

Table of Contents

1 Introduction	1	Rheumatic Inflammation of the Intervertebral Disk	37
		Tumors	37
2 History and Terminology	3	Involvement of the Intervertebral Disks in Systemic Illness	37
History	3	Possible Reactions	37
Pre-Christian Times	4	Achondroplasia	37
AD 1–1700	4	Ochronosis (Alkaptonuria)	38
1700–1900	4	Loss of Bone Density in the Vertebral Bodies ..	38
From 1900 Onward	4	Disk Calcification and Ossification	40
Terminology	5		
Anatomy and Pathology	5		
Clinical Syndromes	6		
3 Epidemiology	11	6 Discosis	43
Lifetime Prevalence	11	Definition	43
Point and Annual Prevalence	11	Classification	43
Localization and Frequency	11	Etiology	46
International Figures	12	Pathogenesis	47
		Biochemical Changes of Aging	51
		Biomechanical Basis of Disk Tissue	
		Displacement	51
		Effects on the Osmotic System	53
		Instability of the Motion Segment	53
		Definition	53
		Pathogenesis of Instability	53
		Clinical Significance	54
		Surgical Indications	54
		Prognosis and Course of Discogenic Degenerative Instability	54
		Prediscotic Deformities	55
		Definition	55
4 General Anatomy, Physiology, and Biomechanics	15	7 Traumatology	59
Development of the Intervertebral Disk	15	Etiologies and Types of Spinal Injury, and the Role of Pre-existing Degenerative Changes	59
Anatomy	18	Sprains of the Motion Segment	60
Ligaments	20	Isolated Traumatic Disk Rupture	60
Fine Structure and Biochemistry	21	Vertebral Body Fracture with Injury of the Intervertebral Disk	62
Biomechanics	22		
The Disk as an Osmotic System	22		
Changes of Intervertebral Disk Height	25		
Traction and the Intervertebral Disk	26		
Vibration and the Intervertebral Disk	27		
Mechanical Functions of the Intervertebral Disks	27		
The Disk and the Intervertebral Joints	29		
Therapeutic Approaches	31		
5 Nondegenerative Disk Diseases	33		
Developmental Disturbances	33		
Notochord Remnants	33		
Developmental Disturbances of the Vertebral Bodies and Intervertebral Disks in Childhood ..	33		
Congenital Anomalies	35		
Inflammatory and Infectious Disorders	36		
Bacterial Infection of the Intervertebral Disk ..	36		
		8 Pain: Its Pathogenesis and the Evolution of Chronic Pain	63
		Local and Radiating Pain	63
		Nerve Supply of the Spine	63
		The Foramino-articular Region	65

Discogenic Pain	65	10 Thoracic Syndrome	127
Spinal Deformities without Pain	66	Definition and Prevalence	127
Pain Arising from the Posterior Longitudinal Ligament	66	Special Anatomy, Biomechanics, and Patho-anatomy of the Thoracic Motion Segments	127
Radicular Pain	66	Classification	128
Intervertebral Joint Pain (Facet Syndrome, Pseudoradicular Syndrome)	68	Clinical Features of Thoracic Disk Prolapse	129
Muscle Pain	69	Intercostal Neuralgia	129
Combined Types of Pain	70	Differential Diagnosis	129
Nociception and the Transition from Acute to Chronic Pain	71	Treatment	130
Physiology of Nociception in the Spine	71	11 Lumbar syndrome	133
Evolution of Chronic Pain	72	Definition and Prevalence	133
Pharmacological Pain Therapy	75	Special Anatomy of the Lumbar Motion Segments	134
Definition	75	Lumbar Disks	134
Classification	75	Intervertebral Foramina	135
9 Cervical Syndrome	79	Ventral Epidural Space	135
Definition and Prevalence	79	Ligamentum Flavum	136
Special Anatomy and Physiology of the Cervical Motion Segments	80	Venous System	136
Uncinate Processes	80	Numerical Variations and Transitional Vertebrae	137
Horizontal Fissures	81	Topographical Relationships Between the Spinal Nerve Roots and Disks in the Lumbar Spinal Canal	138
Vertebral Artery and Cervical Sympathetic Chain	81	Radiological/Surgical Subdivisions of the Lumbar Motion Segments	139
Cervical Nerve Roots and Nerve Root Sleeves ..	82	Special Biomechanics of the Lumbar Spine (H.J. Wilke)	144
Biomechanics	84	Mechanical Stress on the Lumbar Disks	144
Special Pathoanatomy and Pathophysiology	85	Methods of Measuring Stress on the Lumbar Motion Segments	144
Clinical Features of Cervical Syndromes	88	Special Pathological Anatomy and Pathophysiology	153
Overview of Symptoms and Their Classification	88	Protrusions and Prolapses	153
Patients' Description of Symptoms	88	Disk Slackening and Instability	160
Clinical Findings	89	Bony Deformation	161
Radiological Studies	90	Clinical Features of Lumbar Syndromes	162
CT and MRI	92	Introduction	162
Neurophysiological Testing: EMG	92	Symptoms	163
General Differential Diagnosis	93	Findings of Clinical Examination	165
Classification of Cervical Syndromes	93	Neurophysiologic Testing—EMG	169
Local Cervical Syndrome	94	Plain Radiographs	169
Acute Torticollis (Wry Neck)	96	Lumbar Myelography	171
Cervicobrachial Syndrome	97	CT	172
Brachialgia Due to Soft Disk Protrusion	98	Diagnostic Study of the CSF	179
Brachialgia Due to Uncinate Process Exostosis ..	98	Discography	179
Segmental Syndromes	99	MRI	181
Cervicocephalic Syndrome	103	Clinical Syndromes	192
Cervicomedullary Syndrome	107	Classification of Lumbar Syndromes	192
Post-traumatic Cervical Syndrome	108	Local Lumbar Syndrome, Low Back Pain	192
Treatment of Cervical Syndromes	110	Lumbago, Discogenic Back Pain	194
Overview of Treatment Methods	110	Low Back Pain of Arthroligamentous Origin ...	194
Conservative Treatment	111	Facet Syndrome	195
Operative Treatment	120	Imaging Studies in Patients with Low Back Pain	198
Special Patient Exercises, Rehabilitation, and Back School	124	Differential Diagnosis of Low Back Pain	198
Treatment Planning	125		

Red Flags in Low Back Pain	201	Exercise Points	333
Discogenic Hip and Thigh Extension Stiffness	202	Stepwise Program	333
Lumbar Root Syndromes	203	EPFRM Units	333
Red Flags in Lumbar Root Syndromes	217	Running	333
Treatment of Lumbar Syndromes	218	Running with Simultaneous Activation of the	
Classification of Treatment Methods	218	Arms	334
Conservative Treatment	218	Running with a Reduced Load	334
Minimally Invasive Therapy of Lumbar		Swimming	334
Syndromes	241	Cycling	335
Surgical Treatment	259	Gymnastics	336
Post-discotomy Syndrome	286	Arm-jogging	336
Fusion Procedures	291	Dynamic Work at Home, in the Garden, and at	
Intervertebral Disk Prostheses	297	Work	336
Treatment Planning—Integrated Care	301		
		16 Sports	337
12 Natural Course and Prognosis		Introduction and Literature	337
of Intervertebral Disk Diseases	305	Sports and the Cervical Spine	337
Pathoanatomical Changes of the		Sports and the Lumbar Spine	338
Intervertebral Disk	305	Sporting Activities that are Good and Bad for the	
Disk Disease over the Course of Life	306	Intervertebral Disks	338
The Spontaneous Course of Acute Intervertebral			
Disk Disease	307	17 Medicolegal Assessment	341
L5/S1 Case Illustration: Prolapse with Infra-		Introduction	341
discal Extension and Spontaneous Resorption	308	Frequency of Medicolegal Assessment of	
L4/5 Case Illustration: Spontaneous Resorption		Disk-Related Diseases	341
of an Intradiscal L4/5 Disk Prolapse	310	Problems	341
		Disk Herniations and Accidents	342
13 The Spine and the Mind	313	Problems	342
Psychosomatic Processes	313	Pre-existing Damage	342
Mind—Body Interactions as Described in the		The Accident	342
Literature	313	Damage to the Intervertebral Disks After the Loss	
The Spine as a Projective Field for Mental		or Permanent Injury of a Limb	345
Disturbances (Psychosomatic Changes)	315	Cervical Spine	345
The Effect of Disk Disease on the Mind		Lumbar Spine	345
(Somatopsychic Changes)	317	Medicolegal Assessment	345
Deliberate Simulation or Exaggeration of Disk		Whiplash: Acceleration Injury of the Cervical	
Disease	317	Spine	346
Psychotherapy and Relaxation Techniques	319	Epidemiology	346
		Terminology	346
14 Back School	321	Degree of Severity	347
The Biomechanical Principles Of Back School	321	Treatment	348
Sitting	323	Course and Prognosis	348
Sitting Forward	323	Symptoms That Become Chronic	348
Sitting Back	324	Medicolegal Assessment	349
Dynamic Sitting	325	Assessment of Loss of Earning Capacity in	
Standing	326	Lumbar Intervertebral Disk Disease	351
Lying	327	Definition and Classification of Loss of Earning	
		Capacity	351
15 Exercise in a Pain-Free Range of		Levels of Loss of Earning Capacity	353
Motion	331	Problems in Medicolegal Assessment	355
Exercise and Nociception	331	Course and Prognosis	355
Which Exercises are Suitable?	332		
		Index	357