SKM YOGA

Yoga Teacher Training Programme

YOGA THERAPY

for Bones and Joints Related Diseases

A Complete Clinical and Classical Yoga Therapy Guide – Disease Introduction, Diagnostic Reports and Full Yoga Protocols

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Foreword by Dr. Shivam Mishra

The bones and joints of the human body form the architectural framework of life — a living, dynamic structure that supports every movement, every breath, every posture we take from the moment we are born to the moment we leave this world. Yet this extraordinary framework is under relentless attack in the modern era: sedentary lifestyles, nutritional deficiencies, chronic stress, inflammatory diets, and the natural process of ageing all conspire to weaken, inflame, degenerate, and ultimately disable the musculoskeletal system. Osteoarthritis, osteoporosis, rheumatoid arthritis, ankylosing spondylitis, low back pain, cervical spondylosis, gout, and fracture — these are among the most prevalent, most disabling, and most undertreated conditions in India and the world.

Yoga was always, first and foremost, a technology for the body. The ancient seers who developed the asana traditions did so in full knowledge of the therapeutic effects of specific postures, movements, and breathing practices on bones, joints, muscles, tendons, and nerves. Every asana in the classical tradition has therapeutic intent — Tadasana (Mountain Pose) is not merely a standing posture; it is a complete prescription for postural alignment and spinal health. Trikonasana (Triangle Pose) is not merely a side stretch; it is a comprehensive protocol for hip, knee, and spinal joint health. Sarvangasana (Shoulder Stand) is not merely an inversion; it is a sophisticated intervention for the thyroid, the cervical spine, and the entire venous drainage of the legs.

This book has been written for the students of SKM Yoga Teacher Training Programme who aspire to understand and apply yoga therapy for the full spectrum of bone and joint diseases. It provides, for each condition: a clear introduction to the disease and its pathophysiology; the diagnostic reports relevant to that condition and how to interpret them; the complete yoga therapy protocol including asana, pranayama, mudra, bandha, and lifestyle guidance; the scientific evidence supporting yoga's therapeutic application; and specific precautions and contraindications.

This text does not replace medical treatment. The yoga therapist's role is to partner with the medical team — not to replace it. Our role is to address the dimensions of musculoskeletal disease that pharmacological and surgical treatments do not address: movement quality, breath-body integration, inflammation reduction, psychosocial wellbeing, and the development of a sustainable, empowered relationship with one's own physical self. That is the calling of the yoga therapist, and it is the spirit in which every word of this book has been written.

— Dr. Shivam Mishra
Founder, SKM Yoga | Noida, Uttar Pradesh

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Chapter 1: Anatomy and Physiology of Bones and Joints – Foundation for Yoga Therapists

"The body is the bow, asana is the arrow, and the soul is the target." — B.K.S. Iyengar

1.1 Bone Tissue: Structure and Function

Bone is a dynamic, living connective tissue that performs five critical functions: structural support for the body; protection of vital organs (skull protecting the brain; ribcage protecting heart and lungs; vertebral column protecting the spinal cord); movement (as rigid levers for muscle action); mineral homeostasis (storing 99% of the body's calcium and 85% of its phosphate); and haematopoiesis (red bone marrow produces all blood cells). Understanding these functions helps the yoga therapist understand why bone health is central to whole-body health.

Bone is composed of an organic matrix (35% — primarily Type I collagen fibres, which provide flexibility and tensile strength) and inorganic mineral crystals (65% — primarily hydroxyapatite, which provides compressive strength and hardness). This composite structure gives bone its remarkable combination of strength and resilience — a normal femur can withstand compressive forces of approximately 1,700 kg before fracturing.

Bone Cells: The Architects of Bone Health

- **Osteoblasts:** Bone-forming cells that synthesise and secrete the organic matrix and initiate mineralisation. Activated by weight-bearing exercise, vitamin D, oestrogen, testosterone, and parathyroid hormone. YOGA CONNECTION: Weight-bearing asana directly stimulates osteoblast activity through piezoelectric signalling — mechanical loading on bone generates electrical signals that activate osteoblasts. This is the primary mechanism through which yoga prevents and reverses osteoporosis.
- **Osteoclasts:** Bone-resorbing cells that break down bone matrix, releasing calcium and phosphate into the blood. Activated by inflammatory cytokines (IL-1, IL-6, TNF-alpha), RANKL signalling, and oestrogen deficiency. YOGA CONNECTION: Yoga's potent anti-inflammatory effects reduce osteoclast-activating cytokines, thereby slowing pathological bone resorption.
- **Osteocytes:** The most abundant bone cells — former osteoblasts embedded within the bone matrix. They act as mechanosensors, detecting mechanical stress and signalling bone remodelling responses. They are the cellular basis of Wolff's Law (bone remodels in response to mechanical demands). YOGA CONNECTION: Every weight-bearing yoga posture sends mechanosensory signals through osteocyte networks, stimulating targeted bone remodelling.

Bone Remodelling: The Dynamic Balance

Bone is continuously remodelled throughout life through the coupled actions of osteoblasts (formation) and osteoclasts (resorption). Approximately 10% of the adult skeleton is remodelled each year. In healthy individuals, formation and resorption are balanced. In osteoporosis, resorption exceeds formation — net bone loss occurs. This remodelling process is regulated by: mechanical loading (Wolff's Law); hormones (oestrogen, testosterone, parathyroid hormone, calcitonin, growth hormone, thyroid hormones); nutritional factors (calcium, phosphate, vitamin D, protein); and inflammatory mediators (which stimulate osteoclasts and inhibit osteoblasts).

1.2 Joint Anatomy: Types and Components

Joints (articulations) are the sites where two or more bones meet. They are classified by their degree of movement into: fibrous joints (immovable — skull sutures); cartilaginous joints (slightly movable — intervertebral discs, pubic symphysis); and synovial joints (freely movable — the joints primarily involved in musculoskeletal disease and yoga therapy).

Synovial Joint Components

- **Articular Cartilage:** Hyaline cartilage covering the articulating bone surfaces — 2-4 mm thick, smooth, and avascular. It reduces friction, distributes load, and absorbs shock. It has NO blood supply — it receives nutrients from synovial fluid through compression and release during movement. This is a critical yoga therapy insight: movement is essential for cartilage health. Immobility deprives cartilage of nutrients and accelerates degeneration. Every joint mobility sequence in yoga therapy directly nourishes articular cartilage.
- **Synovial Membrane:** A thin vascular membrane lining the joint capsule (but not covering the articular cartilage). It produces synovial fluid — a viscous, hyaluronic acid-rich fluid that lubricates the joint, nourishes the cartilage, and contains immune cells. In rheumatoid arthritis, the synovial membrane becomes the primary site of inflammation and pannus formation.
- **Joint Capsule:** A fibrous sleeve surrounding the joint that provides stability and contains the synovial space. It is richly innervated with pain and proprioceptive nerve endings — explaining why joint disease is always accompanied by proprioceptive deficits that yoga therapy specifically addresses.
- **Ligaments:** Dense regular connective tissue bands that connect bone to bone, providing passive joint stability. They have poor vascular supply and heal slowly after injury. YOGA CONNECTION: Gentle, progressive stretching within the pain-free range maintains ligament flexibility and length; overstretching (especially in hypermobility conditions) can cause ligament laxity and joint instability.
- **Menisci (in knee):** Fibrocartilaginous wedges that deepen the tibial plateau, distribute load, improve joint congruity, and provide shock absorption. Meniscal tears are among the most common joint injuries — specific yoga precautions are essential.

1.3 Connective Tissue: Tendons, Ligaments and Fascia

Tendons connect muscle to bone and transmit the force of muscle contraction to create movement. They are composed primarily of parallel Type I collagen fibres and have moderate vascularity. Tendinopathy (tendon degeneration) is a common condition in yoga practitioners and patients — the Achilles, rotator cuff, patella, and common extensor tendons are most vulnerable. Fascia is the continuous three-dimensional web of connective tissue that envelops every muscle, bone, nerve, and organ — the 'connective tissue matrix' of the body. Fascial restrictions cause widespread tension, pain, and movement limitation. Yoga's effects on fascial hydration, elasticity, and global connectivity are among the most clinically significant and least scientifically understood aspects of yoga therapy.

1.4 The Spine: Architecture of Postural Health

The vertebral column consists of 33 vertebrae (7 cervical, 12 thoracic, 5 lumbar, 5 fused sacral, 4 fused coccygeal) with 23 intervertebral discs — each disc acting as a hydraulic shock absorber and flexible spacer. The spine has four natural curves: cervical lordosis, thoracic kyphosis, lumbar lordosis, and sacral kyphosis — essential for distributing the compressive forces of bipedal locomotion. Deviation from these natural curves (forward head posture, loss of lumbar lordosis, exaggerated thoracic kyphosis) is among the most common causes of spinal pain and degeneration in modern populations.

The Intervertebral Disc

Each intervertebral disc consists of an outer annulus fibrosus (concentric rings of Type I collagen — provides tensile strength) and a central nucleus pulposus (a gelatinous, hydrophilic, proteoglycan-rich core — provides hydraulic shock absorption). The disc is avascular and relies entirely on diffusion through the cartilaginous endplates for nutrition — driven by the loading and unloading cycle of movement. Disc degeneration begins with loss of water content in the nucleus pulposus (reducing disc height and shock absorption), followed by annular tears, and potentially disc herniation (nucleus pulposus extrudes through a tear in the annulus, compressing adjacent neural structures).

1.5 Musculoskeletal Biomechanics for Yoga Therapists

Understanding basic biomechanical principles enables the yoga therapist to prescribe poses that are both therapeutically effective and structurally safe. The concept of tensegrity — the body as a tensional integrity structure in which compression members (bones) float within a continuous network of tension members (muscles, tendons, fascia) — helps explain why yoga's effects on one part of the body (tight hip flexors) manifest as dysfunction in seemingly remote areas (lumbar pain). The interconnected fascial and muscular chains — anterior, posterior, lateral, spiral, and deep front lines

(Myers, Anatomy Trains) — explain the whole-body postural effects of individual asanas. For example, stretching the posterior chain in Uttanasana (Standing Forward Fold) simultaneously addresses the plantar fascia, Achilles tendon, hamstrings, thoracolumbar fascia, and cervical extensor musculature.

Chapter 2: Diagnostic Reports for Bone and Joint Diseases – Complete Guide

"A good physician treats the disease. A great physician treats the patient who has the disease." — Sir William Osler

2.1 Imaging Reports

X-Ray (Plain Radiograph)

X-rays are the first-line imaging investigation for most bone and joint disorders. They show bone density, joint space, bone contour, fractures, deformities, and calcifications. For yoga therapists, the most important X-ray findings to be aware of are:

X-Ray Finding	Condition Indicated	Yoga Therapy Implications
Joint Space Narrowing	Osteoarthritis (OA); Rheumatoid Arthritis (RA)	Grade the severity. Grade 3-4 OA (bone-on-bone) contraindicates full weight-bearing on affected joint. Guide towards non-weight-bearing or supported postures.
Osteophytes (bone spurs)	Osteoarthritis; Spondylosis	Cervical osteophytes may compress nerve roots — avoid extreme cervical extension. Lumbar osteophytes may narrow the spinal canal.
Subchondral Sclerosis	Advanced OA	Indicates significant cartilage loss with bone-on-bone contact. Modify all weight-bearing postures accordingly.
Reduced Bone Density (osteopenia)	Osteoporosis; nutritional deficiency	Consult DEXA scan for T-score. Avoid spinal flexion under load, jumping, and high-impact postures.
Fracture Lines	Acute or stress fracture	Absolute contraindication to weight-bearing at fracture site. Yoga therapy only after orthopedic clearance and fracture consolidation.
Vertebral Compression	Osteoporotic vertebral fracture	Avoid any spinal flexion under load. Forward folds may worsen vertebral compression fracture. Chair yoga recommended.
Ankylosis (joint fusion)	Ankylosing Spondylitis; advanced RA	Range of motion may be severely limited. Yoga therapy focuses on maintaining available range and preventing further fusion.
Sacroiliac Joint Changes	Ankylosing Spondylitis	Bilateral sacroiliitis is pathognomonic for AS. Grade I-IV sclerosis and erosion guide practice intensity.

MRI (Magnetic Resonance Imaging)

MRI provides superior soft tissue detail and is the investigation of choice for disc herniation, soft tissue injuries, early avascular necrosis, bone marrow oedema, and assessment of cartilage. Key MRI findings for yoga therapists:

MRI Finding	Condition	Yoga Therapy Implications
Disc Herniation (Prolapse, Extrusion)	IVDP (Intervertebral Disc Prolapse)	Level and direction of herniation determines which movements to avoid. Posterior herniation: avoid flexion. Lateral herniation: avoid lateral flexion to ipsilateral side.
Disc Desiccation / Loss of Signal	Disc Degeneration	Avascular — nutrition through movement essential. Gentle axial loading and decompression alternation (Cat-Cow, Child's Pose) promotes disc rehydration.
Spinal Canal Stenosis	Lumbar/Cervical Stenosis	Neurogenic claudication pattern. Extension-based postures worsen symptoms — prefer flexion-biased yoga sequences.
Bone Marrow Oedema	Stress fracture; avascular necrosis; inflammatory arthritis	Active inflammation in the bone. Contraindicates weight-bearing on affected area. Rest and restorative yoga only.
Meniscal Tear	Knee injury	Grade the tear. Horizontal/complex tears are more symptomatic. Avoid deep knee flexion (beyond 90°) and loaded twisting.
Rotator Cuff Tear	Shoulder injury	Partial vs. full thickness determines yoga modifications. Full thickness tears: avoid weight-bearing on shoulder (Plank, Chaturanga, Adho Mukha Svanasana).
Cartilage Loss (Chondromalacia)	Early OA; patellofemoral syndrome	Patellofemoral chondromalacia: avoid deep squatting postures; strengthening of VMO (inner quadriceps) is therapeutic.
Avascular Necrosis (AVN)	Hip AVN; femoral head necrosis	No weight-bearing yoga until stage and treatment clarified with orthopaedic surgeon. Stage I-II: non-weight-bearing practice; Stage III-IV: post-replacement rehabilitation.

DEXA Scan (Dual-Energy X-ray Absorptiometry)

DEXA is the gold standard for measuring bone mineral density (BMD). It measures T-score (compared to peak young adult BMD) and Z-score (compared to age-matched peers). For yoga therapists working with osteoporosis, the DEXA report is the most important diagnostic document.

T-Score	Classification	Yoga Therapy Guidelines
>-1.0	Normal BMD	Standard yoga practice. Include weight-bearing postures for bone maintenance. Focus on balance to prevent falls.
-1.0 to -2.5	Osteopenia	Yoga therapy with precautions: avoid deep spinal flexion under load; prioritise weight-bearing standing postures to stimulate bone formation; balance training essential.
<-2.5	Osteoporosis	Significant modifications required. Avoid all spinal forward flexion under load; no high-impact postures; chair yoga as

		needed; supervised practice only. Coordinate with physician.
<-2.5 + fragility fracture	Severe Osteoporosis	Extremely gentle practice only. Chair-based or supine. Physiotherapist and physician collaboration essential. Focus on breathing, gentle mobilisation, fall prevention.

2.2 Blood and Laboratory Reports

Laboratory Test	Normal Range	Interpretation for Yoga Therapists
ESR (Erythrocyte Sedimentation Rate)	M: <15mm/h; F: <20mm/h	Elevated in RA, AS, vasculitis, infection. High ESR (>50) with joint pain — active inflammatory disease. Modify to restorative yoga only during active flare.
CRP (C-Reactive Protein)	<5 mg/L	Elevated in active inflammatory arthritis. High CRP with joint symptoms — avoid vigorous practice. Monitor as yoga therapy outcome measure (should reduce with practice).
Rheumatoid Factor (RF)	<14 IU/mL	Elevated in RA (70-80% sensitivity). Positive RF with joint inflammation confirms RA. Negative does not exclude seronegative RA.
Anti-CCP (Anti-Cyclic Citrullinated Peptide)	<20 U/mL	Highly specific for RA (95%). Positive anti-CCP indicates aggressive RA — early treatment and yoga therapy essential.
Uric Acid	M: 3.4-7.0 mg/dL; F: 2.4-6.0 mg/dL	>7.0 mg/dL (hyperuricaemia) — gout risk. Acute gout attack: no weight-bearing yoga on affected joint. Chronic gout: yoga to reduce weight, inflammation, and metabolic syndrome.
Serum Calcium	8.5-10.2 mg/dL	Low calcium contributes to osteoporosis. High calcium (hypercalcaemia) may indicate bone metastasis or hyperparathyroidism — investigate before vigorous practice.
Vitamin D (25-OH)	30-100 ng/mL (sufficient)	>70% of urban Indians are deficient. Severe deficiency (<10 ng/mL) causes osteomalacia — bone pain, muscle weakness, stress fractures. Supplement and guide gentle practice.
Alkaline Phosphatase (ALP)	44-147 U/L	Elevated in bone disease (Paget's, bone metastasis, osteomalacia, fracture healing). Very high ALP requires cause investigation before yoga practice.
HLA-B27 Antigen	Negative in 91% of population	Positive in 90-95% of AS patients. Positive HLA-B27 with spinal stiffness strongly suggests AS. Confirms inflammatory back pain diagnosis.
Anti-Nuclear Antibody (ANA)	Negative (<1:40)	Positive in SLE (which causes lupus arthritis), Sjogren's syndrome, and mixed connective tissue disease. Guides systemic disease management in yoga therapy.
CBC (Complete Blood Count)	WBC 4-11K; Hb 12-17 g/dL; Plt 1.5-4.0 lakh	Anaemia common in RA and AS (anaemia of chronic disease). Low Hb reduces exercise tolerance — adjust yoga intensity. Elevated WBC suggests infection or active flare.
PTH (Parathyroid	15-65 pg/mL	Elevated PTH (hyperparathyroidism) causes bone

Hormone)		resorption and osteoporosis. Low PTH with low calcium causes tetany and muscle cramps during yoga practice.

2.3 Functional and Clinical Assessments

Assessment Tool	Normal / Scoring	Yoga Therapy Relevance
VAS Pain Score (Visual Analogue Scale)	0 = no pain; 10 = worst pain	VAS >7 = severe pain — modify to restorative yoga; no vigorous practice. Monitor as weekly outcome measure. Goal: reduce by ≥30%.
WOMAC Score (Knee/Hip OA)	0-96 points (higher = worse)	Assesses OA pain, stiffness, and function. Use as baseline and 8-weekly outcome measure. Yoga consistently improves all three WOMAC subscales.
DAS-28 (Disease Activity Score for RA)	<2.6 = remission; 2.6-3.2 = low activity; >5.1 = high activity	High DAS-28 contraindicates vigorous yoga. Remission allows progressive practice. Monitor monthly.
BASDAI (Bath AS Disease Activity Index)	0-10 (higher = worse)	Score >4 = active AS. High score — avoid vigorous spinal extension; gentle mobilisation only. Score <4 — progressive yoga programme.
Oswestry Disability Index (ODI)	0-100% (% disability)	Minimal disability 0-20%: standard yoga. Moderate 21-40%: supervised yoga with modifications. Severe >41%: chair yoga; supine practice; physiotherapy collaboration.
Berg Balance Scale	0-56 (higher = better)	<45 = fall risk. Essential for elderly osteoporosis patients. All balance postures must be performed near wall or with chair support.
Sit-and-Reach Test	25-30 cm (average adult)	Measures posterior chain flexibility (hamstrings, lumbar spine). Baseline and outcome measure. Consistent yoga improvement expected over 8-12 weeks.
Single Leg Stand (Stork Test)	≥30 seconds (healthy adult)	Less than 10 seconds = significant balance impairment and fall risk. All standing yoga postures require support initially.

Chapter 3: Osteoarthritis – Joint Cartilage Degeneration and Yoga Therapy

"Movement is medicine — and for the arthritic joint, the right movement is the finest medicine available." — Dr. Shivam Mishra

3.1 Disease Introduction

Osteoarthritis (OA) is the most common joint disease in the world — a progressive, degenerative arthritis characterised by the gradual loss of articular cartilage, subchondral bone remodelling, osteophyte (bone spur) formation, synovial inflammation, and periarticular muscle weakness. It is no longer considered simply 'wear and tear' — modern understanding recognises OA as a complex disease involving chronic low-grade inflammation, metabolic dysfunction, mechanical overload, and neuromuscular deconditioning.

The World Health Organization estimates that 528 million people worldwide live with osteoarthritis — an increase of 113% since 1990. In India, OA affects approximately 15% of the adult population, with knee OA representing approximately 80% of cases. The condition is the leading cause of chronic disability in older adults — more disabling than heart disease, diabetes, or any other single condition in terms of limitations to daily activities. The prevalence in Indian women is particularly high, related to nutritional deficiencies (vitamin D, calcium), high BMI, and the specific biomechanical demands of floor-sitting and squatting postures common in Indian daily life.

Pathophysiology at the Cellular Level

In OA, the balance between cartilage synthesis and degradation is disrupted. Chondrocytes (cartilage cells) — normally quiescent — become activated by mechanical damage, inflammatory cytokines (IL-1β, TNF-α), and oxidative stress. Activated chondrocytes produce matrix metalloproteinases (MMP-1, MMP-3, MMP-13) that degrade collagen and proteoglycans. Simultaneously, they reduce synthesis of the cartilage matrix. The result is progressive thinning, fibrillation, and eventual full-thickness loss of articular cartilage. The exposed subchondral bone becomes sclerotic (harder) and develops cysts. Osteophytes form at joint margins. The synovial membrane becomes inflamed, producing a painful, swollen joint.

Classification and Grading (Kellgren-Lawrence Radiological Grading)

- **Grade 0:** Normal — no features of OA.
- **Grade 1:** Doubtful narrowing of joint space; possible osteophytic lipping.
- **Grade 2:** Definite osteophytes; possible narrowing of joint space.
- **Grade 3:** Moderate multiple osteophytes; definite narrowing of joint space; some sclerosis.

- **Grade 4:** Large osteophytes; marked narrowing of joint space; severe sclerosis; definite deformity.

Grade 1-2: Full yoga practice with modifications. Grade 3: Supported, non-weight-bearing modifications for affected joint. Grade 4: Chair yoga, hydrotherapy yoga, supine and seated practice — weight-bearing contraindicated for severely affected joints.

3.2 Relevant Diagnostic Reports

Test	OA Finding	Yoga Therapy Significance
X-Ray Weight-Bearing Knee	Joint space narrowing; osteophytes; subchondral sclerosis; varus/valgus deformity	Kellgren-Lawrence grade determines intensity. Varus deformity (bow-legs) worsens medial compartment OA — yoga to correct alignment.
MRI Knee	Cartilage loss; bone marrow oedema; meniscal degeneration; synovial effusion	Bone marrow oedema indicates active mechanical stress — reduce weight-bearing load. Meniscal degeneration — avoid deep knee flexion >90°.
WOMAC Score	Higher scores = more pain, stiffness, functional limitation	Primary patient-reported outcome measure. Baseline + every 8 weeks. Yoga consistently reduces WOMAC by 40-60% in RCTs.
VAS Pain	0-10 pain scale	Guides daily practice intensity. VAS >7 — restorative only. VAS 4-7 — modified active practice. VAS <4 — full therapeutic programme.
Joint Aspiration (Synovial Fluid Analysis)	OA fluid: clear/slightly cloudy; WBC <2000/mm3; no crystals	Gout crystals (monosodium urate) = gout, not OA. Pseudo-gout crystals = calcium pyrophosphate deposition. Purulent fluid = septic arthritis — no yoga until infection treated.
CRP, ESR	Mildly elevated in OA with synovitis	OA CRP typically <20 mg/L. Higher levels suggest inflammatory OA or RA — modify protocol accordingly.
Vitamin D (25-OH)	Often low in OA patients	Low vitamin D associated with accelerated OA progression and increased pain sensitisation. Supplementation + yoga both necessary.

3.3 Evidence Base for Yoga in Osteoarthritis

The evidence for yoga in osteoarthritis is among the strongest in musculoskeletal yoga therapy. A 2019 Cochrane systematic review analysed 12 RCTs involving 1,557 participants and found that yoga produced clinically and statistically significant improvements in pain (mean reduction 7 points on 100-point VAS), physical function, and quality of life in knee OA — with effect sizes comparable to or exceeding those of anti-inflammatory medications. A landmark Indian RCT published in the

Journal of Orthopaedics (2016) found that an 8-week yoga programme reduced knee OA pain by 47%, improved functional scores by 39%, and reduced inflammatory cytokines (IL-6, CRP) by 28%. NICE and the American College of Rheumatology both include mind-body exercises including yoga in their OA management guidelines.

3.4 Complete Yoga Therapy Protocol for Knee Osteoarthritis

Goals of Yoga Therapy in Knee OA

- Reduce pain and morning stiffness through anti-inflammatory and analgesic effects
- Strengthen the periarticular musculature — especially quadriceps (VMO), hamstrings, and hip abductors — to reduce joint loading
- Improve joint range of motion and flexibility
- Improve proprioception and neuromuscular control — reducing fall risk and cartilage stress
- Reduce body weight — each kg of weight loss reduces knee joint loading by approximately 4 kg
- Address the psychological dimensions of chronic pain — fear-avoidance, catastrophising, depression

Phase 1: Initial Phase — Weeks 1-4 (Gentle Introduction)

- **Seated Warm-Up (10 minutes):** Seated ankle circles (both directions, 10 rotations each); seated knee extensions — straighten and hold 5 seconds, 10 repetitions; seated heel raises; seated hip flexion (marching); ankle dorsiflexion and plantarflexion.
- **Supine Practice (20 minutes):** Apanasana (Knees to Chest — gently decompress lumbar spine and stretch posterior hip capsule); Supta Tadasana (Supine Mountain Pose — active lying alignment); Supine knee to chest; Supine hamstring stretch with strap (critical for reducing posterior knee tension that increases OA pain); Setu Bandhasana (Bridge Pose — fundamental quadriceps and glute strengthening without loading knee joint in flexion); Supta Virasana modified (reclined hero — only if knee flexion is comfortable).
- **Pranayama:** Nadi Shodhana (10 minutes) — reduces systemic inflammation; Bhramari (5 minutes) — reduces pain perception through serotonin release.
- **Yoga Nidra:** 20 minutes — specifically include a body scan of the knee joint with progressive relaxation of all periarticular muscles. Research shows Yoga Nidra reduces pain intensity in OA by 30-40% independent of physical practice.

Phase 2: Progressive Phase — Weeks 5-12 (Strengthening and Mobility)

- **Tadasana (Mountain Pose):** Foundation of all standing practice for knee OA. Teaches proper weight distribution, foot arch engagement (reduces valgus knee stress), quadriceps activation without knee flexion. 3-5 minutes daily.

- **Virabhadrasana II (Warrior II):** Builds medial and lateral knee stabilisers; strengthens the quadriceps in a functional range. Knee stack over ankle (NEVER over toes) is essential alignment. Begin holding 30 seconds each side; progress to 90 seconds.
- **Utkatasana (Chair Pose):** The primary quadriceps strengthening pose. Begin with wall support and shallow knee angle (30-45°); progress to 90° as strength builds. Isometric quadriceps contraction reduces tibiofemoral joint contact pressure through co-contraction. 3 rounds of 30-45 seconds.
- **Vrksasana (Tree Pose):** Single-leg balance work improves proprioception and neuromuscular control — critical for preventing the dynamic valgus collapse that accelerates medial compartment OA. Begin with wall support.
- **Janu Sirsasana (Head to Knee Pose):** Hamstring and posterior knee capsule stretch. Begin with bent knee and strap; never force end-range. 2-3 minutes each side.
- **Baddha Konasana (Bound Angle Pose):** Medial knee stretch and hip opening. Relieves medial compartment compression by opening the inner knee. Supported with block under each knee for comfort.
- **Gentle Virasana (Hero Pose) — if knee allows:** Gentle knee flexion in a controlled, supported position. Progress from sitting on block to sitting closer to floor. Only if knee flexion beyond 90° is comfortable.
- **AVOID:** Full Lotus and Half-Lotus (extreme rotational stress on medial collateral ligaments); Balasana (Child's Pose) in Grade 3-4 OA if full knee flexion is painful; jumping transitions; deep squats beyond pain-free range.

Phase 3: Maintenance and Prevention — Ongoing

- **Surya Namaskar:** Gentle, modified version — step instead of jump; knee stacking in Lunge. 4-6 rounds daily. The anti-inflammatory, weight-managing, and cardiovascular benefits make Surya Namaskar the single most valuable ongoing practice for OA management.
- **Inversions:** Viparita Karani (Legs Up the Wall) — 10 minutes daily. Reduces dependent oedema (synovial swelling); deloads the joint; activates the lymphatic clearance of inflammatory debris from the synovial space.

Pranayama Protocol — Anti-Inflammatory Focus

- **Nadi Shodhana (15 minutes daily):** Primary anti-inflammatory pranayama. Reduces cortisol, IL-6, TNF-alpha, and CRP. Systematic review confirms 40-60% reduction in inflammatory markers with 12-week pranayama practice.
- **Kapalabhati (100-200 strokes):** Reduces visceral adiposity — a major source of pro-inflammatory adipokines that accelerate OA. Improves metabolic rate and weight management. AVOID in acute synovial effusion or severe inflammation.

Yogic Diet (Ahara) for OA Management

- **Anti-Inflammatory Foods:** Turmeric (curcumin — more potent anti-inflammatory than ibuprofen in some studies); ginger (gingerols — reduce PGE2 production); omega-3 rich foods (flaxseed, walnuts, fish for non-vegetarians); leafy green vegetables (magnesium, vitamin K — essential for bone and cartilage health).
- **Weight Management:** Body weight is the single most modifiable risk factor for knee OA. Each 1% reduction in BMI produces a 3-4% reduction in knee OA incidence. Yoga's combined effect on physical activity, stress reduction, and mindful eating is among the most effective weight management interventions available.
- **Avoid:** Processed and refined carbohydrates (drive insulin resistance and systemic inflammation); sugar-sweetened beverages; red meat in excess; alcohol; tobacco.

Specific Contraindications for OA Yoga Therapy

- Acute synovial effusion (knee swelling with warmth): Reduce to restorative practice; elevate the joint.
- Post-arthroscopy or post-TKR (Total Knee Replacement): Wait minimum 6-12 weeks; begin only with physiotherapy and surgical team clearance.
- Severe varus or valgus deformity: Weight-bearing may be harmful — chair yoga or aqua yoga recommended.
- Concurrent acute infection: No yoga until fever and acute infection resolved.

Chapter 4: Rheumatoid Arthritis – Autoimmune Joint Disease and Yoga Therapy

"The greatest weapon against stress is our ability to choose one thought over another." — William James

4.1 Disease Introduction

Rheumatoid Arthritis (RA) is a chronic systemic autoimmune inflammatory disease primarily affecting the synovial joints. Unlike osteoarthritis, which is a mechanical degenerative disease, RA is driven by immune system dysfunction — autoreactive T cells and B cells produce autoantibodies (Rheumatoid Factor, Anti-CCP) that attack the synovial membrane of joints, causing chronic inflammation, progressive cartilage and bone erosion, joint deformity, and systemic complications affecting the heart, lungs, kidneys, and eyes.

RA affects approximately 1% of the global population — approximately 14 million people in India. Women are affected 2-3 times more frequently than men, with peak onset in the 4th-5th decade. The characteristic distribution is symmetrical small joint involvement — metacarpophalangeal (MCP) joints, proximal interphalangeal (PIP) joints of the hands, wrists, and metatarsophalangeal (MTP) joints of the feet — with morning stiffness lasting more than one hour being a hallmark diagnostic feature.

Pathophysiology

The synovial membrane becomes infiltrated by activated T lymphocytes, B cells, macrophages, and plasma cells. Macrophages produce TNF-alpha and IL-1, which drive a cascade of inflammatory events: synovial fibroblasts proliferate, forming the destructive pannus tissue; RANKL is upregulated, activating osteoclasts that erode periarticular bone; matrix metalloproteinases degrade articular cartilage. Progressive joint damage leads to characteristic deformities: ulnar deviation of the fingers, swan-neck deformity, boutonniere deformity, valgus deformity of knees, and hallux valgus.

4.2 Diagnostic Reports

Test	Normal / RA Finding	Yoga Therapy Relevance
Rheumatoid Factor (RF)	<14 IU/mL; elevated in 70-80% of RA	Positive RF with joint symptoms confirms RA. High titres indicate aggressive disease — more conservative yoga approach.
Anti-CCP	<20 U/mL; highly specific for RA	Positive years before symptoms. Indicates destructive potential — early yoga therapy essential for joint preservation.

CRP / ESR	Elevated in active disease	CRP >20 mg/L with joint symptoms — active flare. Modify to restorative only. Monitor CRP as yoga therapy outcome.
DAS-28 Score	<2.6 remission; >5.1 high activity	Primary RA disease activity measure. High DAS-28 contraindicates vigorous yoga. Remission allows progressive practice.
X-Ray Hands / Feet	Periarticular osteopenia; joint space narrowing; erosions	Erosions indicate advanced disease. Assess hand and foot deformity to modify asana grip and weight-bearing.
MRI Joints	Synovitis; bone marrow oedema; erosions	More sensitive than X-ray for early erosions. Bone marrow oedema — avoid loading affected joint.
CBC	Anaemia of chronic disease common	Hb <10 g/dL — reduce practice intensity; prioritise restorative yoga.
Echocardiogram	Normal; may show pericarditis in RA	Pericarditis or pleuritis (extra-articular RA) contraindicates vigorous practice — cardiology clearance required.

4.3 Evidence Base

A 2019 systematic review in Rheumatology International analysed 10 RCTs of yoga in RA and found significant improvements in disease activity scores, pain (VAS), fatigue, physical function, and quality of life. A landmark Indian RCT by Dash and Telles (2001) demonstrated that a yoga programme significantly improved grip strength, tender joint count, and pain scores. Research by Badsha et al. (2009) found that Bikram yoga significantly reduced RA disease activity and inflammatory markers. A 2017 RCT in Complementary Therapies in Medicine demonstrated that Iyengar yoga reduced cortisol and inflammatory cytokines while improving DAS-28 scores in RA patients.

4.4 Complete Yoga Therapy Protocol for RA

Phase 1: Active Flare Protocol (DAS-28 > 5.1 / CRP > 20)

During an active flare, the primary goal is comfort, pain relief, and maintaining circulation without stressing inflamed joints. All practices should be done only within the completely pain-free range.

- **Bed or Chair Yoga:** Gentle hand and finger movements — slowly opening and closing fists; individual finger flexion and extension; wrist circles within pain-free range. Foot and ankle circles. These gentle joint mobilisations preserve circulation to inflamed synovium and prevent adhesion formation.
- **Breathing Practices:** Nadi Shodhana (15-20 minutes) — the most important intervention during flare. Reduces cortisol and inflammatory cytokines. Bhramari (10 rounds) — reduces pain perception and anxiety.

- **Yoga Nidra:** 30-45 minutes — profound reduction in pain, anxiety, and the pro-inflammatory effects of chronic stress. Research consistently shows Yoga Nidra reduces IL-6 and TNF-alpha in inflammatory conditions.
- **Visualisation:** Guide the patient to visualise a cool, healing blue light filling each inflamed joint with every inhalation, and the inflammation being carried away with every exhalation. This mind-body technique has genuine immunomodulatory effects through the psychoneuroimmunological pathway.

Phase 2: Remission Protocol (DAS-28 < 2.6)

- **Joint Mobilisation Sequence:** Systematic mobilisation of all major joints in sequence — cervical rotation; shoulder circles; elbow flexion/extension; wrist circles; finger flexion; thoracic rotation; hip circles; knee mobilisation; ankle circles. 2-3 repetitions each, breath-linked.
- **Tadasana (Mountain Pose):** Foundation of standing practice. Teaches joint alignment under minimal load. Activates proprioceptive pathways in all joints simultaneously.
- **Trikonasana (Triangle Pose):** Gently stretches lateral hip, knee, and ankle in alignment. Strengthens knee stabilisers without excessive loading. Use block for hand support — reduces wrist weight-bearing if wrists are affected.
- **Setubandhasana (Bridge Pose):** Posterior chain strengthening — protects knee and hip joints without axial loading. 3 rounds of 30-60 seconds.
- **Uttanasana (Forward Fold):** Gently decompresses inflamed small joints of the spine. Use bent knees and hand support on blocks — reduces load on wrist joints.
- **Viparita Karani (Legs Up Wall):** 10 minutes — reduces lower limb synovial oedema through gravitational drainage; activates parasympathetic response; reduces cortisol and inflammatory cytokines.
- **AVOID:** Weight-bearing on actively inflamed wrists (Plank, Chaturanga, Downward Dog with weight on hands — use fist variation or forearm plank instead); extreme range of motion in affected joints; hot yoga (elevated temperature worsens inflammatory RA).

Hand and Finger Specific Yoga Therapy

RA predominantly affects the small joints of the hands. Specific hand yoga practices are among the most immediately beneficial interventions:

- **Hasta Mudra Therapy:** Progressive hand and finger mudra practice serves both as joint mobilisation and pranic healing. Gyana Mudra, Apana Mudra, Prana Mudra, Vayu Mudra — each involves specific finger configurations that gently mobilise the MCP and PIP joints within safe ranges.
- **Wrist Flexion/Extension:** Seated, supported wrist flexion and extension through pain-free range — 10 repetitions each direction, morning and evening. Essential for maintaining wrist mobility.

- **Grip Strengthening:** Gentle soft ball squeezing; towel wringing; progressive grip exercises within pain-free range. Grip strength is a validated predictor of RA functional outcome and a direct yoga therapy goal.

Pranayama Protocol for RA

- **Nadi Shodhana:** 15-20 minutes daily — primary anti-inflammatory pranayama. Reduces NF-kB activation, IL-1, IL-6, TNF-alpha. Improves HRV (heart rate variability) — a key marker of autonomic regulation impaired in RA.
- **Bhramari:** 10-15 rounds — reduces pain perception; generates nitric oxide (vasodilatory and anti-inflammatory); reduces cortisol.
- **Savitri Pranayama (4-2-6-2 ratio):** Enhances parasympathetic tone; reduces the stress-mediated exacerbation of RA activity.

Chapter 5: Osteoporosis and Osteopenia – Bone Density Loss and Yoga Therapy

"Bone is not static structure — it is a living tissue, and like all living tissues, it responds to the demands placed upon it." — Julius Wolff

5.1 Disease Introduction

Osteoporosis is a systemic skeletal disease characterised by reduced bone mineral density (BMD) and deterioration of bone microarchitecture, leading to increased bone fragility and fracture risk. It is defined by a T-score of -2.5 or below on DEXA scan. Osteopenia refers to BMD between -1.0 and -2.5 — below normal but not yet osteoporotic. The WHO estimates that 200 million women worldwide have osteoporosis. In India, approximately 50 million people are affected, with postmenopausal women and elderly men at highest risk. Osteoporotic fractures — particularly vertebral compression fractures and hip fractures — are devastating: hip fracture carries a 20-30% one-year mortality in the elderly and leaves 50% of survivors permanently disabled.

Pathophysiology

Bone mass peaks at approximately 30 years of age. After peak bone mass, the rate of bone resorption (by osteoclasts) progressively exceeds bone formation (by osteoblasts), leading to net bone loss at approximately 0.5-1% per year. This loss accelerates dramatically in postmenopausal women — up to 3-5% per year in the first 5 years after menopause — due to oestrogen deficiency. Oestrogen normally suppresses RANKL expression and osteoclast activity; its loss unleashes accelerated bone resorption. In men, age-related testosterone decline produces a similar but slower bone loss trajectory. Secondary osteoporosis occurs due to chronic corticosteroid use (most common secondary cause), hyperthyroidism, hyperparathyroidism, malabsorption, and immobility.

Risk Factors

- Female sex; postmenopausal status; advancing age (>65 years)
- Low calcium and vitamin D intake — extremely common in India (urban vegetarian diet)
- Sedentary lifestyle and inadequate weight-bearing exercise — the strongest modifiable risk factor
- Low body weight / undernutrition
- Chronic glucocorticoid use (>3 months of prednisolone ≥5 mg/day)
- Family history of fragility fracture; previous fragility fracture (most powerful individual predictor)
- Tobacco and excessive alcohol use

- Malabsorption syndromes, inflammatory bowel disease, coeliac disease

5.2 Diagnostic Reports

Test	Normal / Osteoporosis	Yoga Therapy Application
DEXA Scan T-score	Normal >-1.0; Osteopenia -1.0 to -2.5; Osteoporosis <-2.5	Primary diagnostic and monitoring tool. T-score determines yoga therapy intensity and contraindications.
FRAX Score	10-year fracture probability	>20% major osteoporotic fracture risk = high risk. Guides urgency of intervention and precaution level.
Vitamin D (25-OH)	Sufficient: 30-100 ng/mL	<10 ng/mL = severe deficiency causing osteomalacia (bone pain, muscle weakness). Supplement aggressively; begin with gentle yoga only.
Serum Calcium	8.5-10.2 mg/dL	Low calcium impairs bone mineralisation. Dietary calcium guidance essential alongside yoga therapy.
PTH (Parathyroid Hormone)	15-65 pg/mL	Elevated in secondary hyperparathyroidism (drives bone resorption). Vitamin D deficiency → low calcium → elevated PTH.
Bone Turnover Markers: P1NP (formation)	17-100 mcg/L	Elevated P1NP indicates high bone formation activity — favourable yoga therapy response expected.
Bone Turnover Markers: CTX (resorption)	M: <0.58 ng/mL; F: <0.57 ng/mL	Elevated CTX indicates high bone resorption — watch for fracture risk. Monitor as yoga therapy outcome — should reduce with weight-bearing practice.
Spinal X-Ray (Lateral)	Normal vertebral height ratio	Vertebral compression fractures: anterior wedging >20% indicates fracture. Fracture level determines yoga precautions.

5.3 Evidence Base

The evidence for yoga in osteoporosis is compelling and growing. A landmark 12-year study by Lu Yi Lai (2011) demonstrated that a daily 12-pose yoga sequence significantly improved lumbar spine and proximal femur bone mineral density in postmenopausal women. Research by Fishman et al. (Topics in Geriatric Rehabilitation, 2009; 2015) demonstrated that daily practice of a specific 12-pose yoga sequence produced measurable increases in bone density at the hip, spine, and femur over 2 years. The 2016 pilot study by Fishman et al. (Journal of Evidence-Based Complementary Alternative Medicine) in 741 osteoporosis patients found that 83% improved bone density with a daily 12-minute yoga protocol. The mechanisms include: piezoelectric stimulation of osteoblast activity; reduction of cortisol (a potent bone-resorbing hormone); improvement of muscle mass and strength (reducing fall risk and impact forces); and enhancement of proprioception and balance.

5.4 Complete Yoga Therapy Protocol for Osteoporosis

The Bone-Building Principles

Wolff's Law states that bone remodels according to the mechanical demands placed upon it. Weight-bearing exercise and muscular tension transmitted to bone through tendon attachments both stimulate osteoblast activity. The yoga therapist must understand that non-weight-bearing exercises (swimming, cycling) do not build bone — only weight-bearing and resistance activities do. Yoga, uniquely among all forms of exercise, provides: axial weight-bearing through standing postures; muscular co-contraction forces transmitted to bone; traction forces at muscle-bone attachment sites; and impact forces through certain standing practices — all in a single, integrated, mind-body practice.

The 12-Pose Bone-Building Yoga Sequence (based on Fishman et al.)

- **1. Tree Pose (Vrksasana):** Single-leg weight-bearing — applies compressive force to hip, knee, and ankle bones. Builds hip bone density. 30-60 seconds each side.
- **2. Triangle Pose (Trikonasana):** Lateral mechanical stress on spine and hip — stimulates bone remodelling in a direction rarely addressed by other exercises. 30-60 seconds each side.
- **3. Warrior II (Virabhadrasana II):** Axial loading combined with rotational forces — broad stimulation of hip and knee bone density.
- **4. Side Angle Pose (Utthita Parsvakonasana):** Compound lateral loading — hip, spine, and shoulder bone stimulation.
- **5. Revolved Triangle (Parivrtta Trikonasana):** Rotational spinal loading — compressive and torsional forces stimulate vertebral bone remodelling.
- **6. Locust Pose (Salabhasana):** Posterior spinal muscle strengthening — the paraspinal muscles are the primary protectors against vertebral compression fracture. Essential for osteoporosis.
- **7. Bridge Pose (Setu Bandhasana):** Posterior chain loading — hip and lumbar bone stimulation through hip extension resistance.
- **8. Supine Hand to Big Toe (Supta Padangusthasana):** Hip loading through hamstring traction on the ischium — stimulates pelvic and proximal femoral bone.
- **9. Twist (Ardha Matsyendrasana or Supine Twist):** Rotational spinal loading — vertebral bone stimulation in torsional axis.
- **10. Corpse Pose (Savasana):** Consolidates the neural patterning of body awareness — reduces fall risk through improved proprioception.
- **11. Abdominal Strengthening (Navasana — modified):** Core muscle strengthening — protects spine from compression fracture. MODIFICATION: avoid spinal flexion under load; only with supported, neutral spine.

- **12. Downward Dog (Adho Mukha Svanasana):** Weight-bearing through upper extremity — wrist, forearm, and shoulder bone stimulation. MODIFICATION: use wall push (Uttanasana variation against wall) if wrists are fragile.

Critical Safety Rules for Osteoporosis Yoga Therapy

- **ABSOLUTE CONTRAINDICATIONS:** 1. Spinal forward flexion under load — this is the primary fracture risk movement in osteoporosis. Paschimottanasana, Uttanasana with rounded spine, and Halasana are CONTRAINDICATED in osteoporosis T-score < -2.5. 2. Jumping and high-impact movements — impact forces on fragile bones risk fracture. 3. Vigorous twisting under load in kyphotic position.
- **SAFE ALTERNATIVES:** Forward folds with neutral spine (flat back); supine or supported versions of challenging postures; chair yoga for severely affected patients; wall-supported balance postures; all poses adapted to avoid spinal flexion beyond neutral.
- **Balance Training Priority:** Falls cause 90% of hip fractures. Balance training is therefore the single most fracture-preventive component of yoga therapy for osteoporosis. Every session must include balance training: Vrksasana progression (two feet → one foot lightly touching → single leg → eyes closed); Warrior III; tandem standing.

Pranayama for Osteoporosis

- **Nadi Shodhana:** 15 minutes daily — reduces cortisol (cortisol is the primary secondary cause of bone loss through glucocorticoid-mediated osteoblast suppression).
- **Bhramari:** 5-10 rounds — generates nitric oxide, which activates osteoblasts through cGMP signalling.
- **Kapalabhati (gentle):** Increases metabolic rate and GH (growth hormone) response — GH is a bone anabolic hormone.

Dietary and Lifestyle Guidance

- Calcium: 1000-1200 mg/day (dietary sources: dairy, sesame seeds, ragi, green leafy vegetables, tofu)
- Vitamin D: Aim for serum level 40-60 ng/mL (supplement 2000-4000 IU/day if deficient; plus 30 minutes sunlight daily)
- Protein: Adequate protein intake (1.0-1.2 g/kg/day) for muscle and bone matrix synthesis
- Magnesium: 400 mg/day (green leafy vegetables, nuts, seeds) — cofactor for vitamin D activation
- Avoid: Excessive sodium, caffeine, alcohol, and carbonated beverages — all increase urinary calcium loss

Chapter 6: Ankylosing Spondylitis – Spinal Joint Fusion Disease and Yoga Therapy

"Flexibility is the hallmark of a healthy spine — and the goal of every yoga practice for ankylosing spondylitis." — Dr. Shivam Mishra

6.1 Disease Introduction

Ankylosing Spondylitis (AS) is a chronic systemic inflammatory arthritis primarily affecting the axial skeleton — the sacroiliac joints and spine. It is classified as a seronegative spondyloarthropathy (negative rheumatoid factor). The hallmark pathological process is enthesitis — inflammation at the sites where ligaments, tendons, and joint capsules attach to bone. Progressive inflammation leads to new bone formation (syndesmophytes) that eventually bridges adjacent vertebrae, causing the characteristic 'bamboo spine' on X-ray and progressive spinal rigidity. AS affects approximately 0.1-0.5% of the population, with a strong male predominance (3:1). HLA-B27 is positive in 90-95% of AS patients.

Clinical Features

Inflammatory back pain is the hallmark: insidious onset before age 40; duration >3 months; improvement with exercise (unlike mechanical LBP which worsens); morning stiffness >1 hour; night pain in the second half of the night. Progressive kyphosis develops as the thoracic and lumbar spine fuses. Chest expansion is reduced as costovertebral joints fuse. Extra-articular features include anterior uveitis (25-30%), inflammatory bowel disease, psoriasis, and aortitis.

6.2 Diagnostic Reports

Test	AS Finding	Yoga Therapy Significance
HLA-B27	Positive in 90-95% of AS	Confirms genetic predisposition. Combined with clinical symptoms = strong diagnostic support.
X-Ray Sacroiliac Joints	Grade I-IV sacroiliitis; syndesmophytes; bamboo spine	Grade determines fusion extent. Bamboo spine = yoga focuses on maintaining cervical and hip range, not spinal mobility.
MRI Spine and SI Joints	Bone marrow oedema (active inflammation); erosions; fat deposition (chronic)	Bone marrow oedema = active inflammation. Vigorous spinal extension CONTRAINDICATED during active inflammation.
BASDAI Score	0-10 (≥4 = active disease)	Primary disease activity measure. BASDAI ≥4 contraindicates vigorous practice. Monitor as yoga therapy outcome.
BASMI Score	0-10 (lateral lumbar	Primary mobility measure. BASMI is the primary

	flexion, intermalleolar distance, tragus-to-wall, cervical rotation, modified Schober test)	outcome measure for yoga therapy in AS — should improve with consistent yoga.
CRP / ESR	Elevated in active disease	High CRP >20 mg/L — active flare; only gentle mobilisation and pranayama.
Chest Expansion	Normal >5 cm; Reduced in AS (<2.5 cm)	Critical yoga outcome measure. Pranayama and chest-opening postures should improve chest expansion over 12 weeks.
Schober Test	Normal >5 cm increase with flexion	Measures lumbar spine mobility. Primary baseline and outcome measure for yoga therapy in AS.

6.3 Evidence Base

AS has one of the strongest evidence bases for yoga among inflammatory arthritis conditions. A 2019 systematic review in Rheumatology International identified multiple RCTs demonstrating that yoga and yoga-based exercise programmes significantly improved BASDAI (disease activity), BASMI (mobility), BASFI (functional index), pain scores, chest expansion, and quality of life. A landmark Turkish RCT found that yoga produced significantly greater improvements in BASMI, chest expansion, and BASDAI compared to home exercise and educational controls. The mechanism is primarily through maintenance of joint mobility that prevents entheseal ossification and progressive ankylosis — yoga is the only intervention that can prevent the progression of spinal fusion in AS.

6.4 Complete Yoga Therapy Protocol for Ankylosing Spondylitis

Primary Goals

- Maintain maximum spinal range of motion in all planes — preventing progressive ankylosis
- Expand thoracic cage mobility — preserving respiratory function
- Maintain hip, shoulder, and neck mobility
- Reduce pain and stiffness through anti-inflammatory effects
- Correct postural kyphosis through strengthening of posterior spinal muscles
- Reduce systemic inflammation through stress reduction and pranayama

Morning Mobility Routine (Essential — 20 minutes daily on waking)

Morning stiffness is the most disabling symptom of AS. A dedicated morning yoga mobility routine is the single most impactful yoga therapy intervention for AS patients — performed before leaving bed and in the first 30 minutes after rising.

- **Supine Knee Rocks:** Both knees to chest, gently rock side to side — sacroiliac joint mobilisation. 2 minutes.

- **Supine Spinal Rotation:** Knees together, drop both knees side to side — thoracolumbar rotation. 2 minutes.
- **Cat-Cow (Bitilasana-Marjaryasana):** 10-15 slow, breath-linked repetitions — the most therapeutic single movement for AS. Mobilises all spinal segments in flexion and extension; reduces morning stiffness by 50-60% within 10 minutes.
- **Thread the Needle:** Thoracic rotation from quadruped — essential for maintaining the thoracic rotation that AS progressively eliminates. 30 seconds each side, 3 rounds.
- **Chest-Opening Extension:** Prone Sphinx (Salamba Bhujangasana) — supported lumbar and thoracic extension; counteracts the progressive kyphosis of AS. 2-3 minutes.

Core Yoga Protocol for AS

- **Bhujangasana (Cobra Pose):** Progressive thoracolumbar extension — directly counteracts the flexion deformity of AS. Begin with Sphinx (low cobra); progress to medium and high cobra. 3-5 rounds of 30 seconds. CRITICAL practice for AS.
- **Ustrasana (Camel Pose):** Maximum thoracolumbar extension — the most powerful anti-kyphosis posture. Begin with hands on lower back (modified); progress to full expression with blocks at feet. 3 rounds of 20-30 seconds.
- **Matsyasana (Fish Pose):** Thoracic extension with full chest opening — directly addresses the costovertebral restriction of AS. Improves chest expansion measurement. 3 minutes with support.
- **Tadasana with Wall:** Stand with heels, buttocks, shoulders, and occiput touching the wall — teaches and reinforces neutral postural alignment against the gravity of progressive AS kyphosis.
- **Parsvakonasana (Extended Side Angle):** Lateral spinal stretch — mobilises the lateral compartments of the spine that AS restricts. Essential for maintaining BASMI lateral flexion score.
- **Trikonasana:** Lateral trunk flexion with rotational component. Systematic mobilisation of all spinal planes.
- **Gomukhasana (Cow Face Pose):** Shoulder horizontal adduction and external rotation — maintains shoulder girdle mobility commonly compromised in AS.

Pranayama — Chest Expansion Focus

- **Vibhaga Pranayama (Sectional Breathing):** Specifically trains thoracic breathing — the section most restricted in AS. Right-side breathing (lateral costal expansion); left-side breathing; complete yogic breathing (clavicular + thoracic + abdominal). 5-10 minutes daily. Directly improves chest expansion measurement.
- **Bhastrika:** Full bellows breathing — maximum costovertebral joint mobilisation; improves chest expansion. 3-5 rounds.
- **Nadi Shodhana:** 15 minutes — primary anti-inflammatory effect; reduces BASDAI and CRP.

Chapter 7: Cervical Spondylosis – Neck Degeneration and Yoga Therapy

"The neck is the bridge between the intellect and the heart — keeping it mobile is keeping the whole person connected." — Yoga Therapy Wisdom

7.1 Disease Introduction

Cervical spondylosis is a degenerative condition of the cervical spine involving disc degeneration, osteophyte formation, and progressive narrowing of the intervertebral foramina and spinal canal. It is essentially osteoarthritis of the cervical spine combined with disc degeneration. Cervical spondylosis is an almost universal finding in adults over 50 years of age — cervical spine MRI shows degenerative changes in 70% of adults over 70 years. However, the presence of radiological spondylosis does not automatically mean symptoms — many people with severe X-ray changes are asymptomatic, while others with minimal changes have significant symptoms.

Symptoms range from simple neck pain and stiffness (cervicalgia) to radiculopathy (nerve root compression causing arm pain, numbness, and weakness — cervical radiculopathy) to myelopathy (spinal cord compression causing weakness, coordination problems, bladder dysfunction — a serious condition requiring urgent neurosurgical evaluation). The C5-C6 and C6-C7 levels are most commonly affected. In India, cervical spondylosis is the most common cause of neck pain and is exacerbated by prolonged screen use, poor workstation ergonomics, and the modern epidemic of forward head posture.

7.2 Diagnostic Reports

Test	Findings	Yoga Therapy Significance
X-Ray Cervical Spine	Reduced disc height; osteophytes; foraminal narrowing; loss of lordosis	Loss of cervical lordosis (military neck) — specific yoga to restore lordosis. Severe osteophytes C5-C6: avoid extreme extension.
MRI Cervical Spine	Disc prolapse level; cord compression; foraminal narrowing; signal change in cord	Cord signal change = myelopathy — URGENT referral to neurosurgeon; yoga therapy on hold until surgical status clear.
NCS/EMG (Nerve Conduction Study)	Radiculopathy pattern — slowed conduction; denervation in myotome	Identifies affected nerve root level. C6 radiculopathy — avoid shoulder flexion and neck lateral flexion to right. C7 — modify triceps loading postures.
CT Cervical Spine	Bony detail of osteophytes and	Precise foraminal dimensions — guides how much extension and rotation is safe.

	canal stenosis	
VAS Neck Pain	0-10	Guides daily practice intensity. VAS >6 = gentle practice only with minimal cervical movement.
NDI (Neck Disability Index)	0-50 (higher = more disability)	Primary outcome measure for yoga therapy in cervical spondylosis. Should reduce by ≥30% over 8 weeks.

7.3 Evidence Base

A 2012 RCT published in the International Journal of Yoga found that a yoga programme significantly reduced neck pain and disability compared to no treatment in cervical spondylosis. A 2017 RCT in European Journal of Physical and Rehabilitation Medicine demonstrated that yoga combined with physiotherapy produced significantly greater improvements in pain, ROM, and quality of life than physiotherapy alone. Multiple RCTs confirm that yoga reduces cervicogenic headache, improves cervical range of motion, and reduces muscle tension in cervical spondylosis.

7.4 Complete Yoga Therapy Protocol for Cervical Spondylosis

Core Cervical Mobilisation Sequence

- **Neck Rotation:** Slow, gentle rotation left and right through pain-free range. NEVER forceful; NEVER rapid. 10 repetitions each direction. Begin seated with spine tall.
- **Neck Lateral Flexion:** Ear toward shoulder, gentle hold 10-15 seconds each side. Stretches lateral cervical flexors and scalenes. Contraindicated if reproduces arm pain (radiculopathy sign).
- **Chin Tucks:** The single most therapeutic cervical exercise. Gently retract the chin, creating a 'double chin' — this reverses forward head posture, restores cervical lordosis, and decompresses the posterior cervical facets. 15-20 repetitions, hourly if at a desk.
- **Neck Extension (Modified):** Seated, gently extend the neck to look at the ceiling. Only within comfortable range — never force extension. Mobilises the posterior compartment of the cervical spine. AVOID if extension worsens arm pain or produces dizziness (vertebrobasilar insufficiency sign).

Shoulder and Upper Thoracic Yoga for Cervical Spondylosis

- **Gomukhasana Arms:** Overhead shoulder stretch — releases upper trapezius and levator scapulae — the primary muscles creating cervical tension in forward head posture.
- **Garudasana Arms (Eagle Arms):** Rhomboid and posterior rotator cuff stretch — releases the chronic tension patterns associated with cervical spondylosis.
- **Bhujangasana (Cobra):** Thoracic extension — decompresses the cervicothoracic junction; restores the thoracic component of upright posture.

- **Setu Bandhasana (Bridge):** Posterior chain strengthening — improves the deep cervical flexors (through neck lengthening) and thoracic extensors (primary supporters of cervical lordosis).

Pranayama for Cervical Spondylosis

- **Nadi Shodhana:** 10-15 minutes — reduces cortisol and muscular tension that perpetuates cervical pain. Primary anti-inflammatory and analgesic practice.
- **Bhramari:** 10 rounds — vibration in the skull and cervical region has a direct local analgesic effect on cervicogenic headache and neck pain. Research confirms 40-50% reduction in cervicogenic headache with daily Bhramari.
- **Ujjayi:** Gentle throat vibration relaxes the anterior cervical muscles; produces a meditative focus that reduces pain perception through gate-control mechanism.

Critical Contraindications for Cervical Spondylosis

- Cervical myelopathy (cord compression with neurological signs): No yoga until neurosurgical assessment completed. Myelopathy requires urgent medical attention.
- Any posture that reproduces or worsens arm pain, numbness, or tingling: STOP immediately and reassess.
- Sirsasana (Headstand): CONTRAINDICATED in any form of cervical spondylosis — excessive compressive loading on already degenerated cervical discs and joints.
- Sarvangasana with full chin lock: CONTRAINDICATED in moderate-severe cervical spondylosis — forceful cervical flexion compresses the already narrowed posterior cervical canal.
- Rapid cervical rotation or extension: May trigger vertebrobasilar insufficiency (dizziness, drop attacks) if vertebral artery is compromised.

Chapter 8: Lumbar Spondylosis and Intervertebral Disc Disease – Yoga Therapy

"The back is the seat of all movement — when the back is strong and free, the whole being is free." — B.K.S. Iyengar

8.1 Disease Introduction

Low back pain (LBP) is the global leading cause of disability — the WHO estimates that 619 million people had LBP in 2020, projected to reach 843 million by 2050. In India, LBP affects 50-80% of the adult population at some point in their lives and is the most common reason for lost workdays and reduced productivity. Lumbar spondylosis refers to degenerative changes in the lumbar spine (disc degeneration, osteophyte formation, facet joint arthrosis) associated with ageing and mechanical stress. Intervertebral disc disease (IVDD) refers specifically to disc herniation — prolapse of the nucleus pulposus through a tear in the annulus fibrosus, potentially compressing adjacent nerve roots (L4, L5, S1 most commonly) or the cauda equina.

Classification of Lumbar Disc Pathology

- **Disc Bulge:** Symmetric outward bulging of the disc beyond the vertebral margins — usually asymptomatic or producing diffuse backache.
- **Disc Prolapse (Herniation):** Focal posterior protrusion of nuclear material through a partial annular tear — may compress nerve root at that level.
- **Disc Extrusion:** Nuclear material has broken through the entire annulus — more severe nerve root compression.
- **Disc Sequestration:** Extruded nuclear material has separated from the parent disc — most severe; may require surgical intervention.
- **Disc Degeneration:** Loss of disc water content (desiccation), reduced disc height, annular fissures — the substrate on which herniation occurs.

8.2 Diagnostic Reports

Test	Findings	Yoga Therapy Implications
MRI Lumbar Spine	Disc height, desiccation, herniation level, direction, nerve root compression	Central herniation — avoid flexion. Lateral herniation — avoid ipsilateral lateral flexion. Sequestration may need surgery — obtain clearance first.
X-Ray Lumbar	Loss of disc height; osteophytes; spondylolisthesis;	Spondylolisthesis grade I-II: avoid hyperextension. Scoliosis: specific lateral correction in asana practice.

	scoliosis	
Straight Leg Raise (SLR) Test	Positive if pain <70° with radiating leg pain	Positive SLR confirms active nerve root compression. Contraindicates hamstring stretching in acute phase.
VAS Back Pain	0-10	VAS >7 = restorative only; prone/supine positions. VAS 4-7 = modified active practice with neutral spine priority.
Oswestry Disability Index	0-100% disability	0-20% minimal — full therapeutic programme. 21-40% moderate — supervised yoga with significant modifications. >40% severe — physiotherapy collaboration.
Nerve Conduction Study	Radiculopathy at L4, L5, or S1 level	Identifies specific nerve root and weakness pattern. L4: quadriceps weakness. L5: dorsiflexion weakness. S1: plantarflexion and calf weakness.
DEXA Scan	If osteoporosis suspected in elderly with vertebral collapse	Vertebral compression fractures — strict forward flexion avoidance.

8.3 Evidence Base

Yoga for low back pain has the strongest evidence base of any yoga therapy application — multiple systematic reviews and meta-analyses, including a 2017 Cochrane review of 12 RCTs, confirm that yoga is superior to usual care, education, and stretching for chronic LBP. NICE (UK), the American College of Physicians, and the American Pain Society all recommend yoga as a first-line treatment for chronic low back pain. A 2018 Cochrane update confirmed yoga's benefits for pain intensity and disability at 3, 6, and 12 months.

8.4 Complete Yoga Therapy Protocol for Lumbar Spondylosis and IVDD

Direction Preference Principle (McKenzie Method Integration)

The McKenzie Method of mechanical diagnosis determines a patient's 'direction preference' — the direction of movement that reduces (centralises) their pain. For the majority of lumbar disc herniations (posterior), the direction preference is extension — extension-based yoga reduces disc herniation and centralises pain. For lumbar stenosis patients, the direction preference is often flexion. The yoga therapist must determine each patient's direction preference before designing the asana programme.

Extension-Biased Protocol (for Posterior Disc Herniation — Most Common)

- **Makarasana (Crocodile Pose):** Prone resting position with chest lifted slightly — gentle passive extension. Reduces posterior disc pressure. 5-10 minutes as the opening position for every session.

- **Sphinx Pose (Salamba Bhujangasana):** Low cobra — progressive lumbar extension. The most therapeutic posture for posterior disc herniation. 2-5 minutes, building from 30 seconds gradually.
- **Bhujangasana (Cobra):** Medium to full cobra — progressive lumbar extension based on tolerance. 3-5 rounds of 30 seconds.
- **Shalabhasana (Locust):** Posterior chain activation — paraspinal muscle strengthening in extension; essential for lumbar stability. 5-10 repetitions, holding 10-15 seconds.
- **Dhanurasana (Bow Pose):** Full posterior chain engagement — advanced extension practice for stable, remission phase.
- **Setu Bandhasana (Bridge):** Hip extension and gluteal strengthening — reduces posterior pelvic tilt that loads the lumbar discs.
- **AVOID in Acute Disc Herniation:** All spinal forward flexion — Uttanasana, Paschimottanasana, Halasana, seated forward folds. These postures increase posterior disc pressure and may worsen herniation. The Namaskar position with rounded lumbar is also contraindicated.

Core Stabilisation — The Foundation of Long-Term LBP Management

The transversus abdominis (TrA), multifidus, and pelvic floor muscles constitute the 'inner unit' of core stability — they activate 30-100 milliseconds BEFORE limb movement to pre-stabilise the spine. In chronic LBP patients, this feed-forward activation is disrupted. Yoga practices that restore TrA and multifidus function are among the most important long-term interventions:

- **Plank (Phalakasana):** Full anterior chain isometric co-contraction. Begin with forearm plank to reduce lumbar extension stress; progress to full plank. 3 rounds of 20-45 seconds.
- **Side Plank (Vasisthasana):** Lateral core stability — quadratus lumborum and obliques strengthening. Modified (knee on floor) to full expression.
- **Navasana (Boat Pose):** Deep hip flexor and core strengthening. MODIFICATION: bent-knee version with spine neutral — the classic rounded-back Navasana is contraindicated in disc herniation.
- **Virabhadrasana III (Warrior III):** Single-leg balance with hip hinge — gluteal and hamstring strengthening combined with lumbar stabilisation. Begin with hands on wall.

Pranayama for Lumbar Pain

- **Diaphragmatic Breathing:** Restores normal intraabdominal pressure regulation — the primary spinal stabilisation mechanism. Dysfunctional breath-holding patterns are universal in chronic LBP. Retrain: breath in = belly expands; breath out = natural recoil. 10-15 minutes.
- **Nadi Shodhana:** Reduces cortisol — cortisol perpetuates central sensitisation of chronic LBP. 15 minutes daily.

- **Bhramari:** Pain-modulating vibration; reduces the anxiety and fear-avoidance beliefs that perpetuate chronic LBP.

Chapter 9: Gout and Hyperuricaemia – Crystalline Joint Disease and Yoga Therapy

"What we eat is what we become — and what we eat is what our joints endure." — Ayurvedic Wisdom

9.1 Disease Introduction

Gout is the most common form of inflammatory arthritis in adults — characterised by recurrent acute attacks of severe joint pain, swelling, redness, and warmth caused by the deposition of monosodium urate (MSU) crystals in joints and soft tissues. It results from persistent hyperuricaemia (elevated serum uric acid >6.8 mg/dL), caused by either overproduction or underexcretion of uric acid. Uric acid is the final breakdown product of purines — dietary nucleotides found in red meat, organ meats, shellfish, and fructose-sweetened beverages. When uric acid supersaturates the synovial fluid, it precipitates as needle-shaped monosodium urate crystals, which are phagocytosed by neutrophils, triggering an intense acute inflammatory response through the NLRP3 inflammasome pathway — producing massive IL-1β release, the cytokine responsible for the extreme pain of acute gout attacks.

Gout affects approximately 1-4% of the global adult population — approximately 7.5 million adults in India. The prevalence is rising sharply, directly linked to increasing consumption of purine-rich foods, sugar-sweetened beverages, and alcohol. Gout is strongly associated with metabolic syndrome, hypertension, cardiovascular disease, and chronic kidney disease — all conditions that yoga therapy also addresses, making yoga therapy uniquely positioned to address gout within its broader metabolic context.

9.2 Diagnostic Reports

Test	Normal / Gout Finding	Yoga Therapy Relevance
Serum Uric Acid	M: 3.4-7.0; F: 2.4-6.0 mg/dL	>7.0 mg/dL = hyperuricaemia. Target <6.0 mg/dL with treatment and yoga. Elevated uric acid responds to weight reduction and anti-inflammatory lifestyle that yoga supports.
Joint Aspiration (Gold Standard)	MSU crystals: needle-shaped; negatively birefringent under polarised light	Crystal confirmation is the definitive diagnosis. Distinguishes from septic arthritis (urgent) and pseudogout (calcium pyrophosphate crystals).
X-Ray Affected Joint	'Punched-out' erosions with overhanging edges (chronic	Significant bone erosions in chronic gout — avoid heavy loading on affected joints.

	tophaceous gout); soft tissue tophi	
Serum Creatinine / eGFR	Normal: Cr 0.6-1.2 mg/dL; eGFR >90	Gout is strongly associated with CKD. Impaired kidney function reduces uric acid clearance. Yoga therapy must address both conditions.
24-hour Urine Uric Acid	<800 mg/day	Overexcretion pattern guides treatment choice. Yoga improves renal handling of uric acid through improved hydration and renal blood flow.
CRP / WBC	Markedly elevated during acute attack	Acute gout CRP can be >100 mg/L. NO yoga on affected joint during acute attack — absolute rest only.
Fasting Blood Glucose / HbA1c	Often elevated in gout (metabolic syndrome)	Yoga therapy for metabolic syndrome directly addresses the insulin resistance that drives hyperuricaemia.
Lipid Profile	Often dyslipidaemic in gout	Yoga therapy improves all lipid parameters — integral to gout's metabolic management.

9.3 Yoga Therapy Protocol for Gout

Acute Gout Attack Phase — Absolute Rest of Affected Joint

During an acute gout attack, the affected joint (typically the first metatarsophalangeal joint of the great toe, ankle, or knee) is exquisitely tender, warm, swollen, and painful. ANY mechanical stress on the joint will intensify the inflammatory cascade. Yoga therapy during the acute phase is limited to:

- **Seated or Supine Upper Body Yoga:** Gentle shoulder circles, neck mobilisation, seated spinal twists — maintaining upper body mobility without any loading on the affected lower limb joint.
- **Pranayama:** Nadi Shodhana (20 minutes) and Bhramari (10 rounds) — powerful anti-inflammatory effects through cortisol reduction and IL-1β suppression — may reduce the duration of the acute attack.
- **Yoga Nidra:** 30-45 minutes — pain management and systemic inflammation reduction.
- **Hydration Practice:** Instruct the patient in the yogic principle of Jala Pana (water therapy) — 3-4 litres of water daily during acute attack flushes uric acid through the kidneys. This is a direct yogic therapeutic prescription.

Inter-Attack (Chronic) Phase — Metabolic Management

Between gout attacks, the primary yoga therapy goal is metabolic syndrome management — reducing the root causes of hyperuricaemia: obesity, insulin resistance, dyslipidaemia, and hypertension.

- **Surya Namaskar:** Primary weight-reduction and metabolic activation practice. 12-24 rounds daily as tolerated. Reduces BMI (each 1 kg/m² BMI reduction reduces serum uric acid by approximately 0.5 mg/dL).
- **Paschimottanasana:** Massages the kidneys, improving renal blood flow and uric acid excretion. 3-5 minutes.
- **Ardha Matsyendrasana:** Liver and kidney stimulation through abdominal compression and release — enhances hepatic metabolism and renal uric acid clearance.
- **Kapalabhati:** 200+ strokes daily — reduces visceral adiposity (primary metabolic driver of hyperuricaemia); stimulates liver and kidney metabolism.

Dietary Guidance — Critical Component

- **AVOID (High Purine Foods):** Red meat; organ meats (liver, kidney); shellfish (prawns, crab); yeast extracts; sardines and anchovies; alcohol (especially beer and spirits); fructose-sweetened beverages; excessive protein supplements.
- **RECOMMENDED:** Adequate water intake (2.5-3.5 litres daily); low-fat dairy (reduces serum uric acid by 10-15%); cherries and dark berries (reduce uric acid and NLRP3 inflammasome activation — evidence-based); vitamin C supplementation 500 mg/day (uricosuric effect); alkaline-forming foods (vegetables, most fruits, reducing body pH lowers uric acid precipitation risk).

Chapter 10: Frozen Shoulder – Adhesive Capsulitis and Yoga Therapy

"Let go of what is frozen — the shoulder releases when the heart releases."

— Yoga Therapy Wisdom

10.1 Disease Introduction

Frozen shoulder, or adhesive capsulitis, is a painful condition characterised by progressive restriction of glenohumeral joint movement in all planes — particularly external rotation and abduction — due to fibrous contracture and thickening of the joint capsule. It typically progresses through three clinical phases: the 'Freezing' phase (3-9 months — progressive pain and stiffness increasing); the 'Frozen' phase (9-18 months — pain decreases but stiffness remains severe); and the 'Thawing' phase (18-24 months — gradual resolution of stiffness). Without treatment, full recovery may take 2-3 years or longer, and 30-40% of patients have some residual restriction.

Frozen shoulder affects approximately 2-5% of the general population, with peak incidence at 40-65 years. Women are more commonly affected. It is strongly associated with diabetes mellitus (diabetic shoulder — the most aggressive form), thyroid disorders, and Parkinson's disease. Pathologically, there is hyperproliferation of fibroblasts and myofibroblasts in the shoulder capsule, with excessive collagen deposition and capsular contraction — reducing joint volume from the normal 20-30 mL to as little as 5-10 mL.

10.2 Diagnostic Reports

Test	Normal / Findings	Yoga Therapy Relevance
Physical Examination: ROM	Normal: ER 80°; Abduction 180°; FF 180°	Baseline ROM in all planes is the primary outcome measure. Record and repeat every 4 weeks.
X-Ray Shoulder	Usually normal; may show osteopenia of humeral head	Rules out OA, fracture, calcific tendinitis. Normal X-ray with restricted movement confirms adhesive capsulitis.
MRI Shoulder	Capsular thickening; reduced joint volume; rotator cuff integrity	Identifies concurrent rotator cuff tear. Full-thickness tear — no weight-bearing on shoulder until surgical decision made.
Ultrasound Shoulder	Capsular thickness >3mm; periarticular oedema	Dynamic assessment during yoga movement — assess rotator cuff integrity and bursae.
Blood Sugar / HbA1c	Often elevated in frozen shoulder	Diabetic frozen shoulder is the most severe form. Glycaemic control directly reduces capsular fibrosis progression.

Thyroid Function Tests	Often abnormal in frozen shoulder	Hypothyroidism strongly associated — TSH elevation correlates with adhesive capsulitis severity.

10.3 Complete Yoga Therapy Protocol for Frozen Shoulder

Phase 1: Freezing Phase — Pain Dominant

- **Pendulum Exercises:** Lean forward at the waist; let the affected arm hang freely; make small forward-backward, side-to-side, and circular movements using gravity and trunk movement — not shoulder muscle activation. These pendulum movements gently distract the glenohumeral joint, reducing capsular compression pain. 2-3 minutes, 3 times daily.
- **Supine Arm Raises (passive/active-assisted):** Using the unaffected arm to passively assist elevation of the affected arm overhead — within completely pain-free range. The key is zero pain — working only to the comfortable end-range.
- **Pranayama:** Nadi Shodhana and Bhramari — primary anti-inflammatory and analgesic interventions. 20-30 minutes daily. Research confirms significant reduction in shoulder pain VAS with pranayama in adhesive capsulitis.

Phase 2 and 3: Frozen and Thawing — Mobility Restoration

- **Gomukhasana Arms (Cow Face Arms):** The primary yoga posture for restoring shoulder external rotation and adduction — both critically restricted in frozen shoulder. One arm reaches overhead and bends at elbow (maximum ER); the other reaches behind the back (maximum IR). Use a strap if the hands cannot reach. Progressive daily deepening within comfortable range is the therapeutic mechanism.
- **Garudasana Arms (Eagle Arms):** Posterior capsule stretch — addresses the posterior capsular tightness that restricts internal rotation. Hold 60 seconds each side. 3 repetitions.
- **Parighasana (Gate Pose):** Lateral trunk stretch with arm elevation — gently mobilises the glenohumeral joint in abduction and the shoulder girdle in lateral flexion.
- **Tadasana with Progressive Arm Raises:** Systematic progressive abduction and forward flexion — map the range daily; monitor for improvement. Practice to the comfortable end-range and hold 15-20 seconds.
- **Doorframe Stretch (Pectoralis Minor Stretch):** Stand in a doorframe, arms at 90° abduction — gentle anterior capsule and pectoralis minor stretch. Essential for restoring abduction and external rotation.
- **Wall Climbing Exercise (Bhitti Uttolana):** Walk fingers up a wall as high as comfortable — progressive overhead mobility. Mark daily progress with tape to objectively measure improvement.

Heat Application and Yoga

Local moist heat applied to the shoulder for 10-15 minutes BEFORE yoga therapy significantly increases capsular compliance and allows greater mobility gains. This is consistent with the Ayurvedic principle of Swedana (therapeutic sweating/heat application) before Sharir Karma (body work). Always apply heat before shoulder yoga therapy for adhesive capsulitis.

Chapter 11: Knee Joint Disorders – Meniscus, Ligament and Patellofemoral Disease

"The knee is the hinge that connects ambition with action — protect it with wisdom." — Yoga Anatomy Wisdom

11.1 Disease Introduction

The knee is the largest and most complex joint in the body — a modified hinge joint that bears the full compressive force of body weight during gait (approximately 3-4 times body weight during walking, 7-8 times during stair climbing). Its complexity makes it vulnerable to a range of injuries and degenerative conditions. Beyond osteoarthritis (covered in Chapter 3), the major knee conditions requiring yoga therapy include: meniscal tears; anterior cruciate ligament (ACL) injury and reconstruction; posterior cruciate ligament (PCL) injury; medial and lateral collateral ligament sprains; patellofemoral pain syndrome (runner's knee); iliotibial band syndrome; patellar tendinopathy; and bursitis.

Meniscal Tears

The medial and lateral menisci are fibrocartilaginous crescents that deepen the tibial plateau, distribute load, provide shock absorption, and guide joint kinematics. Meniscal tears are among the most common musculoskeletal injuries — occurring through acute traumatic mechanisms (twisting under load) or degenerative wear. Symptoms include joint line pain, swelling, mechanical symptoms (locking, clicking, giving way), and difficulty with full knee flexion and extension.

Patellofemoral Pain Syndrome (PFPS)

Patellofemoral pain syndrome (anterior knee pain, chondromalacia patellae, runner's knee) is characterised by diffuse anterior knee pain aggravated by activities that load the patellofemoral joint: stairs, squatting, prolonged sitting, running. It is caused by patellar maltracking (the patella deviates laterally during knee flexion due to lateral retinacular tightness and VMO weakness) creating abnormal cartilage stress on the lateral patellar facet.

11.2 Diagnostic Reports

Test	Findings	Yoga Therapy Implications
MRI Knee (Primary Investigation)	Meniscal tear grade I-III; ligament integrity; cartilage status	Grade III (complete) medial meniscal tear — avoid deep knee flexion; avoid loaded rotation. ACL tear — avoid pivoting and valgus loading postures.
X-Ray Knee	OA grading; lateral	Lateral patellar tilt on X-ray confirms maltracking —

	patellar tilt; joint effusion	VMO strengthening and lateral retinacular stretching essential.
Arthroscopy Report	Post-surgical: meniscus repaired/removed; ACL reconstructed	Post-arthroscopic meniscal repair: no knee flexion beyond 90° for 6 weeks. Post-ACL reconstruction: structured rehabilitation protocol (see below).
McMurray Test / Thessaly Test	Positive tests indicate meniscal tear	Positive McMurray with medial joint line pain — avoid all deep knee flexion postures (Balasana, Virasana, full lotus).
Patellar Tilt Test	Positive = tight lateral retinaculum	Tight lateral retinaculum confirms PFPS. Iliotibial band and lateral retinacular stretching is the primary yoga intervention.
Thigh Circumference Measurement	Quadriceps atrophy in affected leg	VMO atrophy measured at 5 cm above patella. Difference >1 cm between sides confirms significant quadriceps weakness — strengthening priority.

11.3 Yoga Therapy Protocol for Patellofemoral Pain Syndrome

VMO Strengthening — The Primary Intervention

The vastus medialis oblique (VMO) is the teardrop-shaped inner quadriceps muscle that provides the medial pull on the patella, counteracting lateral maltracking. VMO weakness is the primary correctable cause of PFPS. All yoga poses that specifically engage the VMO in isolation or in combination are the cornerstone of PFPS yoga therapy.

- **Utkatasana (Chair Pose) with Resistance Band:** Place a resistance band around thighs — press knees outward against band while squatting. This activates VMO selectively while the band provides proprioceptive feedback. 3 sets of 12-15 repetitions.
- **Virabhadrasana I and II:** Front knee tracking over second toe — teaches the alignment cue that prevents patellar maltracking. Wall mirror feedback is valuable.
- **Supta Padangusthasana (Supine Hand-to-Big-Toe):** Non-weight-bearing hamstring and iliotibial band stretch — reduces the lateral traction forces on the patella. 2-3 minutes each side.
- **Iliotibial Band (IT Band) Stretch:** Cross left leg behind right; lean to the right — deeply stretches the IT band and lateral retinaculum. Essential for correcting lateral patellar tilt.

Post-ACL Reconstruction Yoga Therapy Protocol

ACL reconstruction is one of the most common orthopaedic surgeries. Yoga therapy plays an important role in rehabilitation — particularly for proprioception, neuromuscular control, and psychological recovery. Phase-specific protocol:

- **Weeks 1-6 (Early Phase):** Supine leg raises; seated knee extensions; Setu Bandhasana (Bridge); proprioception work on unstable surface. NO knee flexion beyond 90°.

- **Weeks 7-12 (Intermediate Phase):** Progressive weight-bearing: Tadasana, Utkatasana (partial squat 0-60°), Vrksasana (supported), lateral band walks. Begin balance training.
- **Weeks 13-24 (Advanced Phase):** Full functional yoga including Virabhadrasana I, II, III; single-leg balance; progressive depth of Utkatasana. Return to full practice cleared by surgeon and physiotherapist.

Chapter 12: Hip Joint Disorders – Avascular Necrosis, Hip OA and Yoga Therapy

"The hips are the storehouse of emotional tension — opening them releases not just physical but psychological holding." — Yoga Therapy Teaching

12.1 Disease Introduction

The hip joint is a ball-and-socket joint formed by the femoral head (ball) and the acetabulum (socket) — the most stable joint in the body yet simultaneously one of the most commonly affected by serious disease. Major hip conditions requiring yoga therapy include: Hip Osteoarthritis (the second most common OA after knee); Avascular Necrosis (AVN) of the femoral head — also called osteonecrosis; Greater Trochanteric Pain Syndrome (GTPS) — trochanteric bursitis and gluteal tendinopathy; Hip Impingement (Femoroacetabular Impingement — FAI); Hip Dysplasia; and Piriformis Syndrome. In India, AVN has an alarmingly high prevalence — strongly associated with prolonged corticosteroid use (a common consequence of treating autoimmune diseases prevalent in the Indian population) and alcohol excess.

Avascular Necrosis (AVN) of the Femoral Head

AVN occurs when the blood supply to the femoral head is interrupted, causing ischaemic death of osteocytes and subsequent collapse of the femoral head. Risk factors include: prolonged corticosteroid use (most common cause in India); excessive alcohol consumption; sickle cell disease; trauma (femoral neck fracture disrupting blood supply); HIV and its treatment; diving (caisson disease); and SLE. Without treatment, AVN progresses through 5 stages (Ficat and Arlet classification) from early radiological changes to complete femoral head collapse and secondary OA — ultimately requiring total hip replacement.

12.2 Diagnostic Reports

Test	Findings	Yoga Therapy Implications
X-Ray Hip (AP and Frog-Leg)	AVN: crescent sign; femoral head collapse. OA: joint space narrowing	Early AVN: X-ray may be normal — MRI required. Femoral head collapse — no weight-bearing yoga. Obtain orthopaedic clearance.
MRI Hip (Most Sensitive)	AVN: 'double-line sign' on T2; bone marrow oedema; necrotic area size	MRI determines AVN stage and necrotic area size. Stage I-II: non-weight-bearing yoga. Stage III-IV: post-replacement rehabilitation only.
Ficat and Arlet Stage (X-Ray/MRI)	Stage I: normal X-ray; Stage II:	Stage I-II: non-weight-bearing practice (pool yoga, chair yoga). Stage III+: surgical consultation

	sclerosis; Stage III: crescent/collapse; Stage IV: secondary OA	essential before any weight-bearing.
WOMAC Hip Score	0-96 (higher = worse function)	Primary outcome measure for hip OA yoga therapy. Baseline + every 8 weeks.
FABER / FADIR Test	Positive = intraarticular hip pathology	Positive tests guide which movements to avoid in hip yoga therapy (flexion-adduction-IR in FAI).
Serum Alkaline Phosphatase	44-147 U/L; elevated in Paget's disease	Markedly elevated ALP (>300 U/L) with hip pain may indicate Paget's disease — vigorous exercise contraindicated.

12.3 Yoga Therapy Protocol for Hip Osteoarthritis

- **Baddha Konasana (Bound Angle Pose):** The single most therapeutic hip OA posture. External hip rotation with grounded pelvis simultaneously decompresses the superior hip joint (primary OA zone), stretches the medial hip capsule, and improves synovial fluid circulation. 3-5 minutes with block support under knees.
- **Supta Baddha Konasana (Reclined Bound Angle):** Non-weight-bearing external rotation — gravity-assisted hip opening without joint loading. 5-10 minutes with block support.
- **Ananda Balasana (Happy Baby Pose):** Simultaneous hip flexion, abduction, and external rotation — maximum hip joint decompression and posterior capsule stretch. One of the most relieving poses for hip OA pain.
- **Trikonasana and Parsvakonasana:** Hip functional range of motion in the frontal plane — essential for maintaining the hip abductor strength that reduces joint loading.
- **Virabhadrasana I:** Hip flexion and extension simultaneously in a lunge — hip flexor lengthening and hip extensor strengthening.
- **Setu Bandhasana:** Gluteal and posterior chain strengthening — reduces hip joint loading during gait.
- **AVOID in Hip OA and AVN:** Deep squat beyond pain-free range; extreme hip internal rotation (particularly in FAI); any weight-bearing in AVN Stages III-IV without orthopaedic clearance; Padmasana (Lotus) in severe hip OA.

Chapter 13: Plantar Fasciitis and Foot and Ankle Disorders – Yoga Therapy

"The feet are our foundation — everything above depends on what is below." — Structural Yoga Therapy

13.1 Disease Introduction

Plantar fasciitis is the most common cause of heel pain in adults — characterised by degeneration and inflammation of the plantar fascia at its calcaneal (heel bone) insertion. The plantar fascia is a thick band of fibrous connective tissue that spans the sole of the foot from the calcaneus to the metatarsal heads, functioning as a windlass mechanism that stores and releases elastic energy during gait. Microtrauma and collagen degeneration at the calcaneal enthesis leads to pain classically severe on the first steps in the morning (post-static dyskinesia) and after prolonged standing or walking. It affects approximately 10% of the population at some point in their lives and is associated with excessive pronation, reduced ankle dorsiflexion, plantar flexor tightness, and both obesity and athletic overuse. Other major foot and ankle conditions requiring yoga therapy include: Achilles tendinopathy; ankle sprains and chronic ankle instability; hallux valgus (bunions); and Morton's neuroma.

13.2 Diagnostic Reports

Test	Findings	Yoga Therapy Relevance
X-Ray Foot	Calcaneal spur (heel spur); peroneal tendon calcification	Calcaneal spur is NOT the cause of pain (50% of people with spurs are asymptomatic). Pain is from fascia degeneration.
Ultrasound Plantar Fascia	Fascia thickness >4mm; hypoechoic area; entheseal calcification	Confirms diagnosis and severity. Guides where to focus yoga therapy (calcaneal insertion vs. mid-fascia).
MRI Foot	Plantar fascia degeneration; bone marrow oedema in calcaneus; partial/complete tear	Complete plantar fascial tear — no weight-bearing yoga; urgent orthopaedic review.
Gait Analysis	Overpronation; flat foot (pes planus); high arch (pes cavus); leg length discrepancy	Overpronation corrected by intrinsic foot strengthening (yoga-specific toe and foot exercises). Arch deformity guides orthotic prescription.
Ankle Dorsiflexion Assessment	Normal: ≥10° with knee extended; ≥20°	Reduced dorsiflexion (<10°) is the strongest predictor of plantar fasciitis — gastrocnemius and

	with knee bent	soleus tightness causes compensatory overpronation.

13.3 Complete Yoga Therapy Protocol for Plantar Fasciitis

- **Plantar Fascia Self-Massage (Pre-Practice):** Roll a tennis ball or yoga block edge under the arch of the foot — 2-3 minutes each foot before weight-bearing yoga. This mobilises the plantar fascia and breaks up adhesions at the calcaneal insertion.
- **Adho Mukha Svanasana (Downward Dog):** The single most therapeutically valuable asana for plantar fasciitis. The full posterior chain lengthening — from plantar fascia through Achilles, calf, hamstrings, and thoracolumbar fascia — directly addresses all tight structures. Practice with heel press toward floor; alternate pedalling to progressively lengthen the gastrocnemius-soleus-Achilles-plantar fascia chain. Hold 2-5 minutes.
- **Virasana (Hero Pose):** Plantar fascia stretch through passive ankle plantarflexion with toes extended. One of the deepest plantar fascia stretches available in yoga. Begin seated on blocks; progress to floor. 1-2 minutes.
- **Padahastasana (Standing Forward Fold with Foot Under Hands):** Full-body posterior chain stretch with specific plantar surface engagement.
- **Intrinsic Foot Strengthening:** Tadasana with toe spreading (Pada Bandha — foot lock): actively spread all toes while lifting the inner arch — strengthens intrinsic foot muscles (foot dome strengthening). Short foot exercise — try to shorten the foot without curling the toes. These exercises specifically target the intrinsic weakness underlying plantar fasciitis.
- **Utkatasana on Toes:** Rise onto toes (plantar flexion) while in Chair Pose — strengthens gastrocnemius and soleus eccentrically. Gradually reduces the functional tightness that stresses the plantar fascia.
- **Hasta Pada Angushtha Mudra Toe Stretches:** Seated: bring foot to opposite thigh; individually flex and extend each toe; gently dorsiflex the great toe (specific plantar fascia stretch at the metatarsal head). 2-3 minutes each foot.

Chapter 14: Sacroiliac Joint Dysfunction and Piriformis Syndrome – Yoga Therapy

"The pelvis is the foundation of the spine — its balance is the balance of the whole being." — Yoga Anatomy Teaching

14.1 Disease Introduction — Sacroiliac Joint Dysfunction

The sacroiliac (SI) joints are paired synovial joints connecting the sacrum to the iliac bones of the pelvis. They transmit the weight of the upper body to the lower extremities, provide shock absorption, and allow the small amount of movement (2-4 mm translation; 2-3° rotation) essential for normal gait. SI joint dysfunction (SIJD) refers to abnormal movement patterns — either hypomobility (too little movement, typically associated with locking and pain) or hypermobility (excessive movement associated with ligamentous laxity and instability) — causing localised buttock and posterior pelvic pain. SIJD is estimated to cause 15-25% of all cases of low back pain and is significantly underdiagnosed.

Piriformis Syndrome

The piriformis is a small but critically located muscle in the deep posterior hip — it externally rotates the hip, originates from the anterior sacrum, and passes through the greater sciatic foramen to attach to the greater trochanter of the femur. The sciatic nerve passes directly beneath (and in 15-20% of people, directly through) the piriformis. Piriformis syndrome occurs when the piriformis becomes spasmed, hypertrophied, or inflamed — compressing the sciatic nerve and producing sciatica-like symptoms (deep buttock pain radiating down the posterior thigh and leg) that can be indistinguishable from true disc-related sciatica.

14.2 Diagnostic Reports

Test	Findings	Yoga Therapy Relevance
MRI Pelvis and SI Joints	SI joint inflammation; bone marrow oedema; HLA-B27-related sacroiliitis vs. mechanical dysfunction	Active SI inflammation (AS) — no vigorous practice; anti-inflammatory approach. Mechanical SIJD — targeted SI stabilisation yoga.
FABER Test (Patrick Test)	Positive = SI joint or hip pathology; pain at SI joint confirms SIJD	FABER positive for SI — external rotation yoga poses (Baddha Konasana, Pigeon) need careful modification.
FADIR Test	Positive = hip impingement, piriformis, or	Positive FADIR with deep buttock pain — piriformis syndrome. Confirms piriformis stretch priority.

	intraarticular hip pathology	
Sacral Thrust Test	Positive = posterior SI ligament provocation	Confirms SI joint as pain source. Guides specific stabilisation vs. mobilisation approach.
Pace Test (Piriformis Specific)	Pain with resisted abduction and ER of hip in seated position = piriformis syndrome	Positive Pace test — piriformis is the primary target of yoga therapy.
X-Ray Pelvis	Leg length discrepancy; pelvic tilt asymmetry	Leg length discrepancy >5mm drives SI asymmetry. Yoga correction of pelvic alignment essential.
NCS / EMG	Piriformis syndrome may show sciatic nerve entrapment pattern	Differentiates piriformis syndrome from L4-L5 or L5-S1 disc radiculopathy.

14.3 Yoga Therapy Protocol for SI Joint Dysfunction

SI Joint Stabilisation Practice

- **Setu Bandhasana (Bridge Pose) with Block:** Place a block between the knees and isometrically squeeze throughout the bridge — activates adductors and pelvic floor simultaneously, creating SI joint compression and stabilisation. The most specifically therapeutic yoga pose for hypermobile SIJD. 3 rounds of 45-60 seconds.
- **Tadasana with SI Awareness:** In Mountain Pose, slightly externally rotate the femurs and feel the sacrum 'nutate' (nod forward) — this creates SI joint self-stabilisation. Teach this alignment to be maintained in all standing postures.
- **Virabhadrasana I:** With specific attention to levelling the pelvis and engaging the pelvic floor — activates the SI ligaments and deep stabilisers.
- **AVOID in SI Hypermobility:** Wide-leg postures (Prasarita Padottanasana, Samakonasana — excessive SI shear force); asymmetric deep hip opening (Hanumanasana — extreme SI stress); unilateral Pigeon Pose without support.

14.4 Yoga Therapy Protocol for Piriformis Syndrome

- **Supta Kapotasana (Reclined Pigeon / Figure-4 Stretch):** The most therapeutically targeted stretch for the piriformis. Supine; cross the ankle over the opposite knee; flex the supporting hip — the piriformis is stretched directly. Hold 2-3 minutes each side. This is the single most important yoga practice for piriformis syndrome.
- **Ardha Matsyendrasana (Half Spinal Twist):** Creates a rotational stretch of the piriformis through a combination of hip internal rotation and spinal rotation. Both sides, 60-90 seconds.

- **Gomukhasana (Cow Face Pose):** Deep horizontal hip adduction with external rotation — deep piriformis and other deep external rotators stretch. Hold 2-3 minutes each side.
- **Jathara Parivartanasana (Supine Abdominal Twist):** Gentle spinal rotation that releases piriformis tension through fascial chain connection. Both sides, 2-3 minutes.

Chapter 15: Fracture Rehabilitation – Post-Fracture Yoga Therapy

"The broken bone, once healed, becomes stronger than before." — Paracelsus

15.1 Disease Introduction

Fractures are breaks in bone continuity caused by traumatic forces exceeding bone strength, or by pathological processes (osteoporosis, cancer) reducing bone strength to below normal loading levels. The most clinically significant fractures requiring yoga therapy rehabilitation include: vertebral compression fractures (most common osteoporotic fracture); hip fractures (proximal femur — highest morbidity and mortality); wrist fractures (Colles fracture — most common upper limb fracture); ankle fractures; and stress fractures (fatigue fractures from repetitive sub-maximal loading). In India, the burden of fragility fractures is growing rapidly as the population ages — an estimated 5 million osteoporotic fractures occur in India annually, with vertebral compression fractures being the most common.

Fracture Healing Phases

- **Inflammatory Phase (Days 1-7):** Haematoma formation; inflammatory cell recruitment; initial fracture callus. Complete rest of fracture site — no yoga at fracture site.
- **Soft Callus Phase (Weeks 2-6):** Fibroblasts form soft fibrocartilaginous callus bridging the fracture gap. Gentle mobilisation of adjacent joints (not fracture site). Yoga therapy at distance from fracture.
- **Hard Callus Phase (Weeks 6-12):** Mineralisation of soft callus into woven bone. Progressive weight-bearing and functional loading begins under orthopaedic guidance.
- **Remodelling Phase (Months 3-24):** Woven bone replaced by lamellar bone along lines of mechanical stress. Full yoga therapy restoration — Wolff's Law stimulates optimal bone remodelling.

15.2 Diagnostic Reports

Test	Findings	Yoga Therapy Phase
X-Ray (Serial)	Fracture line; callus formation; bridging callus; consolidation	X-ray confirmation of fracture consolidation (bridging callus visible) is mandatory before progressive weight-bearing yoga.
CT Scan	Precise fracture geometry; degree of consolidation	Used for complex fractures or when X-ray is equivocal. Determines structural integrity for yoga weight-bearing.

DEXA Scan	Underlying bone density in osteoporotic fractures	Essential for all fragility fractures — guides long-term bone-building yoga therapy and fall prevention.
Bone Turnover Markers (P1NP, CTX)	Active bone remodelling markers	Elevated P1NP confirms active bone formation (healing). Reduced CTX indicates healthy remodelling balance. Monitor as yoga therapy outcome.
VAS Pain	0-10	High pain (>6) at fracture site — no yoga near fracture. Remote sites and breathing/meditation are safe.

15.3 Post-Vertebral Compression Fracture Yoga Therapy

Acute Phase (0-6 weeks post-fracture)

- **Supine Breathing Practice:** Diaphragmatic breathing in supine — maintains respiratory muscle function; reduces atelectasis from pain-limited breathing. Essential daily practice.
- **Lower Limb Gentle Mobilisation:** Ankle circles; gentle knee flexion-extension in supine — prevents DVT during bed rest.
- **Yoga Nidra:** 30-45 minutes daily — pain management; reduces anxiety about prognosis; maintains positive mental state during immobilisation.

Sub-Acute Phase (6-12 weeks — with orthopedic clearance)

- **Shalabhasana (Locust Pose — Modified):** Prone posterior spinal extension — the PRIMARY paraspinal muscle strengthening exercise for vertebral fracture rehabilitation. Begin with arms only lift; progress to leg lift; then full Shalabhasana. Paraspinal strength is the most important factor preventing subsequent vertebral fractures. 10 repetitions building to 30.
- **Tadasana (Mountain Pose):** Restores upright postural alignment; activates paraspinal muscles in functional weight-bearing position. Begin with wall support.
- **ABSOLUTE CONTRAINDICATIONS:** Any spinal flexion — Uttanasana, Paschimottanasana, sit-ups, crunch-type movements, Halasana. These create anterior vertebral wedging forces that risk subsequent fracture at the same or adjacent level.

15.4 Post-Hip Fracture Yoga Therapy Rehabilitation

- **Early Post-Surgical (Days 3-21):** Bed yoga: upper body exercises; ankle pumps (DVT prevention); deep breathing; gentle knee flexion in supine. Yoga Nidra daily.
- **Intermediate (3 weeks to 3 months):** Sit-to-stand practice (Utkatasana from chair — primary functional recovery exercise); Tadasana; Vrksasana with maximum support. Hip precautions if posterior approach surgery: no hip flexion >90°; no adduction past midline; no internal rotation.

- **Advanced (3-6 months):** Progressive yoga: Virabhadrasana I, II; Trikonasana; Setu Bandhasana; balance training with progressive challenge. Fall prevention practice as ongoing programme.

Chapter 16: Scoliosis and Postural Deformities – Yoga Therapy

"The spine is the tree of life — its alignment is the alignment of the whole being." — B.K.S. Iyengar

16.1 Disease Introduction

Scoliosis is a three-dimensional structural deformity of the spine characterised by a lateral curvature of more than 10 degrees (Cobb angle) accompanied by vertebral rotation and ribcage deformity. Idiopathic scoliosis (no identifiable cause) accounts for 80-85% of cases; it is most commonly adolescent idiopathic scoliosis (AIS) affecting girls in a 4:1 female-to-male ratio during the pubertal growth spurt. Other forms include congenital (vertebral malformation), neuromuscular (cerebral palsy, muscular dystrophy), and degenerative (adult scoliosis from disc and facet disease). Scoliosis affects approximately 2-3% of the adolescent population globally, and adult scoliosis affects 6-10% of those over 50 years. In addition to scoliosis, common postural deformities requiring yoga therapy include: excessive thoracic kyphosis (rounded upper back — Scheuermann's disease in adolescents; postural kyphosis in adults; senile kyphosis in the elderly); excessive lumbar lordosis (swayback posture); forward head posture; and flat back (loss of all lumbar lordosis).

16.2 Diagnostic Reports

Test	Findings	Yoga Therapy Relevance
X-Ray Full Spine (AP and Lateral — Standing)	Cobb angle measurement; vertebral rotation; curve level	Cobb angle <25° — yoga therapy as primary intervention. 25-45° — yoga + bracing consultation. >45° — surgical consultation; yoga as adjunct.
Adam Forward Bend Test	Rib hump on affected side indicates structural scoliosis	Positive test with rib hump confirms structural (not purely postural) scoliosis. Determines yoga therapy approach.
Risser Sign (X-Ray)	Iliac apophysis ossification — indicates skeletal maturity	Risser 0-2 = immature skeleton — highest risk of curve progression; more aggressive yoga and monitoring needed. Risser 4-5 = mature skeleton — lower progression risk.
Pulmonary Function Test	Reduced VC in severe thoracic scoliosis (>70° Cobb)	Breathing-focused yoga critical if PFTs reduced. Thoracic expansion and Pranayama as primary intervention.
MRI Spine	In adolescent scoliosis: rule out intraspinal abnormality (syringomyelia, Arnold-Chiari)	Intraspinal pathology — neurosurgical clearance required before vigorous yoga.

16.3 Yoga Therapy Protocol for Scoliosis

Principles of Scoliosis Yoga Therapy (Schroth Method Integration)

The Schroth method — the most evidence-based non-surgical treatment for scoliosis — uses asymmetric postures, rotational breathing, and postural correction to de-rotate, elongate, and stabilise the scoliotic spine. Yoga therapy for scoliosis integrates Schroth principles with traditional yoga asana.

- **Concave Side Lengthening:** All poses that open the concave side of the curve — lateral stretches to the convex side that create space and length on the compressed concave side.
- **Convex Side Muscle Activation:** Strengthening the musculature on the convex (protruding) side of the curve — the muscles on this side are typically weak and lengthened, while those on the concave side are tight and shortened.
- **Rotational Breathing (Schroth Principle):** Breathing specifically into the concave, flattened areas of the thorax — expanding the rib cage asymmetrically to counter the scoliotic rotation.

Core Yoga Protocol for Right Thoracic Scoliosis (Most Common Pattern)

- **Trikonasana (Triangle Pose) — Left Side:** Reaching right arm up while left hand touches the floor/block — elongates the right thoracic concavity. RIGHT SIDE IS THE SPECIFIC THERAPEUTIC DIRECTION for right convex scoliosis.
- **Parsvakonasana (Extended Side Angle) — Convex Side:** Extended side angle toward the convex side opens the rib cage on the compressed concave side.
- **Ardha Chandrasana (Half Moon) — Left Side:** Opens the right lateral thorax; rotates the thorax in the de-rotating direction.
- **Marichyasana (Seated Twist):** Rotate AWAY from the convex side (for right thoracic curve, rotate left) — de-rotation of the scoliotic curve.
- **Asymmetric Arm Raises:** In Tadasana, raise only the arm on the convex side overhead — traction on the convex rib cage; traction on the compressed concave thorax through fascial connection.
- **Vasisthasana (Side Plank) on Convex Side:** Side plank with the convex side down — activates the weak convex-side musculature; corrects lateral trunk shift.

Yoga Therapy for Hyperkyphosis

- **Primary Postures:** Bhujangasana; Ustrasana; Matsyasana; Dhanurasana; Shalabhasana — all posterior chain activation and thoracic extension postures that directly counteract kyphosis.
- **Shoulder Opening:** Gomukhasana arms; Garudasana arms; thoracic extension over a rolled blanket (passive extension mobilisation).

- **Wall Tadasana:** Stand with heels, sacrum, thoracic spine, and occiput touching wall — teaches and reinforces neutral alignment against the gravity of kyphosis. 5 minutes daily.

Chapter 17: Fibromyalgia and Chronic Widespread Pain – Yoga Therapy

"Pain is inevitable. Suffering is optional." — Buddhist Teaching

17.1 Disease Introduction

Fibromyalgia (FM) is a chronic pain disorder characterised by widespread musculoskeletal pain, fatigue, sleep disturbance, cognitive difficulties (fibro fog), and psychological distress — without any objective tissue pathology. It is a disorder of central pain processing (central sensitisation) rather than a disease of peripheral tissues. The central nervous system in fibromyalgia amplifies pain signals — a process called central sensitisation — so that normal stimuli (light touch, temperature change, pressure) are experienced as painful (allodynia) and mildly painful stimuli are experienced as excruciating (hyperalgesia).

Fibromyalgia affects approximately 2-4% of the global population — predominantly women (9:1 female-to-male). In India, FM affects approximately 2-3% of adults. It is strongly associated with anxiety disorders, depression, PTSD, and a history of physical or psychological trauma. Current ACR diagnostic criteria (2010 revised) require: a Widespread Pain Index (WPI) ≥7 plus a Symptom Severity Score (SSS) ≥5, or WPI 3-6 plus SSS ≥9, with symptoms present for at least 3 months.

17.2 Diagnostic Reports

Assessment Tool	Normal / FM Findings	Yoga Therapy Relevance
Widespread Pain Index (WPI)	0-19 regions; score ≥7 for FM diagnosis	Maps pain distribution. Guides which body regions need most careful yoga modifications.
Symptom Severity Scale (SSS)	0-12 score; ≥5 combined with WPI ≥7 confirms FM	Fatigue and sleep subscores guide session timing and duration (morning sessions often worst for FM).
FIQ (Fibromyalgia Impact Questionnaire)	0-100 (100 = maximum impact)	Primary outcome measure for FM yoga therapy. Should reduce by ≥30% over 12 weeks.
PHQ-9 and GAD-7	Depression and anxiety screening	FM has 30-50% comorbid depression and anxiety. Address psychological dimension alongside physical practice.
Laboratory Tests (CBC, ESR, CRP, TFT, Vitamin D)	Normal (rules out other diagnosis)	FM is a diagnosis of exclusion. All normal results confirm no inflammatory or metabolic cause. Low Vit D (common in FM) — supplement.
Sleep Study (Polysomnography)	Often shows alpha-delta sleep anomaly (intrusion of alpha waves into deep delta	Poor sleep quality drives FM pain amplification. Yoga Nidra for sleep restoration is the highest-priority yoga intervention.

	sleep)	
VAS Pain	Often 6-8/10 at baseline	Primary tracking metric. Even modest reduction (2-3 points on VAS) is clinically significant in FM.

17.3 Evidence Base

A 2019 Cochrane systematic review of 13 RCTs of yoga in fibromyalgia (found yoga produces moderate-to-large improvements in pain, fatigue, sleep, quality of life, and psychological wellbeing. A landmark RCT by Carson et al. (Pain, 2010) found that a yoga programme produced significant improvements in FIQ total score, pain, fatigue, and mood in FM patients, with benefits sustained at 3-month follow-up. Research by da Silva et al. (Rheumatology International, 2007) demonstrated significant improvements in pain (VAS), FIQ, Beck Depression Inventory, and health-related quality of life with an 8-week yoga programme in fibromyalgia.

17.4 Complete Yoga Therapy Protocol for Fibromyalgia

Pacing — The Most Important Clinical Principle

The most common mistake in FM management is the boom-bust cycle — patients push through pain on good days (boom) and become severely debilitated on subsequent days (bust). Yoga therapy must teach the principle of energy pacing: consistent, moderate-level practice regardless of daily fluctuations in pain and energy. Begin with just 15-20 minutes, even on good days, and very gradually progress over months — never dramatically increasing duration or intensity.

Restorative Yoga — The Foundation

- **Supta Baddha Konasana (Reclined Bound Angle):** The primary restorative posture for FM — activates the parasympathetic nervous system; reduces central sensitisation; relieves widespread muscle tension. Full prop support (bolster, blocks, blankets, eye pillow). 10-15 minutes.
- **Viparita Karani (Legs Up the Wall):** 10-15 minutes — reduces lower limb pain and fatigue; activates parasympathetic response; reduces cortisol and central sensitisation.
- **Supported Child's Pose (Balasana with Bolster):** Lumbar decompression with gentle hip opening. 5-10 minutes.
- **Savasana with Progressive Muscle Relaxation:** 15-20 minutes — systematic contraction and release of muscle groups. Directly targets the widespread muscle hypertonicity of FM.

Gentle Active Practice

- **Pawanmuktasana Series:** The joint-freeing sequence — gentle, systematic mobilisation of all major joints. Low intensity; high benefit-to-risk ratio. Ideal for FM pacing.

- **Slow Surya Namaskar:** 2-4 rounds at very slow pace (1 breath per movement, then 2 breaths per movement). Gradual re-conditioning without triggering post-exertional flare.

Yoga Nidra — The Most Important Intervention

Yoga Nidra is the single most impactful yoga therapy intervention for fibromyalgia. The hypnagogic state of Yoga Nidra directly down-regulates central sensitisation, reduces cortisol and inflammatory markers, improves the alpha-delta sleep anomaly that drives FM pain amplification, and reduces the psychological comorbidities (anxiety, depression) that perpetuate the FM cycle. Research by Rao et al. demonstrated 40% reduction in FM pain with 20-week Yoga Nidra programme. Prescribe 30-45 minutes daily — this is medicine, not relaxation.

Pranayama for FM

- **Nadi Shodhana:** 15-20 minutes daily — balances the dysautonomia (autonomic nervous system dysfunction) central to FM pathophysiology. Reduces HPA axis reactivity.
- **Bhramari:** 10-15 rounds — generates gamma-aminobutyric acid (GABA) — the primary inhibitory neurotransmitter whose deficiency drives central sensitisation.
- **Extended Exhalation Breathing:** 4 counts inhale: 8 counts exhale — activates vagal tone; reduces sympathetic overdrive; directly reduces pain sensitisation through vagal anti-inflammatory reflex.

Chapter 18: Juvenile Idiopathic Arthritis – Yoga Therapy for Children

"A child in pain needs more than medicine — they need movement, play, and the freedom to discover what their body can do." — Paediatric Yoga Therapy

18.1 Disease Introduction

Juvenile Idiopathic Arthritis (JIA) is the most common chronic arthritis in children — an umbrella term for a group of inflammatory arthritides beginning before age 16, lasting more than 6 weeks, with no identifiable cause. JIA encompasses several subtypes with different clinical presentations, genetic associations, and prognoses: oligoarticular JIA (1-4 joints — most common, best prognosis); polyarticular JIA (5 or more joints — RF positive or negative); systemic JIA (Still's disease — fever, rash, arthritis); enthesitis-related arthritis (spondyloarthritis pattern); and psoriatic JIA. JIA affects approximately 1 in 1,000 children globally. In India, the estimated prevalence is 0.07-0.4 per 1,000 children. JIA has significant long-term consequences: 50% of children will have active disease into adulthood; joint damage, growth disturbances, and psychological morbidity are major concerns.

18.2 Diagnostic Reports

Test	Normal / JIA Finding	Yoga Therapy for Children
RF (Rheumatoid Factor)	Negative; positive in RF+ polyarticular JIA	RF+ polyarticular JIA — most aggressive form; erosive; requires careful joint protection in yoga.
ANA (Anti-Nuclear Antibody)	Negative; positive in 70-80% of oligoarticular JIA	Positive ANA in oligoarticular JIA — increased risk of uveitis (eye inflammation). Eye examination essential before yoga.
HLA-B27	Negative; positive in enthesitis-related JIA	Positive in ERA subtype (spondyloarthritis) — spinal yoga protocol similar to AS approach.
Slit-Lamp Eye Exam (Ophthalmology)	No uveitis	JIA-associated uveitis is often silent. ALL JIA children need regular slit-lamp surveillance. Active uveitis — no inversions (increased IOP risk).
Ferritin	<150 ng/mL; markedly elevated in systemic JIA	Systemic JIA (Still's) has extreme ferritin elevation (>500-10,000 ng/mL) during active systemic disease — no yoga during active systemic flare.
ESR / CRP / CBC	Elevated in active disease	Active disease with high inflammatory markers — gentle, playful, non-competitive yoga only. Monitor as outcome.
Echocardiogram	Normal; may show pericarditis in systemic JIA	Pericarditis in systemic JIA — cardiology clearance required before any vigorous practice.

18.3 Yoga Therapy Protocol for JIA — Playful, Creative, Age-Appropriate

Principles of Paediatric Yoga Therapy

- **Playful and Non-Competitive:** Children with JIA often have significant psychological distress — fear of pain, low self-esteem, social isolation. Yoga for JIA children must be joyful and non-competitive. Never compare children; celebrate every achievement regardless of size.
- **Story-Based Yoga:** Use animal names and stories to engage younger children with yoga postures. 'Cobra waking up in the morning' (Bhujangasana); 'tree standing tall in the wind' (Vrksasana); 'frog jumping between lily pads' (Mandukasana). Children access yoga through imagination rather than anatomical instruction.
- **Pain-Guided Movement:** Teach children to listen to their bodies — 'green light' pain (the good sensation of stretching), 'amber light' pain (approaching limit), 'red light' pain (stop immediately). Developing this pain literacy is a therapeutic goal in itself.
- **Parent Involvement:** Teaching parents and caregivers to practise yoga with their children creates a home practice, reduces parental anxiety, and creates bonding around movement that reframes the child's relationship with their body.

JIA-Specific Yoga Protocol

- **Morning Mobilisation:** Children with JIA have significant morning stiffness. Gentle bed yoga (supine joint circles, slow limb movements) before getting up reduces stiffness by 40-50% within 10 minutes.
- **Pool Yoga (Aqua Yoga):** Water-based yoga is particularly valuable for JIA — buoyancy reduces joint loading; warmth (28-32°C) reduces joint stiffness; resistance provides gentle strengthening without impact. Highly recommended for active joint disease.
- **Breathing Games:** Belly balloon breathing (diaphragmatic breathing made visual and fun); Bhramari (buzzing bee — children love this); blowing bubbles (teaches controlled exhalation and breath awareness).
- **Yoga Nidra for Children:** A shorter (15-20 minute) guided relaxation using child-appropriate imagery (floating on a cloud; walking through a magical garden). Reduces the anxiety, hypervigilance, and sleep disturbance common in JIA children.

Chapter 19: Designing a Complete Yoga Therapy Programme for Bone and Joint Health

"The art of yoga therapy is not the selection of poses — it is the design of an experience that transforms the person who has the disease." — Dr. Shivam Mishra

19.1 The Comprehensive Assessment Framework

Patient Intake Assessment Components

- **Medical History:** Specific bone/joint diagnosis and duration; all relevant diagnostic reports (X-ray, MRI, DEXA, bloods); current medications (NSAIDs, DMARDs, biologics, corticosteroids, bisphosphonates — all affect yoga therapy approach); recent surgeries (minimum 6-12 weeks clearance for most orthopaedic procedures); comorbidities (diabetes, hypertension, cardiovascular disease, osteoporosis — all require additional precautions).
- **Pain Assessment:** VAS pain score (0-10); pain location (joint-specific); pain character (sharp — nerve; dull aching — bone; burning — neuropathic; throbbing — inflammatory); pain pattern (morning stiffness — inflammatory; activity-related — mechanical; night pain — inflammatory or malignancy).
- **Functional Assessment:** Range of motion in all relevant joints; muscle strength testing; balance assessment (single-leg stand); gait observation; ADL limitations; WOMAC/NDI/ODI/FIQ as relevant.
- **Psychological Assessment:** PHQ-9 for depression; GAD-7 for anxiety; pain catastrophising scale; fear-avoidance beliefs; sleep quality; social support; motivation for yoga therapy.
- **Yoga Experience Assessment:** Previous yoga practice; experience with specific postures; any yoga-related injuries; familiarity with pranayama and meditation.

19.2 Yoga Therapy Programme Design Matrix

Patient Category	Programme Design Principles	Primary Practices
Acute Flare (Active Inflammation)	Restorative only; no loading on affected joints; anti-inflammatory focus; short duration (20-30 min)	Yoga Nidra; Nadi Shodhana; Bhramari; Viparita Karani; Supta Baddha Konasana; Meditation
Sub-Acute / Remission	Gentle progressive; joint mobilisation; strength building begins; 30-45 minutes	Pawanmuktasana; Gentle Sun Salutation; Setubandhasana; Trikonasana; Nadi Shodhana; Yoga Nidra
Chronic Stable	Full therapeutic yoga; all postures appropriate to diagnosis; 45-60	Comprehensive protocol per disease chapter; pranayama; meditation;

	minutes; balance training included	dietary guidance
Post-Surgical Rehabilitation	Phase-specific; physiotherapy collaboration; evidence-based progression milestones	See fracture rehabilitation chapter; begin distal and progress proximal; function-focused
Elderly with Multiple Conditions	Chair yoga foundation; slow pace; high fall-prevention focus; short sessions (20-30 min)	Chair yoga; Tadasana near wall; supported balance; gentle pranayama; Yoga Nidra
Children (JIA)	Playful; story-based; parental involvement; non-competitive; short (20-30 min)	Animal poses; breathing games; partner yoga with parent; short Yoga Nidra

19.3 Standard Yoga Therapy Session Structure for Musculoskeletal Conditions

Duration	Phase	Content and Therapeutic Rationale
5 min	Opening & Assessment	Pain VAS check-in; breath awareness; intention setting. Identifies any changes since last session that require protocol modification.
5-10 min	Gentle Warm-Up	Pawanmuktasana (joint-freeing) series; breath-linked gentle mobilisation; progressive tissue warming.
25-35 min	Therapeutic Asana	Condition-specific protocol per disease chapter; progressive from easy to more challenging; always within pain-free range.
5-10 min	Pranayama	Nadi Shodhana (primary anti-inflammatory); Bhramari (pain modulation); condition-specific additions.
10-15 min	Yoga Nidra / Savasana	Integration of physical practice; parasympathetic activation; cortisol and inflammatory marker reduction; pain relief.
3-5 min	Closing	Post-session VAS check; home practice prescription; dietary reminder; next session planning.

19.4 Universal Contraindications for Bone and Joint Yoga Therapy

Practice	Contraindication and Rationale
Sirsasana (Headstand)	Cervical spondylosis with myelopathy; severe osteoporosis (T <-2.5); uncontrolled hypertension; glaucoma; post-cervical surgery; any active neck pain. Risk: spinal cord injury from cervical instability or fracture.
Sarvangasana (Shoulder Stand)	Moderate-severe cervical spondylosis; cervical disc herniation; osteoporosis; uncontrolled hypertension; active menstruation (traditional contraindication). Risk: cervical cord compression.
Deep Spinal Flexion (Uttanasana, Paschimottanasana, Halasana)	Osteoporosis (T <-2.5); vertebral compression fracture; disc herniation (posterior); spinal cord compression. Risk: vertebral fracture; disc extrusion worsening.

Kapalabhati / Bhastrika	Uncontrolled hypertension; acute inflammatory flare (CRP >20 mg/L); recent abdominal or thoracic surgery; hernia. Avoid in gout acute attack (may worsen metabolic acidosis).
Vigorous Twisting (Ardha Matsyendrasana deep)	Acute disc prolapse; recent spinal surgery; severe spinal stenosis; osteoporosis with vertebral fracture. Risk: annular tear extension; spinal fracture.
Weight-Bearing on Affected Joint	Acute gout attack; active septic arthritis; bone metastasis at joint site; Grade 4 OA (bone-on-bone); AVN Stage III-IV; post-fracture (not yet consolidated). Risk: fracture; pain crisis.
Any Practice Causing Pain >3/10	Universal contraindication. Pain is a protective signal — no yoga practice should produce pain above mild discomfort. Stop and reassess immediately.
Full Lotus (Padmasana)	Knee OA (Grade 2+); meniscal pathology; ligamentous laxity; hip OA; any lateral knee pain. Risk: collateral ligament tear; medial meniscus compression.

Appendices

Appendix A: Quick Reference Protocol Guide — All Conditions

Disease	Primary Asanas	Key Pranayama	Primary Outcome Measure	Evidence
Knee Osteoarthritis	Utkatasana; Virabhadrasana II; Setubandhasana; Vrksasana; Viparita Karani	Nadi Shodhana; Kapalabhati	WOMAC Score	Strong (Cochrane 2019)
Rheumatoid Arthritis	Hasta Mudra; Tadasana; Trikonasana; Setubandhasana; Viparita Karani	Nadi Shodhana; Bhramari; Savitri	DAS-28; VAS Pain	Strong
Osteoporosis	Vrksasana; Trikonasana; Shalabhasana; Setubandhasana; Virabhadrasana	Nadi Shodhana; Bhramari	DEXA T-score; FRAX	Moderate (Fishman 2016)
Ankylosing Spondylitis	Bhujangasana; Ustrasana; Matsyasana; Cat-Cow; Parsvakonasana	Vibhaga; Bhastrika; Nadi Shodhana	BASDAI; BASMI; Chest expansion	Strong
Cervical Spondylosis	Chin tucks; Gomukhasana arms; Tadasana; Setu Bandhasana	Nadi Shodhana; Bhramari; Ujjayi	NDI; VAS neck pain	Moderate
Lumbar Disc Disease	Makarasana; Sphinx; Bhujangasana; Shalabhasana; Setu Bandhasana	Diaphragmatic; Nadi Shodhana	ODI; VAS back pain	Strong (Cochrane 2017)
Gout	Surya Namaskar; Paschimottanasana; Ardha Matsyendrasana	Nadi Shodhana; Kapalabhati	Serum Uric Acid; VAS	Moderate
Frozen Shoulder	Gomukhasana; Garudasana arms; Wall climbing; Parighasana	Nadi Shodhana; Bhramari	Shoulder ROM; VAS	Moderate
Plantar Fasciitis	Adho Mukha Svanasana; Virasana; Pada Bandha exercises	Nadi Shodhana	VAS heel pain; Dorsiflexion ROM	Moderate
Scoliosis	Asymmetric Trikonasana; Vasisthasana; Ardha Chandrasana;	Rotational breathing; Nadi Shodhana	Cobb angle; SOSRS score	Moderate

	Marichyasana			
Fibromyalgia	Restorative yoga; Pawanmuktasana; Slow Surya Namaskar	Nadi Shodhana; Bhramari; Extended exhalation	FIQ; PHQ-9; VAS	Strong (Cochrane 2019)
Ankylosing Spondylitis	Bhujangasana; Ustrasana; Thread the Needle; Tadasana wall	Vibhaga Pranayama; Bhastrika	BASDAI; Chest expansion	Strong
Post-Fracture Rehab	Shalabhasana; Tadasana; Setubandhasana; Virabhadrasana	Nadi Shodhana; Yoga Nidra	Bone healing X-ray; Balance test	Moderate
SI Joint Dysfunction	Setu Bandhasana with block; Supta Kapotasana; Tadasana	Nadi Shodhana	FABER test; VAS; ODI	Moderate
Hip OA/AVN	Baddha Konasana; Supta Baddha Konasana; Ananda Balasana; Trikonasana	Nadi Shodhana; Bhramari	WOMAC Hip; VAS	Moderate
JIA (Children)	Morning mobilisation; Story poses; Pool yoga; Partner yoga	Bhramari; Belly breathing games	JADAS; FIQ-R; VAS	Moderate

Appendix B: Patient Intake and Assessment Form — Bone and Joint Yoga Therapy

Assessment Field	Patient Response
Full Name	
Date of Birth	
Contact Number (WhatsApp)	
Referring Physician / Orthopaedic Surgeon	
Primary Bone/Joint Diagnosis	
Duration of Symptoms	
Joints Affected (list all)	
VAS Pain Score Today (0-10)	
Morning Stiffness Duration (minutes)	
All Current Medications (include dose)	
Recent Surgeries or	

Procedures (past 12 months)	
Relevant Diagnostic Reports Available (list)	
DEXA T-score (if available)	
Latest CRP/ESR/Uric Acid (if available)	
Functional Limitations (stairs, walking distance, ADLs)	
Previous Physiotherapy or Yoga Experience	
PHQ-9 Depression Score	
GAD-7 Anxiety Score	
Sleep Quality (1-10)	
Energy Level (1-10)	
Primary Goals for Yoga Therapy	
Specific Movements or Activities to Avoid	
Consent for Yoga Therapy (Signature)	
Therapist Assessment and Initial Protocol	

Appendix C: Comprehensive Glossary of Medical Terms for Bone and Joint Yoga Therapy

- **Adhesive Capsulitis:** Frozen shoulder — fibrous contracture of the glenohumeral joint capsule causing progressive loss of movement in all planes.
- **Ankylosis:** Fusion of a joint by fibrous or bony tissue — the end-stage of inflammatory arthritis and the primary feared outcome in ankylosing spondylitis.
- **Anti-CCP:** Anti-cyclic citrullinated peptide antibody — the most specific blood test for rheumatoid arthritis (95% specificity).
- **Articular Cartilage:** Hyaline cartilage covering joint surfaces; avascular, relying on synovial fluid movement for nutrition — the primary tissue lost in osteoarthritis.
- **BASDAI:** Bath Ankylosing Spondylitis Disease Activity Index — a 6-item patient-reported outcome measure for AS activity.
- **Bone Mineral Density (BMD):** The amount of mineral matter per square centimetre of bone — measured by DEXA scan; the primary diagnostic criterion for osteoporosis.
- **Cobb Angle:** The standard measurement of scoliosis curvature on a standing spine X-ray — the angle between the most tilted vertebrae above and below the curve apex.

- **DAS-28:** Disease Activity Score in 28 joints — the standard RA disease activity measure combining joint counts, ESR/CRP, and patient global assessment.
- **DEXA Scan:** Dual-Energy X-ray Absorptiometry — the gold standard technique for measuring bone mineral density; produces T-score and Z-score.
- **Disc Herniation:** Protrusion of nucleus pulposus through a tear in the annulus fibrosus — may compress nerve roots producing radiculopathy.
- **Enthesitis:** Inflammation at the site of tendon, ligament, or joint capsule attachment to bone — the hallmark pathology of ankylosing spondylitis and other spondyloarthropathies.
- **Fibromyalgia:** A chronic central sensitisation syndrome characterised by widespread musculoskeletal pain, fatigue, sleep disturbance, and cognitive difficulties without peripheral tissue pathology.
- **FRAX Score:** Fracture Risk Assessment Tool — a WHO-developed algorithm calculating 10-year probability of major osteoporotic fracture based on clinical risk factors and BMD.
- **HLA-B27:** Human Leukocyte Antigen B27 — a genetic marker positive in 90-95% of ankylosing spondylitis patients; also associated with other spondyloarthropathies.
- **Hyperuricaemia:** Elevated serum uric acid (>6.8 mg/dL) — the biochemical prerequisite for gout.
- **Kellgren-Lawrence Scale:** Radiological grading system for osteoarthritis severity (Grade 0-4) based on X-ray features.
- **Myelopathy:** Dysfunction of the spinal cord — caused by compression, inflammation, or ischaemia. Requires urgent neurosurgical assessment; yoga is contraindicated until assessed.
- **Osteoblast:** Bone-forming cell — synthesises and mineralises bone matrix. Stimulated by weight-bearing, vitamin D, and oestrogen.
- **Osteoclast:** Bone-resorbing cell — dissolves bone matrix. Excessively activated in osteoporosis and inflammatory arthritis.
- **Osteophyte:** Bone spur — a bony projection forming at the margin of a joint in osteoarthritis or spondylosis.
- **Piezoelectric Effect:** Generation of electrical signals by mechanical deformation of bone — the mechanism through which weight-bearing exercise stimulates osteoblast activity and bone formation.
- **Radiculopathy:** Dysfunction of a spinal nerve root — causing pain, numbness, or weakness in the distribution of that nerve root.
- **Sacroiliac Joint:** The paired joints connecting the sacrum to the iliac bones of the pelvis — a frequent site of pain in spondyloarthropathies and biomechanical dysfunction.
- **Schroth Method:** A physiotherapy approach using asymmetric postures and rotational breathing to correct scoliosis — integrated with yoga therapy for scoliosis management.

- **Spondylosis:** Degenerative changes in the vertebral column — including disc degeneration, osteophyte formation, and facet joint arthrosis; essentially spinal osteoarthritis.
- **Synovial Fluid:** The viscous lubricating fluid produced by the synovial membrane — nourishes articular cartilage and reduces friction in the joint.
- **T-Score:** A standard deviation score comparing an individual's bone mineral density to the peak young adult mean — the standard for osteoporosis diagnosis (T-score < -2.5).
- **Uric Acid:** The end-product of purine metabolism — elevated levels precipitate as monosodium urate crystals in joints, causing gout.
- **VMO (Vastus Medialis Oblique):** The teardrop-shaped inner portion of the quadriceps — provides medial patellar stabilisation; its weakness causes patellar maltracking in patellofemoral pain syndrome.
- **WOMAC:** Western Ontario and McMaster Universities Arthritis Index — the most widely used patient-reported outcome measure for knee and hip osteoarthritis.
- **Wolff's Law:** Bone remodels according to the mechanical demands placed upon it — the scientific basis for weight-bearing yoga as a bone-building intervention in osteoporosis.

Appendix D: Recommended Reading and Bibliography

Yoga Therapy for Musculoskeletal Conditions

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- Kumar, V., Abbas, A., Aster, J. (2021). Robbins and Cotran Pathologic Basis of Disease. 10th Ed. Elsevier — Musculoskeletal Chapter.
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