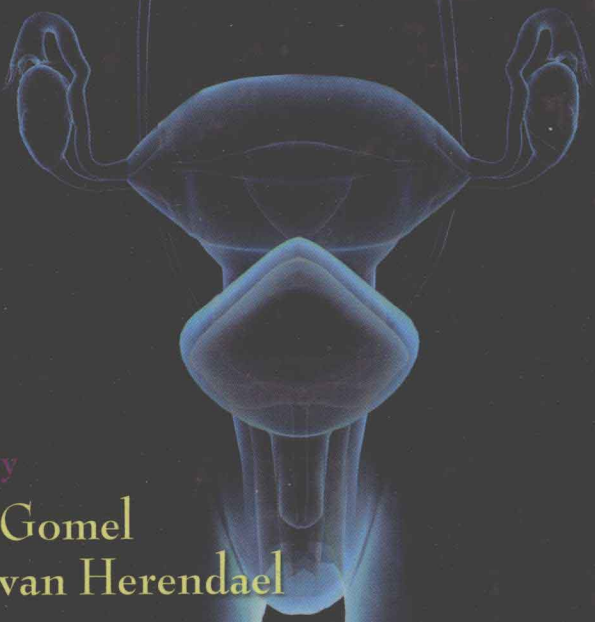
Female Genital Prolapse *and* Urinary Incontinence



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Foreword

When Victor Gomel and Bruno van Herendael asked me to write the foreword for *Female Genital Prolapse and Urinary Incontinence*, I felt proud and overwhelmed at the same time. The pelvic floor is the last new frontier in minimally invasive surgery for gynecologists. I have been privileged to witness this evolution over the past two decades.

As one would expect, endoscopic surgical procedures are the focus of this book, but adequate emphasis is placed on diagnostic investigations and the overriding need for a team approach to the diagnostic and therapeutic challenges of pelvic organ prolapse in the female patient. This multidisciplinary approach is highlighted by the range of specialties represented by the authors of this book. A comprehensive array of clinical as well as radiographic investigations are discussed and reviewed. I can confidently say that *Female Genital Prolapse and Urinary Incontinence* provides a comprehensive analysis of this important clinical entity, which is important due to its prevalence and the conundrum of its pathophysiology.

The keen endoscopic surgeon will not be disappointed. The surgical procedures presented in detail are up-to-date, representing the latest minimally invasive approaches to treatment of pelvic organ prolapse. The various procedures are grouped according to the anatomical division of the anterior, middle, and posterior compartments. There is no particular bias in the selection of procedures presented. The technical description is superb and to the point. For anyone versed in minimally invasive surgery, there is little effort required to fully understand every aspect of the intervention.

Where feasible, the authors have substantiated their choice of surgical maneuvers with good science. Clinical studies are presented or reported to corroborate claims of adequacy and superiority of one method over another.

I commend the authors and editors for their professionalism and excellence in presenting their great contributions to our specialty. There is no doubt that readers will thoroughly enjoy this work as I have.

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Preface

Genital prolapse and urinary incontinence are common conditions that afflict women, especially in their postmenopausal years, and adversely affect their quality of life. Increasing life expectancy has augmented the proportion of the graying population. This, together with improved living conditions and much easier access to information, has increased the demand on the part of women for treatment of such anatomical and functional conditions that afflict them, along with their expectations of the outcomes.

In a parallel fashion, in the last 20 years we have witnessed the introduction of new surgical techniques for the treatment of both genital prolapse and urinary stress incontinence. Many of the traditional techniques have been modified and used by laparoscopic access. New and simpler techniques have been introduced to treat urinary stress incontinence. Most of these are designed to support the urethra by the placement of a strip of mesh using specially designed needles and various routes of introduction.

Dysfunction of the pelvic organs in the female is closely related to disruption of anatomy. Knowledge of anatomic changes in function of the disease is essential for successful reconstructive surgery. This prompted us to open the book with a chapter on anatomy that addresses functional changes. In the same spirit we included chapters on clinical investigation and urodynamic and radiological investigations, to define their roles in the elucidation of genital organ prolapse and urinary incontinence.

Cysto-colpo-defecography has become the keystone in the preoperative investigation of many patients, because this technique is able to pinpoint the defects in a dynamic fashion, not infrequently contradicting the clinical findings. Definitions of different abnormalities and a scoring system that allows the clarification of the extent of the problem have also been included.

In crafting the book we attempted to follow a logical sequence by dividing it into sections. Following the Introduction are three sections: the anterior, mid, and posterior segments, which represent the anatomical segments of the pelvis.

The section on the anterior segment, composed of six chapters, brings together the surgical techniques primarily used in the treatment of urinary incontinence. Data from large series are presented to compare outcomes achieved by the various available mesh techniques. Also included in this

section are chapters on paraurethral treatments, which are less invasive interventions and may be further developed in the future, and computer-based artificial sphincters that provide a treatment option when all others have failed.

The section on the mid segment begins with hysterectomy, which remains the most frequently performed major gynecologic operation. This section details specific measures to prevent subsequent vault prolapse. Each of the subsequent four chapters presents a different method for the treatment of vault prolapse and lateral sidewall prolapse, aimed at obtaining a functional result. The total mesh approach is compared with the traditional suspension methods, now adapted to laparoscopic surgical access.

The section on the posterior segment has two chapters in which the classical approaches are reviewed and compared to a new laparoscopic rectal suspension technique.

In view of the many developments mentioned here, we believe that the publication of this book is timely. The 16 chapters, written by internationally recognized experts, review the pertinent aspects of the field of female genital prolapse and urinary stress incontinence, describe in detail both the more traditional and newer surgical procedures, and discuss their place and outcomes.

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Contents

Part I: Introduction

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Dynamic Anatomy of the Pelvic Floor

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INTRODUCTION

Before taking off it would be interesting to know how to land.

—Arnaud Wattiez

Multiple challenges await the surgeon who operates on the pelvic area. Although specific anatomical landmarks define the limits of the operating field as in any other surgical field, very specific situations exist in this area:

- Nerve-sparing surgery becomes mandatory to retain the function of the different organs.
- Pressure gradients in the different compartments play an important role in the postoperative success rate for suspension surgery.
- The anatomical and functional interaction of the organs is very important to guarantee normal function of both the sexual and voiding aspects of daily life.

These factors make pelvic surgery in the female a challenge. A thorough knowledge is necessary not only of pelvic anatomy, vascular-nervous-muscular-ligamental-fascial-virtual and physical spaces (foramina), and bony structures, but also of the mechanical forces and physiological processes.

Pelvic surgeons have to realize that there exist two different anatomies: the one that is described in anatomy books and observed in cadaver dissections and the one that is encountered during surgery. We need to find specific solutions for the specific patient.

It would be ideal to have a three-dimensional virtual reality picture of the patient's anatomy to properly assess the condition before making surgical decisions (Figs. 1–3).

Virtual reality imaging is not yet available, but the spiral CT scan provides detailed imaging (Figs. 4–7). Computer software programs provide the capability to produce moving images from the sequence of still pictures. By sailing through the tissues the viewer gets the impression of a virtual reality image.

The aim of this chapter is to provide a pictorial description of the female pelvis combining anatomical, physiological, and functional data.

The pelvis of the human female is divided into three functional entities: (*i*) the anterior compartment; (*ii*) the mid compartment; and (*iii*) the posterior compartment (Fig. 8).

The Anterior Compartment

Bone: Starting front to back this compartment contains: the pubic bone, consisting of the superior pubic ramus, the pectineal line (pectin Ossis pubis) ending median in the pubic tubercle, the crista obturatoria, the inferior pubic ramus and the ramus of the ischial bone.

Foramina: The main foramen in the anterior compartment is the obturator foramen delineated anteriorly by the superior pubic ramus and the inferior pubic ramus. This entity is sealed by the obturator membrane and leaves

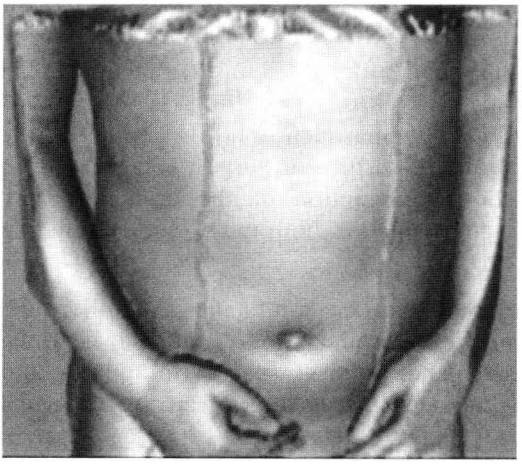

Figure 1 This view is similar to what the physician would see looking at the patient. *Source*: Courtesy of J. Marescaux IRCAD/EITS University of Strasbourg, France.

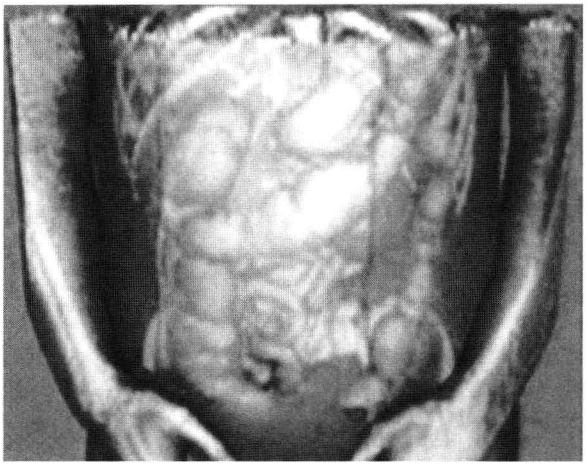

Figure 2 The images, obtained by spiral CT scan of the same patient are treated by computer subtraction of elements to visualize the internal organs. *Source*: Courtesy of J. Marescaux IRCAD/EITS University of Strasbourg, France.

openings superior and lateral under the superior ramus: the obturator channels.

Fascia: These include the urogenital fascia (inferior and superior fascia diaphragmatis urogenitalis), which incorporate the median and lateral pubovesical ligaments anteriorly; the vesicocervical fascial fibers (pubocervical or urogenital); and the tendineus arch of the levator ani muscle. The fascia is the border between the anterior and mid compartments.

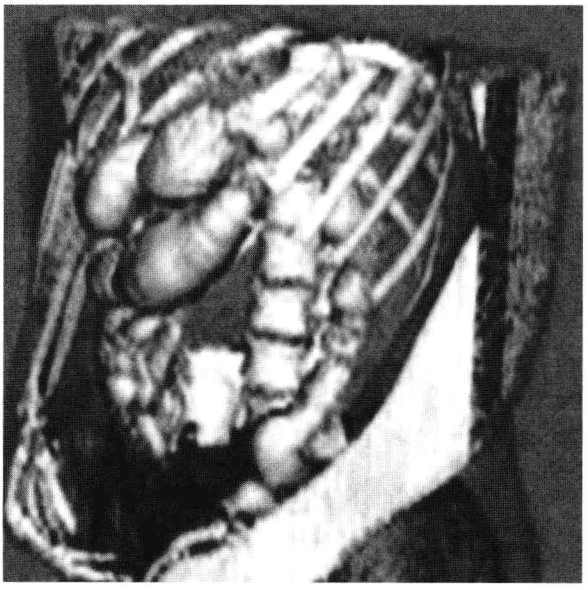

Figure 3 The computer subtraction of elements is now complete, leaving only the study objects, the colon, and the bony elements to be considered. These images can be rotated to visualize the subject from different angles. *Source*: Courtesy of J. Marescaux IRCAD/EITS University of Strasbourg, France.

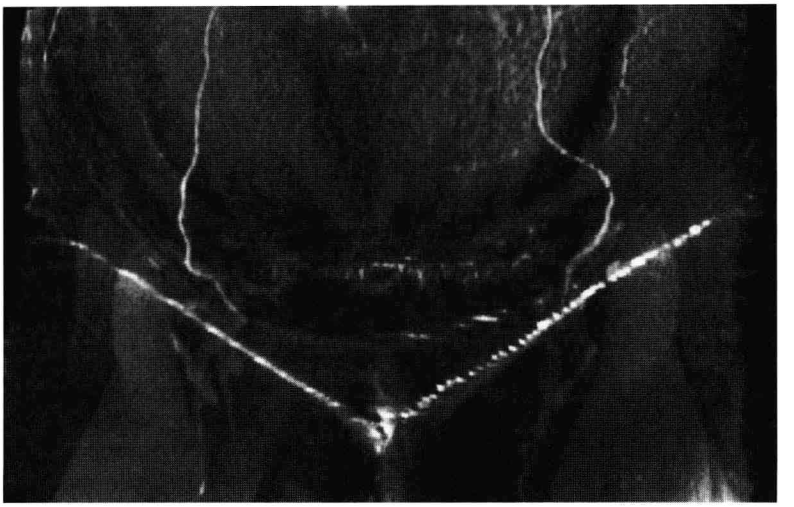

Figure 4 Spiral CT scan image of the frontal view of the lower abdomen. Note the course of the epigastric arteries from the inguinal region to the umbilicus.

Figure 5 The image may be tilted (in the transverse position here) to visualize the pelvic area in the conventional way.

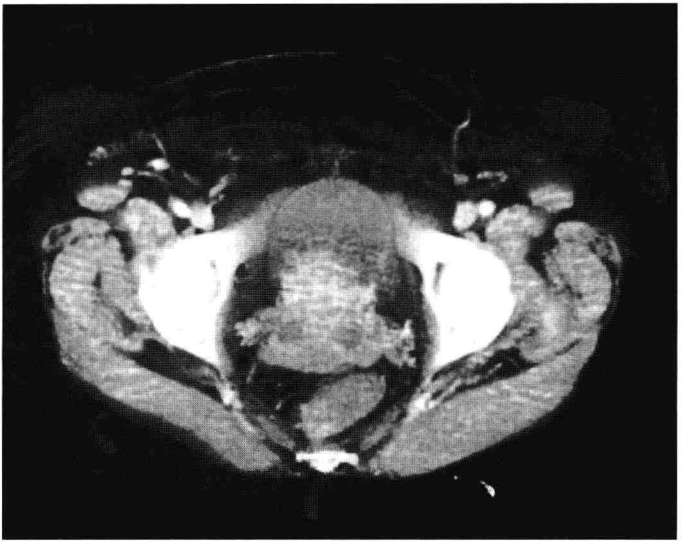

Figure 6 In this image, the lower pelvic area is seen with the bladder in front of the uterus. The bony structures of the pelvis are seen along with the different muscular structures. Note the blood vessels at the level of the inguinal canal, the femoral artery and vein, and the vena saphena magna running down the inner aspect of the leg.

Ligaments: The symphysis pubis with the superior pubic ligament and Cooper's ligaments over the superior pubic ramus are the more important landmarks for the surgeon. The other ligaments encountered when moving from anterior to posterior are: the median and lateral pubovesical ligaments, the inguinal ligament (Poupart's), and the round ligament over its most distal part in the inguinal canal. There are also the arcuate pubic ligament and the transverse perineal ligament.

Muscles: Laterally from the exterior toward the center are the obturator muscle and the anterior aspect of the levator ani muscle. Anteriorly and superiorly are the layers of the rectus abdominal muscle. The deepest part of the female pelvis is closed, anterior by part of a transverse muscle layer surrounding the genital hiatus composed of the ischio-cavernosus, laterally and the bulbo-spongiosus delineating the vagina. Both muscles rest on and are part of the deep transverse perineal muscle.

Nerves: Knowledge of the location and function of the various neural structures and their preservation are essential for the successful outcome of the surgical intervention. The neurological structures of this compartment are: the femoral nerve, the ilio-inguinal nerve, superficial and deep branches of the perineal nerve, the perineal branch of the posterior femoral cutaneous nerve, and the pudendal nerve (somatic) from the sacral plexus (S2–S4).

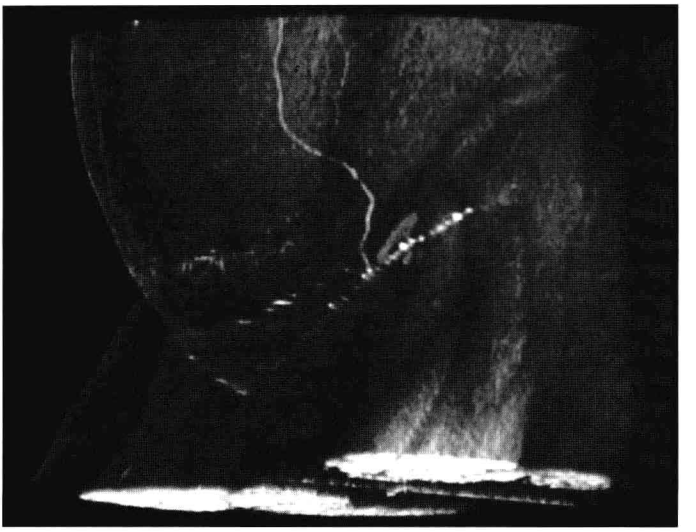

Figure 7 Once the coronal view is analyzed the image can be tilted to a transverse position. The lower body is now turned from the frontal view toward the side by 20°. Note the course of the epigastric artery.

Both sensory and somatic fibers from the lower vagina and the perineum accompany the pudendal nerve. The urinary bladder and the lower ureter are serviced by pre- and post-ganglionic sympathetic and parasympathetic fibers.

- Parasympathetic from S2-S3-S4 (vesical plexus) responsible for transudation at the vaginal level and erection at the level of the clitoris.
- Sympathetic from L1 to L2: the plexus hypogastricus superior ending in the nervus hypogastricus to form the plexus hypogastricus inferior and the plexus uterovaginalis (plexus of Frankenhäuser) terminating in the nervus vaginalis. The main action of these sympathetic fibers is contraction.
- Somatomotoric and somatosensitive: from S2 to S4 the nervus pudendus ending at this level in the nervus dorsalis clitoridis and the nervi labiales posteriores. The main action of the nerve fibers is contraction.

Vessels: Superior and inferior vesical arteries and veins (branches respectively of the umbilical artery and vein and the middle rectal artery and vein) supply the bladder. The vagina gets its blood supply through the vaginal artery and vein (branches of the internal iliac artery and vein). The anterior compartment also contains the inferior epigastric artery and vein (branches of the external iliac artery and vein), a structure best avoided during laparoscopic entry.