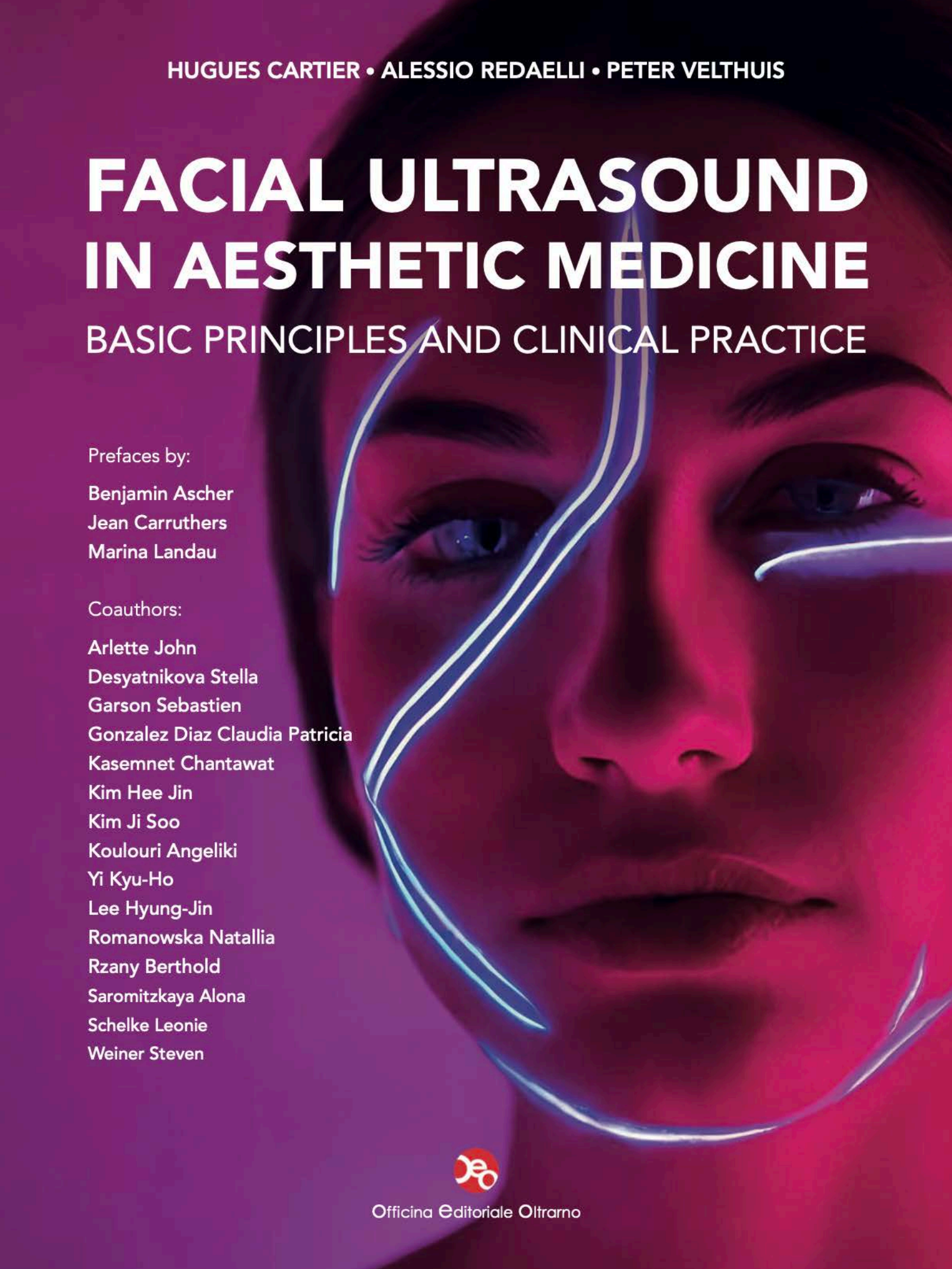
HUGUES CARTIER • ALESSIO REDAELLI • PETER VELTHUIS

FACIAL ULTRASOUND IN AESTHETIC MEDICINE

BASIC PRINCIPLES AND CLINICAL PRACTICE



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Acknowledgements

Although I have already written and co-ordinated books on lasers in dermatology, the idea for this book came from Alessio. This book could not have been written without Peter, because although I'm a phlebologist and a dermatologist, the use of ultrasound in facial aesthetics was revealed to me by Peter and, of course, Leonie. Nothing would have been possible without them, but also with all the authors of this book. I would like to thank them all for their enthusiasm, determination and patience in producing this practical and pragmatic work. Sharing gives meaning to our lives as doctors, and this book on ultrasonography is proof of that. Thank you to my wife, my children and my friends, who have always supported me, and to my medical team, who help me on a daily basis.

Hugues Cartier

I would like to thank my wife Susanna, for her unwavering support, encouragement, and patience for this umpteenth book.

I also extend my gratitude to all the dedicated colleagues and collaborators, super experts, and especially my coauthors Hugues and Peter, for their suggestions. They contributed their expertise, reviewed content, and offered valuable suggestions, making this book an incredible source of tips and tricks, rendering it very practical, and I appreciate it immensely. I learned a lot from all of you!

My usual editor and friend, Davide, and the entire OEO team, who always trust in my projects and help me.

And finally, all my students and followers that are waiting this book to improve their knowledge and drive my ongoing pursuit of excellence.

Alessio Redaelli

Expressing gratitude and recognizing help is, of course, very important. I have added a list of people that I want to thank.

In the book are:

- Dr. Leonie Schelke, my inspirator and creative sparring partner;
- Prof. John Arlette, my inspirator;
- Dr. Hugues Cartier, my inspirator.

Not in the book are:

- Prof. Martino Neumann, a visionary that gave me the opportunity to start a complication filler clinic;
- Prof. Tamar Nijsten, a strong supporter of cosmetic dermatology at Erasmus University
- Dr. Oscar Jansen, who guided my first steps in ultrasound imaging;
- Mr. Patrick Waldram, technician at Cutaneous;
- Mrs. Nienke Diepering, coordinator at Cutaneous;
- Mrs. Dorine Verschoof, my personal assistant.

Peter Velthuis

Preface

Benjamin Ascher, MD
Plastic Surgeon Board Certified, Lecturer & Clinical Assistant, Paris Academy, IMCAS Honorary President & Founder, THINKIN Medical Director

I was really happy and honored when the Authors of this book on Ultrasounds in Aesthetic medicine asked me to prepare a preface to present it to the readers.

Hugues Cartier, Peter Velthuis and Alessio Redaelli are good friends and I have known them for a long time, and their commitment to science and safety in our specialty. Their expertise in the injectables segment is incorporated into this new chapter, which is developing and becoming a fundamental aspect of our practice.

This book, "*Facial Ultrasound in Aesthetic Medicine: Basic Principles and Clinical Practice*", embarks on a new chapter in plastic surgery and aesthetic dermatology, which is gradually being built: ultrasonography.

This preface is your gateway to a comprehensive guide that delves into the remarkable potential of ultrasound echography as a modern and reliable tool for facial and body injections. We will explore the principles and science behind this technology, dissect its applications, and showcase the expertise of pioneering practitioners who have harnessed its capabilities to craft the most natural and pleasing outcomes.

With the increase in malpractice and legal issues, it is increasingly important for HCPs to find a stable solution to prevent complications. There are many safety measures and tools to reduce the risk, including better knowledge of anatomy, a slow injection technique, aspirating before injection, and the "intelligent needle", with alarm. However, the most efficient and safe tool that prevents the risk, is ultrasonography guidance. In recent years, many congresses, training courses, articles, and books have pointed out the importance of ultrasound-guided injection training and have incorporated ultrasonography injection as a critical topic in their programs.It is my hope that this new book, after remarkable books like those by Ximena Worsman and Hee Jin Kim will inspire, educate, and guide all readers on this exciting journey into the captivating world of ultrasound echography guidance in our profession, both in daily activities, with more precision in our injections, and just like in an emergency context.

The field of these applications in medicine and cosmetic surgery is just beginning. My vision is that each of our injections will have to be documented by ultrasound before, during and after. This increasingly rapid practice will likely be recommended or even required on a legal level, hence the importance of this book.

Preface

Prof. Jean Carruthers
Clinical Professor, University of British Columbia
AAD Eugene van Scott
ASOPRS Henry I Baylis Award,
ASDS Stegman Award

I am honored to have been asked to write an introduction to this most comprehensive textbook on Clinical Ultrasound. Drs Velthuis, Cartier, and Redaelli, and their truly international contributing Team have tirelessly brought this very innovative clinical tool to clinics worldwide- a remarkable accomplishment! With their expertise guiding this, what was once a more specialized investigation has become a very practical diagnostic and therapeutic tool.

Having ultrasound to painlessly "see" under the cutaneous surfaces of the entire head and neck to both diagnose and treat is an important – and yes, crucial – distinction between the novice and the expert clinician.

This excellent text informs the reader of the underlying science of ultrasound, head and neck anatomy as seen with ultrasound and the tips and tricks of clinical usage including using ultrasound for guidance in initial treatments as well as in the management of complications. The current commercially available ultrasound technologies are well described.

After visiting Dr Velthuis and Schelke's Rotterdam Ultrasound clinic in September of 2022, I purchased an ultrasound system for my clinic in Vancouver. I highly recommend that you also, after enjoying this new text, add this important modality to your own therapeutic armamentarium.

Dr. Marina Landau
Dermatologist, Israel

In this book, three international experts and good friends, Alessio Redaelli, Hugues Cartier, and Peter Velthuis put together an international team of experts and meticulously crafted a comprehensive guide to the diagnostic applications of ultrasound in the field of aesthetic medicine.

In today's world, where appearances often take the central stage, aesthetic medicine plays a vital role in helping individuals feel confident and beautiful in their own skin. Ultrasound technology has revolutionized this domain, offering safer, non-invasive procedures that deliver remarkable results.

With their deep knowledge and experience, the authors unravel the intricacies of ultrasound and demonstrate its immense potential. The book succeeds in enriching the knowledge of experienced ultrasound users, but also in educating practitioners without any previous experience, providing them the information and guidelines in a uniquely clear and enlightening way.

Introduction

In the reality of modern aesthetics, the pursuit of beauty has evolved far beyond mere cosmetics and skincare routines. Aesthetic medicine, a dynamic field at the intersection of art and science, has unlocked new dimensions in the quest for timeless allure.

Coming from the artistic sculpting of facial features, we are gradually moving into a science-driven understanding of what is needed and the ways we can deliver that. At the heart of beauty science lies a powerful tool that is still insufficiently used by the medical community: ultrasound imaging.

Probably Aesthetic Medicine is still not a totally "evidence-based medicine", but with US this gap will improve!

Visualizing Beauty and the reality of what you are doing helps practitioners to know exactly what they are doing, during normal routine but also in emergencies.

UltraSounds will allow you to see the superficial layers better than in an anatomical theatre, and so will embark all of you, dear readers, on a journey into the captivating world where cutting-edge technology meets the artistry of human form. In these pages, we dive deep into the revolutionary role ultrasound imaging plays in reshaping the landscape of aesthetic medicine.

In the pursuit of personal beauty and rejuvenation, individuals have historically relied on the trust they place in the hands of skilled practitioners. However, as the field of aesthetic medicine continues to flourish, it becomes increasingly evident that knowledge, precision, and innovation are the keys to unlocking the full potential of aesthetic treatments. Ultrasound imaging has emerged as a game-changer, revolutionizing the way we understand, plan, and execute cosmetic procedures.

This book is a comprehensive exploration of how ultrasound technology is transforming the practice of aesthetic medicine. It provides both practitioners and enthusiasts with a window into the intricate world of non-invasive and minimally invasive procedures, shedding light on the scientific principles and artistic subtleties that underlie them. Our aim is to bridge the gap between the science behind ultrasound imaging and its application in the world of aesthetics. US is becoming part of every practice in the world, without thinking of the fact you can use US all over the body for a lot of other indications every minute of your daily job, even if you are not an aesthetic doctor. Dermatologists, vascular, general or plastic surgeons, general practitioners, and all other specialists will find in the ultrasound machine an incredible ally!

As you journey through these pages, you will discover:

1. **The Science Behind Ultrasound Imaging**: Gain a deep understanding of the principles that make ultrasound an invaluable tool for visualizing and assessing the structures beneath the skin. Explore the physics, technology, and methodologies that form the foundation of this powerful diagnostic tool. Everything is written in a very simple way, very understandable in our opinion by a specialist with great experience also in teaching. We strongly suggest you read these introductory pages since only if you know the basics will you be able to translate the images on the screen into real clinical anatomy and useful details.
2. **Aesthetic Anatomy Unveiled**: Dive into the anatomy of beauty. We explored the intricacies of facial structures, helping you appreciate the complexities that lie beneath the skin's surface. Aesthetic medicine is an art, and every masterpiece begins with a profound understanding of the real anatomy, live anatomy. Different anatomists and great practitioners wrote the anatomical chapters,

each with their deep and particular experiences. You will undoubtedly enjoy the clear and explained images, as well as the incredible videos embedded in our book. Simply frame the QR code found throughout the book to access them! The first time, you'll say, "How did she do it so clearly!!!" But then, slowly, you'll understand and find the same delicacy, the same details... the same incredible skills! This is a book to keep on your desk and use every day for assistance. We genuinely hope so!

3. **Diagnostic Precision**: Learn how ultrasound imaging enhances diagnostic precision, allowing practitioners to assess skin, fat, muscles, and other tissues with unparalleled accuracy. Discover how this knowledge is applied in procedures such as facial contouring, body sculpting, and skin rejuvenation. But also in very fine injections like BoNT-A. You'll say us: "we do not have all this time, it's useless. Our injections are very precise as well!" In our opinion, it is not true: your precision will rise accordingly with your anatomical knowledge that never before you had the possibility to have. And you do not know how many times you would like to have Hugues, Peter, Alessio, or one of our incredible coauthors near you to understand and discuss "that little white point on the screen"! What is it? However, we are here at your disposal to provide help and improve together!
4. **Minimally Invasive Techniques**: Explore the world of non-surgical and minimally invasive aesthetic procedures that leverage ultrasound guidance. Witness how ultrasound imaging has redefined these techniques, making them safer, more effective, and capable of delivering stunning results. From a simple cyst to a difficult injection for a complication to a solid neoformation, Ultrasounds will always help you and your patient to make the right decision and have a superior precision. Patients will be enchanted by your way of action, simple and complete!
5. **Patient-Centric Care**: Understand the pivotal role of patient-centered care in aesthetic medicine. Learn how ultrasound imaging empowers both practitioners and patients to make informed decisions and achieve personalized aesthetic goals.

"Visualizing Beauty" is a tribute to the synergy of artistry and technology that defines modern evidence-based aesthetic medicine. Whether you are a seasoned practitioner, a medical student, or an individual curious about the possibilities of aesthetic enhancement, this book invites you to explore the intricate world of ultrasound imaging as a guiding light in the pursuit of beauty, diving in the anatomical reality. US makes our day, every day. Forget the blind technique; ultrasound, as the third eye, allows for a deep dive into the skin.

Join us on this captivating journey through the realms of science and artistry, where beauty is not just skin deep: it's a masterpiece waiting to be unveiled.

Alessio, Hugues and Peter

Coordinators

DR. CARTIER HUGUES

Hugues Cartier is Dermatologist, phlebologist and derm laserist at the Clinic Saint-Jean, Arras, France. He is also the chief of wound care in the dermatology department of Arras Hospital. He is the global course scientific director of IMCAS congresses with Sebastien Garson (plastic surgeon). He is the vice president of the Société Française de Médecine Esthétique and past president of the Société Francaise des Lasers en Dermatologie. He is also the course coordinator of the Société Belge de Médecine Esthétique. He has been a member of EADV for more than 20 years and is on the board of the EADV task force for Tatoo. He is the author and co-author of several peer review papers and for edition: Les lasers en dermatologie 2017; Couperose & erythrose; rejuvenation, LED en dermatologie (Noe C.), chapt IPL / cosmetic medicine & surgery; dermatologie esthétique 2020 Expert phase II, III/ clinical studies fillers, toxin, laser, and wound healing.

PROF. REDAELLI ALESSIO

He lives and works in Milan. He is scientific director of Medical Aesthetic and chairman of IPAM Congress and Masterclass. He has published many books in the field of aesthetic medicine and more than 35 scientific articles in the field of aesthetic medicine and phlebology. KOL for Ipsen company. Visiting Professor at the Genoa University, Master in Aesthetic medicine. Teacher in Iapem and Aims Italian schools. He is chairman and scientific director of International Congress IPAM. He is an active member of the International Academy of Aesthetic Dermatology. He is chairman and KOL at the majority of the most important international congresses.

DR. VELTHUIS PETER

Almost his entire working life as a dermatologist, Dr Peter Velthuis has devoted himself to the practice and science of cosmetic medicine. He founded his 'Velthuis Kliniek' in the Netherlands in 1995. After retiring he picked up scientific work in 2016 at Erasmus Medical Center Rotterdam, where he leads the section of cosmetic dermatology. Dr. Velthuis has co-founded the Dutch Society for Cosmetic Dermatology. He is currently president of ESCAD (European Society for Cosmetic and Aesthetic Dermatology). Together with Dr. Schelke, he is a co-founder and shareholder of Cutaneous.

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Dr. John Arlette MD, FRCPC, FAAD, FACMS, is a Royal College of Canada certified Dermatologist. He is a Clinic Professor at the University of Calgary, Department of Surgery in the Division of Plastic Surgery, as well a Fellow in both the American Academy of Dermatology and American College of Mohs Surgery. His areas of expertise include facial anatomy, filler injection techniques, filler-related complications, and the use of ultrasound in cosmetic therapy.

DR. DESYATNIKOVA STELLA

She is a double board-certified facial plastic surgeon with a specialized focus on both surgical and nonsurgical facial treatments. As the founder of The Stella Center and the Ultrasonos Aesthetic Ultrasound Training Center in Seattle, WA, USA, her practice and research are dedicated to advancing the capabilities of high-definition ultrasound to enhance the safety and precision of injectable treatments. Recognized as a leading authority in ultrasound research and education, Dr. Desyatnikova actively disseminates her insights through publications, teaching engagements, and presentations on both national and international platforms. She is a member of the American Academy of Facial Plastic and Reconstructive Surgery (AAFPRS), the American Institute of Ultrasound in Medicine (AIUM), and the CMAC International Expert Board. Dr. Desyatnikova remains steadfast in her commitment to pushing the boundaries of ultrasound science in the realm of aesthetic medicine.

DR. GARSON SEBASTIEN

Works in private practice in Senlis, France, since 2005. Degree in Medicine in Amiens in 2001 and specialized in plastic surgery in 2004. University diploma in plastic and aesthetic surgery of the face and member of the European Board of Plastic Reconstructive and Aesthetic Surgery and the French Board of Plastic Reconstructive and Aesthetic Surgery. Super expert in 3D surface imaging. Honoured by the Aesthetic Surgery Journal with an award for best international paper for his article, "Fat Injection to the Breast: Technique, Results, and Indications Based on 880 Procedures Over 10 Years."Gold Medal from Amiens University Hospital. President of Plastirisq, past president of the French Society of Aesthetic Plastic Surgeons and past president of the National Union of Plastic, Reconstructive and Aesthetic Surgery. Member of the French College of Plastic, Reconstructive and Aesthetic Surgery, the American Society of Plastic Surgeons, and the International Society of Aesthetic Plastic Surgery. Surgical course coordinator of the International Master Course on Aging Science one of world's biggest actors in medical conferences dedicate to aesthetic.

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DR. KASEMNET CHANTAWAT

Graduated from Thammasat University in 2008. He has over a decade of experience in Aesthetic medicine. He is a special lecturer at MaeFahLuang University in Bangkok. Dr. Kasemnet frequently organizes theoretical lectures and hands-on workshops on safe and natural-look application of dermal filler injections. He has also participated in research on ultrasound imaging to improve the safety and effectiveness of aesthetic procedures. Dr. Kasemnet is an international speaker at various conferences such as IMCAS, Dasil, and Thaicosderm. He is also a Key Opinion Leader (KOL) and speaker for many companies, including Merz Aesthetics, APTOS Thread, and GE ultrasound.

PR. KIM HEE JIN

Professor & Chairman Division in Anatomy & Developmental Biology Department of Oral Biology, Yonsei University, Seoul, Korea. Board Director for Brain Korea 21 Plus Project for Interdisciplinary Oral Science Graduate Program, Applied Life Science. Editor-in-Chief of Anatomy and Cell Biology (acb), Associate Editor of Surgical and Radiologic Anatomy & Editor of European J Clinical Anatomy & Clinical Anatomy & Journal of Oral Biosciences. Vice President / Korea Student Cycling Federation Vice President / Seoul Archery Association. Editor and authors of numerous books or peer-rewiewed papers on facial anatomy and/ or ultrasound. International speaker at numerous congresses.

Coauthors

DR. KIM JI SOO

Medical director at Dr. Youth Clinic in Seoul, Korea, and Kangjin Clinic in Vietnam. He received a Ph.D. degree in medical school at Seoul National University. He published two English textbooks, "Clinical Anatomy of the Face for Botulinum and Filler Injection" (2016, Springer) and "Ultrasound Anatomy of Face and Neck for minimally invasive procedures" (2020, Springer). Dr. Kim's clinical practice is mainly devoted to minimally invasive procedures, such as botulinum toxin, filler, and thread, using ultrasonography to maximize safety and precision. His current research interest is ultrasound-guided clinical aesthetic procedures as a pioneer in aesthetic ultrasound procedures. Now, he is actively present on topics of aesthetic ultrasonography at various international conferences.

DR. KOULOURI ANGELIKI

Degree at National and Kapodistrian University of Athens, Greece, including a clinical elective in dermatology at the Johns Hopkins University School of Medicine, USA. Following two years at Corfu General Hospital, she spent three years as a resident in Angiology at the University Hospital CHUV Lausanne, Switzerland. Subsequently, she completed her residency in Dermatology at the University Hospital CHUV in Lausanne and the University Hospital of Zürich, Switzerland.

She is currently an attending physician at the Department of Dermatology at the University Hospital CHUV in Lausanne and operates her private Dermatology practice in Zürich. Throughout her career, she has pursued several inter-university diplomas in Dermatology, Dermatological Lasers, and Anti-Aging Medicine.

DR. YI KYU-HO

Kyu-Ho Yi is an anatomist and aesthetic physician based in Seoul, South Korea. He has authored more than 50 peer-reviewed articles covering topics such as botulinum neurotoxin, fillers, thread lifting, and ultrasonography. Currently, he holds the position of Director at Maylin Anti-Aging Clinic (Apgujeong), serves as an Adjunct Professor at Yonsei University College of Dentistry, and holds the role of Academic Director at the Korean Association of Laser, Dermatology, and Trichology. He is also a global advisory member for Pharmaresearch, Hugel, and N-finders. Furthermore, he has served as a Special Issue Editor for the journals "Toxins" and "Diagnostics" and won the Best Paper Award for "Plastic Reconstructive Surgery" in 2023.

Coauthors

DR. LEE HYUNG-JIN

Research Assistant Professor at Catholic Institute for Applied Anatomy College of Medicine,the Catholic University of Korea, Seoul. He is an anatomist primarily conducting research on facial anatomy related to filler and botulinum neurotoxin injection, as well as thread lifting. Author and speaker of numerous peer-reviewed papers and international meetings on anatomy, ultrasound for aesthetic medicine, 2023. Best Papers from Plastic and Recons. Surgery United States, 2023. Best Poster Award from Korean Association of Anatomists, Korea, 2020. New Researcher Award from The Korean Acad. of Oral Anatomy, Korea, 2020.

DR. ROMANOWSKA NATALLIA

She is a cosmetic surgeon and the founder of The Romanowska Aesthetic Medicine Clinic in Bialystok, Poland. She specializes in ultrasound-guided facial injection procedures. Natallia Romanowska initially studied at the Medical University of Minsk, Belarus, and continued her education in Poland, graduating from the Postgraduate School of Aesthetic Medicine. Her primary expertise in aesthetic injections lies in lip augmentation procedures, where she combines morphology and ultrasound analysis to study lip tissue behavior following hyaluronic acid and botulinum toxin injections. KOL at international congresses, with a specific emphasis on assessing the factors contributing to lip correction failures. She is also the author of periodical training courses titled "Lips Compendium" and "Lips Praxis".

DR. RZANY BERTHOLD

Professor Berthold Rzany is a dermatologist and clinical epidemiologist (ScM, Johns Hopkins University, USA) in Berlin, Germany. In 2002 he became the head of the Division of Evidence Based Medicine (dEBM) at the Charité-Universitätsmedizin, Berlin. He left in December 2011 to go into private practice in Berlin. Since 2022, he has worked not only in Berlin but also in Vienna. His main scientific focus is the assessment of aesthetic medicine by Evidence Based Medicine. Besides Medicine he is an enthusiastic collector of art and recently bought a profaned church, which now is under restoration (#kirchestoebnitz on Instagram).

Coauthors

DR. SAROMITZKAYA ALONA

Dermatologist, cosmetologist of the highest category, specialist in injection and laser cosmetology. She is the executive general manager and the owner of the center of aesthetic medicine and medical cosmetology «Professional», in Moscow. Authorized trainer for contour plastics, Ipsen-Pharma authorized trainer and member of the Advisory Board of Experts. She is the owner of 2 patents: «Ways of treatment of vascular neoplasms/ tumors of the skin» No 2243792 and Ways of treatment of extensive hemangiomas» No 2264199. She has numerous publications in professional journals, is a speaker at Russian and international Congresses for aesthetic medicine and cosmetology (such as IMCAS, ECALM, and others), a lecturer at Ludwig Maximillian University of Munich, Germany (cadaver course), a participant in satellite conferences and events.

DR. SCHELKE LEONIE

Leonie Schelke is a Dutch-certified cosmetic physician and assistant professor at the Department of Dermatology, Erasmus MC. She has practiced in Amsterdam for more than 20 years. Since 2010, she and her colleagues have run a policlinic for filler complications at the Department of Dermatology, Erasmus MC, Rotterdam the Netherlands. She received her PhD in the use of duplex ultrasound and the management of filler complications. She is a teacher in the Dutch-certified educational program for cosmetic medicine. She is co-founder and trainer of Cutaneous, an organization for ultrasound courses in cosmetic medicine and dermatology

DR. WEINER STEVEN

Board Certified Head and Neck Surgeon, specializing in Facial Plastic Surgery. He had his residency at The Johns Hopkins Hospital, where he became an instructor for 2 years. In mid-2005, he "laid down his scalpel" and began concentrating 100% of his efforts on non-invasive and minimally invasive cosmetic procedures, creating The Aesthetic Clinique. He divides his time between his practice, physician trainings, and lectures. KOL in advisory boards, FDA trials, and authored several clinical papers. He is world-renowned for for his filler techniques using cannulas and rejuvenation ™. He was one of the first to adopt ultrasound into his aesthetic practice in the US and now lectures and trains on using ultrasound for evaluating and treating filler complications and safer filler injections.

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