

# **Shock Wave Lithotripsy 2**

**URINARY AND BILIARY  
LITHOTRIPSY**

# **Shock Wave Lithotripsy 2**

## **URINARY AND BILIARY LITHOTRIPSY**

**Edited by**

**James E. Lingeman**

Director of Research  
Institute for Kidney Stone Disease  
Methodist Hospital of Indiana  
Indianapolis, Indiana

**and**

**Daniel M. Newman**

Director, Institute for Kidney Stone Disease  
Methodist Hospital of Indiana  
Indianapolis, Indiana

**Editorial Consultant**

**Mary Beth Moster**

The publication of the proceedings of this meeting was made possible by educational grants from Methodist Hospital of Indiana and Dornier Medical Systems, Inc.

**Springer Science+Business Media, LLC**

Library of Congress Cataloging-in-Publication Data

---

Symposium on Shock Wave Lithotripsy (5th : 1989 : Indianapolis, Ind.)

Shock wave lithotripsy 2 : urinary and biliary lithotripsy /  
edited by James E. Lingeman and Daniel M. Newman ; editorial  
consultant, Mary Beth Moster.

p. cm.

"Proceedings of the Methodist Hospital of Indiana's Fifth  
Symposium on Shock Wave Lithotripsy, held March 10-12, 1989 in  
Indianapolis, Indiana"--T.p. verso.

Includes bibliographical references.

ISBN 978-1-4757-2054-9

ISBN 978-1-4757-2052-5 (eBook)

DOI 10.1007/978-1-4757-2052-5

1. Ultrasonic lithotripsy--Congresses. I. Lingeman, James E.

II. Newman, Daniel M. III. Methodist Hospital of Indiana.

IV. Title. V. Title: Shock wave lithotripsy two.

[DNLM: 1. Cholelithiasis--therapy--congresses. 2. Kidney Calculi--  
therapy--congresses. 3. Lithotripsy--congresses. 4. Urinary  
Calculi--therapy--congresses. WJ 100 S99125s 1989]

RD646.S96 1989

617.4'61'059--dc20

DNLM/DLC

for Library of Congress

89-70948

CIP

---

Versions of Chapters 6, 45, 48, 50, 52, 55, 63, 64, 74, 79, 80, and 81  
have been previously published in the *Journal of Endourology*  
and are reprinted here with the *Journal's* permission.

Proceedings of the Methodist Hospital of Indiana's Fifth Symposium  
on Shock Wave Lithotripsy, held March 10-12, 1989,  
in Indianapolis, Indiana

© 1989 Springer Science+Business Media New York  
Originally published by Plenum Press, New York in 1989  
Softcover reprint of the hardcover 1st edition 1989

All rights reserved

No part of this book may be reproduced, stored in a retrieval system, or transmitted  
in any form or by any means, electronic, mechanical, photocopying, microfilming,  
recording, or otherwise, without written permission from the Publisher

## Preface

In the years since its development in West Germany and particularly since its arrival in the United States, extracorporeal shock wave lithotripsy (ESWL\*) has become the treatment of choice for most cases of urinary lithiasis. The first shock wave lithotripsy patient in the U.S. was treated with a Dornier HM3 in February of 1984 at the Methodist Hospital of Indiana. In response to the great enthusiasm generated by this new treatment modality, the following year the MHI presented its first symposium on shock wave lithotripsy. Each year the meeting generated more and more interest. Following the 1988 symposium, the presentations were published in a book entitled **Shock Wave Lithotripsy: State of the Art**.

Following on the heels of the success of kidney stone treatment with ESWL, the new field of biliary lithotripsy rapidly was gaining momentum. In response to the great interest generated by this additional application of the technology, the 1989 meeting focused special attention on this new method of treating gallstones. Methodist Hospital's 5th Symposium on Shock Wave Lithotripsy, which was presented in March of 1989, had the largest attendance ever, with over 600 physicians from 42 states and 20 countries.

The publication of the proceedings of this meeting was made possible by generous educational grants from Dornier Medical Systems, Inc., Marietta, Georgia, and the Methodist Hospital of Indiana.

The primary purpose of the publication of the proceedings of this symposium is educational. Because technology is evolving so rapidly, it is our hope that the publication of this material will be of real benefit to those interested in the various aspects of treatment with shock wave lithotripsy, including basic and clinical research, treatment data from around the world, and the long-term results of treatments. The 1989 meeting featured lively debates on several controversial issues, and those debates are included in this publication.

To all authors of these presentations, we extend our thanks for providing such excellent material.

The rapid publication of this material would not have been possible without the devoted efforts of our editorial consultant, Mary Beth Moster, and our energetic and efficient secretary, Joyce Buckler.

James E. Lingeman, M.D.

Daniel M. Newman, M.D.

\*Dornier Medical Systems, Inc., Marietta, Georgia.

# Contents

## Part I: Shock Wave Lithotripsy Research

- 1 Side Effects of Extracorporeal Shock Wave Lithotripsy:  
Assessment of Urinary Excretions of Renal Enzymes  
as Evidence of Tubular Injury** 3  
*Gary S. Karlin, M.D., Morton Urivetsky, Ph.D.,  
and Arthur D. Smith, M.D.*
- 2 Canine Kidneys: Changes in Blood and Urine Chemistry  
After Exposure to Extracorporeal Shock Waves** 7  
*P. Jaeger, M.D., and C. Constantinides, M.D.*
- 3 Immune Response of Urolithiasis Patients Treated  
by Extracorporeal Shock Wave Lithotripsy  
or Transurethral Ureterolithotripsy** 11  
*Seiji Wada, M.D., Taketoshi Kishimoto, M.D., Yasushi Ameno, M.D.,  
Toshinao Kanazawa, M.D., Keisuke Yamamoto, M.D.,  
Masanobu Maekawa, M.D., Hiroki Imori, M.D.,  
and Shinichi Ikemoto, M.D.*
- 4 Functional Aspects of the Kidney After Shock Wave Lithotripsy** 15  
*F. Orestano, M.D., N. Caronia, M.D., G. Gallo, M.D.,  
F. Ocello, M.D., G. Viola, M.D., and M. Curti Giardina, M.D.*
- 5 Morphologic Renal Changes Following Piezoelectric Lithotripsy  
or Spark-Gap Lithotripsy** 19  
*W. Tad Wilson, M.D., George L. Miller, M.D., James S. Morris, M.D.,  
Pat F. Fulgham, M.D., Linda McDougall, R.T., William Erdman, M.D.,  
and Glenn M. Preminger, M.D.*
- 6 Influence of Shock Wave Number on Canine Renal Morphology  
Following Treatment with Piezoelectric Lithotripsy  
Using the Wolf Piezolith 2200** 23  
*D. Neisius, M.D., G. Seitz, M.D., T. Gebhardt, M.D.,  
and M. Ziegler, M.D.*
- 7 Piezoelectric v Electrohydraulic Lithotripsy:  
A Comparison of Morphologic Alterations** 29  
*James S. Morris, M.D., Douglas A. Husmann, M.D.,  
W. Tad Wilson, M.D., Pat F. Fulgham, M.D.,  
and Glenn M. Preminger, M.D.*

<b>8</b>	<b>The Mini-Pig: An Ideal Large Animal Model for Studies of Renal Injury in Extracorporeal Shock Wave Lithotripsy Research</b> <i>Andrew P. Evan, Ph.D., James A. McAteer, Ph.D., Christopher P. Steidle, M.D., Lynn R. Willis, Ph.D., Nancy M. Hockley, M.D., Richard Saint, M.D., Anne Hawk, Bret A. Connors, Stephen A. Kempson, Ph.D., and James E. Lingeman, M.D.</i>	<b>35</b>
<b>9</b>	<b>Cultured Cells as Model Systems in Shock Wave Lithotripsy Research: Advantages, Methodological Concerns and Potential Applications</b> <i>James A. McAteer, Ph.D., Stephen A. Kempson, Ph.D., Sharon P. Andreoli, M.D., Richard Haak, M.D., Robert A. Harris, Ph.D., James E. Lingeman, M.D., and Andrew P. Evan, Ph.D.</i>	<b>41</b>
<b>10</b>	<b>Study of the Aggregation of Calcium Oxalate Crystals Using Shock Wave Lithotripsy</b> <i>Joseph S. Manne, M.D., Robert Douenias, M.D., Gary S. Karlin, M.D., and Arthur D. Smith, M.D.</i>	<b>49</b>
<b>11</b>	<b>Cystine Calculi: Two Types</b> <i>Krishna M. Bhatta, M.D., FRCS, Edwin L. Prien, Jr., M.D., and Stephen P. Dretler, M.D.</i>	<b>55</b>
<b>12</b>	<b>Can Prostaglandins Facilitate the Passage of Ureteric Stone Streets?</b> <i>R. S. Cole, FRCS, and C.H. Fry, Ph.D.</i>	<b>61</b>
<b>13</b>	<b>High-Dosage Extracorporeal Shock Wave Lithotripsy with a Modified Dornier HM3 Lithotripter</b> <i>T. Vogeli, M.D., H.E. Mellin, M.D., and R. Ackermann, M.D.</i>	<b>67</b>
<b>14</b>	<b>Plasma Shield Lasertripsy: <i>In Vitro</i> Studies</b> <i>Krishna M. Bhatta, M.D., FRCS, David I. Rosen, Ph.D., and Stephen P. Dretler, M.D.</i>	<b>73</b>
<b>15</b>	<b>Monitoring of Lasertripsy of Urinary Calculi Using Acoustic Emission Signals and Plasma Optical Emission Signals</b> <i>Krishna M. Bhatta, M.D., FRCS, David I. Rosen, Ph.D., and Stephen P. Dretler, M.D.</i>	<b>79</b>
<b>16</b>	<b>Shielded Electrohydraulic Lithotripsy of Urinary and Biliary Calculi: A New Possibility</b> <i>Krishna M. Bhatta, M.D., FRCS, David I. Rosen, Ph.D., and Stephen P. Dretler, M.D.</i>	<b>85</b>
<b>17</b>	<b>The Effect of Shock Waves on Human Prostatic Carcinoma Cells <i>In Vitro</i></b> <i>Issac Kaver, M.D., Warren W. Koontz, Jr., M.D., John D. Wilson, M.D., John M. Guice, M.D., and M.J. Vernon Smith, M.D.</i>	<b>91</b>
<b>18</b>	<b>Susceptibility of Renal Cell Carcinoma (RCC 7860) to <i>In Situ</i> Extracorporeal Shock Wave Neoplasmotripsy</b> <i>Ali H. Mardan, M.D., Ph.D., and Stefan A. Loening, M.D.</i>	<b>97</b>

- 19 Mapping of the Extended Focus (“Blast Path”) Using Uric Acid Calculi** 99  
*Jay B. Hollander, M.D., and Ananias C. Diokno, M.D. and Bruce Steinert, Ph.D.*
- 20 Stone Damage Modes During Piezoelectric Shock Wave Delivery** 103  
*C.J. Chuong, Ph.D., P. Zhong, M.S., H.J. Arnott, Ph.D., and G.M. Preminger, M.D.*
- 21 Effects of Sector Shock Wave Beaming and Focused Shock Waves on Brittle Targets in Water** 107  
*Lawrence C. Bezirdjian, M.D., and William S. Filler, B.Sc.*
- 22 The Combined Effects of Shock Waves and Cisplatin Therapy on Rat Prostate Tumors** 111  
*Ross P. Holmes, Ph.D., Leslie I. Yeaman, M.D., Wei-Jia Li, M.D., Lois Hart, C. Anne Wallen, Ph.D., R.D. Woodruff, M.D., and David L. McCullough, M.D.*
- 23 Transmission of Shock Waves Through Bone: Is it Possible to Treat Iliac Ureteral Stones with Patient in the Supine Position?** 115  
*J. Graff, M.D., C. Berding, Ph.D., and M. Beck, M.D.*

## Part II: Biliary Lithotripsy

- 24 Preliminary Experience with Extracorporeal Shock Wave Lithotripsy of Gallbladder Stones in 260 Patients** 123  
*R. Heinrich, M.D., A. Schreckenberger, M.D., G. Natterer, H. Benz, H.J. Mager, M.D., and E. Zierden, M.D.*
- 25 Piezoelectric Lithotripsy and Soft-Tissue Injury: Safety Limits Confirmed in Experimental and Clinical Settings** 129  
*A. Darzi, M.D., and F.B.V. Keane, M.D.*
- 26 Extracorporeal Shock Wave Lithotripsy for Gallstones: The “No Touch” Technique** 137  
*A. Darzi, M.D., and F.B.V. Keane, M.D.*
- 27 Acute and Follow-up Results of Piezoelectric Gallbladder Stone Lithotripsy** 143  
*W. Kerzel, M.D., Ch. Ell, M.D., H.T. Schneider, W. Domschke, M.D., and E.G. Hahn, M.D.*
- 28 U.S. Experience with Technomed International Sonolith 3000: Gallstone Lithotripsy and Ursodeoxycholic Acid** 147  
*James R. Adwers, M.D., FACS*
- 29 Extracorporeal Lithotripsy of Gallstones: A Prospective Study** 153  
*F. Lacaine and the French Association of Medical Evaluation*

- 30 Biliary Lithotripsy: Determination of Stone Fragmentation Success and Potential Tissue Injury in Swine** 157  
*Timothy F. Deaconson, M.D., Robert E. Condon, M.D., Lee Ann Weitekamp, M.D., Susan Kretschmar, M.D., Frank P. Begun, M.D., and Russell K. Lawson, M.D.*
- 31 Percutaneous Cholecystolithotomy: A Logical Progression of Endourologic Techniques** 163  
*Donald P. Griffith, M.D., and Malachy J. Gleeson, M.D.*
- 32 Organization of Methodist Hospital of Indiana's Biliary Lithotripsy Study** 171  
*Lee G. Jordan, M.D.*
- 33 United States Dornier MPL 9000 Experience: Crawford Long Hospital** 175  
*William E. Torres, M.D.*
- 34 In Vitro Gallstone Lithotripsy: Effect of Peripheral Calcification on Fragmentation and Sonographic Evaluation of Fragment Size** 179  
*Joseph C. Anderson, M.D., David A. Burnett, M.D., Aurelio Matamoros, M.D., Bruce Peters, B.S., and Sandra Nelson, RDMS*
- 35 Extracorporeal Shock Wave Lithotripsy of Biliary Duct Calculi: Nova Scotian Experience** 185  
*Richard W. Norman, M.D., Lazlo A. Fried, M.D., G. Paul LeBrun, M.D., and Mark C. Taylor, M.D.*
- 36 Renal and Biliary Lithotripsy Using a Medstone 1050 Lithotripter** 189  
*Alexander S. Cass, MBBS*

### Part III: Bioeffects and Long-Term Results

- 37 Acute Renal Failure Following Bilateral Extracorporeal Shock Wave Lithotripsy Without Ureteral Obstruction** 197  
*Ray H. Littleton, M.D., FACS, Marc Melser, M.D., and Warren Kupin, M.D.*
- 38 Magnetic Resonance Imaging Evaluation of Immediate and Intermediate Changes in Kidneys Treated with Extracorporeal Shock Wave Lithotripsy** 203  
*Raymond B. Dyer, M.D., Nolan Karstaedt, M.B., B.Ch., David L. McCullough, M.D., Ronald J. Zagoria, M.D., Lloyd H. Harrison, M.D., Neil T. Wolfman, M.D., and Betty Appel, R.N.*
- 39 Identification of Risk Factors in the Development of Clinically Significant Subcapsular Hematomas Following Shock Wave Lithotripsy** 207  
*Lawrence H. Newman, M.D., and Brian Saltzman, M.D.*



- 40** Blood Pressure Changes Following Extracorporeal Shock Wave Lithotripsy and Other Forms of Treatment for Urolithiasis 211  
*James E. Lingeman, M.D., John R. Woods, Ph.D., and Phillip D. Toth, M.D.*
- 41** Shock Wave Lithotripsy and Hypertension: A Study of 1,002 Patients 217  
*B.S.I. Montgomery, M.D., R.S. Cole, M.D., M.G. Warden, E.L.H. Palfrey, M.D., and K.E.D. Shuttleworth, M.D.*
- 42** Hypertension After Extracorporeal Shock Wave Lithotripsy: Incidence Following Treatment with Dornier HM3 Lithotripter or Wolf Piezolith 2300 Lithotripter 223  
*T.B.H. Zwergel, M.D., D. Neisius, M.D., U.E. Zwergel, M.D., E. Becht, M.D., and M. Ziegler, M.D.*
- 43** Comparison of Stone-Free Rates as Determined by Radiography and Endoscopy Following Percutaneous Nephrostolithotomy or Combination Therapy 227  
*John D. Denstedt, M.D., Ralph V. Clayman, M.D., and Daniel P. Picus, M.D.*
- 44** Patient Positioning Following Extracorporeal Shock Wave Lithotripsy 231  
*John J. Pahira, M.D., and B.J. Reid Czarapata, CRNP*
- 45** Pediatric Extracorporeal Shock Wave Lithotripsy: Long-Term Results and Effects on Renal Growth 233  
*Mark C. Adams, M.D., Daniel M. Newman, and James E. Lingeman, M.D.*
- 46** Results of Extracorporeal Shock Wave Lithotripsy in Young Children 243  
*Ahmed Mosaad, M.D., and Tarek El-Salamouni, M.D.*
- 47** Evaluation of Residual Stone Fragments Following Lithotripsy: Sonography v Radiography 247  
*Brett B. Abernathy, M.D., James S. Morris, M.D., W. Tad Wilson, M.D., George L. Miller, M.D., and Glenn M. Preminger, M.D.*
- 48** Flexible Ureterorenoscopy, Dilatation of the Narrow Calyceal Neck, and Extracorporeal Shock Wave Lithotripsy: A New, Minimally Invasive Approach to Stones in Calyceal Diverticula 251  
*Gerhard J. Fuchs, M.D., and Richard D. David, M.D.*
- 49** The Bioeffects of Shock Wave Lithotripsy: An Overview 255  
*David L. McCullough, M.D.*

## Part IV: Large Renal Stone Management

- 50** Comparison of Extracorporeal Shock Wave Lithotripsy and Percutaneous Nephrostolithotomy for the Treatment of Renal Calculi in Lower Pole Calices 263  
*Elspeith M. McDougall, M.D., John D. Denstedt, M.D., R.D. Brown, M.D., Ralph V. Clayman, M.D., Glenn M. Preminger, M.D., and Bruce L. McClennan, M.D.*
- 51** The Utility of Double-J Stents in the Treatment of Staghorn Calculi 271  
*Masuyoshi Harada, M.D., Hiroshi Eto, M.D., and Sadao Kamidono, M.D.*
- 52** The Relative Efficacy of Extracorporeal Shock Wave Lithotripsy and Percutaneous Nephrostolithotomy in the Management of Cystine Calculi 277  
*Nancy M. Hockley, M.D., James E. Lingeman, M.D., and Cindy L. Hutchinson, R.N.*
- 53** Multistaged Extracorporeal Shock Wave Lithotripsy Monotherapy for Large Renal Calculi 285  
*Ahmed Mosaad, M.D., and Tarek El-Salamouni, M.D.*
- 54** Piezoelectric Lithotripsy Monotherapy (EDAP LT-01) for Partial or Total Staghorn Stones and Large Non-Staghorn Renal Calculi 291  
*J.A. Amiel, M.D., A.Y. Peyrottes, M.D., K. Touabi, M.D., E.J. Benizri, M.D., and J. Toubol, M.D.*
- 55** PCNL/ESWL v Stent/ESWL for Large Stones and Staghorn Calculi: What Have We Learned? 297  
*K. Miller, M.D., R. Bachor, M.D., T. Sauter, M.D., and R. Hautmann, M.D.*
- 56** Relative Roles of Extracorporeal Shock Wave Lithotripsy and Percutaneous Nephrostolithotomy 303  
*James E. Lingeman, M.D.*
- 57** Is Extracorporeal Shock Wave Lithotripsy Monotherapy a Rational Approach to Large Renal Calculi? 309  
*Alan D. Jenkins, M.D.*

## Part V: Ureteral Stone Management

- 58** Ureteroscopy at a Lithotripsy Center 319  
*Douglas L. Gaker, M.D., Peter O. Carey, M.D., and Alan D. Jenkins, M.D.*
- 59** Efficacy of Electrohydraulic Lithotripsy v Laser Lithotripsy in the Ureter 323  
*Thomas W. Schoborg, M.D.*
- 60** Lessons Learned from Patients with *Grossen Steinstrassen* 327  
*John L. Weinerth, M.D., James M. Flatt, M.D., and Culley C. Carson, III, M.D.*

- 61** Is the Liberal Use of Double-J Ureteral Stents Justified for Outpatient Extracorporeal Shock Wave Lithotripsy 333  
*Woody N. York, M.D.*
- 62** Morbidity Associated with Ureteral Stents Placed Prior to Extracorporeal Shock Wave Lithotripsy 339  
*Glenn M. Preminger, M.D., Michael C. Kettelhut, Ph.D., Sammie L. Elkins, R.N., JoAnn Seger, R.N., and Christopher D. Fetner, M.D.*
- 63** Management of Ureteral Calculi: The Impact of Anesthesia-Free Extracorporeal Shock Wave Lithotripsy 345  
*K. Miller, M.D., T. Sauter, M.D., R. Bachor, M.D., and R. Hautmann, M.D.*
- 64** *In Situ* Extracorporeal Shock Wave Lithotripsy v Ureteroscopy: The Case for Ureteroscopy 351  
*Stephen P. Dretler, M.D.*

#### Part VI: Treatment Results with Urologic Lithotripters

- 65** Belgian Experience with the Direx Tripter X-1 359  
*R. Andrienne, M.D., P. Bonnet, M.D., B. Similon, M.D., H. Nicholas, M.D., L. Coppens, M.D., C. Bouffioux, M.D., and J. de Leval, M.D.*
- 66** Experience in Israel with the Direx Tripter X-1 363  
*Pinhas M. Livne, M.D., Dan Simon, M.D., and Ciro Servadio, M.D.*
- 67** Treatment of Urinary Calculi with the EDAP LT-01 Extracorporeal Shock Wave Lithotripter: Report of 1,544 Cases 367  
*Zheng Ke-Li, M.D., Qui Shao-Peng, M.D., Wei De-Yue, M.D., Mei Hua, M.D., and Chen Yu-Lin, M.D.*
- 68** Piezoelectric Lithotripsy: Experience with 511 Patients 371  
*E. A. Kiely, M.Ch., FRCSI, P.C. Ryan, FRCSI, T.E.D. McDermott, FRCSI, R. Grainger, FRCSI, and M.R. Butler, B.Sc., FRCSI*
- 69** Piezoelectric Lithotripsy of Renal and Ureteric Stones with the EDAP LT-01 377  
*Hitoshi Takamoto, M.D., Mitsuhiro Yoshida, M.D., and Tohru Araki, M.D.*
- 70** Piezolithotripsy: Experience with the Wolf Piezolith 2300 381  
*T. A. McNicholas, M.B., B.S., FRCS; D.J. Jones, M.B., B.S., FRCS; G. Russell, M.B., B.S., FRCS; A. Pope, M.B., B.S., FRCS; A. Timoney, M.B., B.S., FRCS; S. Carter, M.B., B.S., FRCS; T. Philp, M.Ch., FRCS; and J.E.A. Wickham, M.S., FRCS*
- 71** Treatment of Renal Calculi Using Piezoelectric Lithotripsy: A Preliminary Report 387  
*Jane E. Lacey, M.D., Culley C. Carson, M.D., and John L. Weinerth, M.D.*

<b>72</b>	<b>Experience with Second-Generation Lithotripsy: Medstone 1050</b> <i>Jon Marks, M.D., Elliot Leiter, M.D., Bernard Fruchtman, M.D., Jacob Heyman, M.D., and Adrian Zorziotti, M.D.</i>	<b>393</b>
<b>73</b>	<b>Medstone 1050 ST Lithotripter: A Clinical Review</b> <i>Gaines W. Hammond, Jr., M.D.</i>	<b>397</b>
<b>74</b>	<b>Lithostar: An Electromagnetic, Acoustic Shock Wave Unit for Extracorporeal Lithotripsy</b> <i>Ralph V. Clayman, M.D., Bruce L. McClennan, M.D., Todd J. Garvin, M.D., John D. Denstedt, M.D., and Gerald L. Andriole, M.D.</i>	<b>403</b>
<b>75</b>	<b>Extracorporeal Shock Wave Lithotripsy Using Only Intravenous Analgesia with an Unmodified Dornier HM3 Lithotripter</b> <i>Daniel M. Newman, M.D., James E. Lingeman, M.D., Phillip G. Mosbaugh, M.D., Ronald E. Steele, M.D., Peter M. Knapp, M.D., and Cindy L. Hutchinson, R.N.</i>	<b>411</b>
<b>76</b>	<b>Experience with Anesthesia-Free Shock Wave Lithotripsy Using the Unmodified Dornier HM3 Lithotripter</b> <i>Hans-Goran Tiselius, M.D., and Bill Pettersson, M.D.</i>	<b>417</b>
<b>77</b>	<b>Experience with a Dornier HM4 Lithotripter in Urinary Stone Treatment</b> <i>Geert G. Taily, M.D.</i>	<b>421</b>
<b>78</b>	<b>Benefits of Ultrasound-Guided Shock Wave Lithotripsy</b> <i>Gary S. Karlin, M.D., Celeste Marino, Gopal Badlani, M.D., and Arthur D. Smith</i>	<b>427</b>
<b>79</b>	<b>Experience with a New Multifunctional Lithotripter, the Dornier MFL 5000: Results of 415 Treatments</b> <i>J. Graff, M.D., S. Benkert, M.D., J. Pastor, M.D., and T. Senge, M.D.</i>	<b>431</b>
<b>80</b>	<b>Sonographic Piezoelectric Lithotripsy: More Bang for your Buck</b> <i>Glenn M. Preminger, M.D.</i>	<b>437</b>
<b>81</b>	<b>Pro: Electrohydraulic Lithotripsy with Fluoroscopic Imaging</b> <i>Christian C. Chaussy, M.D.</i>	<b>445</b>
	<b>Contributors</b>	<b>451</b>
	<b>Index</b>	<b>455</b>