Ankylosing Spondylitis

Self study materials for students.
5th year, Internal Medicine, 2nd semester
Topic 6. Ankylosing spondylitis.
6th year, Internal Medicine, Rheumatology circle
Topic 4. Management of patients with back pain and joint syndrome.

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Definition

- **Ankylosing spondylitis (AS)** – is is a chronic systemic inflammatory disease of the axial skeleton, with variable involvement of peripheral joints and nonarticular structures.
- AS is one of the seronegative spondyloarthropathies and has a strong genetic predisposition. It mainly affects joints in the spine and the sacroiliac joint in the pelvis.
- In severe cases, complete fusion and rigidity of the spine can occur.

Synonyms

- **Bekhterev (Bechterew's) disease**
- **Marie-Strümpell disease**
- **Bekhterev-Marie-Strümpell disease**

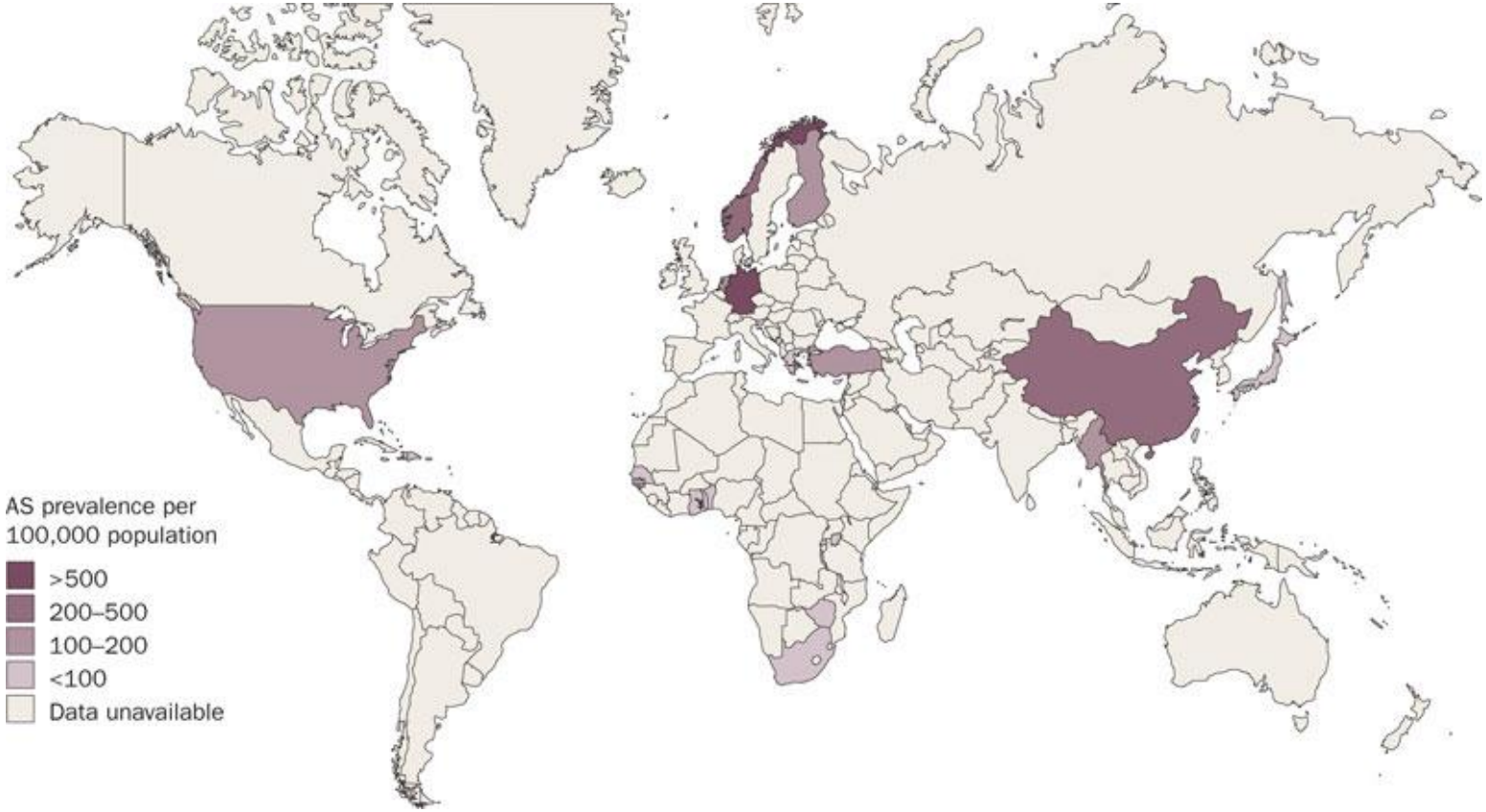
http://www.lawyers-plus.com/wp-content/uploads/2015/05/Dollarphotoclub_34521222.jpg

What is ankylosing spondylitis?

https://www.youtube.com/watch?v=zXYwMMxqxhs

Epidemiology

- The prevalence ranges from 0.1 to 1 % of the population
- Men are affected 3 times more than women
- Commonly develops between the ages of 15 and 40
- Predominant in Caucasians worldwide



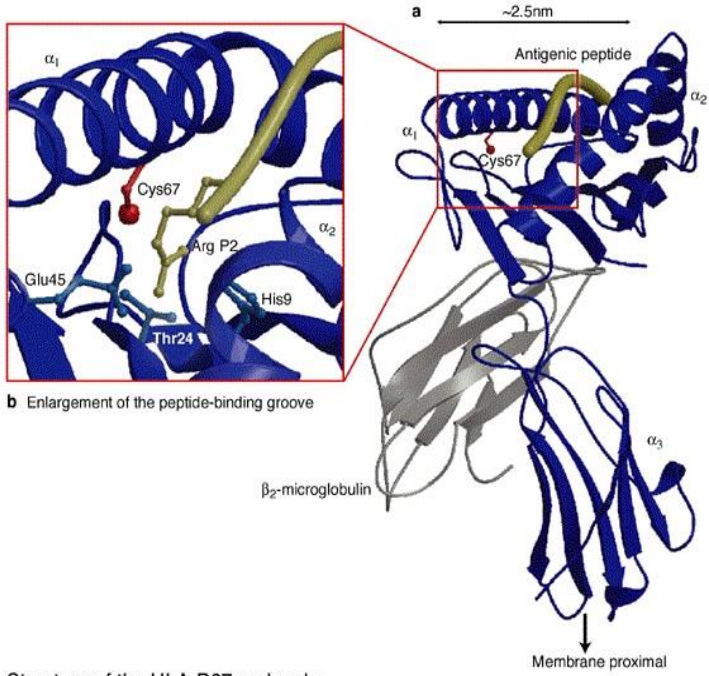
http://www.nature.com/nrrheum/journal/v6/n8/images/nrrheum.2010.86-f3.jpg

Etiology

- Etiology is **unknown**, but probable etiologic factors are:
- **Genetic predisposition** - % of people with AS share the genetic marker **HLA-B27**
- **Bacterias** - Klebsiella pneumoniae and some other Enterobacterias.

HLA B27

- **Human Leukocyte Antigen (HLA) B27** is a surface antigen encoded by the B locus in the major histocompatibility complex (MHC) on chromosome 6 and presents antigenic peptides to T cells.
- It lies on the surface of WBC.
- HLA-B27 is strongly associated with ankylosing spondylitis , and other associated inflammatory diseases referred to as "spondyloarthropathies".
- More than 100 disease associations have been made, including many ocular diseases and systemic diseases with specific ocular manifestations.



Structure of the HLA-B27 molecule

http://journals.cambridge.org/fulltext_content/ERM/ERM1_16/S1462399499001118sup011.gif

HLA B27

Associated pathologies:

- Ankylosing spondylitis
- Juvenile rheumatoid arthritis (JRA)
- Arthritis related to Crohn's disease or ulcerative colitis
- Psoriatic arthritis
- Reactive arthritis (Reiter's syndrome)
- Uveitis

http://photos.gograph.com/thumbs/CSP/CSP992/k13474673.jpg

HLA B27

- **HLA-B27 Typing** is a laboratory immunogenetic PCR blood test that determines the presence or absence of the HLA B27 alleles.
- Venous blood is been tested.
- Patient shouldn't smoke for 1 hour before blood collecting.
- Price: Ukraine 6-30 USD, USA 200 USD, India 17-60 USD.
- Indications: differential diagnostics of systemic diseases. Most valuable in case of validating ankylosing spondylitis and reactive arthritis, making out it's prognosis.

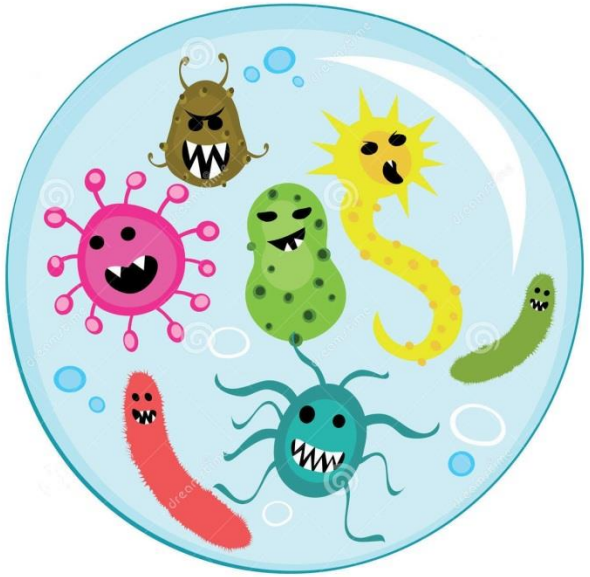
- **NB!!!** It's an additional test which helps to validate Ds of AS. It's not the main and only investigation!!!
- **NB!!!** This test is negative in about 10% of patients with AS .

https://edc2.healthtap.com/ht-staging/user_answer/reference_image/11530/large/thromboplastin_blood_test.jpeg?1386670724

Enterobacterias

The **Enterobacteriaceae** are a large family of Gram-negative bacteria that includes, along with many harmless symbionts, many of the more familiar pathogens, such as:

- *Salmonella*
- *Escherichia coli*
- *Yersinia pestis*
- *Klebsiella* pneumoniae



http://thumbs.dreamstime.com/z/viruses-cartoon-vector-22358237.jpg

Pathogenesis

There are 2 theories:

- **Receptors theory** – HLA B27 is a receptor for etiologic factor (bacteria, virus, etc.). The resulting complex provokes production of cytotoxic T-cells which cause damage to cells with HLA B27 molecule.
  So, urinary or bowel infection can be a trigger for AS.
- **Molecular mimicry theory** – bacterial antigen (or other damaging factor) in complex with other HLA molecule gets similar to HLA B27 properties and is been recognized by cytotoxic T-cells as HLA B27 or decreases the immune reaction at pathologic peptide **(immunological tolerance).**

Pathogenesis

In both cases **autoimmune inflammatory process** is a result. It has features:

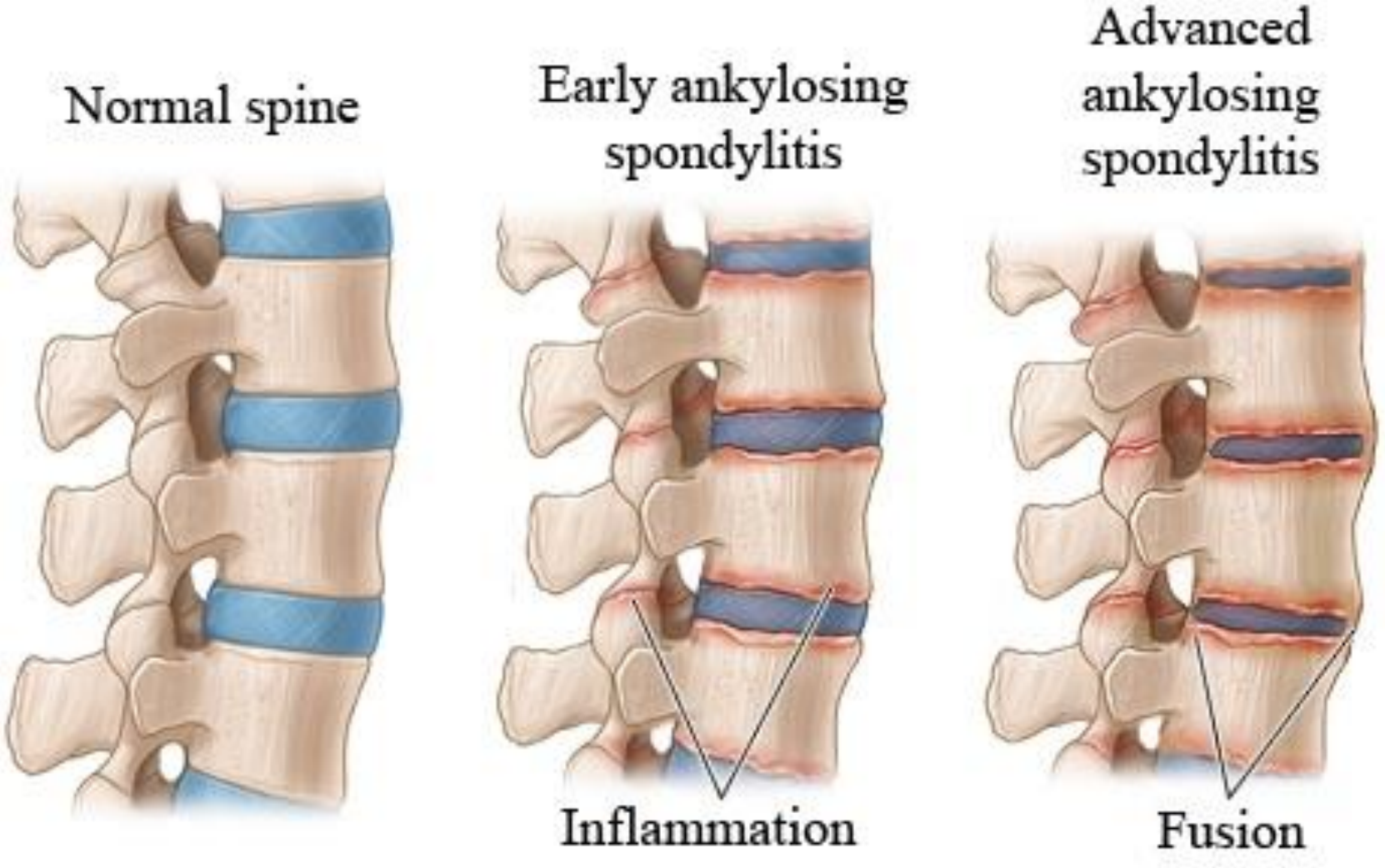
- Usually starts with affection of sacroiliac joints, then intervertebral and costovertebral joints are involved (rarely – peripheral joints).
- Characterized by active fibrosis with further ossification and calcification, and ankylosis as result.

https://live100stemcell.files.wordpress.com/2015/01/spine4.jpg

Pathomorphology

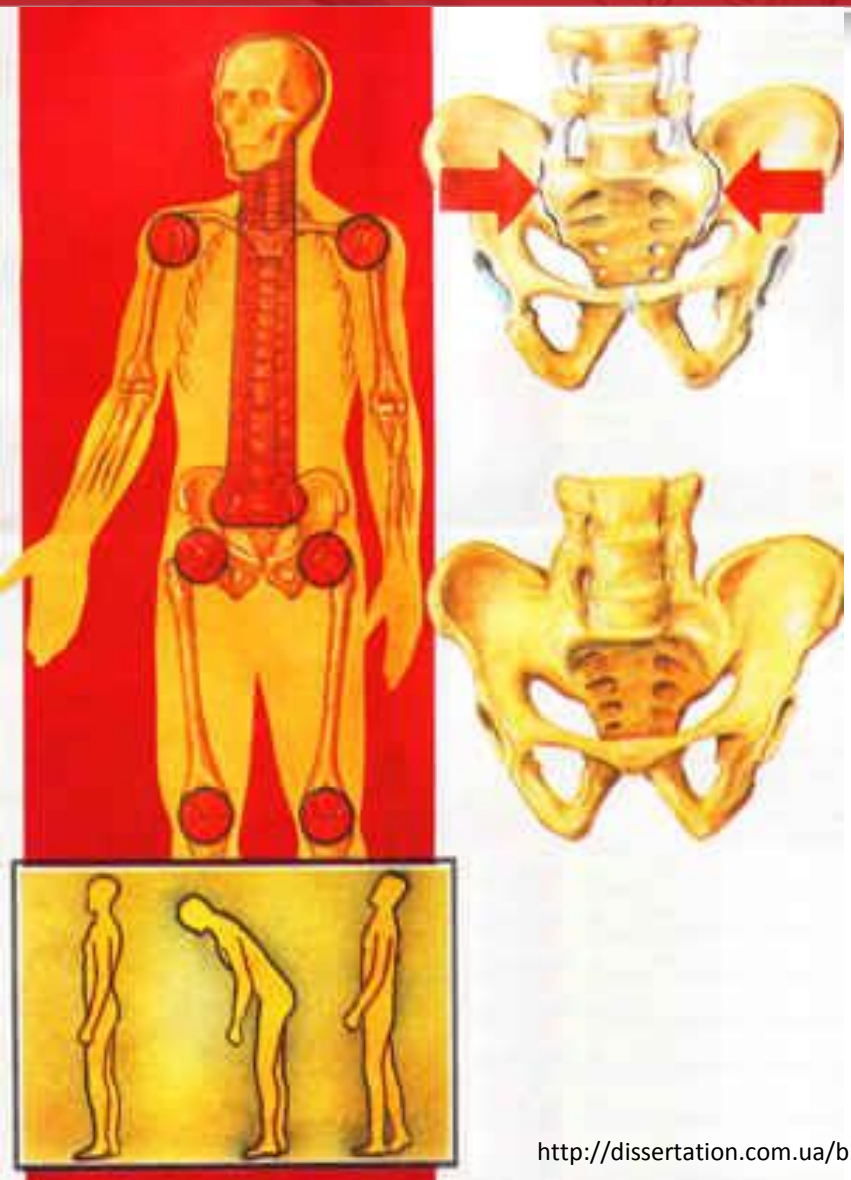
- **Enthesitis** - the site of ligamentous attachment to bone is the primary site of pathology. The early lesions consist of subchondral granulation tissue, infiltrates of lymphocytes and macrophages in ligamentous and periosteal zones, and subchondral bone marrow edema.
- **Synovitis** - may progress to pannus formation with islands of new bone formation.
- **Ostitis** – with fibrosis and ossification.
- **Ankylosis**

Pathomorphology



 http://img.webmd.com/dtmcms/live/webmd/consumer_assets/site_images/media/medical/hw/h9991602_001.jpg

Sites of affection



- **Sacroiliac** joints
- **Intervertebral** joints
- **Costovertebral** joints
- **Brachial** (shoulder) joints
- **Coxofemoral** (hip) joints
- **Knee** joints
- **Ankle** joints
- **Small joints** of hands

http://dissertation.com.ua/blog/wp-content/uploads/2012/09/ankilozirujushhij-spondiloartrit-bolezn-behtereva-2_1.jpg

Symptoms (early AS)

1. Pain in sacroiliac and lower back regions:

- permanent; dull
- worsens in rest; in the morning; nocturnal
- reliefs in motion; in the afternoon

2. Buttock pain:

- irradiates into posterior surface of hip
- migrates from left to right gluteus

http://www.ljmodernpilates.co.uk/wp-content/uploads/2012/08/spine-for-brochure.jpg

Symptoms (early AS)

3. Lower back stiffness:

- in the morning, for ≥ 30 minutes
- reliefs after activity, warm shower

4. Chest pain:

- mimicries intercostal neuralgia and intercostal muscles myositis
- worsens in coughing, sneezing, deep breathing

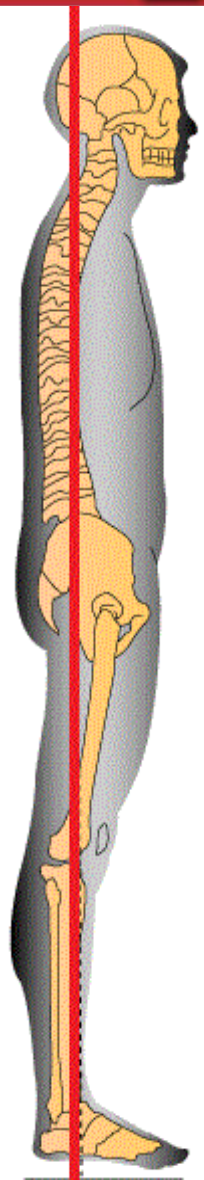
http://img.gawkerassets.com/img/17h57cyhn3onnjpg/original.jpg

Symptoms (early AS)

5. Stiffness and tenderness of back muscles.

6. Flattening of lumbar lordosis

7. Bilateral sacroilitis.



http://3.bp.blogspot.com/-HM4rC3QLwhE/UuWv3rZr2EI/AAAAAAAAARI/MoqTE3ajffk/s1600/fit009_2_lr11_3.gif

Symptoms (early AS)

8. Enthesopathies – pain in the site of ligamentous attachment to bone:

- Iliac crests
- trochanters
- spinous processes of vertebrae
- costovertebral joints

9. Extra-articular manifestations – usually **eyes affection** (anterior uveitis); bilateral, acute onset, lasts for 2-3 months, registered in 30% of patients.

Symptoms (advanced AS)

1. **Pain in different segments of spine.**
2. **Question mark posture**
3. **Atrophy of back muscles.**
4. **Decreased thorax excursion.**
5. **Decreased articulations in spine.**
6. **Ankylosis of sacroiliac and intervertebral joints.**
7. **Cutaneous lesions** – that are identical to pustular psoriasis

Symptoms (advanced AS)

8. Cardiovascular system involvement:

- aortitis
- aortic insufficiency
- pericarditis, myocarditis

9. Bronchopulmonary system involvement – fibrosis of apical lung segments.

10. Urinary system involvement

- amyloidosis
- IgA-nephropathy

11. Gastrointestinal system involvement

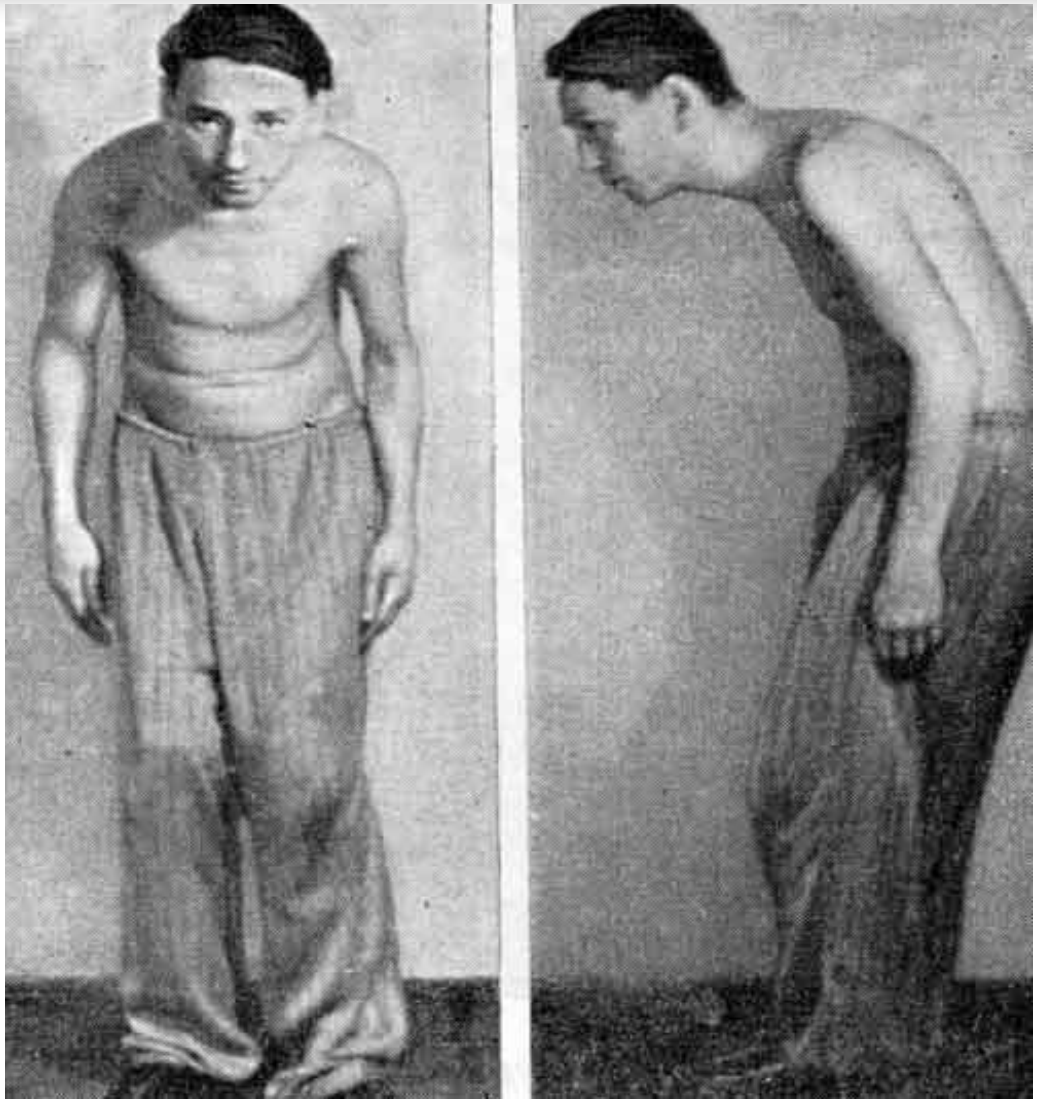
- ulcerative colitis
- Crohn’s disease

Question mark posture

Question mark posture, or suppliant posture - loss of lumbar lordosis, fixed kyphosis, compensated extension cervical spine, protruberant abdomen.

http://usercontent1.hubimg.com/5791834_f520.jpg

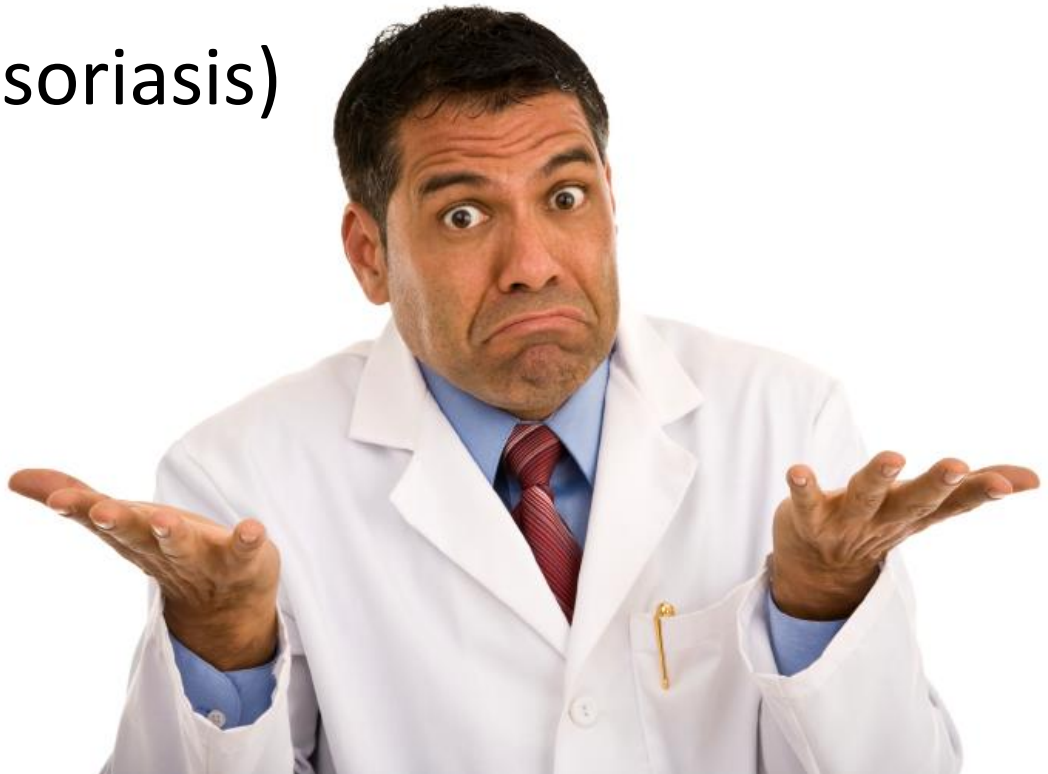
Question mark posture



http://lechenie-simptomy.ru/wp-content/uploads/2015/02/поза-при-болезни.jpg

Extra articular manifestations

- **Ocular** (anterior uveitis)
- **Cardiovascular** (aortitis, myocarditis, AV-block)
- **Gastrointestinal** (colitis, enteritis)
- **Cutaneous** (pustular psoriasis)
- **Pulmonary** (fibrosis)
- **Renal** (amyloidosis)



http://www.themindrestrained.org/wp-content/uploads/2015/05/confused-doctor.jpg

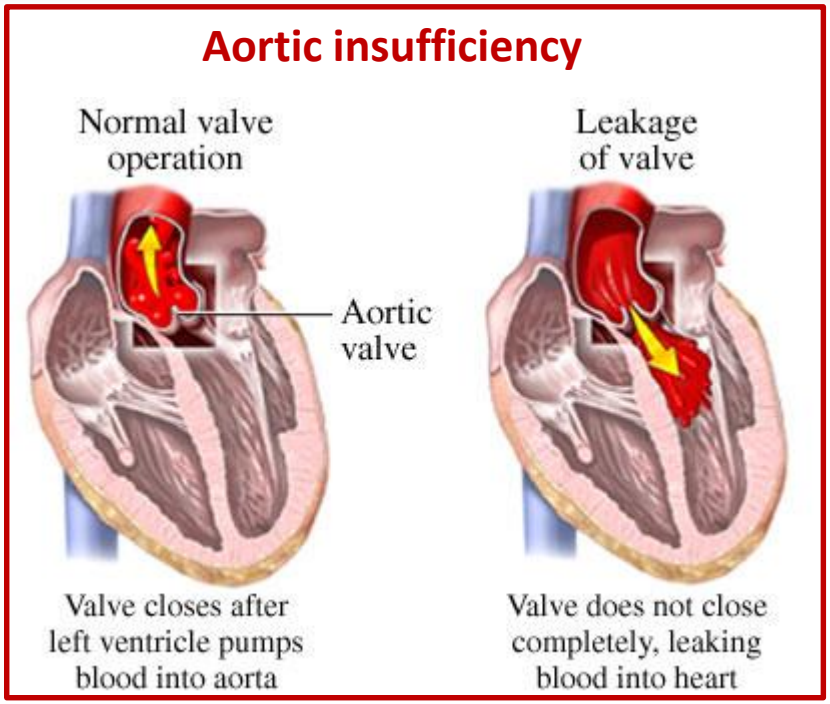
Ocular manifestations

- **Anterior uveitis (iritis, iridocyclitis)** – is an inflammation of the front part of the eye, between the cornea and the lens.
- Appears in 20-30% of patients with AS.
- **Symptoms:** eye pain, sensitivity to light, eye redness, blurred vision, spots in field of vision.
- Usually resolves within 2–3 months without residual visual impairment.
- **Complications:** hypopion, synechia, cataract and glaucoma.
- **Treatment:** steroid, antibiotic and midriatic eye drops, usage of sunglasses.

http://zdorovyeglaza.ru/wp-content/uploads/2015/06/Problema-perednego-uveita-500x300.jpg

Cardiovascular manifestations

- May include:
  1. **Aortitis**
  2. **Aortic insufficiency**
  3. **Pericarditis**
  4. **Myocarditis**
  5. **AV-blocks**



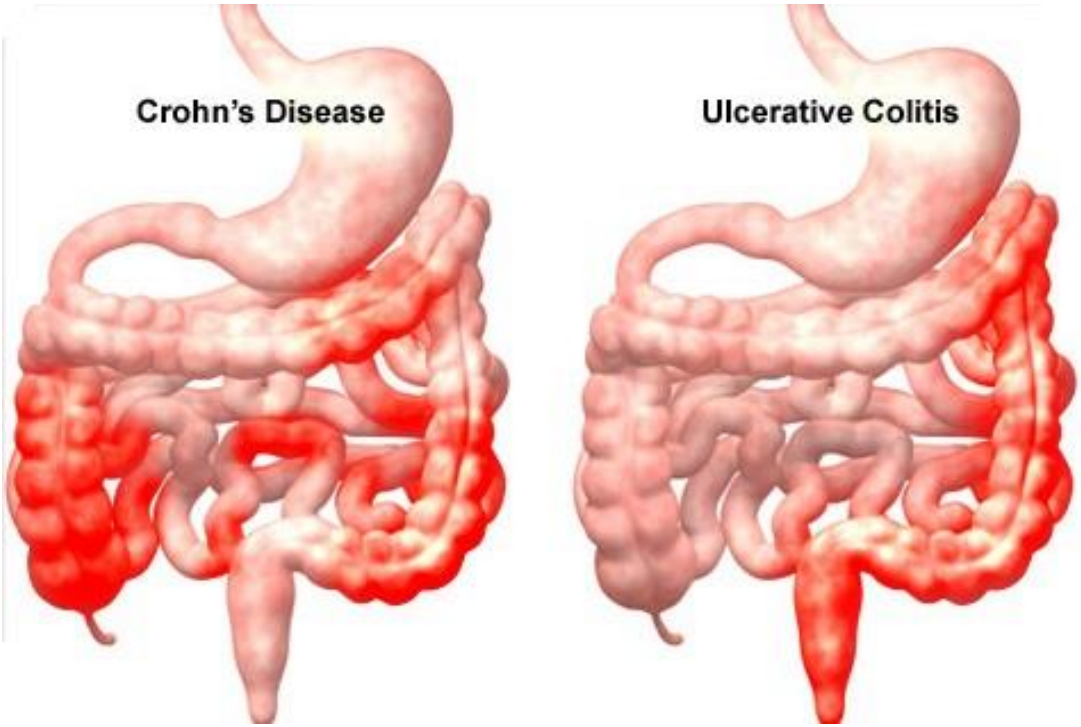
- Registered in about 33% of patients with AS.
- **Investigations**: ECG, echocardiography, CT.
- All these conditions should be treated by cardiologist.

http://www.doctortipster.com/wp-content/uploads/2011/07/aortic-regurgitation1.jpg

Gastrointestinal manifestations

- **Inflammatory bowel diseases (IBD)** - is a group of inflammatory conditions of the colon and small intestine, which include:

1. **Crohn's didease**
2. **Ulcerative colitis**



- Diagnosed in 5-10% of patients with AS.

http://images.medicinenet.com/images/slideshow/crohns-disease-s5-illustration-of-crohns-disease-and-ulcerative-colitis.jpg

Gastrointestinal manifestations

- **Symptoms:** abdominal pain, vomiting, diarrhea, rectal bleeding, severe internal cramps, weight loss, anemia.
- **Complications:** toxic megacolon, bowel perforation, colorectal cancer, intestinal obstruction, fistulas, abscesses, malabsorption and malnutrition.

http://www.athersys.com/images/IBDFigure1.jpg

Gastrointestinal manifestations

- **Investigations:** stool analysis, colonoscopy with biopsy.
- **Treatment:** steroids, immunesupressants, antibiotics, TNF inhibitors, surgery, fecal bacteriotherapy.

NB! **NSAIDs are prohibited in case of IBD!!!**

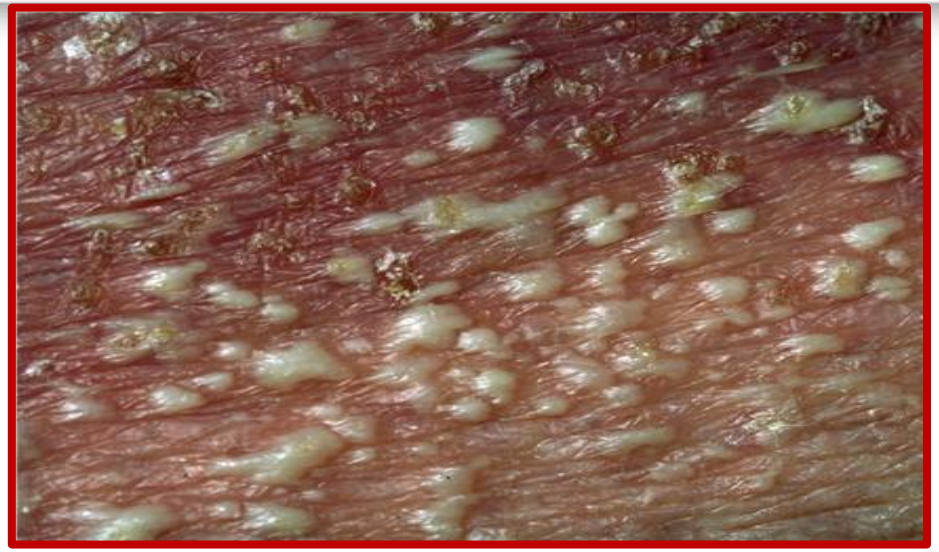
http://www.dailytimesgazette.com/wp-content/uploads/2015/09/drugsinhand1.jpg

Cutaneous manifestations

- **Psoriasis** is a chronic autoimmune disease characterized by patches of abnormal skin (typically red, itchy, and scaly) that may vary in severity from small and localized to complete body coverage.
- There are 5 main types: plaque, guttate, inverse, pustular, and erythrodermic.
- **Pustular psoriasis** associates with AS.
- Occurs in 10-25% of patients with AS.
- **Dermatologist**'s assistance is needed.

http://www.healthline.com/hlcmsresource/images/slideshow/Photos-of-the-Types-of-Psoriasis/285x285_Types_of_Psoriasis_Slide_9.jpg

Cutaneous manifestations

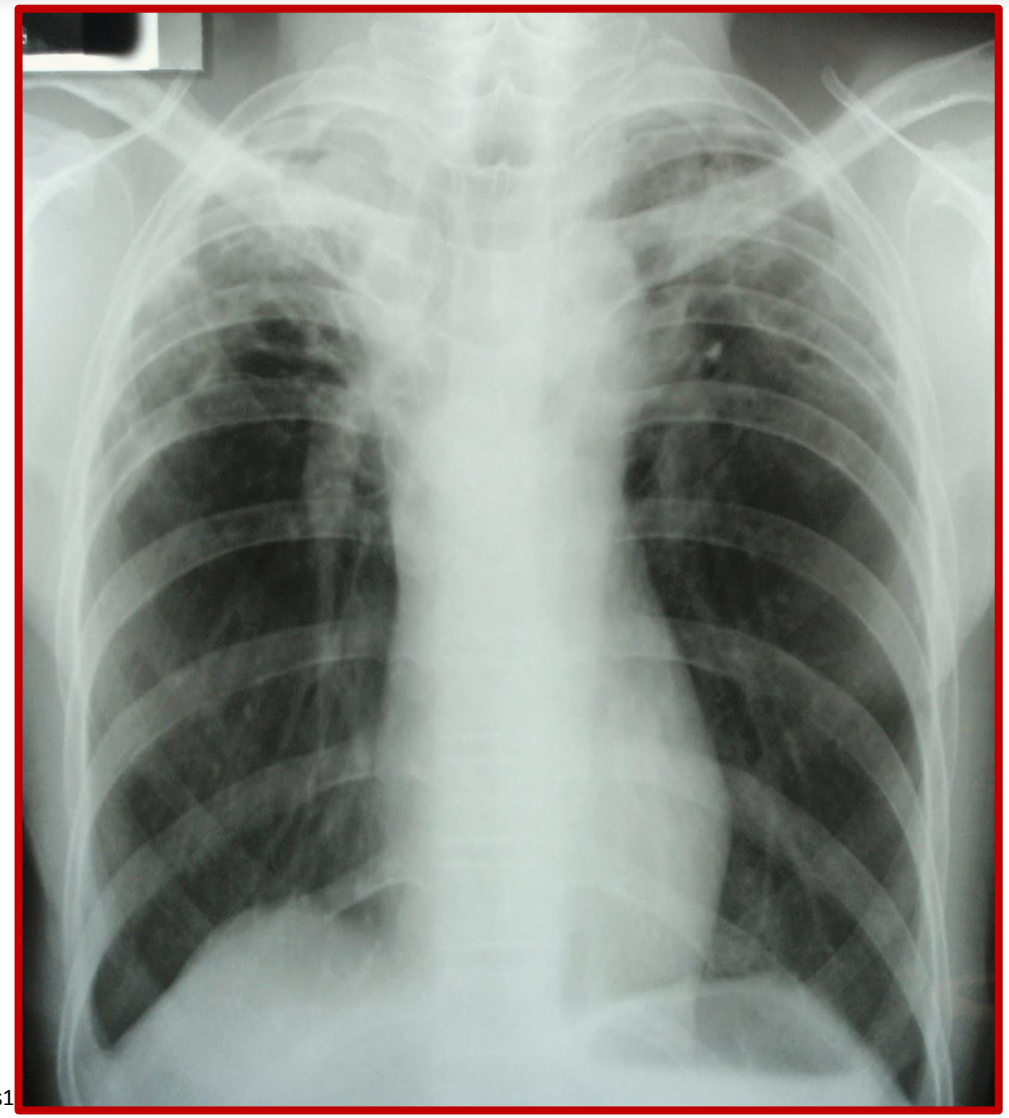


Pustular psoriasis usually exists as a large red area covered with green tender pustules (blisters) that are 1-2 mm diameter.

Pulmonary manifestations

- **Apical (upper lobe) fibrosis** – is a rather prevalent complication of a large number of pathologies.
- **Symptoms:** productive/non-productive cough, dyspnea.
- Develops in up to 50% of patients with AS.

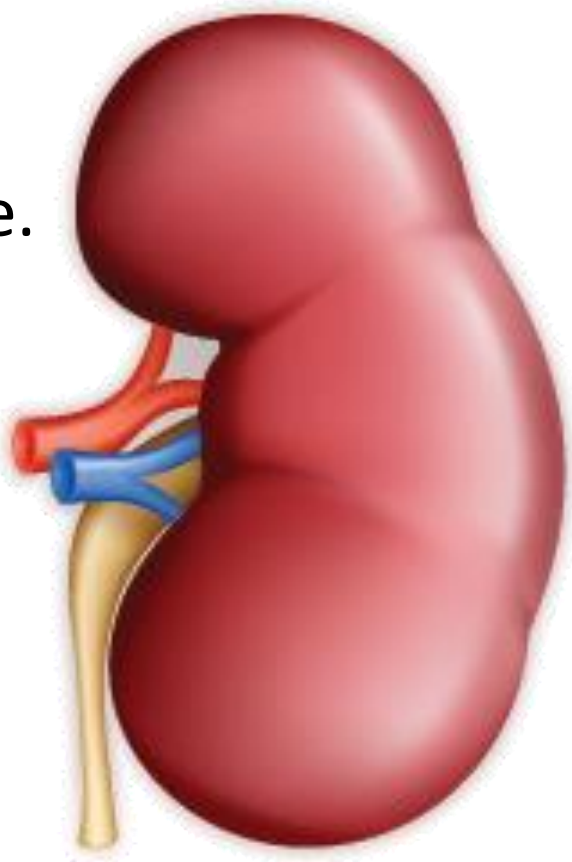
NB! Check for tuberculosis!!!



http://2.bp.blogspot.com/_WnNkrYwZkW8/Sub3XSt0GwI/AAAAAAAACiM/LwScCtQkFlY/s1600-h/fibrosis2.JPG

Renal manifestations

- **Renal amyloidosis** – renal deposits of amyloid, especially in glomerular capillary walls, which may cause albuminuria and the nephrotic syndrome.
- **IgA nephropathy** - deposition of the IgA antibody in the glomerulus, the most common variant of nephritic syndrome.
- Met in 10-35% of patients with AS.
- **Complication:** chronic renal failure.
- Cooperation with nephrologist is needed.



hhttp://cdn.shopify.com/s/files/1/0316/8657/files/Kidney.png?1418

Nota Bene!!!

- Uveitis without joint syndrome = Uveitis
- Joint syndrome + Uveitis = **AS**
- Aortitis without joint syndrome = Aortitis
- Joint syndrome + Aortitis = **AS**
- IBD without joint syndrome = IBD
- Joint syndrome + IBD = **AS**

… and so on.

http://st2.depositphotos.com/1004918/7100/i/950/depositphotos_71006221-Female-Doctor-With-Noticeboard.jpg

Complications

- **Functional insufficiency** (ankylosis)
- **Spinal fractures** (osteoporosis)
- **Cauda equina syndrome** - is a rare complication that occurs when nerves at the bottom of spine become compressed. Causes pain or numbness in lower back and buttocks, weakness in legs (can affect ability to walk), urinary incontinence or bowel incontinence.

http://obesitycoverage.com/wp-content/uploads/2014/09/complications2.jpg

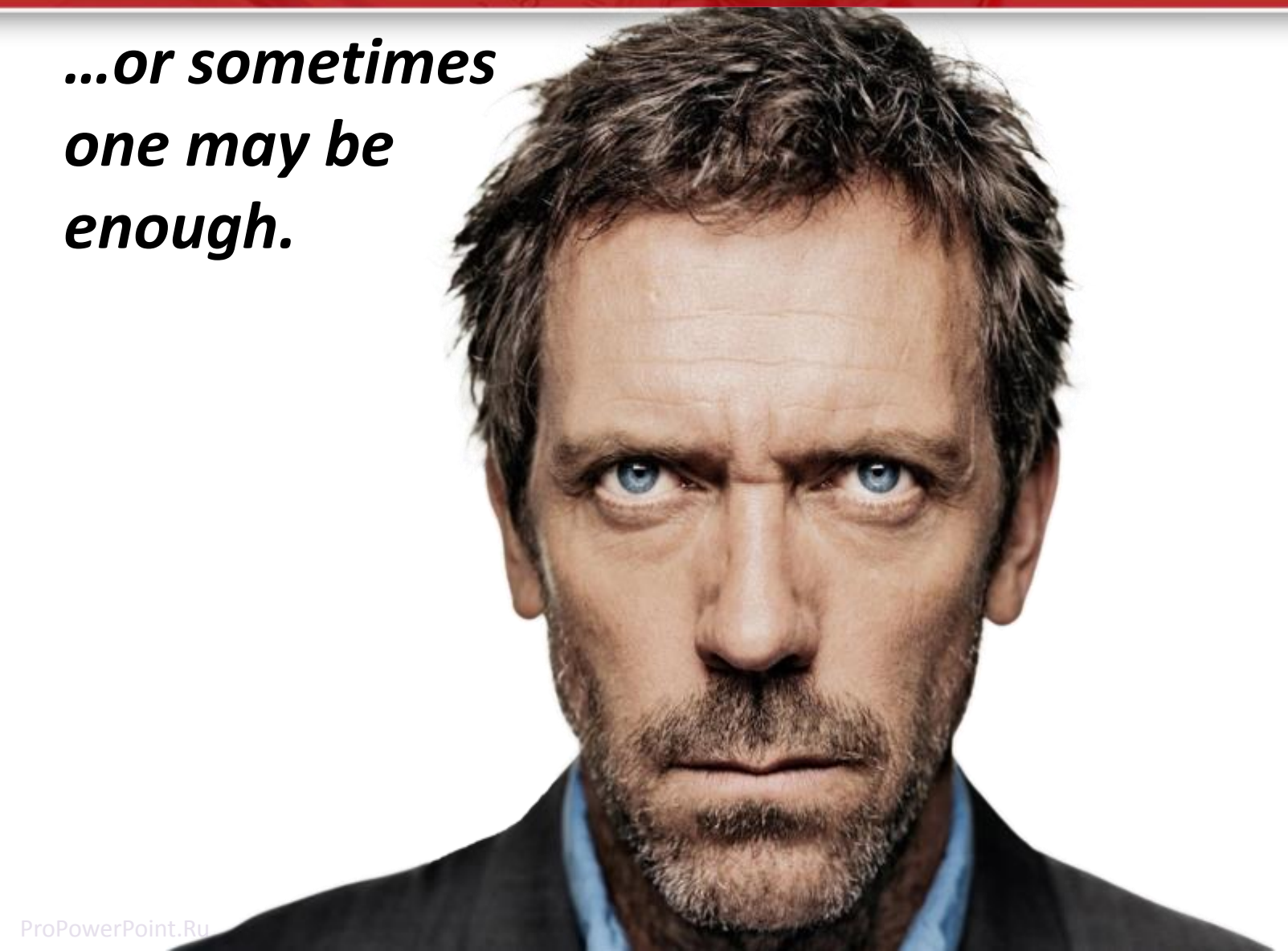
Teamwork

A large number of different specialists may be needed for management of AS patients.

http://www.riglocums.com/system/site/uploads/content/images//iStock_000022514360Large.jpg

Teamwork

…or sometimes one may be enough.



Forms of the disease

- **Central** – affection of only spine and sacroiliac joints.
- **Rhizomelic** – affection of spine, shoulder and hip joints.
- **Peripheral** – affection of both axial and peripheral joints (knee, ankle, etc.)
- **Scandinavic** – affection of spine and hand joints (mimicries rheumatoid arthritis)
- **Visceral** – affection of joints and internal organs.

http://www.terryarondberg.com/wp-content/uploads/2010/08/Thinking-doctor-1.jpg

Mobility measurement

1. Lumbar mobility

- Modified Schober test (lumbar flexion test)
- Finger-to-floor distance (Tomayer test)
- Lumbar lateral flexion

2. Thoracic mobility

- Chest expansion

3. Cervical mobility

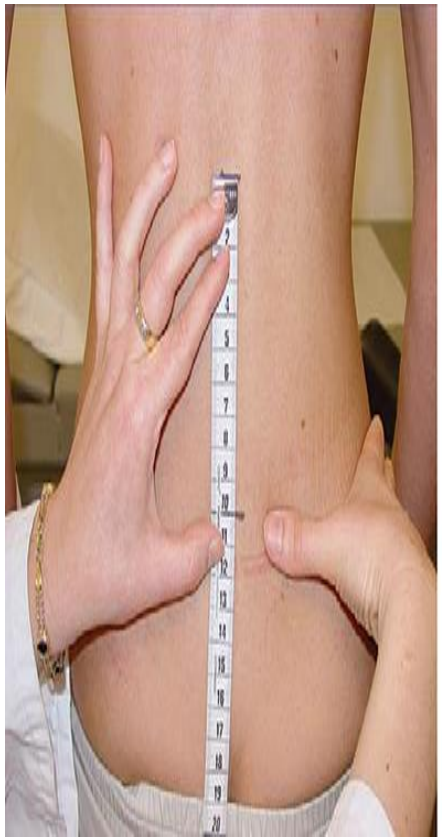
- Occiput-to-wall distance (Forestier test)
- Tragus-to-wall distance
- Cervical rotation

4. Hip mobility

- Intermalleolar distance

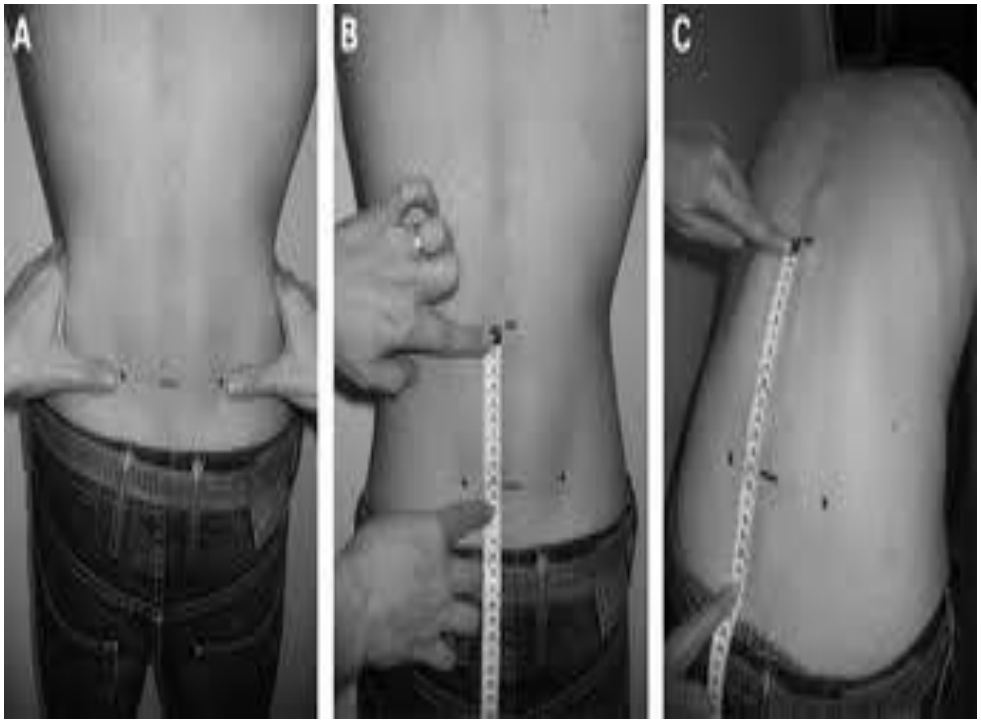
Schober test

- Patient standing upright
- Two marks are made on the patient's back: one at the level of the sacral dimples (at the fifth lumbar spinous process) and the other 10 cm above.
- The patient then bends forward as far as possible (ie, attempts to touch toes with knees extended), and the distance between the two marks is again measured.
- Normally the overlying skin will stretch to 15 cm
- Values less than this can be indicative of reduced lumbar mobility.



Modified Schober test

- In this test marks are made 5 cm below and 10 cm above the sacral dimples.
- The distance between these marks should increase from 15 cm to at least 20 cm with lumbar flexion.
- The distance less than 5 cm is abnormal.



Modified Schober test

https://www.youtube.com/watch?v=B9RaFB5BwrQ&index=1&list=PLB376ABEAA66A984D

Finger-to-floor distance

- Expression of spinal column mobility when bending over forward
- Measured distance is between the tips of the fingers and the floor when the patient is bent over forward with knees and arms fully extended.

http://www.ampli5.eu/media/wysiwyg/gelenkigkeits-test-ohne.jpg

Lateral lumbar flexion

- Patient stands with heels and buttocks touching the wall, knees straight, shoulders back, outer edges of feet 30 cm apart, feet parallel.
- The patient bends laterally as much as he can
- Measure minimal fingertip-to-floor distance in full lateral flexion without flexion, extension or rotation of the trunk or bending the knees.
- The difference between start and endpoint is recorded
- Normally >10 cm.

Lateral lumbar flexion

https://www.youtube.com/watch?v=c-IeFZkPEoE&index=2&list=PLB376ABEAA66A984D

Chest expansion

- Measured as the difference between maximal inspiration and maximal forced expiration in the fourth intercostal space in males or just below the breasts in females
- Normal chest expansion is ≥5 cm.

http://i.ytimg.com/vi/PmOgrzQ3INI/maxresdefault.jpg

Chest expansion

Normal values depending on age and sex.

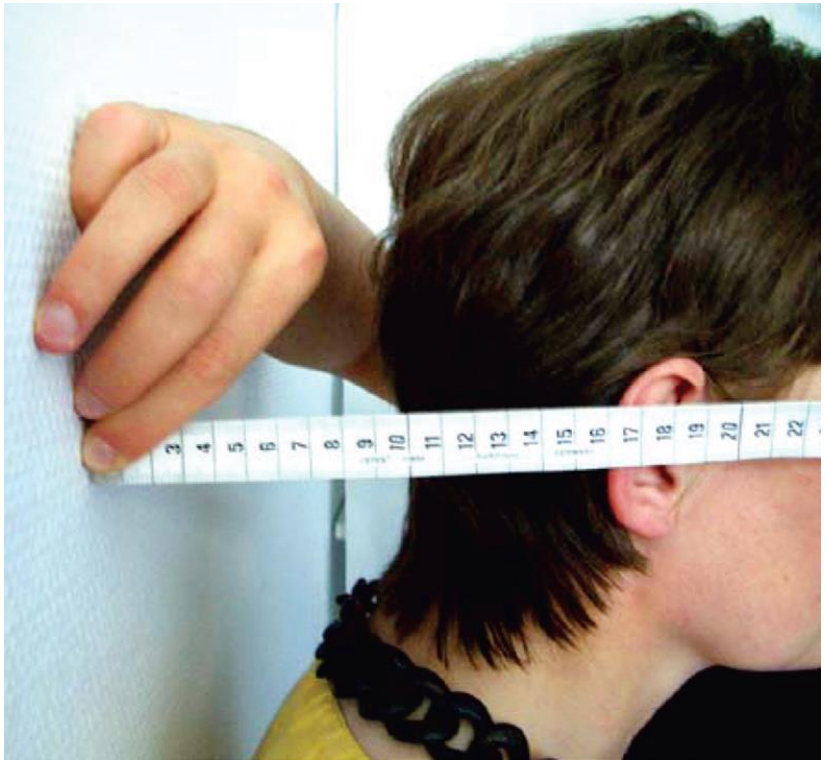
Age	18-24		25-34		35-44		45-54		55-64		65-74		75+	
Sex	M	F	M	F	M	F	M	F	M	F	M	F	M	F
cm	7.0	5.5	7.5	5.5	6.5	4.5	6.0	5.0	5.5	4.0	4.0	4.0	3.0	2.5

Chest expansion

https://www.youtube.com/watch?v=SumtVr5c1Qg&list=PLB376ABEAA66A984D&index=3

Occiput to wall distance

- Patient stands, with heels and buttocks against the wall; the head is placed back as
  far as possible, keeping the chin horizontal
- Patient extends his neck maximally in an attempt to touch the wall with the occiput.
- Normally = 0.



Tragus to wall distance

- Patient stands, with heels and buttocks against the wall.
- The head is placed back as far as possible, keeping the chin horizontal.
- Normally <15 cm.

Tragus to wall distance

Cervical rotation

- Patient supine, head in neutral position, forehead horizontal.
- If necessary head on pillow or foam block to allow this.
- Gravity goniometer / bubble inclinometer placed centrally on the forehead.
- Patient rotates head as far as possible, keeping shoulders still, ensure no neck flexion or side flexion occurs.
- Normally $70\text{-}90^0$

Cervical rotation

https://www.youtube.com/watch?v=t7Z47hxrdcI&list=PLB376ABEAA66A984D&index=4

Intermalleolar distance

- Patient stands with legs separated as far as possible.
- The distance between the medial malleoli is measured.
- Normally >100 cm.

Intramalleolar distance

Tests for sacroiliitis

- Pelvic compression test
- Fabere test
- Gaenslen Test

 https://edc2.healthtap.com/ht-staging/user_answer/avatars/1728307/large/Sacroiliac_joint_pain.jpeg?1397394172

Pelvic compression test

- Test irritability by compressing the pelvis with the patient prone.
- Sacroiliac pain will be lateralised to the inflamed joint.

http://i.ytimg.com/vi/0yxg_Zj9Dg4/hqdefault.jpg

Pelvic compression test

https://www.youtube.com/watch?v=ux8G2pNhQQs&list=PLik7TzimeymI_Fd8aTceYUp6YNTjkz1Rq

Fabere test

- FABER test (Fabere test, Patrick test, Figure Four test) is performed by having the tested leg flexed, abducted and externally rotated.
- If pain occurs anteriorly on the same side of the body → hip joint disorder.
- If pain occurs posteriorly on the opposite side of the body → sacroiliac joint disorder.

https://i.ytimg.com/vi/p1jo3puFDAU/maxresdefault.jpg

Fabere test

Gaenslen test

- The non-tested leg is kept in extension, while the tested leg is placed in maximal flexion.
- The examiner places one hand on the anterior thigh of the non-tested leg and the other hand on the knee of the tested leg to apply a flexion overpressure
- The extended leg may also be placed off the table to create a greater force.
- A positive test occurs if it produces low back pain.

http://www.e-rheumatology.gr/sites/default/files/SDS-Sacroiliac-Gaenslen-test.gif

Gaenslen test

Laboratory tests

- **CBC:** increased ESR, sometimes – hypochromic anemia and leucocytosis.
- **Biochemistry:** increased level of α-2-globulines and γ-globulines, seromucoid, sialic acid, CRP.
- **Rheumatoid factor** in blood – negative.
- **HLA-B27 Typing** – positive in about 90% of cases.
- **Others** – depending on extra articular manifestations and complications.

http://www.cryohc.com/wp-content/uploads/2013/04/lab_tests.png

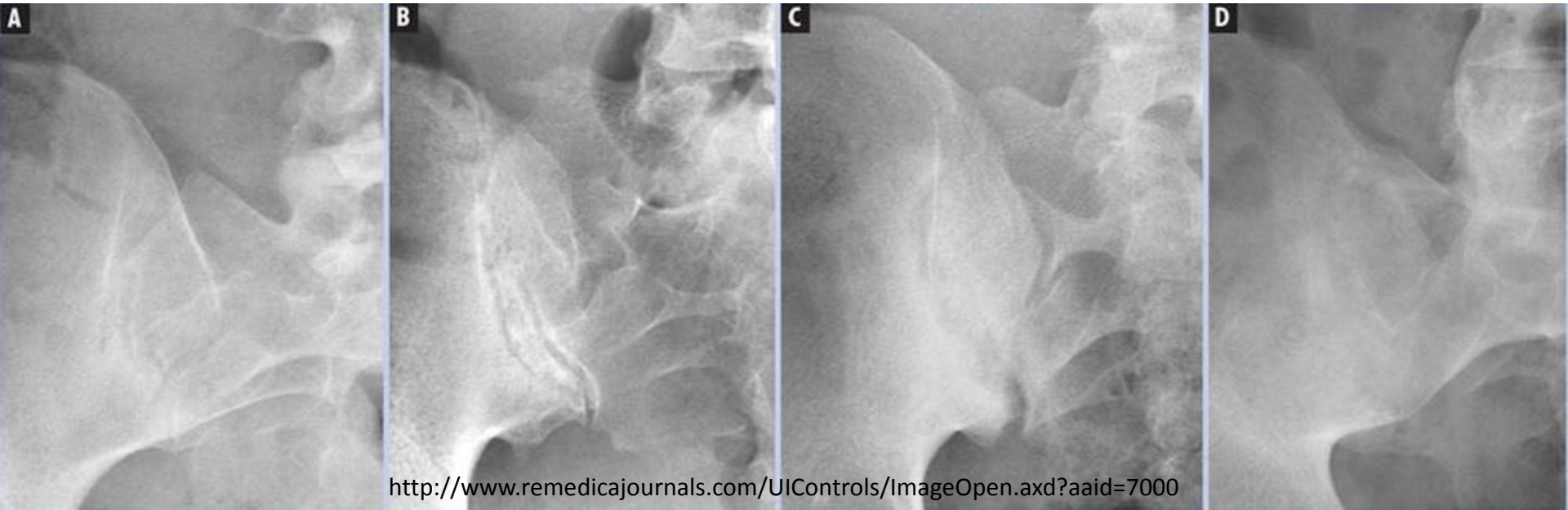
Instrumental tests

- **X-ray** – main diagnostic method
- **Scyntygraphy**
- **CT-scan, MRI**
- **Others** - depending on extra articular manifestations and complications.

http://www.medgadget.com/wp-content/uploads/2014/10/ct-scanner.png

X-Ray Grading of SI joints

- **Grade 0:** normal
- **Grade I:** some blurring of the joint margins – suspicious **(A)**
- **Grade II:** minimal sclerosis with some erosion **(B)**
- **Grade III:**
  - definite sclerosis on both sides of joint
  - severe erosions with widening of joint space with or without ankylosis **(C)**
- **Grade IV:** complete ankylosis **(D)**



http://www.remedicajournals.com/UIControls/ImageOpen.axd?aaid=7000

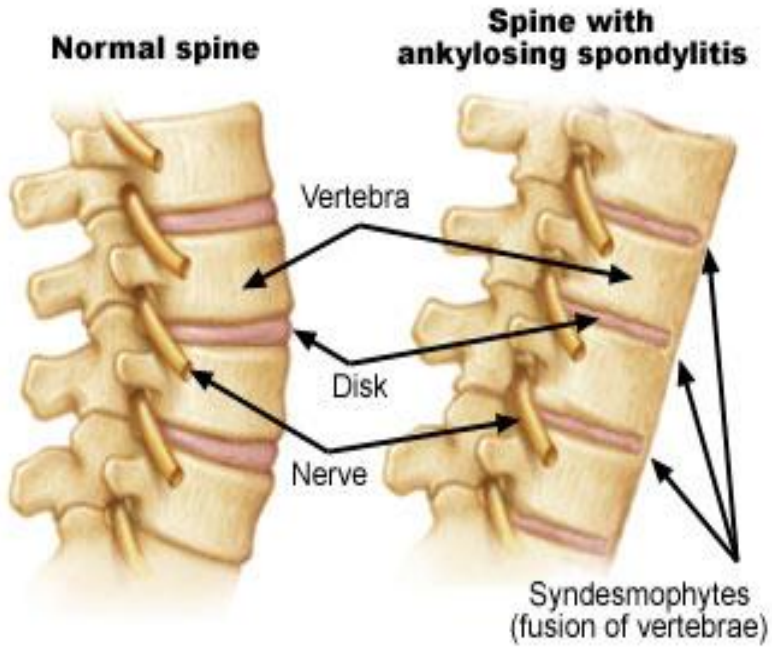
Bamboo spine

- **Bamboo spine** occurs as a result of vertebral body fusion by marginal syndesmophytes. It is often accompanied by fusion of the posterior vertebral elements as well.
- Typically involves the thoracolumbar and or lumbosacral junctions and predisposes to unstable vertebral fractures.

http://radiopaedia.org/images/564392

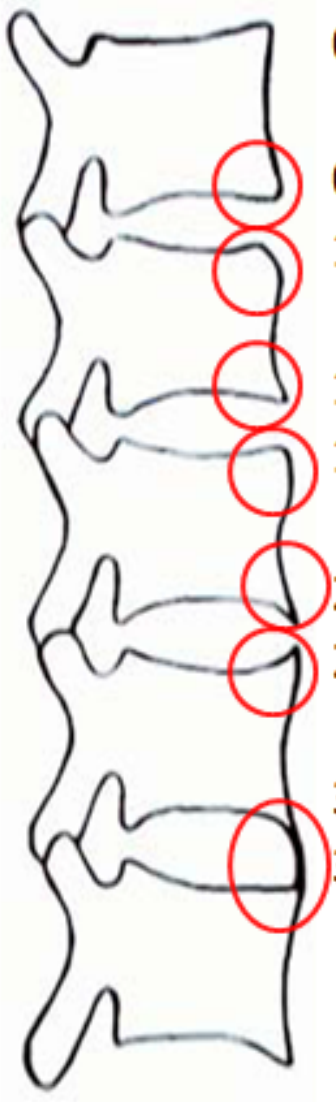
Bamboo spine

- The outer fibres of the annulus fibrosus of the intervertebral discs ossify, which results in the formation of marginal syndesmophytes between adjoining vertebral bodies. The resulting radiographic appearance therefore is that of thin, curved, radio-opaque spicules that completely bridge adjoining vertebral bodies.
- There is also accompanying squaring of the anterior vertebral body margins with associated reactive sclerosis of the vertebral body margins (shiny corner sign).



 http://1.bp.blogspot.com/_QeK6h6J8gEo/SxILouJ-0UI/AAAAAAAAAEA/hdt3AhCyJek/s1600/ASSpinepic.jpg

Bamboo spine



0 Normal

0 Normal

1 Erosion

1 Sclerosis

1 Squaring

2 Syndesmophyte

2 Syndesmophyte

3 Complete bridging

3 Complete bridging

Modified New York Criteria (1984)

Clinical Criteria

- Low back pain, > 3 months, improved by exercise, not relieved by rest
- Limitation of lumbar spine motion, sagittal and frontal planes
- Limitation of chest expansion relative to normal values for age and sex

Radiologic Criteria

- Sacroiliitis grade ≥ 2 bilaterally

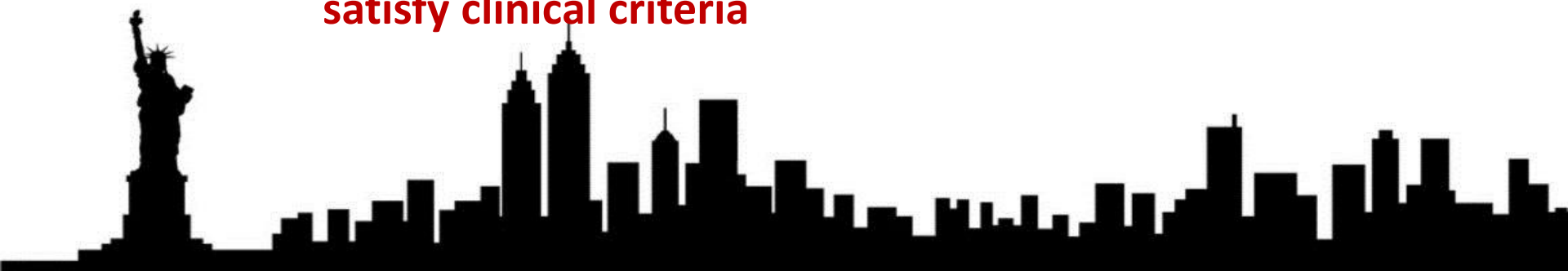
OR

- Sacroiliitis grade 3 – 4 unilaterally

Definite AS if radiologic criterion present plus at least one clinical criteria

Probable AS if:

- **Three clinical criterion**
- **Radiologic criterion present, but no signs or symptoms satisfy clinical criteria**



ASAS Criteria (2010)

Sacroiliitis on imaging
AND
≥ 1 SpA feature

OR

HLA-B27 positive
AND
≥ 2 other SpA features

SpA features

- inflammatory back pain
- arthritis
- enthesitis (heel)
- uveitis
- dactylitis
- psoriasis
- Crohn's / colitis
- good response to NSAIDs
- family history of SpA
- HLA-B27
- elevated CRP

ASAS
Assessment of SpondyloArthritis international Society

Sacroiliitis on imaging

- active (acute) inflammation on MRI highly suggestive of sacroiliitis associated with SpA
- definite radiographic sacroiliitis according to modified New York criteria

http://www.rheumtutor.com/wp-content/uploads/2012/08/ASAS-Criteria-for-Axial-SpA6.jpg

Treatment

1. Regime

2. Drug therapy:

- NSAIDs
- Steroids
- DMARDs
- Anti-TNF drugs

3. Physiotherapy

4. Surgical treatment

 http://nomoreenabling.com/wp-content/uploads/2013/05/recovery.jpg

Regime

- **Regular exercises** – swimming, yoga.

NB! Contact sports are NOT recommended.

- **Hard bed**
- **Posture** – sit/walk straight.
- **Diet** – rich with Calcium, avoid overweight.

http://georgii56.ru/proekt/uvelir/images/images263-CHasy.jpg

NSAIDs

- **Indomethacin (Indocin)** – 25mg 3 times per day, up to 150 mg per day.
- **Diclofenac (Cataflam, Voltaren-XR, Zorvolex)** – 25-50 mg 3 times per day.
- **Ibuprofen (Motrin, Advil)** – 200 mg 3 times per day.

http://rccatalyst.com/wp-content/uploads/2015/07/nsaids.jpg

Steroids

- Used when **NSAIDs non-effective.**
- **Prednisone** – 5-60 mg per day (1 mg/kg/day).
- **Hydrocortisone** – 20-240 mg per day.
- **Pulse therapy** – prednisone IV 1000 mg 1 time per day for 3 days.

http://predexpress.com/prednisone.jpg, http://www.buy-pharma.co/img/uploads/1804-hisone-10-hydrocortisone-tablet-10-mg-samarth.jpg

DMARDs

- Extremely effective in case of **peripheral form** of AS.
- **Sulfasalazine** – 2-3 g per day.
- **Methotrexate** – 7.5 – 20 mg 1 time per week.

http://img.tradeindia.com/fp/2/727/846.jpg, http://www.allivet.com/images/product/large/163.jpg

TNF inhibitors

- **TNF inhibitors** - are pharmaceutical drugs that suppresses the physiologic response to tumor necrosis factor (TNF), which is part of the inflammatory response.
- **Advantages:** high specificity, selectivity; decreased risk of immunosuppression.
- **Disadvantages:** high price, increased oncological risk.

NB! The global market for TNF inhibitors in 2008 was **$13.5 billion** and **$22 billion** in 2009.

http://authoritynutrition.com/wp-content/uploads/2013/01/doctor-with-thumbs-up1.jpg

TNF inhibitors

- **Indications:** rheumatoid arthritis, ankylosing spondylitis, inflammatory bowel disease, psoriasis.
- **Side effects:** lymphomas, infections, congestive heart failure, demyelinating disease, a lupus-like syndrome, induction of auto-antibodies, injection site reactions.

http://thumbs.dreamstime.com/x/miraculous-cure-panacea-12517519.jpg

TNF inhibitors

- **Golimumab (Simponi)** – SC 50 mg every month.
- **Adalimumab (Humira, Exemptia)** – SC 40 mg 1 time per 2 weeks.
- **Infliximab (Remicade, Remsima, Inflectra)** – IV drop 5 mg/kg once, repeat in 2 weeks, then – in 6 weeks and perform every 6-8 weeks.

Physiotherapy

- Exercises
- Massage
- Heat procedures

http://www.ankylosing-spondylitis.ie/uploads/img/5294876f1b916.png

Surgical Treatment

- **Spine osteotomy** is a surgical procedure in which a section of the spinal bone is cut and removed to allow for correction of spinal alignment.

- Usually needed for correction of severe deformed, rigid and fixed spinal deformity.

- The three main types of osteotomy are:

  1. Smith-Petersen Osteotomy (SPO)

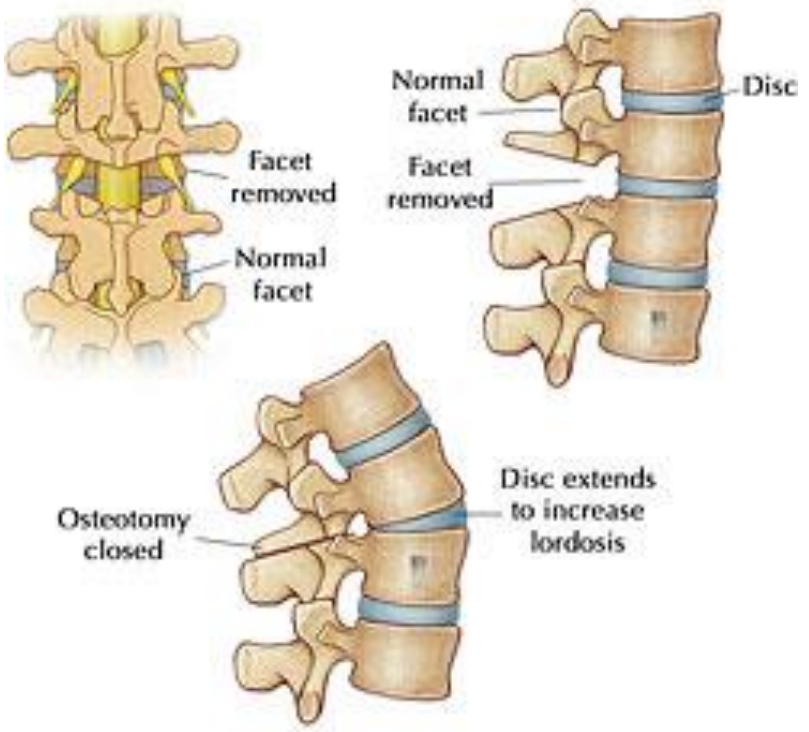
  2. Pedicle Subtraction Osteotomy (PSO)

  3. Vertebral Column Resection Osteotomy (VCR)

http://ecx.images-amazon.com/images/I/6190NWg%2ByHL._SL1000_.jpg

Surgical Treatment

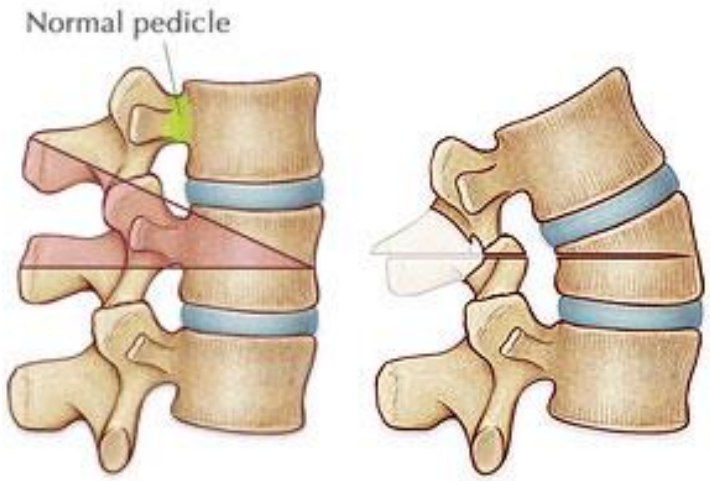
- **Smith-Petersen Osteotomy (SPO)** - is recommended in patients in whom a relatively small amount of correction (10-20° for each level) is required.
- A section of bone with posterior ligament and facet joints are removed from the back of the spine causing the spine to lean more toward the back.
- SPO may be performed at one or multiple locations along the spine to restore lordosis.



https://www.superteachertools.net/jeopardyx/uploads/20141009/Ponte.jpg

Surgical Treatment

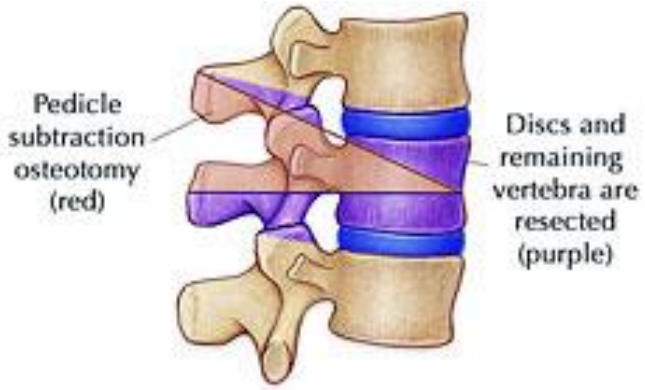
- **Pedicle Subtraction Osteotomy (PSO)** - is recommended in patients in whom a correction of approximately 30° is required mainly at the lumbar level.
- PSO involves all three posterior, middle, and anterior columns of the spine.
- A posterior element and facet joints (similar to a SPO) and a portion of the vertebral body along with the pedicles are removed.
- PSO allows for more correction of the lordosis than SPO.



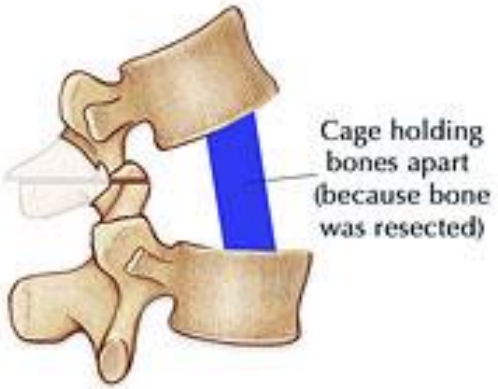
http://www.yurielkaim.com/wp-content/uploads/2012/04/imgres-1.jpeg

Surgical Treatment

- **Vertebral Column Resection Osteotomy (VCR)** - involves the complete removal of a single or multiple vertebral bodies.
- It allows for maximum correction that can be achieved with any spinal osteotomy.



- It introduces a large defect in the spine, so the spinal fusion is also performed over these levels for reconstruction (autograft, structural allograft or metal cage).



http://www.myissc.com/spine_problems/spinal_cord_tumor/graphics/anterior-posterior_osteotom.jpg

Surgical Treatment

Prognosis

http://www.painneck.com/images/ankylosing-spondylitis-symptoms.jpg

Thank you

http://www.brettsanders.me/wp-content/uploads/2015/01/bamboo_texture1595.jpg