

Pain in Osteoarthritis

By

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Objectives

Understand

1. Clinical presentations of osteoarthritis
2. Background and Epidemiology of osteoarthritis
3. Pain and medical conditions associated with osteoarthritis
4. Sex, Gender and Ethnic influences on osteoarthritis

Osteoarthritis

Definition/Characteristics

1. Gradual loss of articular cartilage, combined with thickening of the subchondral bone; bony outgrowths at joint margins (osteophytes), and mild chronic non-specific inflammation
2. Commonly associated with aging, trauma, or degenerative and medical conditions supporting connective tissue



Clinical Presentation



Early RA



Intermediate
RA

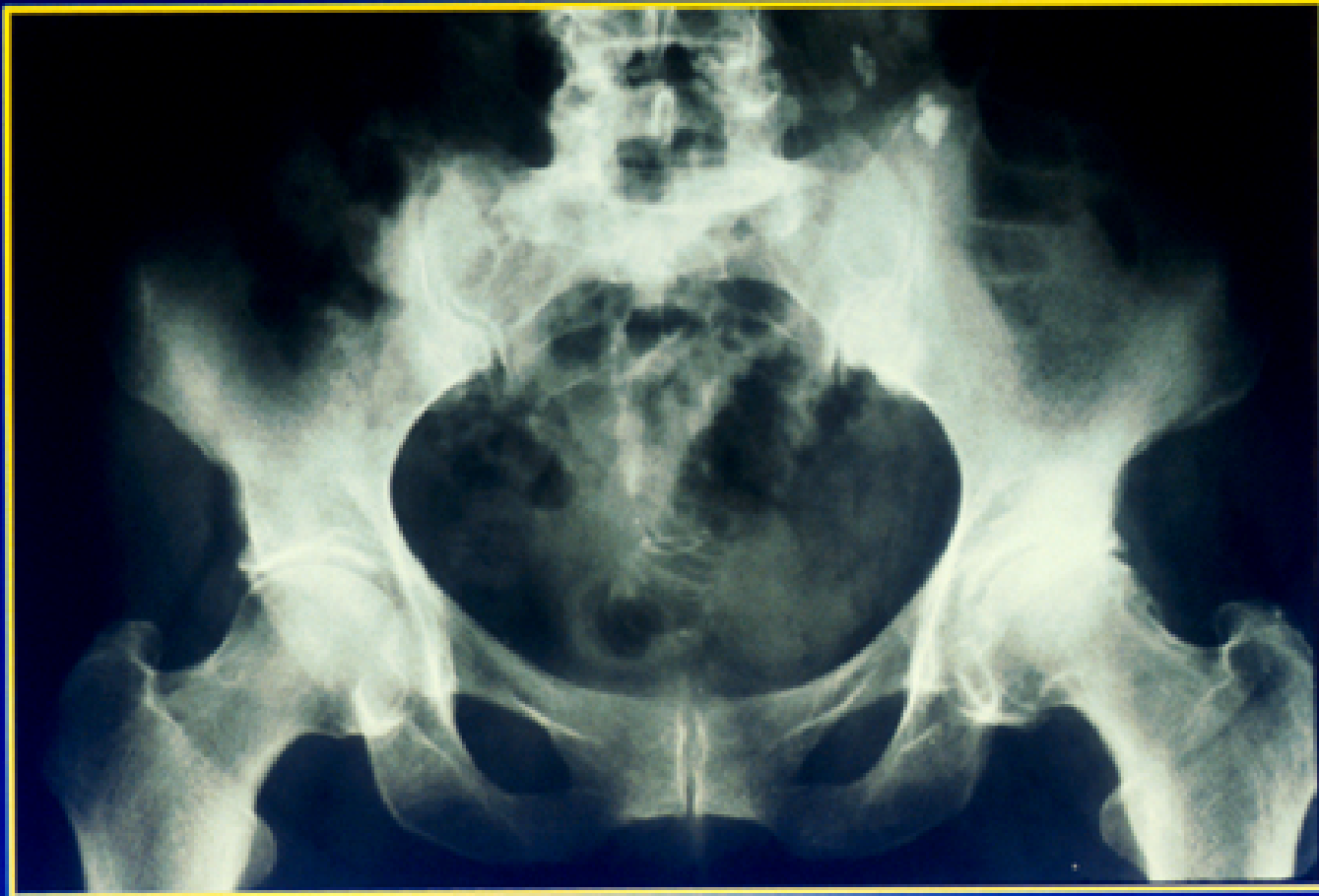


Severe RA



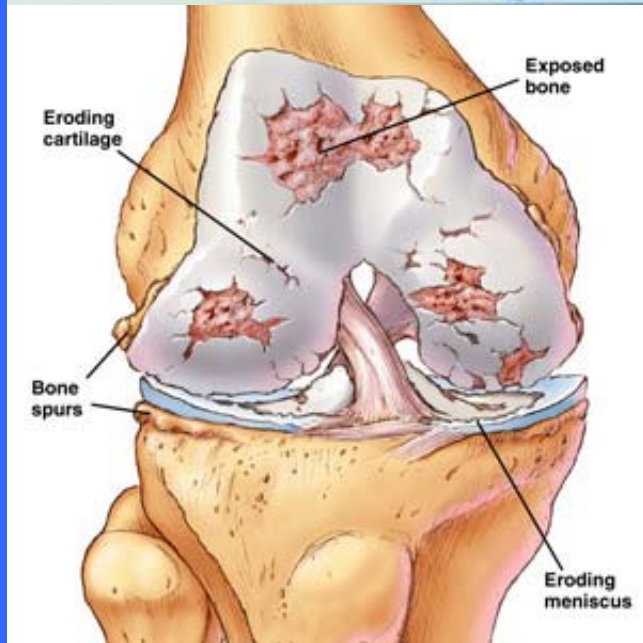
Latinis KM, et al. *The Washington Manual™
Rheumatology Subspecialty Consult.*
Philadelphia, Pa: Lippincott Williams & Wilkins;
2004.

OA of the Hip: Early Disease

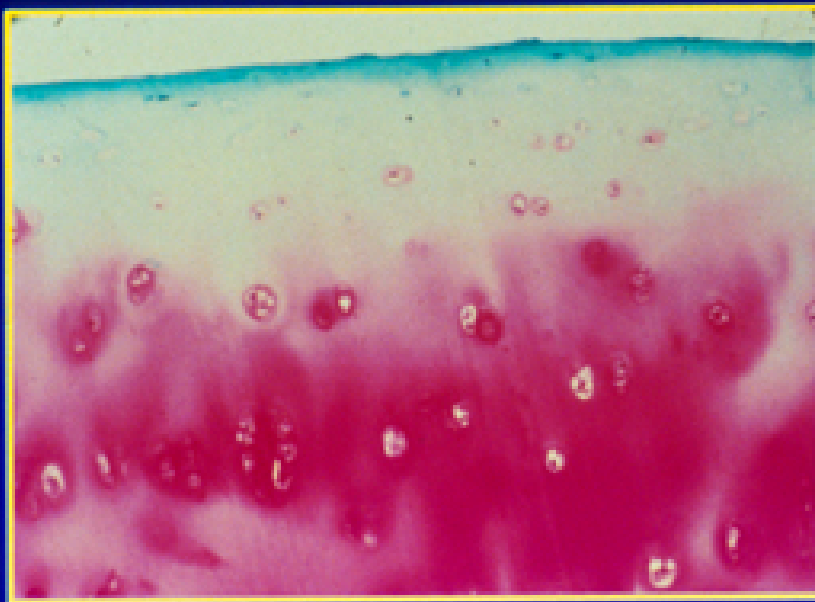


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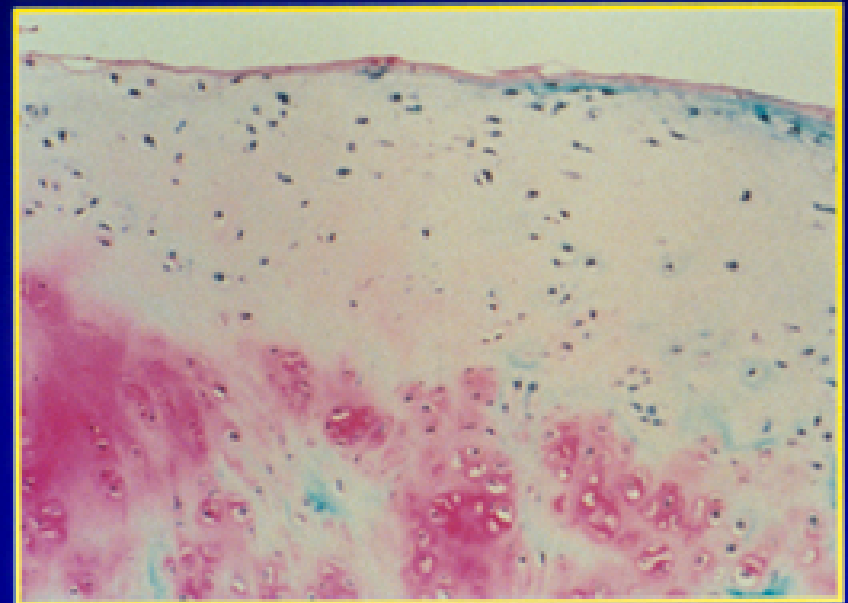
Osteoarthritis



Articular Cartilage of the Hip: Normal vs. OA



Normal



OA

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Common Clinical Presentations of Osteoarthritis

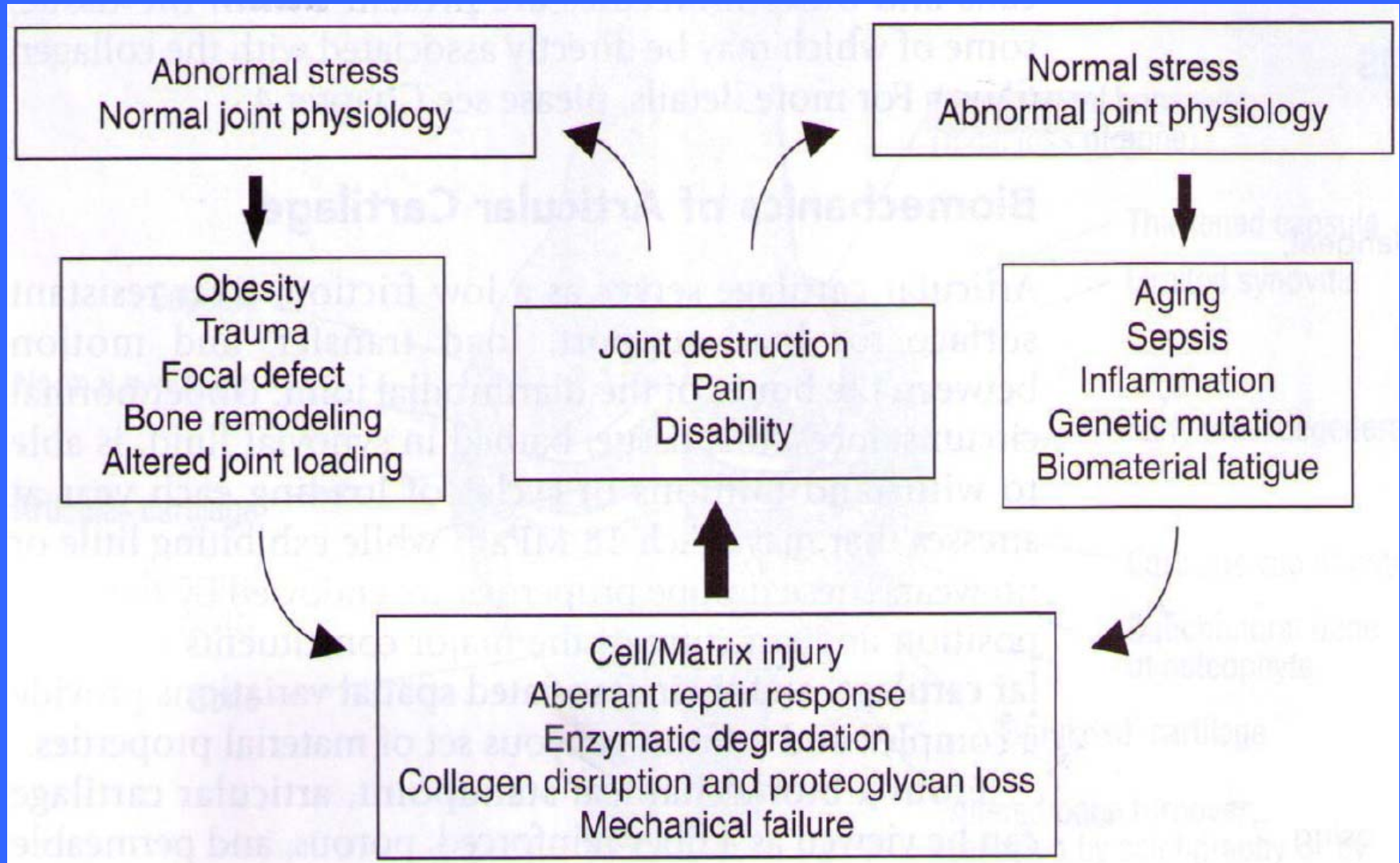
- Pain or other discomfort in a single or few joints
- Discomfort or pain after trauma or injury following an activity
- Early morning stiffness less than 30 minutes in select joints with increasing pain with use of the joint
- Joint swelling or effusions
- Findings on X-rays of osteoarthritis changes
- Normal acute phase reactants (ESR and C-reactive proteins) and other serological tests

Osteoarthritis

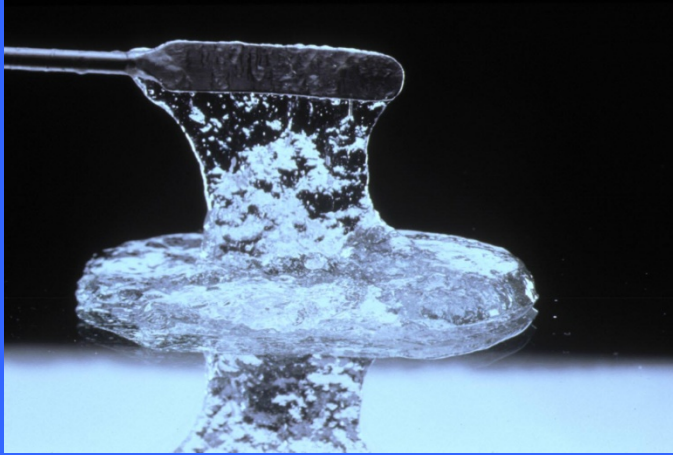
Pathogenesis

- Enhanced cartilage degrading enzymes by inflammatory and pro-inflammatory cytokines (Interleukins, interferon gamma and tumor necrosis factor, metalloproteinases and stromelysin)
- Alteration of proteoglycans (Aggrecan) containing chondroitin and keratin sulfate and extracellular matrix (type II, IX and XI collagen) which are the supporting structures

Etiopathogenesis of OA

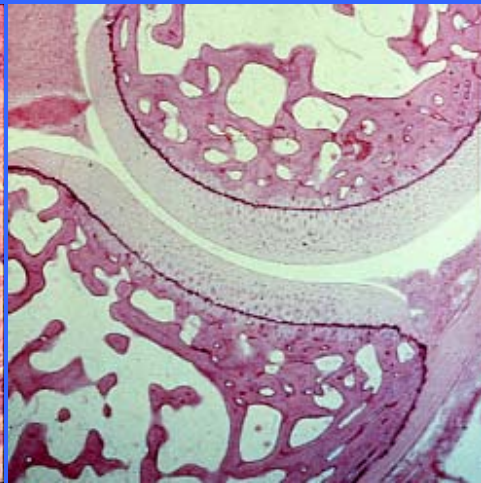
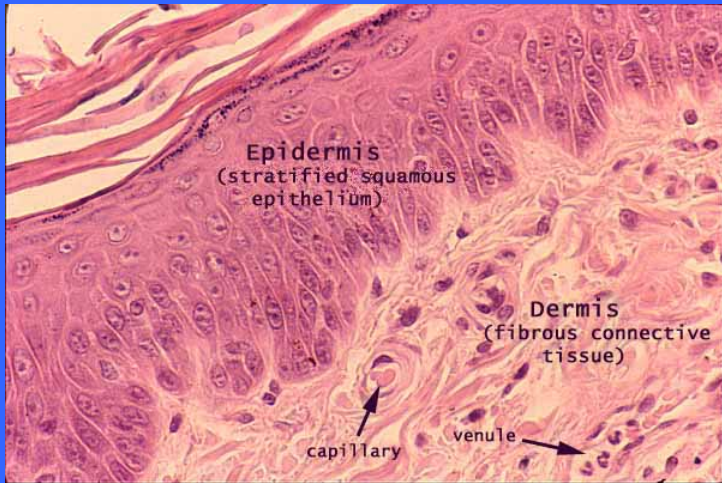
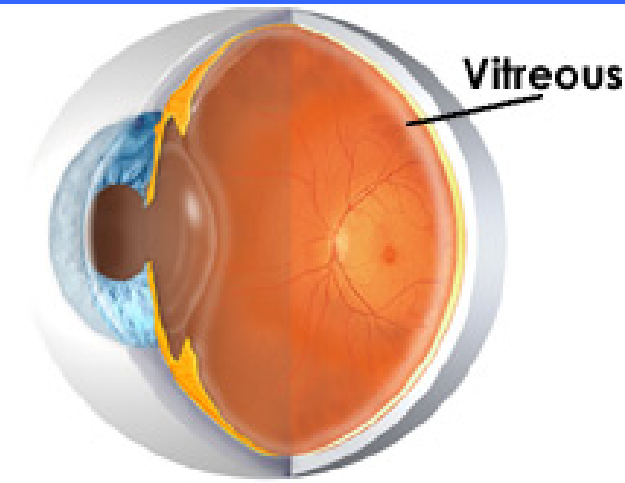


Hyaluronan is a ubiquitous polysaccharide of the extracellular matrix

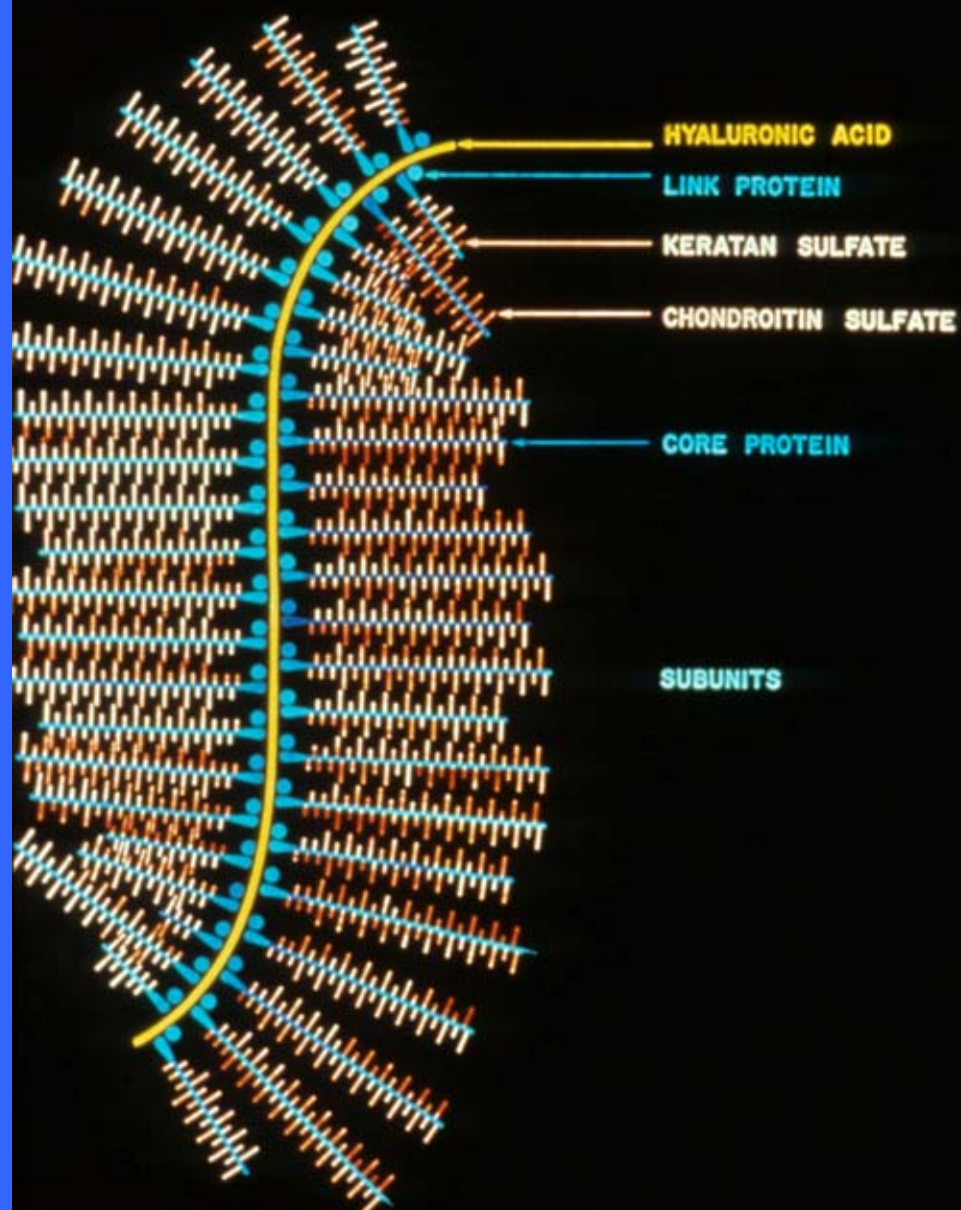


	molecular weight (Daltons)	
	2,000,000-7,000,000	

hyalos in Greek
vitreus in Latin, mean "glass"



PROTEOGLYCAN AGGREGATE

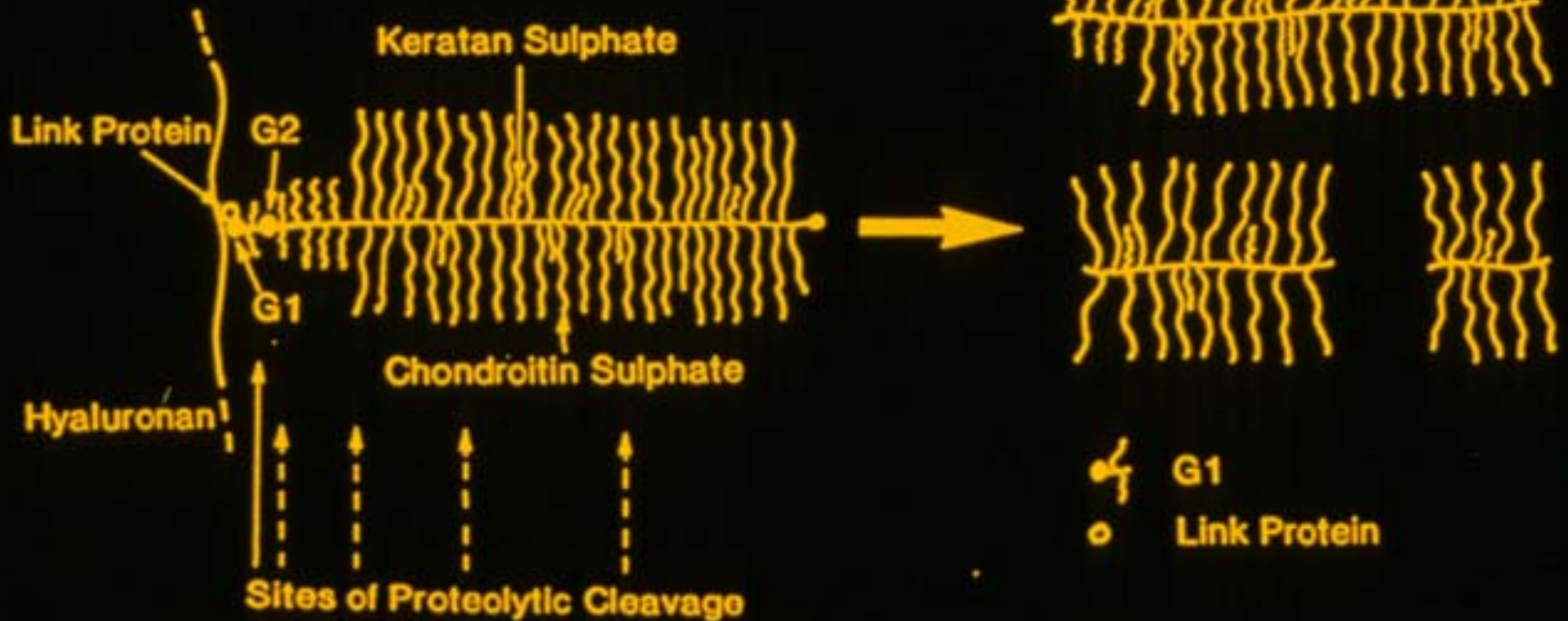


CARTILAGE

Aggregating Proteoglycan

SYNOVIAL FLUID/MEDIUM

Non-aggregating Proteoglycan Fragments



Secondary Osteoarthritis Factors

- Trauma
- Developmental deformities
- Polymyositis
- Systemic lupus erythematosus
- Rheumatoid arthritis
- Psoriatic arthritis
- Gout

Secondary Arthritis Factors

- Chondrocalcinosis
- Septic arthritis
- Hemophilia-induced arthropathy
- Neuropathic arthropathy
- Osteochondritis/osteonecrosis
- Paget's disease
- Ehlers Danlos (hypermobility syndromes)

Objectives of Osteoarthritis therapy

- Decrease Pain
- Improve Function
- Decrease inflammation and pain
- Strengthen supporting joint structures

Nonpharmacologic Therapy for Patients with Osteoarthritis

- Patient education
- Self-management programs (Arthritis Foundation Self-Management Program)
- Personalized social support through telephone contact
- Weight loss (if overweight)
- Aerobic exercise programs

Nonpharmacologic Therapy for Patients with Osteoarthritis

- Physical therapy range of motion exercises
- Muscle-strengthening exercises
- Assistive devices for ambulation
- Patellar taping
- Appropriate footwear
- Lateral-wedged insoles (for genu varus)

Management Guidelines for Osteoarthritis

+ American College of Rheumatology (ACR)

<http://www.rheumatology.org>

Summary of Management Guidelines for Osteoarthritis of the Knee

Step: 1

Acetaminophen (up to 1 gm q.i.d.)
for pain and symptom control



Step: 2

If necessary, add topical capsaicin cream



Summary of Management Guidelines for Osteoarthritis of the Knee

Step: 3

If response inadequate, use alternative analgesic, low-dose ibuprofen (up to 400 mg q.i.d.) or non-acetylated salicylates



Step: 4

If response inadequate, use full-dose nonsteroidal anti-inflammatory drug (with misoprostol if patient has risk factors for UGI bleeding or ulcer disease)



Summary of Management Guidelines for Osteoarthritis of the Knee

Step: 5

If response inadequate and surgery is contraindicated, consider referral for joint lavage and/or arthroscopic debridement



Step: 6

If response inadequate, and surgery is not contraindicated, consider referral for joint surgery (osteotomy, total joint arthroplasty)

Note: q.i.d. = 4 times a day; UGI = upper gastrointestinal (tract)

Summary of Osteoarthritis of the Hip Management Guidelines

Step: 1

Nonpharmacologic modalities and acetaminophen
(up to 1 gm q.i.d.)



Step: 2

If response inadequate, use alternative analgesic, low-dose ibuprofen (up to 400 mg q.i.d.) or non-acetylated salicylates



Summary of Osteoarthritis of the Hip Management Guidelines

Step: 3

If response inadequate, use full-dose nonsteroidal anti-inflammatory drug (with misoprostol if patient has risk factors for UGI bleeding or ulcer disease)



Step: 4

If response is inadequate, consider referral for joint surgery (osteotomy, total joint arthroplasty)

Note: q.i.d. = 4 times a day; UGI=upper gastrointestinal (tract)

Osteoarthritis-Surgical Treatment

- Total Joint replacements- Hips and knees most common, shoulders and elbows improving
- Arthrodesis or immobilization- Wrists and ankles common
- Arthroscopic- Debridement and lavage questionable benefit in prospective 180 patient trial (Mosley et. al 2002 N Engl J Med 347:81-88)

Osteoarthritis : Potential therapies

1. Chondroitin-Glucosamine sulfate

No benefit in prospective NIH trial for pain. Long term prevention unknown (Clegg et al. N Engl J Med 2006; 354:795)

2. Autologus chondrocyte transplant for cartilage defects of the knee (Healing of defects and prevention or improvement -14/16 patients (Brittberg et al. N Engl Med 1994; 331:1890)

3. Biologic Therapies- anti- IL-1 for polyarticular osteoarthritis

Osteoarthritis

WHO IS AFFECTED?

Osteoarthritis

Epidemiology

- Most common joint disorder in the United States (80 million people or 10% of adults over 60) and the world
- Leading cause of pain and disability
- Weight bearing joints, spine, hips, knees, shoulders and repetitively used joints (hands most affected)

Osteoarthritis: Associated Factors

- Age is the strongest risk Factor: 12-13% over age 60 vs. 6.1% age 30-60 in knees (Felson, Lawrence et al. Ann Intern Med 2000; 133:635)(Arthritis Rheum 1998; 41:1343)(Arthritis Rheum 2008;58: 26)
- Predominant female disease in prevalence and severity (Srikanth et al. :Osteoarthritis Cartilage; 2005:13:769), increasing at menopause 30-50% (Hannan et al. :Arthritis Rheum 1990; 33: 525-32)

Osteoarthritis (OA)

Race-Ethnicity

- Hip and Hand OA Less in Chinese Subjects; Chinese women > white women (Beijing OA Study (Zhang et al. Arthritis Rheum 2001:44:2065-71) (Hannan et al.: The OA Framingham Study. Arthritis Rheum 1990:33:525-32)
- Knee OA less in African Americans but equal Hip OA (National Health and Nutritional Examination Survey(NHANES-I. Am J Epidemiol 1983:117:1081-8)(Johnston County OA Project. J Rheumatol 2007: 34:172-180)
- OA less in Native Africans, Jamaicans/West Indians

Prevalence and Incidence of Symptomatic Osteoarthritis

Affected	Prevalence (sources)	Incidence/1,000/year (sources)
Knee	6.1% (Framingham study)	2 (Olmsted County and Massachusetts)
Hip	0.7% (NHANES 1)	0.5-0.74 (Olmsted County and Massachusetts)
Hand	2.4% (Lawrence et. Al.)	0.9 (Massachusetts)

NHANES, National Health and Nutrition Examination Survey. From Lawrence JS. Rheumatism in populations. Bristol, UK: JW Arrowsmith, 1977:98-155, with permission. (Koopman and Moreland: Arthritis and Allied conditions – A textbook of Rheumatology; 15th edition;2005:p.27. Lippincott Williams & Wilkins, Philadelphia, PA.)

Prevalence Studies with Radiographic Knee Osteoarthritis (OA) Data

Study	Time Period	N	Age Range, yrs	Women, %	African American, %
NHANES-1*	1971-75	5193; 315 with radiographic knee OA	35-74	53.2	NR
Framingham Osteoarthritis Study	1983-85	1805; 1424 with knee radiographs	63-94	58.5	0
NHANES-3	1988-94	6596 with knee pain data	60-90+	NR	NR
	1992-94	2426 with knee radiographs			
MBHS/SWAN**	1992/1996	1053	27-52/ 42-53	100	39

*National Health and Nutrition Examination Survey. **Michigan Bone Health Study/Study of Women's Health Across the Nation, Michigan site. NR: not reported in this reference; KL: Kellgren-Lawrence scale. Modified from Jordan, JM et. al. Prevalence of Hip Symptoms and Radiographic and Symptomatic Hip Osteoarthritis in African Americans and Caucasians: The Johnston County Osteoarthritis Project. J Rheumatol 2007; 34:1:pp. 172-180.

Questions for Osteoarthritis (OA) Knee Symptoms

Study	Knee symptoms
NHANES-1*	“ever had significant pain in knees on most days for at least 1 month”
Framingham Osteoarthritis Study	“ever had pain in or around a knee of most days for at least a month”
NHANES-3	“significant knee pain on most days over the preceding 6 weeks”
MBHS/SWAN**	“any joint pain in knees in the past month”

*National Health and Nutrition Examination Survey. **Michigan Bone Health Study/Study of Women’s Health Across the Nation, Michigan site. NR: not reported in this reference; KL: Kellgren-Lawrence scale. Modified from Jordan, JM et. al. Prevalence of Hip Symptoms and Radiographic and Symptomatic Hip Osteoarthritis in African Americans and Caucasians: The Johnston County Osteoarthritis Project. J Rheumatol 2007; 34:1:pp. 172-180.

Johnston County Osteoarthritis Project (n=3068) 1991-1997

Variable	Categories	Unweighted		Weighted	
		Count	%	%	95% CI
Sex	Men	1162	37.9	42.6	41.2, 44.0
	Women	1906	62.1	57.4	56.0, 58.8
Race/ethnicity	Caucasian	2069	67.4	81.5	79.4, 83.5
	African American	999	32.6	18.5	16.5, 20.6
Body mass index kg/m ²	<18.5 (underweight)	35	1.2	1.1	0.8, 1.3
	18.5-24.9 (normal)	749	24.5	25.1	23.9, 26.4
	25.0-29.9 (overweight)	1160	38.0	39.5	38.1, 40.9
	≥ 30 (obese)	1112	36.4	34.3	32.9, 35.8

Modified from Jordan, JM et. al. Prevalence of Hip Symptoms and Radiographic and Symptomatic Hip Osteoarthritis in African Americans and Caucasians: The Johnston County Osteoarthritis Project. J Rheumatol 2007; 34:1:pp. 172-180.

Johnston County Osteoarthritis Project (n=3068) 1991-1997

Variable	Categories	Unweighted		Weighted	
		Count	%	%	95% CI
Age group, years	45-54	1008	32.9	33.8	31.9, 35.6
	55-64	885	28.8	27.1	25.8, 28.4
	65-74	794	25.9	26.5	25.1, 28.0
	75+	381	12.4	12.6	11.4, 13.8

Modified from Jordan, JM et. al. Prevalence of Hip Symptoms and Radiographic and Symptomatic Hip Osteoarthritis in African Americans and Caucasians: The Johnston County Osteoarthritis Project. J Rheumatol 2007; 34:1:pp. 172-180.

Hip Symptoms and Radiographic Hip Osteoarthritis (OA) – The Johnston County OA Project (n=3068)

	Number
Female age < 50 yrs	326
Hip Symptoms	2997
Radiographic Hip OA	2637
Hip Replacement	25
Missing Hip Symptoms	71
Missing Hip Radiographs	34
Modified from Jordan, JM et. al. Prevalence of Hip Symptoms and Radiographic and Symptomatic Hip Osteoarthritis in African Americans and Caucasians: The Johnston County Osteoarthritis Project. J Rheumatol 2007; 34:1:pp. 172-180.	

Johnston County Osteoarthritis Project - Knee

Demographic Subgroup	Knee Symptoms		Radiographic Knee OA		Symptomatic Knee OA		Severe Radiographic Knee OA	
	%	95% CI	%	95% CI	%	95% CI	%	95% CI
All participants ages 45-75+	43.3	41.7, 44.9	27.8	26.5, 29.2	16.4	15.4, 17.6	7.9	7.2, 8.7
Men	37.4	35.4, 39.4	23.7	22.0, 25.5	13.5	12.2, 14.8	6.2	5.4, 7.2
Women	47.6	45.7, 49.6	31.0	29.2, 32.8	18.7	17.3, 20.2	9.2	8.2, 10.3
Caucasian	42.4	40.5, 44.3	26.8	25.3, 28.4	15.9	14.7, 17.2	6.6	5.9, 7.4
African American	47.1	44.7, 49.6	32.4	29.8, 35.1	19.0	17.2, 20.8	13.9	12.1, 15.8

Modified from Jordan, JM et. al. Prevalence of Hip Symptoms and Radiographic and Symptomatic Hip Osteoarthritis in African Americans and Caucasians: The Johnston County Osteoarthritis Project. J Rheumatol 2007; 34:1:pp. 172-180.

Johnston County Osteoarthritis Project - Knee

Ethnic Group	Knee Symptoms		Radiographic Knee OA		Symptomatic Knee OA		Severe Radiographic Knee OA	
	%	95% CI	%	95% CI	%	95% CI	%	95% CI
Caucasian Men ages 45-75+	36.7	34.4, 39.0	22.9	21.0, 25.0	13.3	11.8, 14.8	5.2	4.4, 6.3
Caucasian Women Ages 45-75+	46.8	44.4, 49.2	29.8	27.8, 32.0	18.0	16.3, 19.7	7.6	6.6, 8.8
African American Men Ages 45-75+	40.9	37.0, 44.9	27.5	24.3, 30.9	14.5	12.1, 17.4	11.0	8.9, 13.6
African American Women Ages 45-75+	51.0	48.2, 53.8	35.7	32.6, 38.9	21.9	19.8, 24.2	15.8	13.1, 18.9

Modified from Jordan, JM et. al. Prevalence of Hip Symptoms and Radiographic and Symptomatic Hip Osteoarthritis in African Americans and Caucasians: The Johnston County Osteoarthritis Project. J Rheumatol 2007; 34:1;pp. 172-180.

Johnston County Osteoarthritis Project – Hip 1991-1997

Demographic Subgroup	Hip Symptoms		Radiographic Hip OA		Symptomatic Hip OA		Severe Radiographic Hip OA	
	%	95% CI	%	95% CI	%	95% CI	%	95% CI
All participants ages 45-75+	36.2	34.7, 37.8	27.6	26.3, 28.9	9.7	8.9, 10.6	2.5	2.2, 3.0
Men	31.8	29.8, 33.8	25.4	23.6, 27.3	8.3	7.2, 9.5	2.6	2.0, 3.2
Women	39.5	37.7, 41.5	29.5	27.8, 31.3	11.1	9.9, 12.3	2.5	2.1, 3.1
Caucasian	36.0	34.3, 37.8	26.6	25.1, 28.1	9.2	8.3, 10.2	2.4	2.0, 3.0
African American	37.1	34.9, 39.4	32.1	29.9, 34.4	12.0	10.3, 13.9	3.1	2.5, 4.0

Modified from Jordan, JM et. al. Prevalence of Hip Symptoms and Radiographic and Symptomatic Hip Osteoarthritis in African Americans and Caucasians: The Johnston County Osteoarthritis Project. *J Rheumatol* 2009; 36:4:pp. 809-815.

Johnston County Osteoarthritis Project - Hip

Racial/ethnic Group	Hip Symptoms		Radiographic Hip OA		Symptomatic Hip OA		Severe Radiographic Hip OA	
	%	95% CI	%	95% CI	%	95% CI	%	95% CI
Caucasian Men ages 45-75+	31.7	29.6, 34.0	23.8	21.9, 25.9	7.6	6.4, 8.9	2.5	1.9, 3.3
Caucasian Women ages 45-75+	39.4	37.1, 41.6	29.1	27.1, 31.2	10.8	9.5, 12.2	2.3	1.8, 3.0
African American Men ages 45-75+	32.0	28.5, 35.8	33.2	29.6, 37.0	11.7	9.1, 14.9	2.7	1.7, 4.2
African American Women ages 45-75+	40.3	37.7, 43.0	31.2	28.2, 34.4	12.2	10.3, 14.5	3.5	2.7, 4.6

Modified from Jordan, JM et. al. Prevalence of Hip Symptoms and Radiographic and Symptomatic Hip Osteoarthritis in African Americans and Caucasians: The Johnston County Osteoarthritis Project. J Rheumatol 2009; 36:4:pp. 809-815.

Johnston County Osteoarthritis Project – Hip 1991-1997

Demographic Subgroup	Hip Symptoms		Radiographic Hip OA		Symptomatic Hip OA		Severe Radiographic Hip OA	
	%	95% CI	%	95% CI	%	95% CI	%	95% CI
Age group								
45-54	30.7	28.5, 33.0	21.2	19.0, 23.6	5.9	4.7, 7.3	1.4	0.8, 2.4
55-64	35.9	33.6, 38.3	23.0	21.1, 25.1	8.9	7.5, 10.5	1.1	0.8, 1.6
65-74	40.7	38.1, 43.4	31.1	28.9, 33.4	10.8	9.4, 12.5	3.6	2.8, 4.6
75+	42.3	38.3, 46.3	42.9	39.2, 46.7	17.0	14.6, 19.6	5.7	4.3, 7.5

Modified from Jordan, JM et. al. Prevalence of Hip Symptoms and Radiographic and Symptomatic Hip Osteoarthritis in African Americans and Caucasians: The Johnston County Osteoarthritis Project. *J Rheumatol* 2009; 36:4:pp. 809-815.