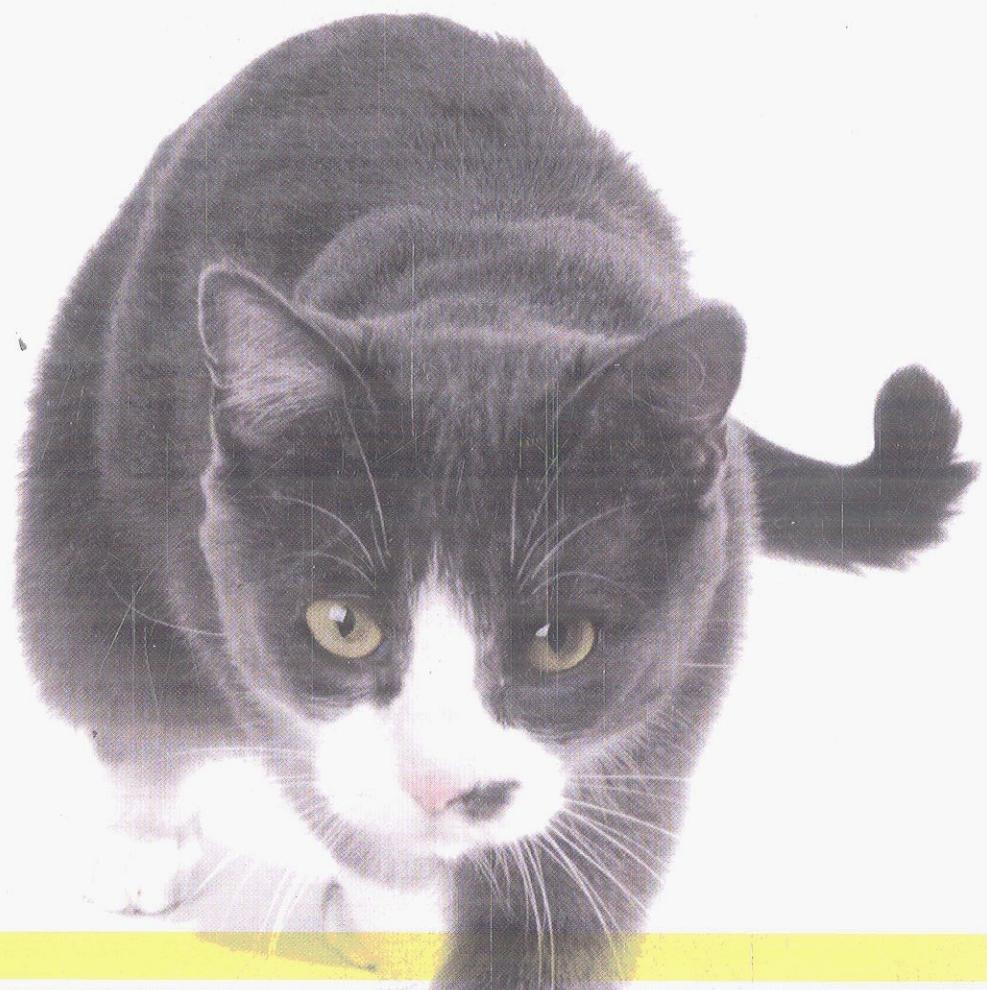


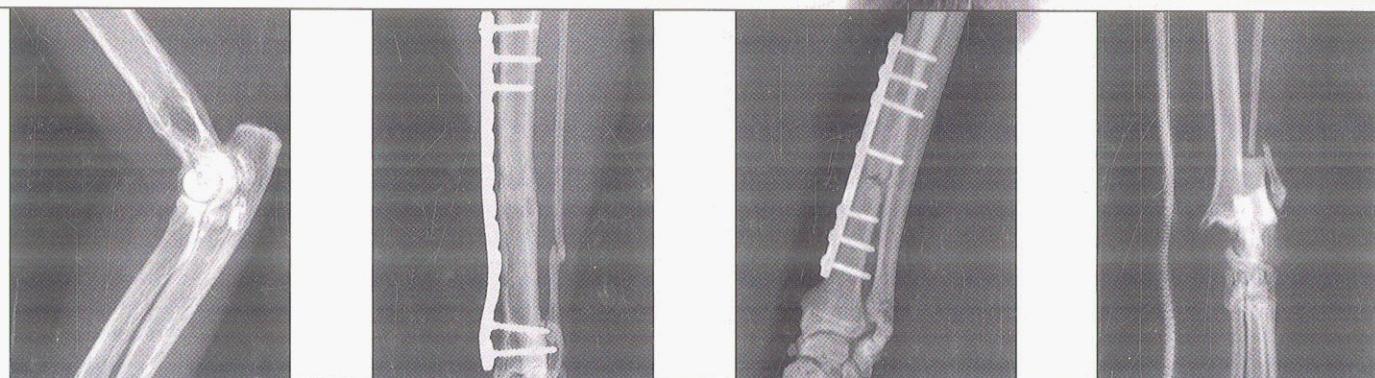
Feline Orthopedic Surgery and Musculoskeletal Disease



P.M. Montavon

K. Voss

S.J. Langley-Hobbs



Contents

Preface	xiii
Acknowledgments	xv
Contributors	xvii

Part 1: Clinical approach to the orthopedic patient

Chapter 1 Patient assessment	3	Chapter 2 Further diagnostic procedures	21
<i>K. Voss, F. Steffen</i>			
1.1 History	3	2.1 Diagnostic imaging	21
1.2 Handling and restraint	4	2.2 Arthrocentesis and synovial fluid evaluation	33
1.3 General physical examination	6	2.3 Selected biopsy techniques	34
1.4 Orthopedic examination	8	2.4 Neurodiagnostic procedures	36
1.5 Neurological examination	10		

Part 2: Musculoskeletal diseases

Chapter 3 Hereditary and congenital musculoskeletal diseases	41	6.1	Compressive diseases of the spinal cord	75																																																
<i>M. Hubler, S. Arnold, S.J. Langley-Hobbs</i>																																																				
3.1 Hereditary metabolic diseases of the musculoskeletal system	41	6.2	Non-compressive diseases of the spinal cord	77																																																
3.2 Congenital skeletal malformations	49	6.3	Infections of the spine and spinal cord	79																																																
Chapter 4 Diseases of bone	55	6.4	Congenital abnormalities of the spine and spinal cord	80																																																
<i>K. Voss</i>																																																				
4.1 Secondary hyperparathyroidism	55	6.5	Peripheral nerve and muscle disorders	81																																																
4.2 Vitamin D deficiency (rickets)	57	Chapter 7 Diseases of soft tissues	87																																																	
4.3 Hypervitaminosis A	57	<i>C. Favrot, F. Gallorini, K. Voss, S.J. Langley-Hobbs</i>																																																		
4.4 Hematogenous osteomyelitis	58	7.1 Diseases of muscles	87	4.5 Bone cysts	59	7.2 Diseases of tendons	90	4.6 Hypertrophic osteopathy	60	7.3 Conditions of the feet	91	4.7 Osteocartilaginous exostoses	60	Chapter 8 Tumors of the musculoskeletal system	97	Chapter 5 Diseases of joints	63	<i>V.J. Poirier, F. Steffen</i>				<i>K. Voss, S.J. Langley-Hobbs</i>				5.1 Degenerative joint disease	63	8.1	Bone tumors	97	5.2 Polyarthritis	67	8.2	Soft-tissue tumors	99	5.3 Miscellaneous diseases	72	8.3	Oral tumors	100	Chapter 6 Diseases of the spine and nervous system	75	8.4	Tumors of the nervous system	101	<i>F. Steffen, F. Grünenfelder</i>				8.5	Miscellaneous tumors	102
7.1 Diseases of muscles	87																																																			
4.5 Bone cysts	59	7.2 Diseases of tendons	90																																																	
4.6 Hypertrophic osteopathy	60	7.3 Conditions of the feet	91																																																	
4.7 Osteocartilaginous exostoses	60	Chapter 8 Tumors of the musculoskeletal system	97																																																	
Chapter 5 Diseases of joints	63	<i>V.J. Poirier, F. Steffen</i>																																																		
<i>K. Voss, S.J. Langley-Hobbs</i>																																																				
5.1 Degenerative joint disease	63	8.1	Bone tumors	97																																																
5.2 Polyarthritis	67	8.2	Soft-tissue tumors	99																																																
5.3 Miscellaneous diseases	72	8.3	Oral tumors	100																																																
Chapter 6 Diseases of the spine and nervous system	75	8.4	Tumors of the nervous system	101																																																
<i>F. Steffen, F. Grünenfelder</i>																																																				
8.5	Miscellaneous tumors	102																																																		

Part 3: Polytrauma

Chapter 9	Etiology and severity of polytrauma	107	Chapter 11	Traumatic hemorrhagic shock	113
	<i>K. Voss</i>			<i>K. Voss</i>	
9.1	Road traffic accidents	107	11.1	Stages of shock	113
9.2	High-rise syndrome	108	11.2	Signs of shock in cats	113
9.3	Gunshot injury	109	11.3	Fluid resuscitation	114
9.4	Dog bite wounds	109	Chapter 12	Specific injuries in the polytraumatized cat	117
9.5	Trauma by entrapment in bottom-hung windows	109		<i>K. Voss</i>	
Chapter 10	General approach to the trauma patient	111	12.1	Thoracic trauma	117
	<i>K. Voss</i>		12.2	Abdominal trauma	121
			12.3	Brain injury	124

Part 4: Introduction to musculoskeletal injuries

Chapter 13	Fractures	129	14.4	Principles of joint surgery	155
	<i>K. Voss, P.M. Montavon</i>		14.5	Postoperative management of joint injuries	158
13.1	Fracture biomechanics	129	14.6	Complications of joint surgery	158
13.2	Fracture classification systems	130	14.7	Principles of arthrodesis	159
13.3	Fracture healing	132	Chapter 15	Injuries of the spine, spinal cord, and peripheral nerves	161
13.4	Decision-making in fracture treatment	134		<i>K. Voss, F. Steffen</i>	
13.5	Fracture reduction techniques	142	15.1	Injuries of the spine and spinal cord	161
13.6	Complications in fracture repair	143	15.2	Principles of spinal surgery	164
13.7	Bone grafting	147	15.3	Traumatic neuropathy	165
13.8	Growth deformities	148	Chapter 16	Soft-tissue injuries	169
13.9	Implant removal	151		<i>K. Voss</i>	
Chapter 14	Joint injuries	153	16.1	Muscle injuries	169
	<i>K. Voss, P.M. Montavon</i>		16.2	Tendon injuries	170
14.1	Structure and function of joints	153	16.3	Degloving injuries	171
14.2	Healing of joint injuries	153	16.4	Cat bite wounds	173
14.3	Diagnosis of joint injury	154			

Part 5: The surgical patient

Chapter 17	Anesthesia	177
<i>S. Kaestner</i>		
17.1	Preoperative assessment of the surgical patient	177
17.2	Preparation for anesthesia	179
17.3	Venous access	179
17.4	Premedication	179
17.5	Injectable anesthetics	185
17.6	Inhalation anesthesia	186
17.7	Monitoring	192
17.8	Supportive care during anesthesia	195
17.9	Cardiopulmonary resuscitation	196
Chapter 18	Perioperative analgesia	199
<i>S. Kaestner</i>		
18.1	Local anesthetics	199
18.2	Opioids	201
18.3	Non-steroidal anti-inflammatory drugs (NSAIDs)	203
18.4	Analgesic adjuncts	204
Chapter 19	Preparation for surgery	207
<i>K. Voss</i>		
19.1	Preparation of the patient	207
19.2	Preparation of the surgical team	210
Chapter 20	Postoperative care	213
<i>K. Voss, E. Steffen</i>		
20.1	Postoperative care of the fracture patient	213
20.2	Postoperative care of the patient with joint injuries	214
20.3	Postoperative care of the neurological patient	214
20.4	Nutritional support	215
Chapter 21	Rehabilitation of the cat	221
<i>S. Hudson</i>		
21.1	Principles of rehabilitation	221
21.2	Four target areas of rehabilitation	221
21.3	Passive and active rehabilitation	222
21.4	The rehabilitation program	227
21.5	How do you know you have reached a goal?	227
21.6	Examples of exercises	229

Part 6: Orthopedic materials, instruments, implants, and techniques

Chapter 22	External coaptation	239
<i>S.J. Langley-Hobbs, M. Keller, K. Voss</i>		
22.1	Bandages	239
22.2	Splints and casts	240
22.3	Slings, muzzles, and hobbles	244
22.4	Aftercare for bandages, splints, casts, and slings	247
Chapter 23	Orthopedic instrumentation	249
<i>J.P. Lapish</i>		
23.1	Instruments used for surgical approaches	249
23.2	Instruments used for osteosynthesis	252
Chapter 24	Orthopedic implants	259
<i>S.J. Langley-Hobbs, K. Voss, J.P. Lapish, P.M. Montavon</i>		
24.1	Orthopedic wire	259
24.2	Kirschner wires	261
24.3	Intramedullary pins	262
24.4	Interlocking nails	263
24.5	External skeletal fixation	265
24.6	Bone screws	271
24.7	Bone plates	274
24.8	Internal fixators	279
Chapter 25	Feline arthroscopy	283
<i>B. Beale</i>		
25.1	Arthroscopic instrumentation	283
25.2	Patient preparation and positioning	287
25.3	Postoperative care	287
25.4	Arthroscopy of the shoulder	287
25.5	Arthroscopy of the elbow	290
25.6	Arthroscopy of the hip	294
25.7	Arthroscopy of the stifle	296

Part 7: Treatment of selected surgical diseases and injuries

Chapter 26	Mandible and maxilla	311	Chapter 29	Humerus	343
	<i>K. Voss, S.J. Langley-Hobbs, S. Grundmann, P.M. Montavon</i>			<i>K. Voss, S.J. Langley-Hobbs, P.M. Montavon</i>	
26.1	Surgical anatomy	311	29.1	Surgical anatomy	343
26.2	Diagnosis and general considerations	311	29.2	Stabilization techniques	343
26.3	Stabilization techniques	312	29.3	Fractures of the proximal humerus	347
26.4	Fractures of the mandible	316	29.4	Diaphyseal fractures of the humerus	348
26.5	Disorders of the temporomandibular joint	320	29.5	Fractures of the distal humerus	351
26.6	Fractures of the maxillary bones	326	29.6	Postoperative treatment and prognosis	356
26.7	Postoperative treatment and prognosis	327	Chapter 30	Elbow joint	359
Chapter 27	Scapula	329		<i>K. Voss, S.J. Langley-Hobbs, P.M. Montavon</i>	
	<i>K. Voss, S.J. Langley-Hobbs, P.M. Montavon</i>		30.1	Surgical anatomy	359
27.1	Surgical anatomy	329	30.2	Diagnosis and treatment options	359
27.2	Stabilization techniques	329	30.3	Approaches to the elbow joint	360
27.3	Fractures of the body and spine	329	30.4	Elbow dysplasia and congenital elbow luxation	361
27.4	Fractures of the scapular neck and glenoid cavity	332	30.5	Synovial cysts	361
27.5	Scapular avulsion	333	30.6	Elbow epicondylitis	361
27.6	Postoperative treatment and prognosis	335	30.7	Avulsion of the triceps tendon	362
Chapter 28	Shoulder joint	337	30.8	Elbow luxations	363
	<i>K. Voss, S.J. Langley-Hobbs</i>		30.9	Fractures of the elbow joint	366
28.1	Surgical anatomy	337	30.10	Arthrodesis of the elbow joint	366
28.2	Diagnosis and treatment options	337	30.11	Postoperative treatment and prognosis	368
28.3	Approaches to the shoulder joint	337	Chapter 31	Radius and ulna	371
28.4	Dysplasia of the shoulder joint	338		<i>K. Voss, S.J. Langley-Hobbs, P.M. Montavon</i>	
28.5	Biceps tenosynovitis or rupture	338	31.1	Surgical anatomy	371
28.6	Accessory centers of ossification	338	31.2	Stabilization techniques	371
28.7	Shoulder joint instability and luxation	339	31.3	Fractures of the proximal radius and ulna	373
28.8	Fractures of the shoulder joint	341	31.4	Diaphyseal fractures of the radius and ulna	375
28.9	Arthrodesis of the shoulder joint	341	31.5	Fractures of the distal radius and ulna	378
28.10	Postoperative treatment and prognosis	341	31.6	Postoperative treatment and prognosis	383

32.2	Diagnosis and treatment options	385	Chapter 35	Pelvis	423
32.3	Approaches to the carpal joints	387		<i>K. Voss, S.J. Langley-Hobbs, L. Borer, P.M. Montavon</i>	
32.4	Antebrachiocarpal instability and luxation	387	35.1	Surgical anatomy	423
32.5	Hyperextension injury	389	35.2	Diagnosis and general considerations	423
32.6	Rare carpal injuries	390	35.3	Stabilization techniques	424
32.7	Partial carpal arthrodesis	390	35.4	Sacroiliac fracture/luxation	426
32.8	Pancarpal arthrodesis	391	35.5	Fractures of the ilium	430
32.9	Postoperative treatment and prognosis	392	35.6	Acetabular fractures	434
Chapter 33	Metacarpus, metatarsus, and phalanges	397	35.7	Fractures of the pelvic floor	437
	<i>S.J. Langley-Hobbs, K. Voss, P.M. Montavon</i>		35.8	Fractures of the pelvic margin	437
33.1	Surgical anatomy	397	35.9	Postoperative treatment and prognosis	439
33.2	Stabilization techniques	397	Chapter 36	Hip joint	443
33.3	Fractures of the metacarpal and metatarsal bones	399		<i>K. Voss, S.J. Langley-Hobbs, P.M. Montavon</i>	
33.4	Fractures of the phalanges	402	36.1	Surgical anatomy	443
33.5	Metacarpophalangeal, metatarsophalangeal, and interphalangeal luxation	404	36.2	Diagnosis and treatment options	443
33.6	Postoperative treatment and prognosis	405	36.3	Approaches to the hip joint	443
Chapter 34	Spine	407	36.4	Hip dysplasia	444
	<i>K. Voss, P.M. Montavon</i>		36.5	Conditions of the femoral head and neck	446
34.1	Surgical anatomy	407	36.6	Coxofemoral luxation	447
34.2	Diagnosis and general considerations	407	36.7	Femoral head and neck excision	449
34.3	Decompressive procedures	407	36.8	Total hip replacement	451
34.4	Stabilization of spinal fractures/luxations	408	36.9	Postoperative treatment and prognosis	451
34.5	Surgical conditions of the cervical spine	408	Chapter 37	Femur	455
34.6	Surgical conditions of the thoracolumbar spine	409		<i>K. Voss, S.J. Langley-Hobbs, P.M. Montavon</i>	
34.7	Surgical conditions of the lumbosacral spine	415	37.1	Surgical anatomy	455
34.8	Surgical conditions of the sacrococcygeal spine	419	37.2	Stabilization techniques	455
34.9	Postoperative treatment and prognosis of spinal fractures and luxations	420	37.3	Fractures of the proximal femur	458
			37.4	Diaphyseal fractures of the femur	460
			37.5	Fractures of the distal femur	466
			37.6	Postoperative treatment and prognosis	470
			Chapter 38	Stifle joint	475
				<i>K. Voss, S.J. Langley-Hobbs, P.M. Montavon</i>	
			38.1	Surgical anatomy	475
			38.2	Diagnosis and treatment options	475

38.3	Approaches to the stifle joint	476
38.4	Meniscal mineralization	477
38.5	Disorders of the patella	477
38.6	Tendon injury	481
38.7	Ligament injuries	481
38.8	Stifle joint disruption	485
38.9	Arthrodesis	487
38.10	Postoperative treatment and prognosis	488
Chapter 39	Tibia and fibula	491
	<i>K. Voss, S.J. Langley-Hobbs, P.M. Montavon</i>	
39.1	Surgical anatomy	491
39.2	Stabilization techniques	491
39.3	Fractures of the proximal tibia and fibula	494
39.4	Diaphyseal fractures of the tibia and fibula	497
39.5	Fractures of the distal tibia and fibula	502
39.6	Postoperative treatment and prognosis	504
Chapter 40	Tarsal joint	507
	<i>K. Voss, S.J. Langley-Hobbs, P.M. Montavon</i>	
40.1	Surgical anatomy	507
40.2	Diagnosis and treatment options	508
40.3	Approaches to the tarsal joint	508
40.4	Rupture or avulsion of the Achilles tendon	509
40.5	Luxation of the superficial digital flexor tendon	510
40.6	Tarsocrural instability and luxation	510
40.7	Intertarsal and tarsometatarsal instability	515
40.8	Fractures of the tarsal bones	518
40.9	Partial tarsal arthrodesis	521
40.10	Pantarsal arthrodesis	521
40.11	Postoperative treatment and prognosis	523
Chapter 41	Amputations	527
	<i>S.J. Langley-Hobbs, K. Voss, P.M. Montavon</i>	
41.1	Preoperative evaluation	527
41.2	General principles of amputation	527
41.3	Forelimb amputation	529
41.4	Hindlimb amputation	529
41.5	Tail amputation	529
41.6	Metacarpal, metatarsal, and phalangeal amputation	529
41.7	Postoperative treatment and complications	533
Chapter 42	Bloopers	535
	<i>P.M. Montavon</i>	
	Index	547