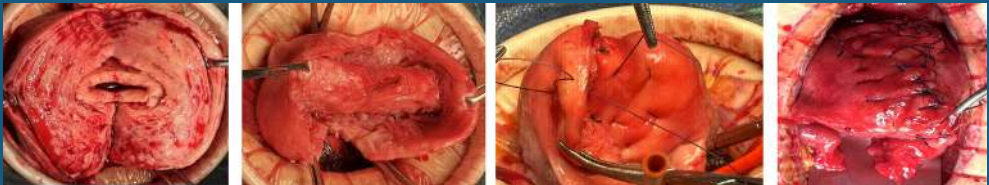


Ruifang WU, Liping ZENG, and Xinfeng QU
(Editors-in-Chief)

PUSH Approach

*Innovations on Fertility-Reconstructive
Surgical Procedures for Diffuse Uterine
Pathologies*



**ADENOMYOSIS
& HUMAN
FERTILITY**

PUSH Approach

Innovations on Fertility-Reconstructive Surgical Procedures for Diffuse Uterine Pathologies

Ruifang WU, Liping ZENG, and Xinfeng QU
(Editors-in-Chief)

This book introduces a novel surgery for treating diffuse adenomyosis (DAD) and diffuse uterine leiomyomatosis (DUL), two conditions commonly encountered in women of reproductive age. Both diseases share similar symptoms, including dysmenorrhea, menorrhagia, uterine enlargement, and infertility. For severe cases of DAD and DUL, surgical approaches are often the only option to preserve or restore a patient's fertility, though it presents significant challenges. The PUSH (Process for Uterine Structural Healing) Approach, a novel approach developed by a team led by Dr. Ruifang Wu and Dr. Liping Zeng from Peking University Shenzhen Hospital (PUSH), provides a surgical solution for patients with DAD and DUL. The data of over 500 DAD and 60 DUL patients who underwent the PUSH Approach and the pregnancy outcome from some of them demonstrate that it is highly effective in achieving radical excision of DAD/DUL lesions, resulting in symptom relief and satisfactory preservation of the functional uterine anatomy for fertility. This book explains the rationale and mechanism, detailed procedures, and perioperative management of the PUSH Approach, with particular focus on its features, which form the basis for lesion type- and location-specific surgical protocols.

This book not only provides significant referral information about PUSH Approach to professionals but also conveys key messages on uterine health and fertility preservation to all readers.

ISBN : 978-2-7598-3885-1



ed sciences
www.edsciences.org

SCIENCE PRESS

Current Natural Sciences

Ruifang WU, Liping ZENG,
and Xinfeng QU (Editors-in-Chief)

PUSH Approach

Innovations on Fertility-Reconstructive
Surgical Procedures for Diffuse Uterine
Pathologies



SCIENCE PRESS



Printed in France

EDP Sciences – ISBN(print): 978-2-7598-3885-1 – ISBN(ebook): 978-2-7598-3886-8
DOI: 10.1051/978-2-7598-3885-1

All rights relative to translation, adaptation and reproduction by any means whatsoever are reserved, worldwide. In accordance with the terms of paragraphs 2 and 3 of Article 41 of the French Act dated March 11, 1957, “copies or reproductions reserved strictly for private use and not intended for collective use” and, on the other hand, analyses and short quotations for example or illustrative purposes, are allowed. Otherwise, “any representation or reproduction – whether in full or in part – without the consent of the author or of his successors or assigns, is unlawful” (Article 40, paragraph 1). Any representation or reproduction, by any means whatsoever, will therefore be deemed an infringement of copyright punishable under Articles 425 and following of the French Penal Code.

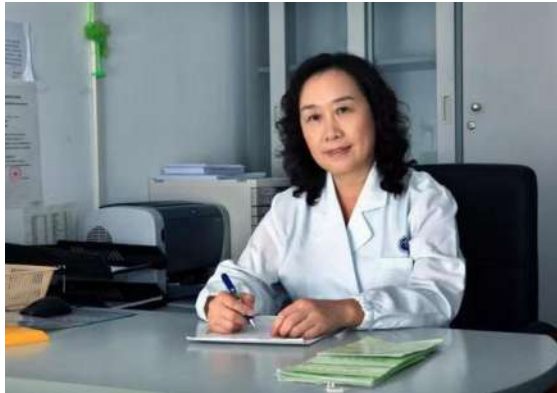
This book cannot be reproduced or used for training artificial intelligence systems. Text and data mining is prohibited in accordance with Article 4(3) of Directive (EU) 2019/790.

The printed edition is not for sale in Chinese mainland.

© Science Press, EDP Sciences, 2026

About the Editors-in-Chief

Ruifang Wu



Dr. Ruifang Wu is currently a Professor at Peking University in Obstetrics & Gynecology and serves as the Chair of the Obstetrics & Gynecology Institute at Peking University Shenzhen Hospital (PUSH). With over 40 years of medical practice, she devoted 21 years as the Director of the Department of Obstetrics & Gynecology at PUSH. As the principal investigator, she has designed and led numerous clinical trials, including five international collaborative cross-sectional research projects and multiple multi-center clinical trials. Her research covers a wide range of areas, including cervical cancer prevention, cervical precancer treatment, female fertility preservation, and the development of innovative surgical procedures. Dr. Wu has gained international recognition for her contributions in validating new technology for cervical cancer screening, creating new models for screening, developing and validating protocols for triaging primary HPV positives, popularizing innovative treatment technologies for cervical precancers, and advancing in-facility

preservative surgery for diffuse adenomyosis. She has published over 300 papers in journals.

Some notable research projects led by Dr. Wu as Principal Investigator include the China Multiple Center Cervical Cancer Screening Trial (CHIMUST). Additionally, she served as Co-Principal Investigator on significant collaborative trials in China, such as the Shenzhen Cervical Cancer Screening Trial II and III (SHENCAST II & III), China Cervical Cancer Screening Study (CHICAPS), and the National Institutes of Health/National Cancer Institute (NIH/NCI) awarded clinic trial, “Comparison of cervical intraepithelial neoplasia 2/3 treatment outcomes with a portable LMIC-adapted thermal ablation device *vs.* gas-based Cryotherapy”.

Dr. Wu’s recognition is further evidenced by her public service roles, including Chairperson of the Chinese Society for Fertility Preservation of the Chinese Preventive Medicine Association (CSFP); Vice Chairperson of the Obstetrics & Gynecology Committee of the Female Physician Committee of China; Member of the Reproductive Endocrinology Specialists Committee of the Obstetrics & Gynecology Subsidiary of the Chinese Medical Association; Executive Member of the Chinese Society of Colposcopy and Cervical Pathology (CSCCP); Member of the Council for the Committee of Shenzhen of the Chinese Medical Association; and Guest Editor for various journals, including the Chinese Journal of Obstetrics and Gynecology, Journal of International Obstetrics and Gynecology, Gynecology and Obstetrics Clinical Medicine (GOCM), and the Chinese Journal of Clinical Obstetrics and Gynecology.

Liping Zeng



Prof. Liping Zeng is the Chief Physician and Director of the Reproductive Surgery Department at the Obstetrics & Gynecology Center of Peking University Shenzhen Hospital. She has worked in gynecological education and clinical practice for

35 years, specializing in gynecological reproductive surgeries, the diagnostics and therapeutics of gynecological endocrine diseases, and minimally invasive surgeries for fertility preservation.

Over the past 15 years, Dr. Liping Zeng, as the co-principal investigator of the reproductive surgery team, played a core role in the development and optimization of the PUSH Approach. Meanwhile, she has dedicated herself to research in fertility preservation therapeutics with remarkable achievements evidenced by more than 38 scientific publications, 12 SCI collected publications, 10 national and provincial research funds, and authorship in two academic books.

She also holds positions as a Member of the Standing Committee and Secretary-General of Fertility Preservation of the Chinese Preventive Medicine Association (CSFP), Deputy Director of the Family Planning Division of the Shenzhen Medical Society, Deputy Leader of the Female Fertility Protection Group of the Maternal and Child Health Industry Branch of the National Health Industry Enterprise Management Association, and a member of the first council of the Obstetricians and Gynecologists Branch of the Shenzhen Medical Doctor Association, among others.

Xinfeng Qu



Xinfeng Qu, MD, is a core fellow of the “Sanming Project” at Peking University Shenzhen Hospital. He previously served as a senior researcher at Preventive Oncology International (POI) and Basic Health International (BHI). Dr. Qu has decades of experience in clinical research, specializing in research project design, implementation, and evaluation, particularly in program quality assurance mechanisms. As a key member of research teams, he has served as Site Coordinator in several internationally collaborative investigator-initiated clinical trials, including “Shenzhen Cervical Cancer Screening Trial II” (SHENCAST II), “China Cervical Cancer Prevention Study” (CHICAPS), and “China Multi-center Cervical Cancer

Screening Trial” (CHIMUST). He was also the China coordinator for two NIH/NCI-funded international multi-center clinical trials: “A randomized controlled trial comparing cure rates of cervical intraepithelial neoplasia grade 2 and higher (CIN2+) treated with CO₂-based cryotherapy, CryoPen®, and thermoablation” (HU3 funds) and “Comparison of cervical intraepithelial neoplasia or higher 2/3 (CIN2+) treatment outcomes with a portable LMIC-adapted thermal ablation device *vs.* gas-based cryotherapy” (jointly funded by NIH/NCI RO1 and Gateway funds). Additionally, he is the core investigator of a study titled “Self-Collected Cervical Cancer Prevention Study” (SCOCCAPS), which focuses on evaluating an internet-facilitated community model and online approach for self-collected cervical cancer screening, as well as assessing positive triage algorithms specifically for self-collected screening.

In recent years, he has been listed as a main author or a corresponding author on more than 20 publications. He served as the Deputy Editor-in-Chief, the Deputy Translator-in-Chief, and one of the core translators of published academic monographs: “PUSH Surgery-A Fertility-Preservative Surgery for Diffuse Adenomyosis With Process for Uterine Structure Healing,” “Benign Diseases in Female Lower Reproductive Tract,” and “Gynecological Oncology”, respectively.

Contributors

Editors-In-Chief

Ruifang WU
Liping ZENG
Xinfeng QU

Deputy Editors

Changzhong LI, Peking University Shenzhen Hospital
Yan LIU, Fudan University Huashan Hospital
Hui DU, Peking University Shenzhen Hospital
Qicai HU, Peking University Shenzhen Hospital
Wei ZHANG, Peking University Shenzhen Hospital

Editors *(in alphabetical order by surname)*:

Wenkui DAI
Hui DU
Chunlei GUO
Qicai HU
Xin JIANG
Changzhong LI
Yan LIU
Yinghong PAN
Xinfeng QU
Xiuli SUN
Chun WANG
Nan WANG
Weixia WEI
Ruifang WU
Yingjuan YU
Dachuan ZHANG
Wei ZHANG
Liping ZENG
Yucui ZENG

Foreword

We are thrilled to discover that a team led by Professor Ruifang Wu and Professor Liping Zeng has proposed a fertility-preserving surgical procedure for diffuse uterine pathologies, which was developed by modifying the well-recognized “Triple-Flap” procedure with some technical and procedural innovations that are composed to be a **process for uterine structural healing (PUSH)**, which made the modified procedures distinguishable from its origin, and is known as the PUSH Approach. To develop and optimize the PUSH Approach, they have dedicated over 15 years to research and clinical exploration. Drawing from a comprehensive understanding of the histological and physical characteristics of uterine anatomies, they designed and developed inventive surgical procedures and techniques to facilitate the radical removal of diffuse uterine lesions while ensuring the protection of functional uterine anatomies.

Diffuse Uterine Pathologies (DUP) commonly occur among women of childbearing age and cause infertility and intolerable pain that significantly impacts the quality of life of these patients. DUP mainly refers to diffuse adenomyosis (DAD) and diffuse uterine leiomyomatosis (DUL), which are histologically characterized by the diffuse invasion of ectopic endometrial tissues into the myometrium and the dense distribution of numerous myomas within the myometrium, respectively. Drug therapy for DAD usually does not provide sustainable relief from intolerable symptoms. Most patients with severe DAD have to undergo a hysterectomy, resulting in the loss of fertility. Although surgical approaches enable the excision of myomas in DUL patients without the need for hysterectomy, conventional methods are often associated with incomplete removal of lesions, a high rate of recurrence, and subsequent infertility.

To treat DAD and in referring to the “triple-flaps” procedure, the team developed multiple skills for lesion excision, optimized the surgical procedures for uterine reconstruction, and introduced innovative techniques such as vertically penetrative mattress sutures (VEPMAS) and muscle flap wrinkling overlapping (MUFWRO). These skills and technologies work well to protect the cervical mucosa, minimize injury to the endometrium, and preserve the functional uterine anatomy while radically excising the DAD lesions, enabling the surgeons to achieve sufficient thickness and pressure tolerance for the reconstructed uterus. PUSH Approach is a

surgical approach that can alleviate patients' symptoms and sustainably and effectively restore their fertility.

To treat DUL, the team employs innovative skills and technology in surgical procedures to address the challenges of radical excision of DUL lesions and reconstruction of the uterus. They excise numerous myomas radically and reconstruct the uterus with MUFWRO to protect and restore uterine anatomy for fertility. They achieved satisfactory outcomes regarding the elimination of patients' intolerable symptoms and restoration of fertility.

Undoubtedly, the innovations in the PUSH Approach offer a novel approach for DUP treatment aimed at preserving patients' fertility. More than 500 DAD patients and 60 DUL patients from 25 provinces nationwide have accepted the PUSH Approach. Data from follow-ups on those patients show very satisfactory therapeutic outcomes. The PUSH Approach is now adopted by several hospitals in Mainland China. The team is maintaining and will continue follow-ups with all the patients who have undergone and will undergo the PUSH Approach, in order to collect more data for evaluating the long-term outcomes of the PUSH Approach.

This book provides readers with exhaustive descriptions of the indications, contraindications, essential surgical procedures, lesion excision, and uterine reconstruction techniques and skills, optional solutions for various lesion conditions, perioperative patient management, and postoperative pregnancy instructions, all of which are highly instructive and practical for gynecological clinical practice. It is a valuable reference book for gynecologists and physicians in relevant areas.

For all of the above, I write this foreword for the book.

Lihui Wei

Professor of Peking University People's Hospital

Honorary Director of the Obstetrics & Gynecology System of Peking University
Chairperson of the Chinese Society of Colposcopy and Cervical Pathology (CSCCP)

Preface

In this book, we try to provide readers with exhaustive descriptions of an innovative surgical approach for diffuse adenomyosis (DAD) and diffuse uterine leiomyomatosis (DUL), two diseases that commonly occur in women of childbearing age. These conditions share symptomatic problems such as dysmenorrhea, menorrhagia, anemia, uterine enlargement, and infertility, and they have significant negative impacts on patients' fertility and quality of life.

Conventionally, until now, surgical treatment has been the only approach for patients suffering from severe DAD/DUL who hope to preserve their fertility. These diffuse uterine pathologies have long been recognized as “impossible for complete cure”, as conventional surgical methods often fail to eliminate the lesions and prevent recurrence. Many patients have had to painfully accept a hysterectomy, resulting in the loss of their fertility, even when some were eager to have a baby.

The challenge of radically excising the DUP lesion for symptom improvement while adequately protecting the uterus for fertility recovery has generated significant demand within the medical community for more effective approaches. With over more than 15 years of diligent exploration, experimentation, and optimization, our team — the reproductive surgical team from the Gynecology Center of Peking University Shenzhen Hospital (PUSH) — has developed a fertility-preserving surgical procedure for DUP through modifying the “Triple-Flap” procedure with technical and procedural innovations tending to achieve both long-term symptom relief and safe pregnancy. We gave the modified surgical procedure a name: “Fertility-reconstructive approach for diffuse uterine pathologies with a **p**rocess for **u**terine **s**tructural **h**ealing” or PUSH Approach, to distinguish it from its origin and to address its effectiveness in facilitating the radical excision of DUP lesions while properly protecting the uterine anatomy. Data from follow-ups with more than 500 DAD patients and over 60 DUL patients who underwent the PUSH Approach demonstrate satisfactory outcomes in terms of sustainable symptomatic relief and fertility restoration. The success of the PUSH Approach is altering the conventional understanding of DUP treatment. With the PUSH Approach, we have opened a door for patients suffering from DUP who strongly desire to preserve their fertility.

In this book, we aim to introduce the PUSH Approach, focusing on its rationales and mechanisms, detailed surgical techniques, perioperative patient management, and case analyses. The introduction of the PUSH Approach in this book also includes alternative solutions for the challenging conditions we may encounter in the treatment of DUP patients.

Written on each page of the book are the concerns of the team for our patients, the commitment of the team to medical innovations, and the aspirations of the patients for new lives. With the publication of this book, I express my deep thanks and sincere gratitude to all team members for their unwavering efforts and outstanding contributions to the development of the PUSH Approach, to all the patients who underwent the PUSH Approach for their trust in us and their high level of cooperation, to all the medical colleagues for their encouragement and recognition of our work, to the editors for their hard work in making this book published, and, especially, to Professor Lihui Wei for her foreword for this book.

Ruifang Wu, MD
Liping Zeng, MD
Xinfeng Qu, MD

Contents

About the Editors-in-Chief	III
Contributors	VII
Foreword	IX
Preface	XI
CHAPTER 1	
Introduction	1
References	4
CHAPTER 2	
Overview of Diffuse Uterine Pathologies	5
2.1 Diffuse Adenomyosis	5
2.1.1 Etiology and Pathogenesis	6
2.1.2 Clinical Classification and Imaging Examination	10
2.1.3 Clinical Manifestations	15
2.1.4 Key Points for AD Diagnostics	17
2.1.5 Principles for AD Treatments	17
2.1.6 Impairment of Reproductive Function and Preservation of Fertility	19
2.2 Diffuse Uterine Leiomyomatosis (DUL)	21
2.2.1 Etiology and Pathogenesis	21
2.2.2 Clinical Classification	21
2.2.3 Clinical Manifestations	23
2.2.4 Diagnostic Points	23
2.2.5 Principles of Treatment	26
References	27
CHAPTER 3	
Innovations of PUSH Approach for Diffuse Lesions on Uterus	33
3.1 Innovations in Surgery and Evaluations	33
3.1.1 IDEAL Framework for Novel Surgery Evaluation	34

3.1.2	Renovation of Surgical Concepts for Diffuse Uterine Pathologies	35
3.2	Indications and Contraindications for Surgery	37
3.2.1	The Indications for PUSH Approach	37
3.2.2	Contraindications for PUSH Approach	38
3.3	The Innovations and Advantages of PUSH Approach	38
3.3.1	Techniques for PUSH Approach to Reshape the Uterus	39
3.3.2	Skills for Excising Lesions in the Functional Anatomies of the Uterus	40
3.3.3	The Advantages of PUSH Approach for the Treatment of Diffuse Adenomyosis	41
	References	43

CHAPTER 4

	<u>PUSH Approach for Diffuse Adenomyosis</u>	<u>45</u>
4.1	The Procedures and Techniques of the PUSH Approach for Diffuse Adenomyosis	47
4.1.1	The Essential Steps of the PUSH Approach	47
4.1.2	Technical Requirements for PUSH Approach	57
4.2	Protecting Functional Uterine Anatomy with the PUSH Approach	58
4.2.1	Protection of the Cervical Canal Mucosa	59
4.2.2	Protect the Anatomy of the Interstitial Region of the Fallopian Tubes	61
4.2.3	Protect the Endometrium from Damage	63
4.2.4	Maintain the Integrity of the Musculature from the Fundus to the Uterine Horn	66
4.2.5	Ensure the Reconstructed Myometrium has Sufficient Thickness for Pressure Tolerance	66
4.3	Challenges and Solutions of the PUSH Approach for Diffuse Adenomyosis	72
4.3.1	Incision Positioning	72
4.3.2	Resection of Lesions that Invade the Functional Uterine Anatomies (FUA)	72
4.3.3	The Procedures for the PUSH Approach for a Typical DAD	83
4.4	Perioperative Management, Postoperative Follow-Up, and Birth Management of DAD Patients	94
4.4.1	Preoperative Evaluation and Perioperative Monitoring	94
4.4.2	Postoperative Management and Long-Term Follow-Ups	95
4.4.3	Management of Fertility and Childbirth	95
4.5	Evaluation of PUSH Approach for DAD	96
4.5.1	Method for Evaluating Surgical Efficacy	96
4.5.2	The Short- and Long-Term Efficacy of the PUSH Approach	97
4.6	The Potential Complications and Preventive Measures	97
4.6.1	Uterine Hematoma	97
4.6.2	Postoperative Bleeding	98

4.6.3	Uterine Arteriovenous Fistula	98
4.6.4	Postoperative Intrauterine Adhesions	99
4.6.5	Uterine Rupture	99
4.6.6	Regular Follow-Ups	99
References		99

CHAPTER 5

PUSH Approach for Diffuse Uterine Leiomyomatosis		103
5.1	Procedures and Techniques of the PUSH Approach for Diffuse Uterine Leiomyomatosis	106
5.1.1	The Initial Operational Steps	106
5.1.2	Resection of Myomas	107
5.1.3	Reconstruction of the Uterus	120
5.1.4	Anti-Adhesion Management	122
5.2	Special Types of Diffuse Uterine Leiomyomatosis	122
5.2.1	Millimeter Myomas Clustered in the Submucous Myometrium and Spread Throughout the Entire Endometrium	122
5.2.2	Myomas not Invading the Endometrium	123
5.2.3	Diffuse Uterine Leiomyomatosis with a Large Myoma at the Isthmus or Cervix	124
5.2.4	On a Uterus that was Severely Damaged by Multiple Previous Operations	125
5.3	Preserving Important Functional Uterine Anatomies Through the PUSH Approach in Cases of Diffuse Uterine Leiomyomatosis	126
5.4	Perioperative Management and Postoperative Follow-Up for Patients Undergoing the PUSH Approach for Diffuse Uterine Leiomyomatosis	126
5.4.1	Preoperative Evaluation and Perioperative Monitoring	126
5.4.2	Postoperative Follow-Up	127
References		128

CHAPTER 6

Questions and Answers (Q/A)		129
6.1	Q/A On the PUSH Approach	129
6.2	Q/A On the Option of the PUSH Approach	130
6.3	Q/A On Common Concerns After the PUSH Approach	132
6.4	Q/A On the Procedures of the PUSH Approach	133
6.5	Q/A Regarding Perioperative Management and Fertility Issues After the PUSH Approach	135

CHAPTER 7

Case Analysis	137
7.1 Case 1. Spontaneous Labor Lasted for 2 h, Showing a Good Tolerance to Uterine Contractions of the Uterine Wall Reconstructed with the PUSH Approach	137

7.2	Case 2. Live Birth Following a Cervical Cerclage During the PUSH Approach for DAD Invasion Resulted in Cervical Insufficiency	140
7.3	Case 3. Two Full-Term Cesarean Sections Following Three Natural Pregnancies After the PUSH Approach for Diffuse Adenomyosis	145
7.4	Case 4. Uterine Arteriovenous Fistula Following the PUSH Approach Resulting in Hysterectomy	147
7.5	Case 5. Satisfactory Outcome Achieved by Reperforming the PUSH Approach for Recurrence.	150
7.6	Case 6. Treatment of Diffuse Uterine Leiomyomatosis with the PUSH Approach, in Which the Uterus Was Filled with Sub-Endometrial Lesions	154
7.7	Case 7. Diffuse Uterine Leiomyomatosis Complicated by Fumarate Hydratase Deficiency (FHD)	157
	References	162

Chapter 1

Introduction

Adenomyosis (AD) is a common condition among women of childbearing age. The prevalence of AD has been reported as 24.4% in infertile populations and up to 40% in women over 40 years old (Abu Hashim *et al.*, 2020; Puente *et al.*, 2016). The clinical manifestations of AD primarily include progressive dysmenorrhea, significantly increased menstrual volume, consequent anemia, infertility, and diffuse uterine enlargement.

Diffuse Adenomyosis (DAD), also known as the severe type of AD, is characterized by intolerable pain that significantly affects women's lives and can lead to infertility. No medical therapy is definitively effective except for hysterectomy for severe cases. According to reports in recent years, DAD is trending toward increased incidence and younger onset. Balancing symptomatic relief with fertility preservation and restoration has always been, and continues to be, a challenge and the focus of surgical treatment for DAD.

Diffuse Uterine Leiomyomatosis (DUL) is a rare type of uterine fibroid characterized by the dense distribution of numerous benign smooth muscle tumors throughout the uterine wall, with diameters ranging from less than 1 mm to 3 cm. The tumors can fuse and are often indistinguishable from surrounding tissues. The clinical manifestations of DUL primarily include heavy menstrual bleeding and infertility, accompanied by uterine enlargement that can reach a size corresponding to 3–4 months of gestation. A conservative myomectomy often results in rapid recurrence due to incomplete removal of the tumors, which may lead to pelvic and/or uterine adhesions, consequently compromising patients' fertility.

The presence of DAD-related infertility predominantly affects women of childbearing age who often strongly desire to have a baby. Conventional surgical approaches present a dilemma regarding the radical removal of DAD lesions and the adequate preservation of essential uterine anatomy: to maximize symptom improvement and reduce recurrences, excessive tissue excision is necessary, which compromises uterine integrity and weakens the uterus's ability to withstand increased tension during future pregnancies. To address this dilemma, investigators worldwide have explored various conservative surgical approaches that focus on completely removing DAD lesions to alleviate intolerable symptoms while sufficiently preserving the important functional anatomy of the uterus for fertility.

recovery. Surgical approaches for preserving fertility in DAD patients are categorized based on the extent of lesion removal into the following:

- **Complete excision approaches**, represented by the “Triple-flap approach” reported by Japanese investigators (Osada *et al.*, 2011);
- **Partial excision approaches**, including the “H-incision approach” (Fujishita *et al.*, 2004) and wedge-excision of the uterine wall (Nishida *et al.*, 2010); and
- **Non-excisional approaches**, such as endometrial ablation, uterine artery embolization (UAE), and high-intensity focused ultrasound (HIFU) (Mikos *et al.*, 2020).

However, the outcomes of reported fertility-preserving surgical approaches vary significantly in terms of the rates of postoperative pregnancies, the occurrence of postoperative complications, and the rates of recurrence. Such significant diversity is due to the limited cases performed with such surgeries, the high heterogeneity of DAD lesions, and the unstandardized criteria in evaluating surgical outcomes. High-quality multicenter controlled study data are currently lacking.

As DAD, DUL similarly affects women of childbearing age, who usually see a doctor for heavy menstrual bleeding and infertility. The early stages of DUL are often indicated by B-ultrasound as multiple uterine fibroids, leading to inadequate preoperative assessments of the patients’ conditions.

Surgical approaches for DUL aimed at preserving the uterus often lead to rapid recurrence due to incomplete removal of the fibroids. Repeated surgeries are often necessary to achieve the anticipated relief of symptoms, which also compromise the uterine structure and lead to complications such as adhesions in the pelvic and uterine cavities. All of these factors make restoring the patient’s fertility challenging.

DUL is a rare condition; only around 100 cases have been reported to date. Various conservative treatment options have been explored, including gonadotropin-releasing hormone (GnRH) therapy, abdominal or hysteroscopic myomectomy, and/or surgical approaches combined with GnRH therapy, UAE, and HIFU. However, these approaches have only shown short-term reductions in menstrual flow and uterine size, with a minor portion of patients achieving pregnancies. Additionally, these approaches have not yet accomplished the anticipated complete lesion removal, reshaping of important uterine anatomies, and prevention of recurrence.

To address the challenges posed by diffuse uterine lesions, Osada H, *et al.* reported a new surgical procedure in 2011, known as the “Triple-flap” Surgery (Osada *et al.*, 2011), which focused on thorough excision of the diffuse adenomyotic lesion and uterus reconstruction, and has been recognized as the most innovative fertility-preserving surgical procedure for DAD at that time. However, in our practice of performing the “Triple-flap” procedure on three DAD cases after Osada presented this surgical procedure at a conference, we found that the “Triple-flap” procedure should be modified. The Triple-flap procedure requires the surgeon to maintain both the submucosal and subserosal myometrial layers (the inner- and outer-muscle flaps) with a minimum thickness of 5 mm for uterine reconstruction. However, DAD lesions vary greatly in location and origin, from internal-type, external-type, to mixed type. Complete excision of different types of DAD may leave

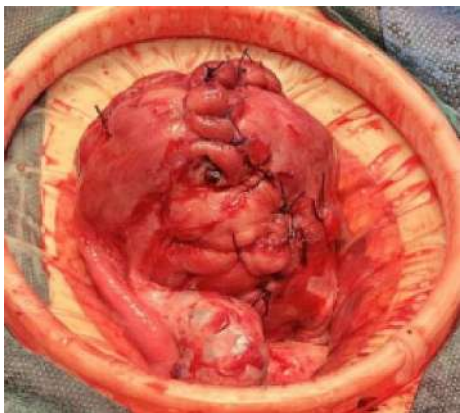


FIG. 7.21 – The reconstructed uterus.



FIG. 7.22 – The removed fibroid specimens.

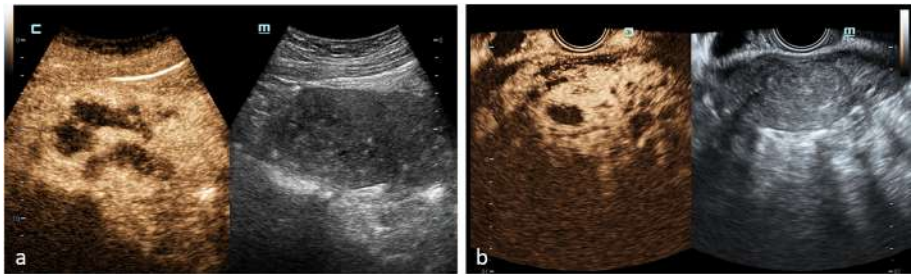


FIG. 7.23 – Images from postoperative ultrasound venography. (a) Image taken 5 months after the PUSH Approach. (b) Image taken 8 months after the PUSH Approach.



FIG. 7.24 – Image from hysteroscopy 8 months after the PUSH Approach.

Case analysis: This was a DUL case with numerous fibroids of various sizes that diffusively invaded most of the myometrium. With the PUSH Approach, we removed about a thousand DUL lesions, some individually and others in bulk, and reconstructed her uterus while protecting the important functional uterine anatomies (FUA). The one-year postoperative exams have verified that the FUA of the reconstructed uterus has recovered well for pregnancy. This case demonstrates the effectiveness and safety of the PUSH Approach in treating DUL for durable recovery concerning symptom improvement, uterine function and structure, and pregnancy outcomes. The patient had FH deficiency, which is associated with hereditary leiomyomatosis and renal cell carcinoma (HLRCC) syndrome. She should be advised to have close follow-ups afterward.

References

- Dubreuil G., Loubat E. (1926) Aneurysme cirsoïde de l'utérus, *Ann. Anat. Pathol.* **3**, 697–718.
- Tamura H., Kishi H., Kitade M., *et al.* (2017) Complications and outcomes of pregnant women with adenomyosis in Japan, *Reprod. Med. Biol.* **16**(4), 330–336. doi: [10.1002/rmb2.12050](https://doi.org/10.1002/rmb2.12050).