2.1 Back Pain

This lead symptom is more significant and universal than arthralgias, and applies most predominantly to the problems of arthrological, as well as musculoskeletal and orthopedical disorders, described in this section. It is the initial diagnostic opening to further concepts, whereby consideration must always be given to neurological diseases and conditions, circulatory disorders, and virtually the entire scope of internal medicine (pulmonary, cardiological, gastrointestinal, nephrological, hematological, infectious diseases and conditions), but also psychosomatics (trauma) surgery and gynecology.

Once such diseases and conditions have been ruled out, the arthrological and vertebral syndromes, and above all the back pain, should be specifically addressed. The focus should be directed at the associated myelogenic (CS 46) and vascular syndromes reminiscent of MS (CS 18), which are seen in the neurological setting.

Back pain could be the initial signs of vasculitis (e.g., Takayasu’s arteritis, cf. comments on Fig. 77 see in RCS, Chap. 2) or tumor disease. Arthrological back pain is not uncommon, for example, in spondyloarthopathy (SpA), under the guise of generalized panalgesia or tendomyopathy (fibromyalgia). The time taken on average to diagnose SpA is far too long and at the present time is a mean of 6.4 years. The characteristics of arthrological back pain are:

- Pain on movement or exertion
- Nocturnal pain with morning stiffness
- Restricted mobility, with and without pain
- Increased muscular tone (muscular tension)

Arthrological back pain affects all the anatomical structures of the spine, including the bones, soft tissue, and nerves (neuropathic components). Etiology: mostly degenerative (Chap. 2.3) and inflammatory (Chap. 2.2) diseases of the spine.

The features of back pain are linked to:

- The section of the backbone
- The many different etiologies

In their consideration, a distinction is made as given below.
2.1.1 Neck Pain

Cervicobrachialgias/CS 63/

- *Torticollis* (“stiff neck”), acute neck pain with asymmetrical positioning of the head and myalgia, mostly with *uncovertebral arthrosis* (caused by a “draught”)
- Subacute neck pain (DD *polymyalgia rheumatica* in patients over the age of 50)
- Chronic *cervical* syndrome (*pseudoradicular* pain syndrome), often with abnormal sensations (tingling and numbness) in one or more fingers and vegetative symptoms (dizziness, ocular disorders, tinnitus, etc.)
- Cervical radicular syndrome (*cervical nerve root compression* syndrome). Neurological deficits of sensitivity, motor function, and reflexes in the arms (C6–C7 most common; nerve roots C1–C4 hardly ever, except post-traumatic). In cervical spine block: typical “head inclination”
- Cervicomedullary syndrome (*cervical myelopathy*). Neurological deficits in the hands, arms, and legs (radicular syndrome with muscular atrophy, paresthesias, paraplegias)
- Headache (“*cervical migraine*”), episodic on exertion, also psychological, changes in the weather, *giant-cell arteritis*
- Dizziness (neurological investigation upon suspicion of *cervical arthritis* C1/C2)
- Pain in the shoulder/arm (DD *polymyalgia rheumatica*, *rotator cuff disease*, *impingement* syndrome, *Sudeck’s* disease in the form of *shoulder-hand* syndrome in glenohumeral subluxation or after stroke)
- Pain with recumbency\(^1\) or nocturnal pain (tumors, benign or malignant)
- Muscular tension\(^1\) in the neck/shoulder region with radiation (*tendomyosis*)
- Pain with morning stiffness\(^1\) (*AS*, Fig. 60: fresh syndesmophytes/left/are of absolute specificity to the disease)
- Localized bone pain\(^1\) to the midline over osseous structures (fracture, bone necrosis, inflammatory, or neoplastic disorders)
- *RA* patients are a special risk group\(^2\): in roughly 17% arthritis of the atlanto-axial joints with or without pain (X-ray Fig. 60 and MRI diagnosis, CS 63), the following are involved:
  - Pannus formation (about 20%)
  - *Subluxations* (70%), atlanto-dental dislocation also with *PsA*
  - *Spondylodiscitis* below C2 (20%), as in Fig. 48a in thoracic spine region
  - *Myelocompression* (28%), as in Figs. 126 and 127a in the thoracic spine region

2.1.2 Thoracic Back Pain

Brachialgia/CS 17/

It is less often caused by rheumatic factors than the neck and low back pain, but has a broad spectrum of differential diagnostic patterns with regard to other non-rheumatological diseases and conditions.

\(^{1}\)also applies to other sections of the spine
2.1 Back Pain

- **Rheumatic etiology:**
  - AS (the pain may occasionally intensify on breathing)/Fig. 117/
  - Tension in all the back muscles (*tendomyoses*)
  - *Spondylodiscitis* in AS (Fig. 48a) and other diseases
  - *Osteoporosis* with or without fractures (Figs. 125–127)
  - Postural abnormalities
  - *Scheuermann’s* disease (adolescent kyphosis) most common *spinal* disease in adolescence

- **Non-rheumatological causes:**
  - Cardialgia (DD *angina pectoris, myocardial infarction/CS 21*, pericarditis)
  - Pulmonary diseases (*pneumonia, pleuritis, pulmonary embolism*)
  - Infections (*Herpes zoster*), often during and after immunosuppression
  - Gastrointestinal diseases (*pancreatitis, ventricular and duodenal ulcer*)
  - Tumors (*plasmocytomas*, among others) and metastases
  - Psychogenic *rheumatism*

2.1.3 Low Back Pain

Lumbar syndrome (CS 69), radicular pain (sciatica)

Low back pain is the most common musculoskeletal complaint. Mechanical disorders are the most common causes of these syndromes:

- **Sciatica** (Acute low back pain or lumbago) – sudden onset of deep-seated pain in the lower back
- **Chronic back pain** (chronic lumbago) – radicular lumbar and/or nerve root compression syndrome → Chap. 3.12): lower back pain radiating into the gluteal muscles or iliac crest; depending on the area affected, localized tenderness, impaired sensitivity, and reflex deficits can be found (etiology: mostly prolapsed disc or lumbar spinal canal stenosis with distance-related pain, *Claudicatio spinalis*)
- **Cauda equina syndrome and/or sacral root compression syndrome** (radiating pain, “saddle block anesthesia” as far as spinal transverse symptoms, impaired urination or defecation)
- **Aortitis** within the context of *Takayasu's arteritis in Aorta abdominalis* involvement (Figs. 77ab) or AS

Emergancy surgery with neurosurgical decompression (CS 46, Figs. 125–127)

- **Pseudo-sciatica or pseudoradicular** syndrome (plus radiating pain, no neurological deficits)
- **Ischialgia** pain, radiating as far as the legs or tips of the toes

When recording the patient’s history, these two most common symptoms associated with back pain should be identified.
2.1.4 Noninflammatory Back Pain

(Mechanical disorders)

- Onset after the age of 40
- Occurrence connected with over-exertion (physical, psychosomatic), trauma, malpositioning
- As a rule, brief morning stiffness is described
- Deterioration following strain and over-exertion
- Inadequate improvement from nonsteroidal agents (NSAIDs)
- Particularly if there are neurological symptoms

Such features of low back pain could be attributed to functional conditions in the guise of noninflammatory STR (Chap. 3.4), or degenerative conditions and diseases (Chap. 2.3).

2.1.5 Inflammatory Back Pain

- Onset of back pain before the age of 40
- Persistent symptoms for over 3 months
- Pain in the early morning and when at rest (when waking early)
- Morning stiffness
- Improvement of pain and stiffness after moving and NSAIDs
- Lack of neurological symptoms

Such back pain is associated with SpA (Chap. 2.2)\(^8\) and necessitates a strategic program of clinical and imaging examinations. To confirm the diagnosis, the intensity of the pain in the back and joints – measured by the patients on the VAS between 0 and 10 points – must be considered in combination with the intensity and duration of morning stiffness, as a parameter (BASDAI: Bath Ankylosing Spondylitis Disease Activity Index) of activity and severity in AS.

It must be remembered thereby that the specificity of the scores given by the patients using the BASDAI is relatively low (e.g., in patients with fibromyalgia or panalgesia (Chap. 3), and consequently a diagnosis is required which meets specific criteria. On that basis, these indices are used for monitoring therapy.

2.2 Spondyloarthritis

This global term is used as a suspected diagnosis for spinal involvement, on account of the back pain and existing or identified concurrent diseases, and encompasses the inflammatory, degenerative, metabolic, and neurological diseases or conditions of the spine. Classification of SpA:
(a) Inflammatory spondyloarthritis

- Rheumatic SpA
  - Ankylosing spondylitis – AS (CS 15, 63; Figs. 60, 117, 124)
  - Inflammatory bowel disease (Crohn’s disease, Colitis ulcerosa)
  - Psoriasis, ReA
  - Juvenile SpA
    - Differentiated form includes juvenile SpA, ReA, PsA, and arthritis with inflammatory bowel disease
    - Undifferentiated form includes enthesitis-related arthritis, uveitis
  - Spondylitis, nonspecific and specific
    - Spondylitis infectiosa (TB)
  - Spondylodiscitis (AS, CS 17) also with CTD (e.g., MCTD)

(b) Degenerative (spondylarthrosis)/Figs. 116, 118, 123/

(c) Metabolic

- Osteoporosis (CS 46)
- Osteomalacia
- Diabetic spondylopathy (Fig. 118)
- Hypo-/hyperparathyroidism

(d) Neurological

- Tabes dorsalis
- Syringomyelia

To formulate the diagnosis, this term is mostly used for metabolic and neurological problems, preferably just before confirming the diagnosis in line with specific criteria. In the case of inflammatory and degenerative changes, spondyloarthritis and spondylarthrosis are used. All these (many others are not mentioned) diseases and conditions are essentially significant in clinical terms to rheumatology and orthopedics.

### 2.2.1 Spondyloarthritis

(Inflammatory spine diseases)

A group of diseases and conditions with lead symptoms:

- Inflammatory back pain
- Primary inflammatory diseases (arthritis, enteropathies, TB, sepsis)
- Sacroilitis (Figs. 44–46, 124)
- Spondylodiscitis (Fig. 48a)
- Asymmetric joint involvement, primarily of the lower extremities (Fig. 24)
- Cutaneous (Figs. 84ab) and mucosal changes (potential association with above mentioned syndromes)
2.2.2 Spondylitis, Spondylodiscitis

Spondylitis is characterized by inflammation of the vertebrae, *spondylodiscitis* (Fig. 48a) by inflammation or tumorous destruction of the intervertebral discs and the adjacent base and top plates.

A differentiation is made between the following forms of spondylitis:

- Rheumatic (see above)
- Bacterial (abscess formation or osteomyelitis of a vertebral body), from
  - *Staphylococcus aurens*
  - *Streptococcus viridans*
  - Brucella
  - Tuberculosis bacteria
- Iatrogenic conditions, or conditions following
  - Nucleotomy
  - Chemonucleolysis
  - Peridural anesthesia
  - Lumbar puncture
- Tumorous (mostly resulting from metastasis)

Lead symptoms for bacterial and iatrogenic spondylitis or *spondylodiscitis*:

- Localized pain in the spinal column
- Primary localization: lower thoracic and upper lumbar spine
- Adaptive posture, stiffness
- Neurological deficits
- Serious signs of inflammation (*CRP, ESR* elevation)
- Historical evidence of previous or existing
  - Bacterial infections
  - TB
  - Sarcoidosis
  - HIV infection
  - Severe immunosuppression
  - Tumors
  - Therapeutic interventions

Diagnosis should be confirmed by means of the following procedures:

- X-ray
- Bone scan
- CT and MRI
- Vertebral body biopsy
2.3 Degenerative Spinal Diseases or Mechanical Disorders of the Spine

2.3.3

Sacroiliitis

Sacroiliitis (Figs. 44–46, 124) is characterized by (a) symmetric destructive arthritis of the sacroiliac joints, with a distinction being made between

- Nonbacterial (rheumatic)
- Bacterial (TB) or septic (Staphylococcus aurens)

Clinically, there is a suspected diagnosis of SpA if the following are present:

- “Inflammatory pattern of back pain” in the lumbar region
- Tenderness in the sacroiliac joints
- Provoked pain (physical exertion, Mennell’s test)
- Stiffness in the lumbar region
- Curvature in the lumbar spine (kyphosis, scoliosis)

Additionally, in bacterial sacroiliitis

- Predisposing factors (HIV infection, immunosuppression, TB, sepsis)
- Serious signs of inflammation (CRP, ESR elevation)
- Acute (after 2–3 weeks) and widespread destruction

Confirmation of diagnosis by

- X-ray (Figs. 44, 60, 117, 124)
  - A “colorful picture” of
    - Widening or narrowing of joint space (Figs. 44, 124)
    - Sclerosis (Figs. 117, 124)
    - Erosions or osteolysis (Fig. 45)
    - Ankylosis, partial or full (cf. staging, Fig. 124)
  - Symmetric changes (mostly AS, Figs. 117, 119, 124)
  - Asymmetric (also with other forms of SpA, Fig. 46)
  - Bone scintigraphy (in particular, relatively specific asymmetric enhancement in sacroiliac joint)
  - CT (Figs. 45, 118, 126, 127ab) and MRI (Figs. 46, 121)
  - Vertebral body biopsy

2.3

Degenerative Spinal Diseases or Mechanical Disorders of the Spine

Such diseases are most common in humans and are mostly treated by orthopedic specialists. They involve changes in the intervertebral discs, vertebrae, and often unco-vertebral, sacroiliac joints and paraspinous ligaments. The classic signs of disc and
joint degeneration (osteophyte formation in the joints, fissuring, and curvatures) can best be verified by radiological, CT, and MRI scans. They involve, primarily the following.

### 2.3.1 Disc and Paraspinal Ligament Disorders

- **Chondrosis (Chondrosis intervertebralis)** – diminishment of the intervertebral space as a result of sintering of the disc or loss of height in the disc space (Figs. 123, 127a)
- **Osteochondrosis (Osteochondrosis intervertebralis)** – chondrosis + irregularities and condensation, that is, sclerotic reaction of the adjacent vertebral bodies and/or facing top and base plates, with formation of spondylophytes (Fig. 116)
- **Diffuse idiopathic skeletal hyperostosis/DISH/(Forestier’s disease)** refers to calcification and ossification of paraspinal ligaments – a special form influenced by metabolism: serious ventral hyperostoses (NB: no syndesmophytes) found radiologically, almost always in the lower thoracic spine with stiffening of this area (Fig. 118)
- **Intervertebral disc herniation** causes nerve impingement and inflammation that result in radicular pain (sciatica), often with neurologic deficits
- **Osteochondrosis juvenilis (Scheuermann’s disease)**

### 2.3.2 Spondyloarthrosis

- **Spondylosis (Spondylosis deformans)** – formation of marginal spikes (spondylophytes) on the vertebral bodies (Figs. 116, 123, 127b)
- **Spondylarthrosis (Spondylarthrosis deformans)** – diminishment of the small vertebral joints with increased sclerosis and formation of marginal spikes (the same characteristics as for the joints in the extremities)
- **Baastrup’s disease** (constitutional enhancement of the spinous processes, intensified lordosis)
- **Spondylolisthesis** is the anterior displacement of a vertebral body in relation to the underlying vertebra and usually secondary to osteochondrosis
- **Uncovertebral arthrosis** (disorders of the neck) – restriction of Foramina intervertebralia with potential nerve root syndrome and impairment of Arteria and Plexus vertebrales
- **Spinal canal stenosis** (Fig. 126) caused in certain circumstances by Claudicatio spinalis (Chap. 9.2.5): pain on exertion and neurological symptoms in the legs, possibly dramatic (“numbness in the legs”), but transient

Such radiomorphological signs are not necessarily consistent with local symptoms and more likely serve as an exclusion diagnosis for nondegenerative spinal disease (bacterial, rheumatic, traumatic, malformations, tumors, metastases).
2.4 Involvement of the Joints in Diseases of the Spine

Involvement of the joints in diseases of the spine (as well as a history of such) is deduced from the manifestation of the back pain. Conversely, such joint problems indicate the type of spinal involvement and can even occur prior to the back pain itself.

2.4.1 Arthritis

(Inflammatory pattern in spinal diseases)

- Mono-/oligoarthritis, possibly erosive with destruction and ankylosis/Figs. 21, 24, 119/within a short period; occurring as the initial symptom of SpA in 20–40% of cases (CS 8). In one of our patients, a 16-year-old male, full ankyloses developed in both hips during the first 6 months of AS:
  - Predominantly in the large joints near the trunk/hips, knees, and shoulders/(rhismelic form)
  - Asymmetric, rarely symmetric hip arthritis (Fig. 119)
  - Mostly not destructive
- Following concomitant syndromes:
  - Ocular involvement (Epi-/Scleritis, Fig. 57), could precede AS
  - Urogenital problems of an inflammatory nature
  - Heel pain (calcaneopathy) and other forms of enthesitis (Figs. 98, 108, 120)
  - Neurological deficits (due to atlanto-dental arthritis and dislocations in SpA) or myelocompression with paraplegia, as in Figs. 126, 127a, CS 46

2.4.2 Osteoarthritis

(Noninflammatory pattern in spinal diseases)

- Generalized OA of the large and small joints (Chap. 1.4)
- No concurrent inflammatory symptoms or history thereof

2.4.3 MRI-Confirmed Syndromes

- Osteitis (Fig. 102), synchondritis (symphysis, Figs. 119, 120) or sternum, perichondritis manubrii sternalis, cf. comments on CS 21 in RCS, Chap. 2
- Aseptic necrosis (Fig. 121)
• Secondary *arthritis* and *periarthritis* (Fig. 106)
• *Atlanto-dental arthritis* (this area is presented in Fig. 60 and the relevant clinical findings in CS 63) and dislocations

### 2.5 Malpositioning and Curvature of the Spine

An abnormal profile to the *spine* has various components which can possibly be combined:

- Constitutional or idiopathic
- Age-related (*osteoporosis*)
- Disease-related (*SpA, spondylosis, spondylolisthesis*)

The *acquired malpositioning* of the spine is expressed by a diminishment in height, axial deviations, blockades, or pelvic asymmetry, and are associated with:

- *Osteoporosis* (primary and cortisone-induced) due to shrinking of the spine (Figs. 125, 127a)
- *AS* (Figs. 117, 124) and *osteochondrosis* (Figs. 116, 118, 123)
- *Spondylodiscitis* (sterile, septic, tumorous) due to diminishment of the intervertebral space (Fig. 48a)
- *Kyphosis* of neck and thorax sections (in *SpA*, most commonly *AS* and *spondylloses*), also in what is known as *Scheuermann’s kyphosis* (impaired growth in the top and base plates with cuneiform, deformed vertebral bodies)
- Spondylolistesis reveals *lordosis* with a “step off”
- Pelvic malpositioning arises from differences in leg length and contractures of the hip joints (*OA of the hip*, Fig. 97; *aseptic osteonecrosis*, Fig. 121)

Curvatures of the *spine* and static disorders (support reaction!) are characterized inevitably by *back pain*, which, above all, is almost always attributable to concomitant *osteochondrosis*, *tendomyoses* with facet joint blocks (*pseudoradicular syndrome*), and *compression syndrome*.

The *most common curvatures* and profile disorders of the spine are:

- *Kyphosis* (round/flat back)
- *Lordosis*
- *Scoliosis*, structural and functional, due to
- Differences in the *lengths of the extremities*

At the same time as vertebral symptoms, pulmonary (restrictive ventilatory disorders, *pulmonary hypertension* in scoliosis) or myelogenic (spinal overextension with severe kyphosis) factors must be considered.
2.6 Extra-articular Manifestations and Associated Diseases

Such factors play a decisive role in the diagnosis, therapy, and prognosis of spinal diseases (Chap. 2.4).

2.6.1 Extra-articular Manifestations

(See Chaps. 1.6 and 10)

- Ocular (iritis-/iridocyclitis, uveitis, epi-/scleritis, Fig. 57)
- Cardiovascular (aortitis, aortic insufficiency, arrhythmias)
- Pulmonary (diminished vital capacity, restrictive ventilatory disorders, pulmonary fibrosis, Caplan’s syndrome/association of the seropositive RA and pneumoconiosis/)
- Renal (interstitial nephritis, amyloidosis)
- Intestinal (Crohn’s disease, Colitis ulcerosa, infections)
- Neurological (compression syndrome/CS 46/, atlas dislocation, cauda equina syndrome)
- Drug-induced toxicity of coxibs, NSAIDs, DMARDs, and TNF-blockers

2.6.2 Associated Diseases and Conditions

- Curvatures, hereditary and acquired (kyphosis, lordosis, scoliosis)
- Psoriasis vulgaris and pustulosa (Figs. 84, 110–111, 129b)
- Urogenital diseases (urethritis, balanitis)
- Inflammatory bowel diseases (Crohn’s disease, Colitis ulcerosa)
- Degenerative or inflammatory joint changes and such whose nature is likewise a key to diagnosis of the respective changes in the spine

2.7 Deterioration in General Health

The related symptoms are seen to be highly relevant in joint and spinal diseases, and are remarkable primarily in inflammatory diseases due to:

- Fever and more severe signs of inflammation (with florid polyarthritic involvement of RA, Still’s disease, SpA, inflammatory arthropathies, septic arthritis)
- Considerable restrictions to mobility, particularly active painful movements (gout arthritis, aseptic necrosis, Sudeck’s syndrome) or in marked spinal kyphosis, several
contractures and ankylosis of the musculoskeletal system (impairment to passive movements) or due to compression syndrome (Chap. 3.12)

- Systemic extra-articular symptoms (Chaps. 1.6 and 10)
- Serious concomitant diseases (Crohn’s disease, Colitis ulcerosa, infections, sepsis)

If there is no clinical correlate to the deterioration in general health, and the history is short, a broad therapeutic investigation in the context of systematic screening for tumors, metastases, and infections should be instigated (Chap. 13.3).

2.8 Restrictions to Quality of Life

This important syndrome, involving diseases of the joints and spine, has a significant influence on the burden suffered by affected patients. In some diseases the full burden of the disease is difficult to gauge on account of the often inconsistent correlation between (radio) morphology and symptoms, for example, in osteoporosis (spine sintering or fracturing) or in destructive forms of arthritis (Chap. 1.3.4). The quality of life is measured on a scale of functional loss and is closely monitored, in fact as part of study routine (using specific questionnaires, for example, BASMI: Bath Ankylosing Spondylitis Metrology Index) or on account of difficulties concerning insurance and pensions.

Quality of life is regarded as an endpoint of clinical, morphological, and pathophysiological changes and their socioeconomic consequences, as well as a primary objective of all rheumatological and orthopedic treatment measures and studies.
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