

Ankylosing Spondylitis

Inflammatory axial skeletal disease • morphology • diagnosis • clinical implications

Sacroiliac inflammation • cartilage injury • bony ankylosis

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Learning objectives

- Place ankylosing spondylitis within the seronegative spondyloarthritis group.
- Connect enthesis/joint inflammation to cartilage damage, new bone, and spinal rigidity.
- Interpret clinical, laboratory, and imaging evidence without overreliance on one test.
- Compare key differentials and identify major clinical management principles.

Core disease definition

Inflammation + skeletal fusion

- Chronic inflammatory disease with prominent sacroiliac and spinal involvement.
- Articular cartilage damage coexists with progressive bony ankylosis.
- Lower back pain and loss of spinal mobility are the characteristic clinical consequences.

The seronegative spondyloarthritis family

Shared group features

RF absence • enthesitis involvement •
sacroiliac/vertebral disease

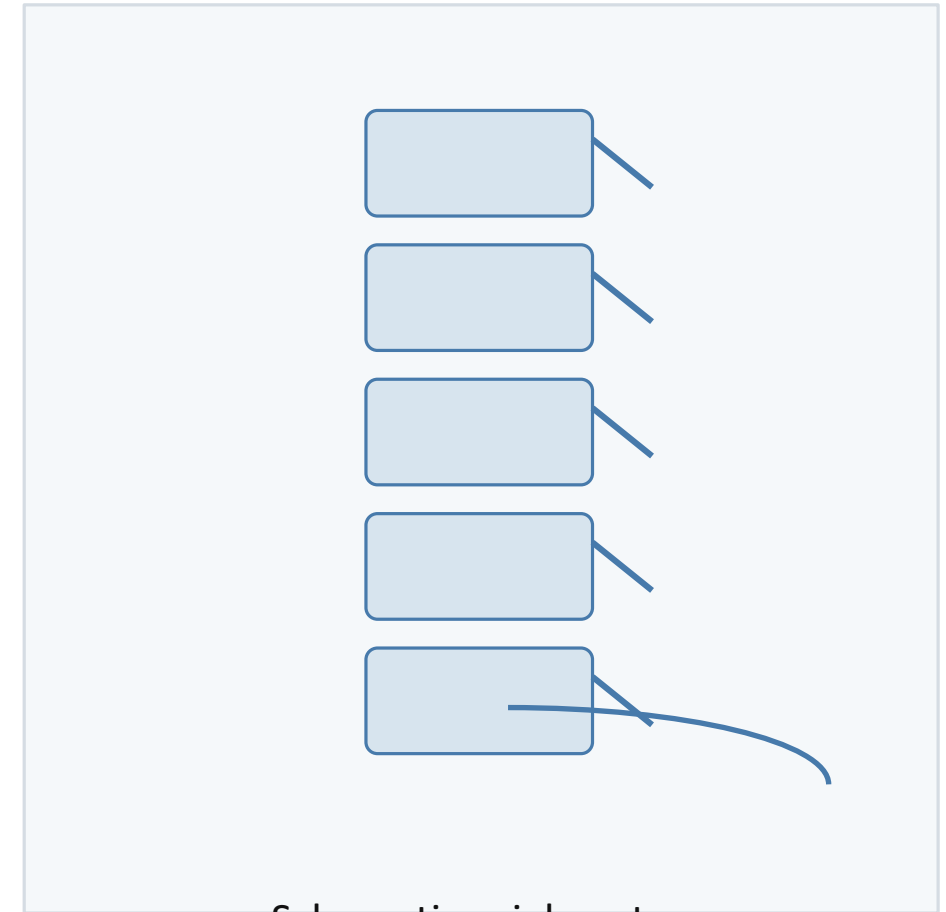
Structural outcome

Bone proliferation may progress to
ankylosis

- Group feature: Rheumatoid factor is absent by definition of the classic seronegative pattern.
- The enthesitis is a prominent site of pathology, unlike synovium-dominant rheumatoid arthritis.
- Sacroiliac/vertebral involvement and new bone formation are recurring themes.

Predominantly axial anatomical distribution

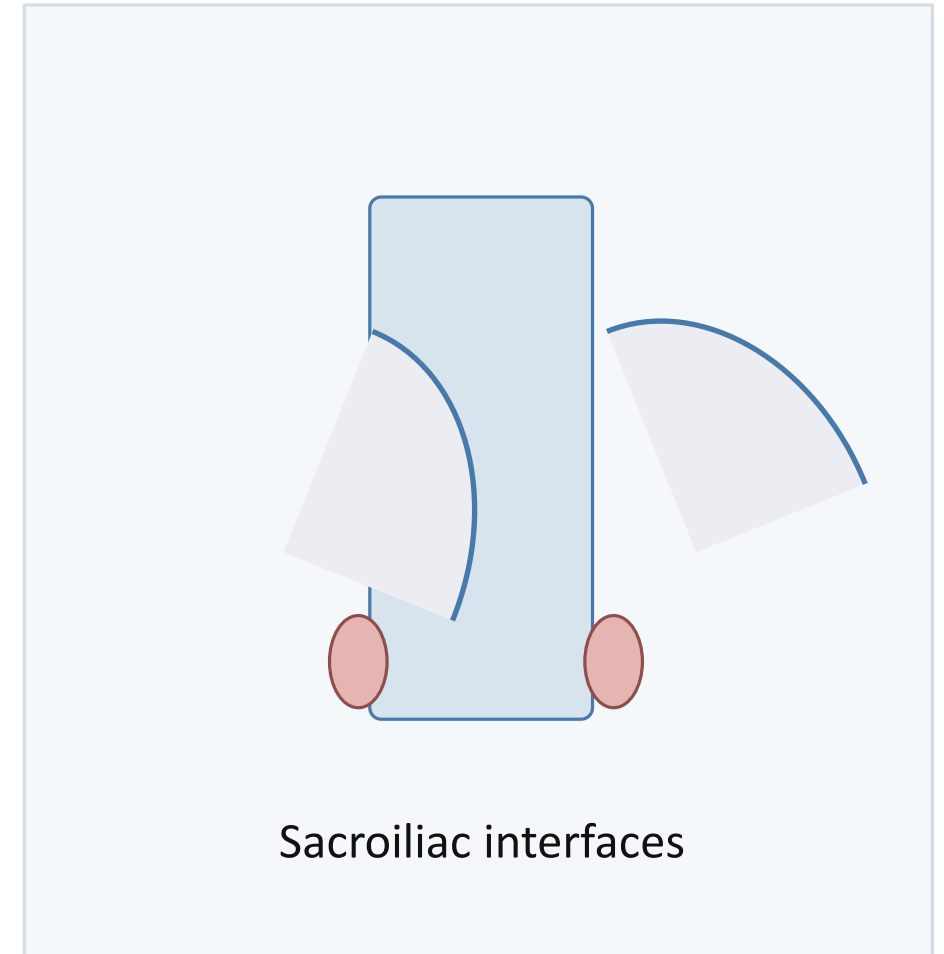
- Sacroiliac joints link the spine with the pelvis.
- Vertebral apophyseal (facet) joints are characteristic sites.
- Peripheral joints can also be involved; Axial predominance does not mean axial exclusivity.



Schematic axial anatomy

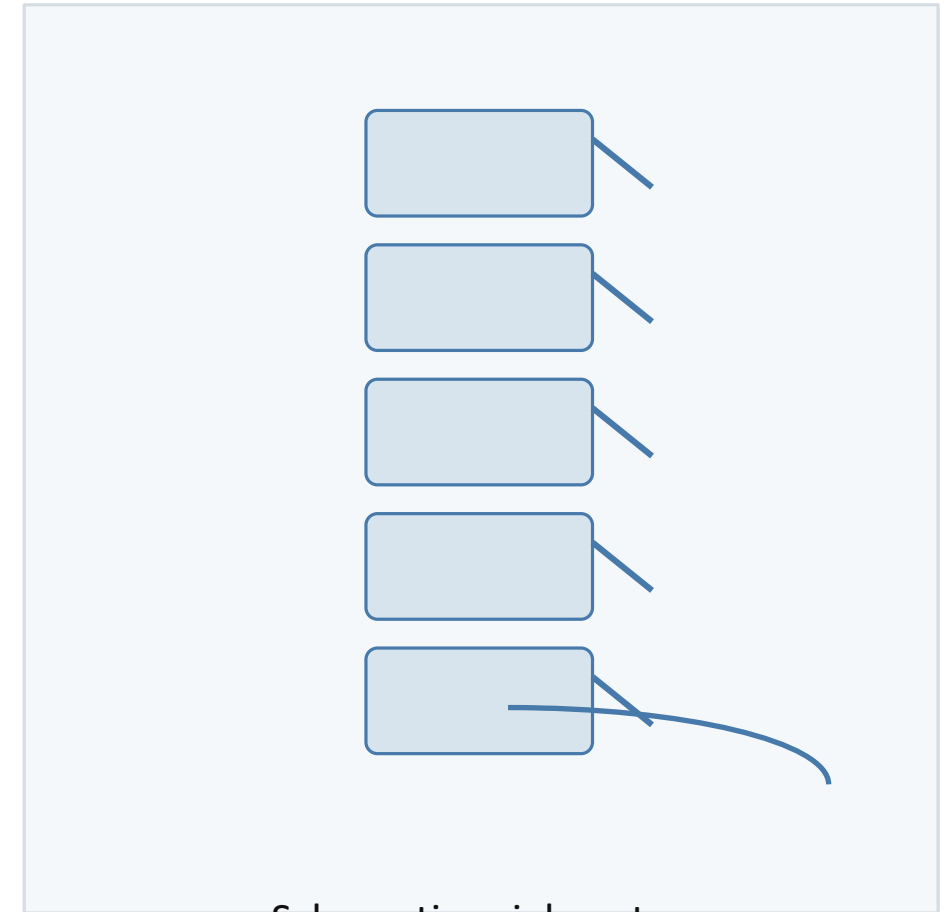
Sacroiliac joints: Why their involvement matters

- Inflammation in these joints produces a recognizable axial disease distribution.
- Sacroiliac involvement links lower-back symptoms to objective anatomical pathology.
- The sacroiliac region is a major focus of radiographic and MRI assessment.



Vertebral apophyseal joints

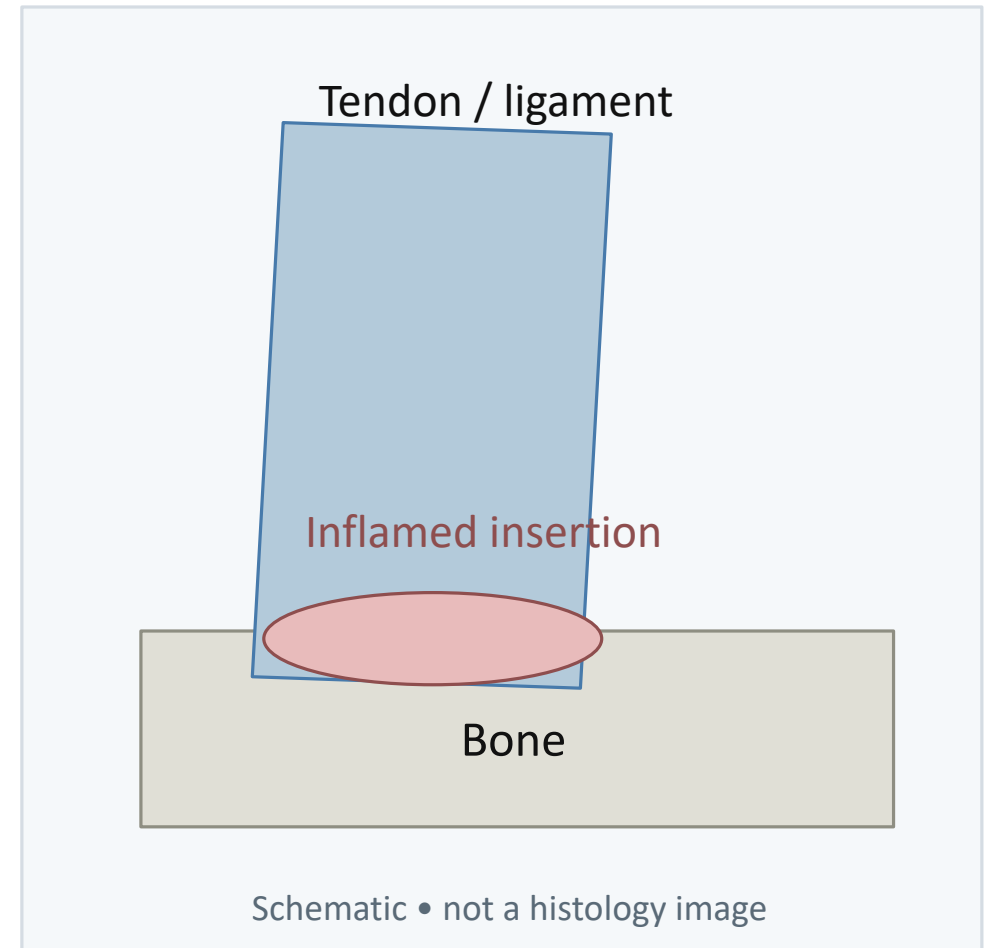
- These synovial joints connect adjacent vertebrae posteriorly.
- Articular damage followed by osseous fusion restricts segmental movement.
- Accumulated fusion across spinal segments contributes to a rigid spinal column.



Schematic axial anatomy

Enthesis: A characteristic lesion site

- An enthesis is the attachment of a tendon, ligament, or related structure to bone.
- Spondyloarthropathies prominently affect ligamentous/tendinous attachments.
- Local inflammation and subsequent bone formation help explain painful insertion sites and stiffness.



Axial and peripheral musculoskeletal disease

SACROILIAC

Axial

VERTEBRAL

Axial

HIP / KNEE / SHOULDER

Peripheral

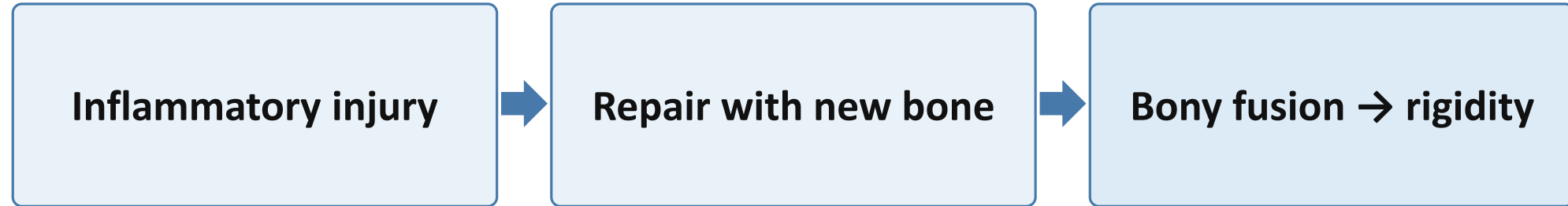
- Axial: Sacroiliac and vertebral joints are defining sites.
- Peripheral: The hips, knees, and shoulders may be involved.
- The full distribution should be elicited rather than assuming only back symptoms.

Articular cartilage destruction



- Inflammation can injure articular cartilage in affected joints.
- Loss of a smooth articular surface alters joint function.
- Cartilage destruction is only one component; Later new bone can also limit movement.

Ankylosis: Pathological endpoint



- Ankylosis denotes pathological joint immobility from fusion.
- Bony ankylosis can occur in sacroiliac and vertebral apophyseal joints.
- Fusion may reduce mobility even when symptoms fluctuate.

A distinctive paradox: Damage and new bone

Destructive

Cartilage damage

Inflammatory joint lesions

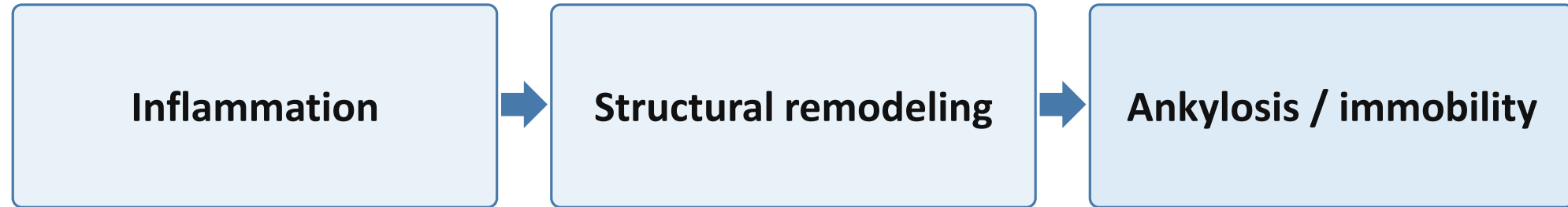
Proliferative

New bone formation

Osseous ankylosis

- Inflammatory injury produces destructive changes.
- The structural response may also include abnormal bone proliferation.
- Consequently, decreased flexibility can reflect fused structures, not merely ongoing painful inflammation.

Disease as an inflammation-to-fusion sequence



- Persistent or recurrent inflammatory lesions can precede structural damage.
- New bone formation may bridge previously mobile structures.
- Clinical stiffness can progressively become fixed immobility.

Typical age at presentation

Usually begins in young people

- Presentation most often during the second and third decades.
- An early-onset chronic back-pain pattern should prompt consideration of inflammatory causes.
- Age is supportive context, not sufficient evidence for an individual diagnosis.

Inflammatory versus mechanical back pain

Inflammatory pattern

Improves with movement • may worsen at rest/night

Mechanical pattern

Often more load-related • requires other explanations

- Inflammatory pain often improves with exercise and does not reliably improve with rest.
- Mechanical pain is more likely to be activity-provoked, although overlap exists.
- Back-pain quality guides investigation; It does not establish ankylosing spondylitis alone.

Inflammatory back pain: A recognizable pattern

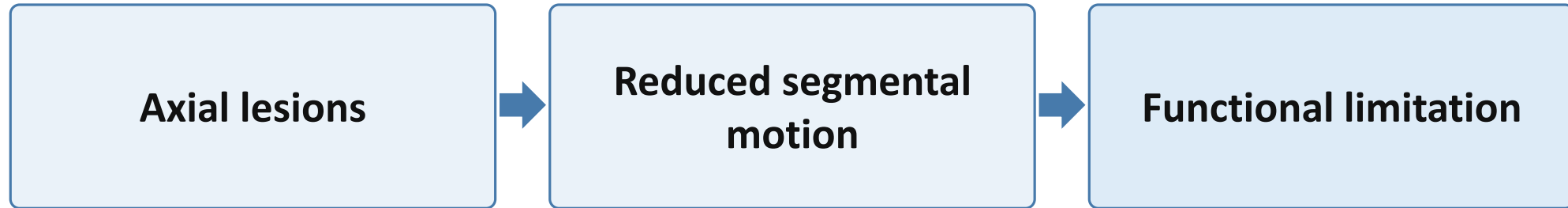
- Insidious onset and onset at a younger age support inflammatory back pain.
- Improvement with exercise and lack of improvement with rest are informative.
- Night pain that eases after getting up can be another clue.

Pain during rest and overnight

Ask what happens after rest

- Periods of immobility may increase perceived stiffness and pain.
- Nocturnal pain can be particularly informative when relieved by rising or movement.
- Symptom timing should be documented, not replaced by a generic “back pain” label.

Spinal mobility is an objective clinical target



- Longstanding axial inflammation and fusion restrict bending and rotation.
- Examination includes lumbar/cervical movement in multiple planes.
- Symptoms and measured restriction convey different, complementary information.

Chest-wall mobility can be affected

Assess chest excursion and spinal motion

- Spinal/chest-wall involvement may constrain rib movement.
- Patients may report difficulty taking deep breaths when rib-associated joints are involved.
- Chest expansion can be assessed alongside spinal flexibility.

Peripheral joints are not exceptional

SACROILIAC

Axial

VERTEBRAL

Axial

HIP / KNEE / SHOULDER

Peripheral

- Peripheral joint involvement in at least one-third of cases.
- Hips, knees, and shoulders are named sites.
- Peripheral arthritis can coexist with typical axial manifestations.

Hip involvement and functional burden

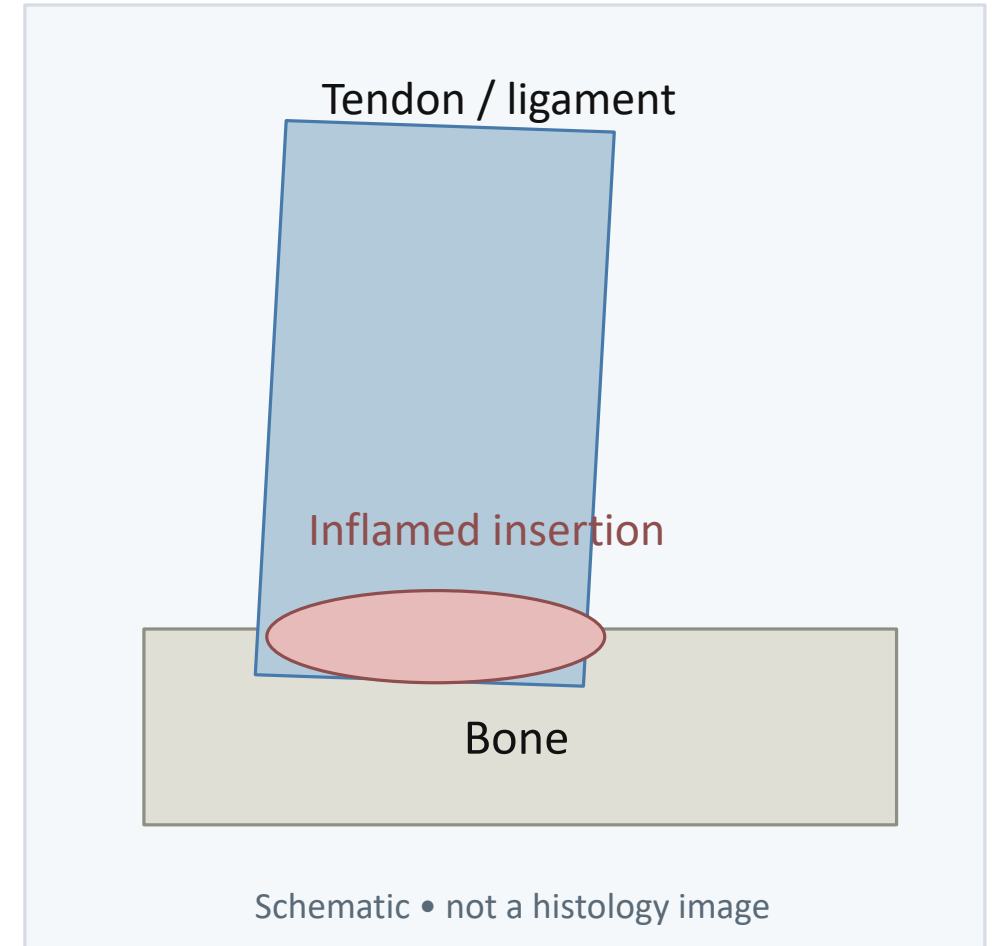
- Hip disease can compound disability beyond spinal stiffness.
- Lower-limb joint symptoms should be evaluated in the full joint examination.
- The presence of peripheral disease can influence treatment individualization.

Knee and shoulder involvement

- Peripheral inflammation need not follow the distribution of rheumatoid arthritis.
- Document painful/swollen joints rather than inferring synovitis from reported pain alone.
- Clinically significant peripheral disease contributes to the total disease burden.

Enthesitis and peripheral manifestations

- Enthesitis is inflammation at a tendon/ligament insertion.
- Peripheral arthritis, enthesitis, and dactylitis are recognized axial-SpA-associated domains.
- Peripheral examination helps identify disease that back-focused evaluation misses.



Beyond the skeleton

AXIAL

Spine / sacroiliac

PERIPHERAL

Joints / entheses

EXTRA-SKELETAL

Eye / skin / gut

- Axial spondyloarthritis can be accompanied by uveitis.
- Psoriasis and inflammatory bowel disease are other associated manifestations.
- These findings affect differential diagnosis and management selection.

Acute anterior uveitis

Eye pain + visual change merit prompt assessment

- Eye pain, redness, and visual change may indicate uveitis.
- Ocular inflammation requires clinical assessment; Do not attribute every red eye to axial SpA.
- A history of uveitis strengthens the overall spondyloarthritis clinical context.

Psoriasis and inflammatory bowel disease

Skin domain

Psoriasis and characteristic skin findings

Gut domain

Crohn disease or ulcerative colitis

- Skin and bowel inflammatory disease can coexist with axial spondyloarthritis.
- Ask about psoriasis, abdominal symptoms, and inflammatory bowel diagnoses.
- The presence of these manifestations is relevant when selecting advanced therapies.

HLA-B27: Powerful association

~90% HLA-B27 positivity (Robbins)

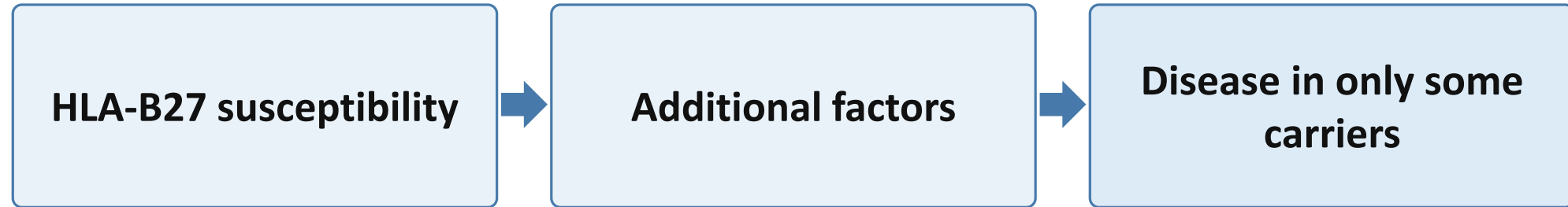
- Approximately 90% of patients with ankylosing spondylitis as HLA-B27 positive.
- HLA-B27 is an MHC class I allele.
- Genetic association is strong, but the biological mechanism is not fully established.

HLA-B27 is not diagnostic by itself

Genetic evidence	Diagnostic decision
HLA-B27 association	Clinical pattern
Raises clinical probability	Imaging + alternative causes

- A positive result can occur without ankylosing spondylitis.
- A negative result does not automatically exclude the disease.
- Interpret the result together with symptoms, examination, inflammatory markers, and imaging.

Genetic susceptibility is not destiny



- Having the HLA-B27 allele does not mean a person will develop the disease.
- Other genetic and environmental factors may contribute.
- Family and personal history are useful risk context, not a deterministic test.

Known mechanism versus unanswered mechanism

Supported

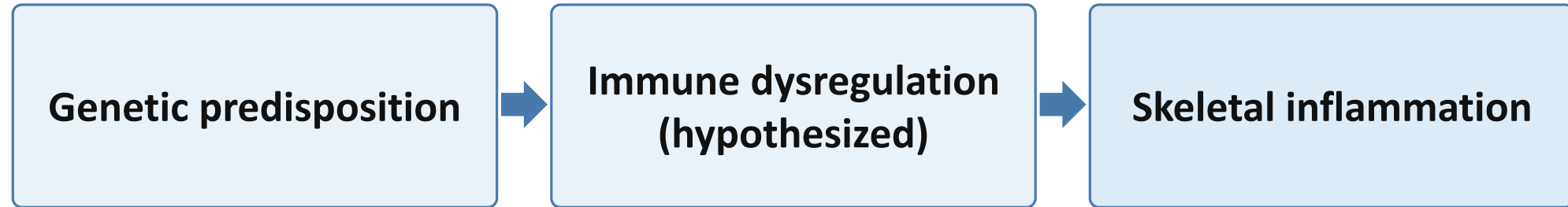
HLA-B27 association
Inflammatory bone/joint lesions

Unresolved

Triggering antigen
Specific causal immune-cell response

- The disease shows HLA association and inflammatory skeletal pathology.
- The precise antigen and pathogenic immune-cell population are unknown.
- Do not portray a speculative single antigen-to-T-cell pathway as established fact.

Immune pathogenesis: Calibrated interpretation



- Seronegative spondyloarthropathies are placed in an immune-mediated disease group.
- Textbook discussion proposes T-cell responses to incompletely defined antigenic triggers.
- This is a pathogenesis hypothesis, not proof of a specific microbial cause in ankylosing spondylitis.

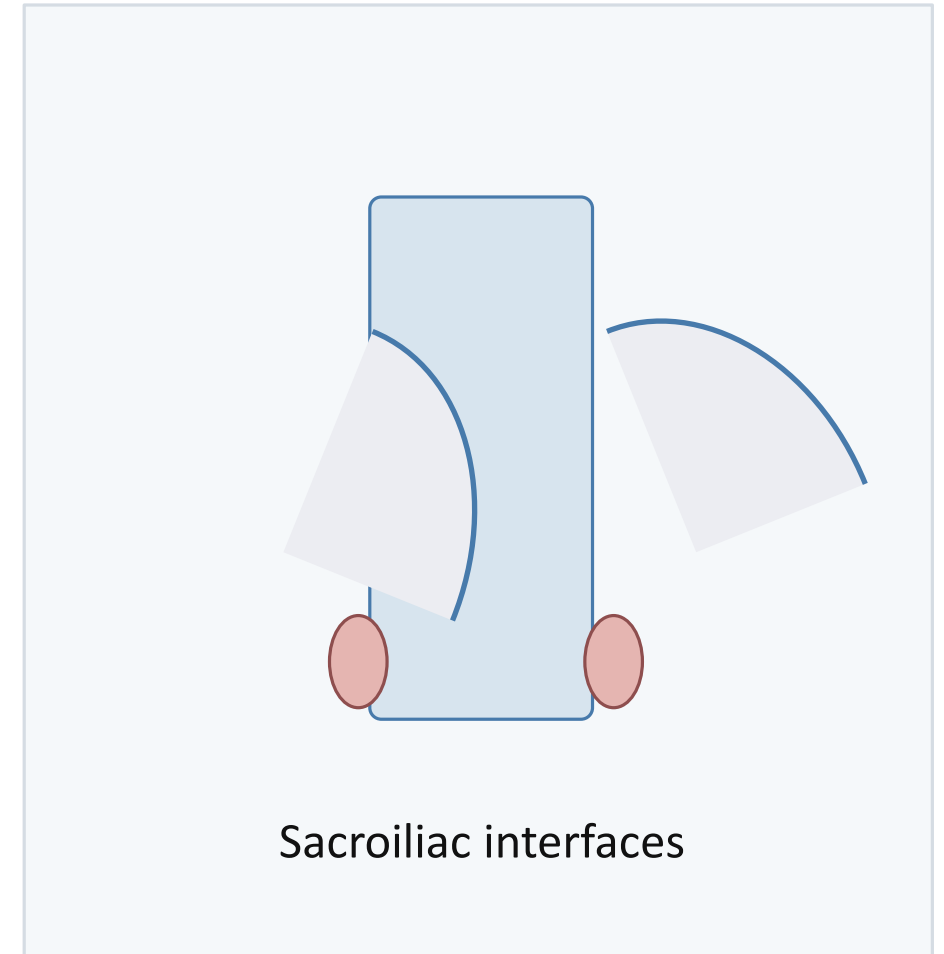
Inflammatory injury and structural remodeling

Active process	Structural outcome
Pain and inflammation	Ankylosis and rigidity
Potentially changeable	May be permanent

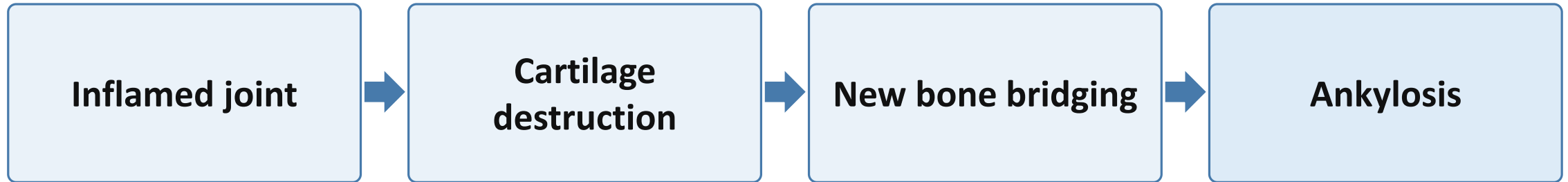
- Axial lesions have both inflammatory and structural dimensions.
- Cartilage loss and new bone formation can coexist in affected joints.
- Clinical activity and accumulated irreversible damage are not identical constructs.

Sacroiliitis is a core anatomical lesion

- Inflammation affects the joints between sacrum and ilium.
- Changes in sacroiliac joints can be detected structurally by radiographs.
- MRI can provide evidence of early inflammatory disease before radiographic change is apparent.

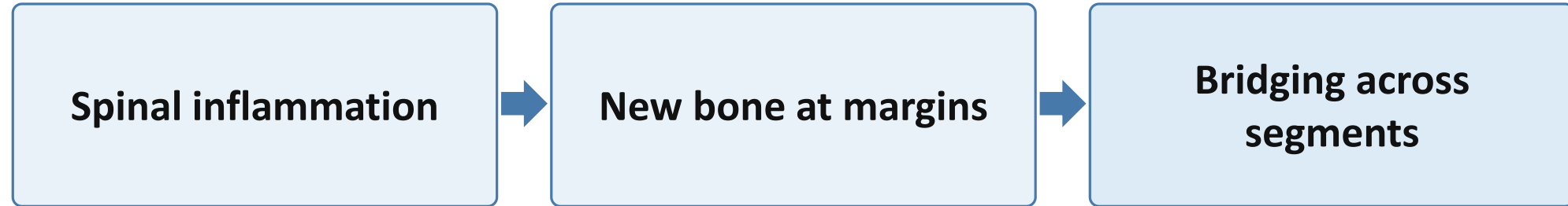


Progression from joint injury to fusion



- Joint inflammation damages the cartilage and adjacent structures.
- Repair and abnormal bone proliferation may progressively reduce the joint space.
- Extensive osseous bridging produces fixed ankylosis.

Syndesmophytes: An imaging correlate



- Syndesmophytes are new bone bridges associated with spinal spondyloarthritis.
- Their presence indicates structural involvement beyond symptoms alone.
- Accumulated bridging can contribute to the classic rigid spinal appearance.

“Bamboo spine” is an advanced structural pattern

Late radiographic appearance ≠ required entry criterion

- The term describes extensive spinal bridging and reduced segmental mobility.
- It is not required to establish earlier axial spondyloarthritis.
- Avoid using an advanced radiographic endpoint as the universal disease phenotype.

Radiographs: What they reveal

PLAIN RADIOGRAPH

Structural abnormalities

MRI

Inflammation and structural lesions

- Plain radiographs can demonstrate established structural sacroiliac changes.
- Spinal structural damage can be followed over time when clinically appropriate.
- Normal early radiographs cannot independently exclude inflammatory axial disease.

MRI: What it adds

PLAIN RADIOGRAPH

Structural abnormalities

MRI

Inflammation and structural lesions

- MRI evaluates inflammatory changes in sacroiliac joints and spine.
- It can support earlier diagnosis when plain films have not yet shown structural lesions.
- Findings require clinical interpretation; MRI alone is not a diagnostic shortcut.

Structural damage is not synonymous with current activity

Inflammatory signal	Damage signal
Current clinical symptoms	Syndesmophytes/fusion
CRP/MRI as indicated	Structural radiographs

- Radiographic bone bridging reflects accumulated structural change.
- Pain and functional status do not always track radiographic findings precisely.
- Inflammatory activity and established damage therefore deserve separate assessment.

Laboratory tests: Supportive, not decisive

- No single blood test diagnoses ankylosing spondylitis.
- HLA-B27 is a susceptibility marker rather than a definitive disease marker.
- Inflammatory markers may support activity assessment but must be interpreted contextually.

Build the diagnosis from converging domains

History

Examination

Imaging + labs



Integrated clinical probability and differential diagnosis

- History: Chronic inflammatory back pain and related clinical features.
- Examination: Spinal/chest motion, joints, insertion sites, and extra-articular findings.
- Objective evidence: Appropriate imaging and selective laboratory testing.
- Explicitly evaluate alternative causes of symptoms.

When referral for axial SpA is appropriate

Back pain ≥ 3 months + onset before age 45



Plus ≥ 1 supporting axial-SpA feature

- At least one supportive feature is required in that referral approach.
- Examples: Inflammatory back pain, HLA-B27, imaging changes, enthesitis, uveitis, or elevated inflammatory markers.

Classification criteria are not clinical diagnosis

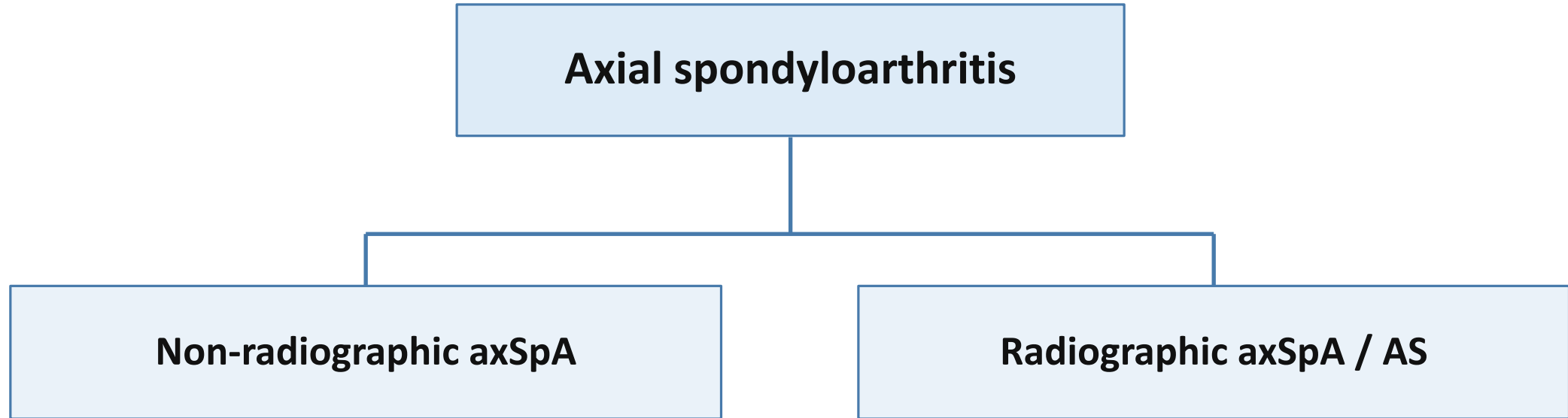
Classification	Diagnosis
Research enrollment Standardized inclusion rules	Individual clinical judgment Differential exclusion

- Classification schemes create comparable groups for research.
- Clinical diagnosis weighs pretest probability, disease pattern, imaging, and competing conditions.
- ASAS–EULAR specifically cautions against diagnosing solely by research classification criteria.

Historical modified New York criteria

- Clinical components include chronic inflammatory back pain, restricted lumbar motion, and reduced chest expansion.
- Radiographic component requires a specified grade of sacroiliitis.
- This is a historical radiographic classification framework—not a substitute for specialist diagnosis.

The axial spondyloarthritis spectrum



- Radiographic axial spondyloarthritis is conventionally termed ankylosing spondylitis.
- Non-radiographic axial spondyloarthritis may have inflammatory disease without qualifying radiographic sacroiliitis.
- The terms describe an imaging-defined spectrum, not a simple distinction between “real” and “unconfirmed” disease.

Assess axial and peripheral compartments separately

Axial

Sacroiliac/spinal joints • spinal mobility

Peripheral

Hip/knee/shoulder arthritis • enthesitis

- Axial symptoms include back stiffness, limited spinal flexibility, and sacroiliac pain.
- Peripheral manifestations may include arthritis and enthesitis.
- The relative burden of each compartment should guide assessment and follow-up.

Inflammatory versus nonspecific mechanical back pain

Inflammatory clues

Insidious, younger onset; Movement relief; Night/rest pain

Other causes

Load-related pain, radicular causes, injury or infection require separate assessment

- Age at onset, morning/rest symptoms, and response to movement can orient the differential.
- Examining neurologic features and red flags remains important when presentations are atypical.
- Neither an isolated symptom nor a normal early radiograph reliably settles the diagnosis.

Ankylosing spondylitis versus rheumatoid arthritis

Ankylosing spondylitis

Axial/sacroiliac disease • entheses •
bony ankylosis

Rheumatoid arthritis

Synovial inflammation • peripheral
erosive arthropathy

- Ankylosing spondylitis preferentially involves the sacroiliac and vertebral joints.
- Rheumatoid arthritis is characteristically synovium-centered and erosive.
- RF absence and enthesitis-dominant pathology help orient the classic group distinction.

Ankylosing spondylitis versus osteoarthritis

Ankylosing spondylitis

Inflammatory axial pattern • sacroiliitis • ankylosis

Osteoarthritis

Degenerative cartilage damage • mechanical joint symptoms

- Osteoarthritis predominantly reflects cartilage/joint failure, unlike immune-mediated axial inflammation.
- Ankylosing spondylitis is associated with seronegative axial inflammatory disease and new bone fusion.
- Clinical pattern and imaging distribution are essential discriminators.

Ankylosing spondylitis versus reactive arthritis

Ankylosing spondylitis

Chronic axial-predominant pattern

Reactive arthritis

Postinfectious onset • asymmetric peripheral arthritis

- Reactive arthritis is temporally associated with gastrointestinal or genitourinary infection.
- It often begins as asymmetric oligoarthritis of the lower extremities.
- Sacroiliitis and inflammatory back pain can overlap; Clinical history may discriminate.

Do not miss infectious arthritis

Acute hot joint: Investigate infection

- Acute destructive monoarthritis needs a different, urgent diagnostic pathway.
- A swollen, hot joint should not be attributed automatically to chronic spondyloarthritis.
- That microbial arthritis may rapidly damage cartilage.

Case 1: Early inflammatory back pain

- A young adult reports insidious lower-back pain for months.
- Symptoms are worse after rest and improve after movement.
- Plain radiographs are not diagnostic.

What findings would increase or decrease the probability of axial SpA?

Case 1: Integrate the evidence

History

Examination

Imaging + labs



Integrated clinical probability and differential diagnosis

- Ask about morning stiffness, night pain, uveitis, psoriasis, bowel disease, and family history.
- Examine spinal mobility and peripheral joints/entheses.
- Consider HLA-B27, inflammation markers, and sacroiliac MRI as clinically appropriate.
- Exclude competing diagnoses before labeling the patient.

Case 2: Established structural disease

- An adult has chronic back stiffness and progressive restriction in spinal movement.
- Imaging demonstrates sacroiliac structural damage and extensive vertebral bridging.
- Structural ankylosis explains fixed loss of flexibility.

Which findings reflect current inflammation, and which reflect accumulated damage?

Case 2: Separate activity from damage

Activity	Damage
Pain/stiffness	Fusion/rigidity
Inflammatory assessment	Mobility and safety

- Inflammatory pain and CRP changes reflect possible active disease.
- Sacroiliac/spinal fusion reflects established structural damage.
- Both domains inform care, but their management targets are not identical.

Disease activity: More than pain intensity

- Monitor pain, stiffness, function, clinical examination, and patient-reported outcomes.
- ASDAS incorporates a patient report and an objective inflammatory marker.
- BASDAI is based on patient-reported symptoms and is not interchangeable with structural damage.

Imaging is selective during follow-up

PLAIN RADIOGRAPH

Structural abnormalities

MRI

Inflammation and structural lesions

- MRI may clarify uncertain inflammatory activity or symptom origin.
- Routine serial MRI is not generally recommended by ASAS–EULAR for every visit.
- Progressive radiographic damage evolves slowly; Imaging frequency must be justified.

Management objectives



- Reduce pain and suppress inflammation.
- Preserve mobility, function, posture, and participation.
- Limit progressive structural damage when possible, while individualizing treatment to disease features.

Exercise and posture are central

- Regular exercise and physical therapy help maintain flexibility, mobility, and posture.
- Nonpharmacologic care complements medicines rather than replacing indicated treatment.
- Program choice should account for current symptoms, disability, and safety.

NSAIDs as initial pharmacologic therapy

- ASAS–EULAR recommends NSAIDs as first-choice pharmacologic treatment of axial symptoms.
- Choice and use depend on clinical response, comorbidities, and adverse-effect risk.
- Analgesic response does not, by itself, prove a specific diagnosis.

Persistent high activity: Targeted therapy



- When activity remains high despite conventional measures, biologic or targeted synthetic therapy may be considered.
- Guideline-supported options include TNF inhibitors, IL-17 inhibitors, and JAK inhibitors.
- This is specialist-directed, individualized treatment—not a fixed sequence for every patient.

Extra-musculoskeletal disease guides therapy

AXIAL

Spine / sacroiliac

PERIPHERAL

Joints / entheses

EXTRA-SKELETAL

Eye / skin / gut

- Uveitis, psoriasis, and inflammatory bowel disease influence treatment choice.
- No single drug class is automatically optimal for every extra-articular phenotype.
- Collaboration with relevant specialists is part of individualized care.

Long-term therapy needs monitoring

- Follow-up should incorporate patient-reported outcomes, examination, and relevant tests.
- Sustained remission may support cautious dose tapering rather than abrupt withdrawal of biological therapy.
- Major treatment decisions require discussion of disease activity and adverse effects.

A rigid spine has additional vulnerability

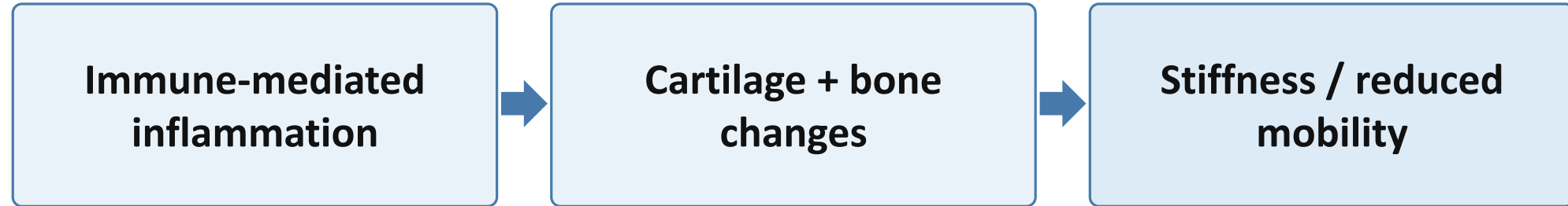
New pain after trauma in a fused spine requires assessment

- Advanced fusion produces a long, inflexible spinal lever arm.
- Structural rigidity complicates normal motion and increases concern when trauma occurs.
- New pain after trauma in advanced ankylosis warrants appropriate clinical evaluation.

Complications are not inevitable

- Severity varies considerably between individuals.
- Some patients have intermittent mild symptoms; Others develop major mobility limitations.
- Early recognition and ongoing management can support sustained function.

Integrated pathology-to-clinic map



- Enthesis/joint inflammation → painful axial and peripheral manifestations.
- Articular injury plus bone proliferation → spinal and sacroiliac ankylosis.
- Clinical examination, imaging, and laboratory evidence must be integrated.

Practice question: HLA-B27-positive back pain

- A patient has HLA-B27 positivity but a nonspecific short history of back pain.
- There is no suggestive examination, no defined inflammatory pattern, and no objective inflammation.
- Question: Is HLA-B27 positivity sufficient to diagnose ankylosing spondylitis?

Choose the next step in clinical reasoning, not a label.

Practice answer: Probability, not proof

A risk marker must never replace diagnosis

- No. HLA-B27 is associated with disease but is not sufficient for diagnosis.
- Clarify clinical features; Examine for other SpA domains and alternatives.
- Use targeted investigation and specialist assessment where warranted.

Five points to retain

- Sacroiliac and vertebral joints define the axial distribution.
- Cartilage destruction coexists with bony proliferation and ankylosis.
- HLA-B27 association is strong but not diagnostic.
- MRI and radiographs answer different inflammation-versus-damage questions.
- Management aims to control inflammation while preserving mobility and function.

Source references

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