ARTHROSCOPIC SURGERY principles & practice

Lanny L. Johnson, M.D.

Clinical Professor of Surgery Michigan State University College of Human Medicine East Lansing, Michigan

VOLUMES ONE AND TWO

THIRD EDITION

with 3,196 illustrations, including 1,958 in full color

The C. V. Mosby Company

Contents

Courses, 14

Organization, 14

Research, 14

The future, 16

1 Development, 1 Instrumentation, 3 Arthroscopes, 3 Hand instrumentation, 5 Motorized instrumentation, 6 Arthroscopic techniques, 7 Diagnostic arthroscopy, 7 Operative arthroscopy, 8 Other energy sources for arthroscopic surgery, Documentation, 12 Learning arthroscopy, 13 Literature, 13

Clinical practice of arthroscopic surgery, 20

Review of status in the United States, 21 1978 AAOS questionnaire, 21 1981 practice review, 22 1981 Shneider survey, 25 1982 residency review, 25 1983 practice review, 29 The future, 31 Clinical evaluation, 33 Medical history, 33 Physical examination, 34 X-ray evaluation, 43 Laboratory tests, 61 Psychological tests, 62 Patient expectations, 64 Patient management, 64 Pathological clinical impression, 64 Indications for arthroscopy, 66 Physician education, 68 Physician selection, 68 Patient selection, 69 Hospital credentials, 70 Learning arthroscopic surgery, 75 Philosophy, 75 Expectations, 75

I-beams for success, 76 Courses, reading, and laboratory work, 76 Use one system—perfect it, 78 Arthroscopic surgical simulator, 78 Human material, 87 Personal visits, 87 Personal experience, 87 Self-study (video and charts), 87 Progression of skills, 88 How not to be successful technically, 91 Mechanics of surgical scheduling, 92 Inpatient-outpatient status, 92 Arthroscopy in children, 92 Anesthesia, 93 Choice of anesthesia, 93 Local anesthesia, 94 Postoperative patient management forms, 98 Convalescence, 99 Successful rehabilitation, 105 Strength is not everything, 108 Patient responsibility, 109 Specific modalities, 110 Principles of various modalities, 111 Complications, 112 Operative complications, 113 Postoperative complications, 118 Physician hazards, 124 Joints other than the knee: shoulder, 124 Medical market changes and arthroscopy, 124 Consumer demand, 125 Professional response and effects, 126 Government and insurance industry effects, 127 Medical economics, 129 Supply and demand, 129 The new ball game, 130 Administrative setbacks, 130 The new direction, 130 Health maintenance organizations, 131 Preferred providers, 131 Preferred provider organizations, 132 Preferred provider products, 132 Diagnostic related groups, 132 Near-future practices, 132 New definition of preferred provider, 133

New system and arthroscopic procedures, 133 Advantages of arthroscopic surgery, 134

3 Environment, 137

Creating the environment, 137 Getting started, 138 Hospital personnel, 139 The physician-patient relationship, 141 The surgeon, 141 Hospital administration, 142 Patient considerations and relationships, 142 The operating room, 144 Operating room construction, 144 Room arrangement, 147 Storage and warehousing, 155 Instrumentation, 155 Operating room personnel, 166 Related hospital services, 170 Outpatient services, 170 Physical therapy, 170 X-ray department, 171 Laboratory, 171

4 Instruments, 172

Characteristics of arthroscopic instrumentation, 172 Purchasing equipment, 173 Investments, 174 Image transmission, 176 Arthroscopes, 177 Types, 177 Selection of an arthroscope, 180 Light sources, 188 Light guides (cables), 190 Bundle light cables, 190 Liquid light guide, 191 Halo light, 191 Light wand, 191 Bifurcated cable, 192 Articulated viewing device (AVD), 193 Surgical Assistant, 195 Foam insert, 199 Inflow-outflow system, 199 Cannula system, 202 Switching sticks, 203 Wissinger rod, 204 Palpation instruments, 205 No. 18 spinal needle, 205 Probes, 206 Grasping instruments, 206 Miniature forceps, 206

Meniscal grasper, 208

Loose body grasper, 210

Golden Retriever, 211 Cutting instruments, 212 Knife blades, 212 Miniature knives, 215 Disposable blades, 215 Knife handles, 216 Basket forceps, 216 Variable axis system, 218 Scissors, 220 Curettes, 220 Motorized drill and saw, 220 Tendon stripper, 224 Arthroscopic motorized instrumentation, Repair and reconstruction instruments, 234 Needles, 234 Meniscus Mender, 234 Meniscus Mender II, 237 The ligamentous and capsular repair (LCR) system, 238 Cannulated screw sets, 240 Organization of instrumentation, 242 Care of instrumentation, 242 Sterilization and disinfection, 242 Various energy sources, 244 High-speed motor, 244 Electrothermal, 244 Laser, 245 Cryosurgery, 245

Retrieving instrument, 211

5 Documentation, 246

Handwritten chart notes, 247 Dictated narrative, 247 Worksheets and diagrams, 249 Computerized record, 251 The computer as a surgical instrument, 251 Computer glossary, 300 Still photography, 307 Factors, 307 35 mm still photography, 308 Movie photography, 310 Television, 314 Arthroscopic television history, 315 Cameras, 316 Solid-state camera (chip camera), 318 Support electronics, 319 Suspension system, 319 Monitors, 320 Recorders, 320 Editing equipment, 321 Storage, 321 Scientific meetings, 321 Operating room-television studio, 322

6 Arthroscopic surgical principles, 324

Perspective, 326

Staged experience, 326

Patient's expectations, 327

Surgeon's expectations, 329

Personal preparation, 329

Organization and planning, 329

Plan of action, 330

General surgical principles, 333

Asepsis, 333

Hemostasis, 333

Gentleness, 333

Working from known to unknown, 335

Arthroscopic surgical principles, 335

Projection into joint, 335

Patient positioning, 337

Lens system, 337

Illumination, 339

Surgical exposure, 339

Surgical setup, 341

Distention with fluid, 341

Infusion system, 341

Inflow on arthroscope: smaller scope, small

joints, 343

Separate superior portal inflow: knee,

shoulder, 343

Inflow-outflow control: diagnostic phase,

346

No-flow viewing, 350

Operative outflow, 350

Postoperative inspection, 350

Suction pressure, 350

Fine-tuning of flows, 351

Cleaning and vacuuming, 354

Distention with gas, 355

Scope techniques, 356

Placement, 356

Fulcrum, 360

Replacement, 361

Direction, 361

Redirection, 362

Body control, 364

Hand control, 366

Manipulation of joint, 381

Scope sweeping, 382

Composition, 384

Visual interpretation, 385

Orientation, 387

Disorientation and vertigo, 389

Surgical imagination, 389

Surgical conductor, 389

Surgical portals, 389

Multiple portals, 389

Anterolateral (inferior) portal, 390

Superomedial portal (anterior), 391

Superolateral portal (anterior), 391

Anteromedial (inferior) portal, 391

Posteromedial portal, 392

Posterolateral portal, 392

Transpatellar tendon approach, 392

Midpatellar lateral approach, 393

Accessory portals, 393

Diagnostic techniques, 394

Routine diagnostic arthroscopy of the knee

(general anesthesia), 394

Coordinated team effort, 394

Arthroscope placement, 395

Suprapatellar space, 396

Patellar tracking, 397

Lateral and medial gutters, 398

Medial compartment, 398

Anterolateral compartment, 401

Transcutaneous posteromedial approach,

402

Transcutaneous posterolateral approach,

405

Suprapatellar viewing, 408

Operative portals, 409

Needle placement, 409

Probing, 409

Control of joint leakage, 413

Diagnostic probing, 414

Diagnostic arthroscopy, 416

Local anesthesia, 416

Postoperative care, 420

Arthroscopic surgical techniques, 421

Surgical approaches to compartments, 421

Arthroscopic operative principles, 434

Cannula system, 434

Surgical exposure, 434

Debridement and tissue preservation, 435

Resection principles, 435

Techniques, 437

Instrument selection, 438

Final operative steps, 453

Host tissue response, 453

Intraoperative complications, 454

Instruments, 454

Technical problems, 455

Intraarticular bleeding, 458

Postoperative care, 458

7 Arthroscopic anatomy, 460

Normal arthroscopic anatomy by compartments, 461

Suprapatellar pouch, 461

Patellar position and tracking, 464

Collagen typing of reparative fibrocartilage. Medial gutter, 464 Lateral gutter, 465 581 Fate of regenerated tissue, 582 Anteromedial compartment, 466 Factors in abrasion surgery, 584 Posteromedial compartment, 469 Site of lesion, 584 Intercondylar notch, 472 Size of lesion, 584 Lateral compartment, 479 Depth of lesion, 585 Posterolateral compartment, 482 Normal arthroscopic anatomy by structure, Configuration of lesion, 585 Deformity, 585 483 Range of motion, 585 Synovium, 483 Instability, 585 Synovial folds (plicae), 483 Weight or force, 586 Patella, 486 Weight-bearing pressure, 586 Articular cartilage, 487 Presence of meniscus, 588 Femoral and tibial condyles, 488 Mobilization, 588 Meniscus, 488 Exercise, 588 Anterior cruciate ligament, 490 Effect of aspirin, 588 Posterior cruciate ligament, 490 Osteonecrosis, 591 Athroscopic variations in composition, size, Osteochondritis dissecans, 594 and shape, 491 Loose bodies, 596 Anatomical differences, 491 Chondrocalcinosis, 597 Differences in response to various Meniscal disease, 599 influences, 494 Trauma, 599 Pathology of the knee, 498 Degeneration, 602 Diagnostic and treatment implications, 605 Glossary, 500 Histological observations of torn meniscus, Pathological changes in articular cartilage, 605 503 Classification, 605 Laceration, 503 Response to injury, 606 Contusion, 505 Factors adversely affecting repair of Blunt trauma, 506 meniscus, 620 Bubble, 506 Meniscus repair, 622 Fissure, 506 Cystic meniscus, 632 Furry degenerative changes, 508 Diskoid meniscus, 632 Articular debris, 510 Ligaments and tendons, 636 Degenerative process, 514 Acute tear, 638 The sclerotic lesion in degenerative arthritis, Anterior cruciate pedicle, 642 516 Chronic anterior cruciate ligament tears, Arthroscopic surgical perspective, 529 Sources of cellular healing in synovial joints, Absent anterior cruciate ligament, 644 531 Histological response to repair, 644 Avascular source, 531 Semitendinosus augmentation Vascular source, 534 reconstruction, 651 Articular cartilage response to injury/disease, Normal tendon-bone junction, 660 539 Vascularization, 662 Age, 539 Augmentation with meniscal tissue, 662 Vascularity, 539 Mobilization, 663 Depth of lesion, 539 Experimental and open surgical Chondral conditions, 669 debridement, 557 Pathological tissue response to abrasion, 565 Historical review, 671 Patient management, 672 Arthroscopic appearance, 568

Interview, history, and physical

examination, 672

Gross appearance, 572

Light microscopy, 574

X-ray films, 672

Patient selection and education, 674

Trauma, 674

Contusion, 675

Laceration, 675

Avulsion, 676

Fracture, 677

Osteochondritis dissecans, 685

Technique of repair, 695

Degenerative arthritis, 697

Patient evaluation, 697

Conservative treatment, 698

Surgical treatment: palliative, not curative,

Diagnostic arthroscopy, 699

Accompanying lesions, 717

Lesions, 719

Intraarticular fracture, 719

Cartilage trauma, 719

Chondronecrosis, 720

Osteonecrosis, 720

Meniscus tear, 728

Instability, 728

Synovial diseases, 728

Chondrocalcinosis, 730

Surgical treatment, 730

Patient management, 730

Arthroscopic surgical dimension, 731

Arthroscopic abrasion arthroplasty, 737

Reconstruction, 771

Combined procedure—arthroscopy and

osteotomy, 772

Reconstruction and correction of instability,

783

10 Patella (femoral trochlea), 788

Clinical management, 792

Medical history, 792

Physical examination, 792

X-ray evaluation, 798

Sorting patellofemoral complaints, 812

Differential diagnosis, 812

Indications for diagnostic arthroscopy, 813

Expectations, 815

Arthroscopic approaches to the patella, 815

Normal arthroscopic findings, 816

Patellar tracking, 823

Prospective study, 823

Local anesthesia observations, 825

Normal patellofemoral arthroscopic

alignment, 826

Patellofemoral contact, 830

Patellofemoral degeneration and

relationship to position, 832

Patellar malposition, 834

Patellofemoral arthralgia, 842

Etiology, 843

Physical examination, 847

Cause of pain, 847

Overall management, 847

Patellofemoral debridement, 862

Operative conditions and procedures, 872

Bipartite patella, 872

Contusion, 873

Fracture, 874

Osteochondritis dissecans, 876

Osteonecrosis, 878

Degenerative arthritis, 881

Lateral patellar position (lateral compression

syndrome), 881

Subluxation, 886

Dislocation, 909

Patella alta, 933

Patella baja, 937

Management of previously operated patellar

conditions, 944

11 Meniscal conditions, 951

Meniscus, 952

Anatomical characteristics, 952

Function, 953

Pathological conditions, 953

Arthroscopic diagnosis, 953

Meniscal tears, 958

Degeneration and deformation of meniscus,

962

Diskoid meniscus, 963

Hypermobile meniscus, 965

Conditions associated with meniscal tears, 966

900

Anterior cruciate deficiency, 966

Anterior impingement, 967

Acute articular cartilage injury, 969

Degenerative arthritis, 969

Degenerative synovitis, 972

Failure of open surgery, 972

Retained meniscus, 973

Postarthroscopic problems, 973

Excessive physical therapy, 974

Synovitis, 975

Second-look arthroscopy, 975

Historical review of meniscal surgery, 975

Meniscectomy, 976

Meniscal repair, 979

Arthroscopic meniscal surgery, 980

Preoperative considerations, 980

Anesthesia, 982

Surgical planning, 983

Principles of arthroscopic meniscectomy, 983

Arthroscopic surgical technique, 984

Surgical approaches, 984

Principles of surgical instrumentation, 985

Instruments, 988

Routine procedural steps, 990

Location of lesion, 991

Tight knee, 992

Surgical imagination, 998

Cutting meniscal tissue, 998

Removal of meniscal fragments, 998

Completion of procedure, 1001

Surgical precautions, 1005

Typical arthroscopic meniscectomy, 1006

Postoperative management, 1018

Complications, 1018

Arthroscopic meniscal repair, 1019

Preoperative patient counseling, 1027

Surgical principles, 1027

Preoperative considerations, 1032

Arthroscopic technique, 1032

Meniscus grafting, 1043

Clinical experience, 1043

Technique, 1055

Postoperative management, 1057

Arthroscopic surgery for specific lesions, 1058

Medial, 1058

Lateral, 1082

12 Extrasynovial conditions, 1101

Background, 1103

Clinical evaluation, 1107

Medical history and patient interview, 1107

Evaluation of involvement, 1108

Knee ligament testing, 1108

X-ray films, 1115

Ligaments, 1116

Tibial collateral ligament, 1116

Anterior cruciate ligament, 1124

Posterior cruciate ligament, 1216

Tendons, 1224

Patellar tendon, 1224

Popliteus tendon, 1227

Semimembranosus tendon, 1227

Bursae, 1227

Prepatellar bursa, 1227

Pretibial tubercle bursitis, 1228

Pes anserinus bursa, 1228

Semimembranosus tendon bursa, 1230

Cysts, 1231

Lateral cysts, 1231

Medial cysts, 1231

Semimembranosus cysts, 1231

Baker's cysts, 1231

Foreign body bursae, 1232

Juxtaarticular bony lesions, 1233

13 Synovial conditions, 1239

Normal anatomical structures, 1240

Plica surgery, 1241

Synovial conditions, 1244

Fibrosis, 1244

Degenerative arthritis, 1246

Rheumatoid arthritis, 1247

Rheumatoid spondylitis, 1250

Reiter's syndrome, 1250

Psoriatic arthritis, 1250

Gout, 1251

Pseudogout, 1252

Localized synovitis, 1255

Pigmented villonodular synovitis, 1257

Localized nodular ligamentous villonodular

synovitis, 1258

Hemangioma, 1259

Hemophilia, 1259

Hemorrhagic synovium, 1262

Chondromatosis, 1262

Osteochondromatosis, 1264

Fibrinoid loose bodies, 1264

Alkaptonuria, 1265

Foreign bodies, 1266

Infection, 1267

Postsurgical inflammation, 1269

Arthroscopic synovectomy, 1269

Depth of resection, 1270

Breadth of resection, 1273

Localized synovectomy, 1273

Generalized synovectomy, 1278

Quadricepsplasty, 1292

Postoperative management, 1295

14 Temporomandibular joint, 1297

Technique, 1297

Distention, 1298

Arthroscopic landmarks, 1299

Indications, 1299

Normal findings, 1299

Pathological findings, 1300

Postoperative developments, 1300

Complications, 1300

15 Shoulder arthroscopy, 1301

Medical history, 1303

Physical examination, 1311

Inspection, 1311 Palpation, 1312 Neurovascular assessment, 1313 Manipulation, 1313 Percussion, 1318 Auscultation, 1318 X-ray examination, 1319 Shoulder arthrogram, 1321 Bone scan, 1321 Anatomy of the shoulder, 1321, Landmarks for entry, 1321 Labrum, 1324 Glenohumeral ligaments, 1326 Glenohumeral ligament-labrum junction, 1330 Glenoid sulcus, 1331 Subscapularis tendon, 1332 Posterior wall, 1333 Superior wall, 1333 Inferior wall, 1333 Variations of normal, 1333 Subacromial bursa, 1334 Acromioclavicular joint, 1335 Indications for arthroscopy, 1336 Patient preparation and room organization, 1338 Anesthesia, 1341 Arthroscopic technique, 1341 Distention, 1342 Fluid solution, 1344 Cannula system, 1345 Multiple portal approach, 1345 Surgical technique, 1345 Diagnostic arthroscopy, 1356 Acromioclavicular joint, 1356 Bones, 1359 Glenohumeral ligaments, 1359 Frozen shoulder, 1360 Loose bodies, 1362 Degenerative arthritis, 1364 Aseptic necrosis, 1366 Osteochondritis dissecans, 1367 Inflammatory synovitis, 1367 Reactive synovitis, 1368 Degenerative synovitis, 1368 Rheumatoid synovitis, 1368 Biceps tendon problems, 1370 Rotator cuff problems, 1371 Labrum injury, 1379 Subluxation, 1389 Dislocation, 1390 Operative arthroscopy, 1396 Specific procedures, 1400

Lavage, 1400

Forceps removal, 1400 Incision, 1400 Debridement, 1400 Techniques of anterior glenohumeral ligament repair, 1405 Number of staples, 1417 Placement of staples, 1417 Technique for absence of glenohumeral ligaments, 1420 Potential problems, 1422 Second looks, 1424 Postoperative management, 1425 Treatment of repeat dislocation, 1427 Present perspective, 1427 Arthroscopic repair of posterior dislocation, 1427 Technique of rotator cuff tear, 1434 Arthroscopic, 1434 Combined procedure, 1436 Debridement of calcific cuff deposits, 1439 Future of arthroscopic surgery of the shoulder

16 Elbow arthroscopy, 1446

joint, 1442

Medical history, 1446
Physical examination, 1447
X-ray examination, 1448
Anesthesia, 1450
Surgical portals, 1451
Routine operative arthroscopic technique, 1452
Technical notes, 1475
Postoperative management, 1476
Complications, 1477

17 Wrist joint, 1478

Anesthesia, 1478
Technique, 1479
Diagnostic findings, 1483
Traumatic synovitis, 1483
Meniscoid lesion, 1483
Torn capsular ligaments, 1484
Torn triangular cartilage, 1484
Fractures, 1484
Compression of articular cartilage, 1484
Operative arthroscopy, 1485
Postoperative management, 1485

18 Finger joints, 1486

Indications, 1486 Surgical technique, 1487 Trapezium–first metacarpal joint, 1488

19 Hip joint, 1491

Surgical anatomy, 1491 Preliminary considerations, 1492 Medical history, 1492 Physical examination, 1492 X-ray examination, 1493 Indications, 1493 Anesthesia, 1493 Surgical setup, 1493 Instruments, 1495 Arthroscope, 1495 Operative arthroscopy, 1495 Diagnostic technique, 1495 Diagnosis of specific conditions, 1502 Surgical technique, 1508 Example cases, 1510 Loose bodies, 1510 Osteochondromatosis, 1510 Synovitis, 1512 Degenerative arthritis, 1512

Combined procedures for aseptic necrosis, 1512 Postoperative management, 1514 Complications, 1516 The future, 1516

20 Ankle joint, 1517

Medical history, 1517 Indications, 1517 Anesthesia, 1518 Anatomy, 1519 Technique, 1521 Diagnostic technique, 1523 Operative techniques, 1528 The future, 1539

Appendix

Instruments for arthroscopy, 1540