Movement impairment syndrome

Shirly Sahrman

Basic question

What is the cause of back pain?

Following structures can give rise to pain :

- Vertebrae: (nociceptors in periostium and blood vessels).
- Intervertebral disk (annulus, scar)
- Dura and nerve root sleeves
- Facet joint capsules
- Lig. And facia
- Muscle

Back pain is a physical problem

- **Introduction:**

- How about psychosocial issues?

- We must start with clinical problem,

Then look at the basic science to explain o clinical observation

Pain receptors:

Structures with nerve endings: tendon, lig, joint capsule,

Kellgren: possible sources of LBP: injection of hypertonic saline in to various low back structures

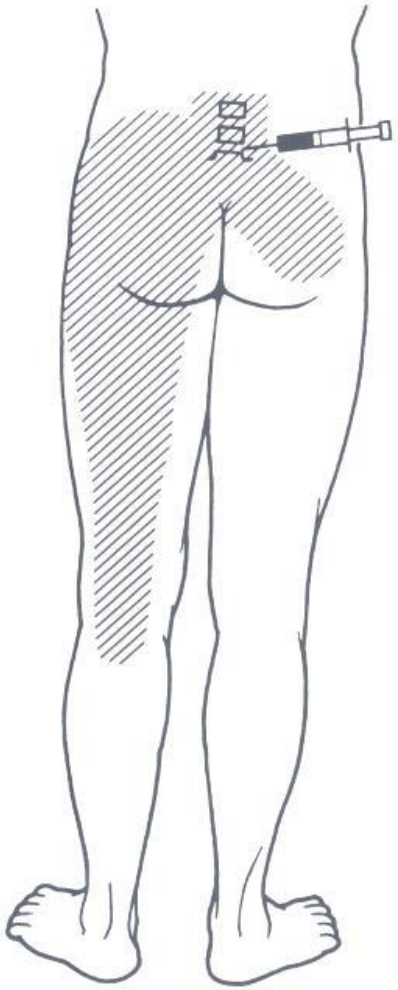


Figure 2.5 Referred leg pain is dull, ill-localized

All these structures

- Post. Primary rami of the lumbar nerve roots supply all these structures.
- Links with sympathetic and parasympathetic nerves.
- Stimulation of most of these structures can produce pain in the lower back and referred pain into the legs similar to that in patients.

However:

- Identifying a sensitive site to artificial stimulation is not necessarily the same as finding the cause of the clinical problem.

- The anatomic site and the pathologic nature of any disorder are separate issue.

- Even if we find the site of pain, that does not diagnose pathology. Eg: pain in hip,
- If we cannt localize an anatomic site, we may understand the nature of it: neurologic disease.

A structural basis for back pain?

- Orthodox medicine, orthopedics and biomechanics look for a structural cause for back pain: disease, injury or damage.

Radiologic anomalies

Box 9.2 Radiographic anomalies that appear to be incidental findings in adult back pain (Wiltse 1971, Van Tulder et al 1997, Nachemson & Vingaord 2000)

- Transitional vertebra
- Lumbarization, sacralization
- Spina bifida occulta
- Accessory ossicles
- Schmorl's nodes
- Disk calcification
- Height of sacrum in pelvis
- Lumbosacral angle
- Lumbar lordosis
- Mild–moderate scoliosis
- Spondylolysis
- Spondylolisthesis
- Scheuermann's disease

Cause and effect of anatomic coincidence?

- Red hair logic!

- Anesthetic blocks or specific treatment should relive the pain.

Disk degeneration

- Iresistable X-ray and MRI changes

Figure 9.1 Severe degenerative changes ... an incidental

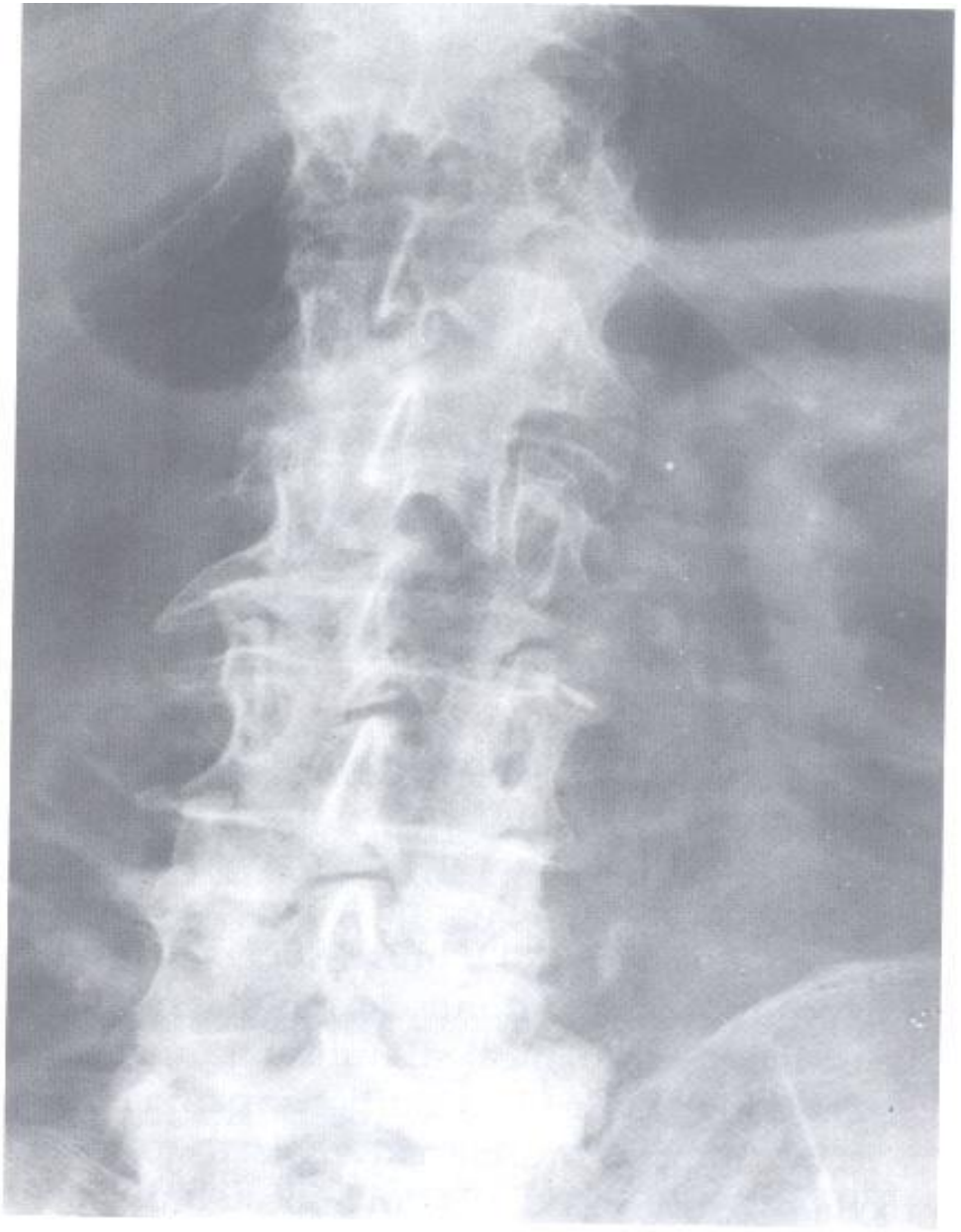


Figure 9.1 Severe degenerative changes ... an incidental

Aging or Degeneration?

- We know about gross changes, histology, biochemistry, and biomechanics of disk.

- Increase changes with age
- Degenration
- How to distinguish them: aging or gegeneration?
- Adams (2002): normal aging: biochemical and functional changes in the composition of disk
- Pathologic Degeneration: structural changes
- But they go together

cause and effect

Van Tulder (1997) compared X-ray in people with or without symptoms: ***Weak association between degenerative changes and back pain,***

But

1. Asymptomatic people show the same changes. 2. They had the symptoms in the

past and back pain at present.

No cause and effect.

X-ray and MRI

- There is strong evidence that X-ray and MRI findings have no predictive value for future low back pain or disability.

- Back pain does not increase with age but peaks in middle life.

- Patients with LBP and normal, asymptomatic people show similar age related findings in their disks.

Conclusion

- They failed to find the cause of back pain.

- Our starting assumption is questionable:
- Back pain is due to disease, or injury or structural damage.
- Soft tissue is as important or more important than bones, disks, and nerves.

Conclusion

- Physiologic rather than anatomic?
- Hypothesis:
- disturbed function is more important than structural damage

Clinical concepts of dysfunction

- Structure and function are intimately related.
- We used structure as a starting point to understand disturbed dysfunction.

- Let approach the Problem from opposite direction: **dysfunction as a possible explanation for back pain.**

Clinical concepts of dysfunction

- The key concept in Osteopathy, chiropractic and physiotherapy (alternative medicine):

- **A painful musculoskeletal dysfunction, which may occur in tissues that are structurally normal.**

- **Primary dysfunction arising in response to abnormal forces imposed on or generated within the musculoskeletal system.**

Clinical concepts of dysfunction

- MacDonald gave more exetensive list of possible dysfunction (box 9.4):

- **Altered pattern of movement**
- **Altered muscle function**
- **Soft tissue changes due to changed autonomic function neurophysiologic changes**
- **Psychophysiologic changes**

- **They are all integral elements of the one functional unit, no matter how or where the problem started.**

Altered pattern of movementt

- Vertebra or disc out of place? Discredited now, too much emphasis on anatomy and structural pathology
- Limitation of movement? ROM is normal in patient with CLBP.
- **More complex: dynamic patterns of movement.**

Altered pattern of movementt

- **It may be possible to palpate altered patterns of movement at one or more segmental level: postural disturbance, hypo-hyper mobility, lack of joint play,** *Quality of joint movement may vary,* **altered end feel, locking. Palpation of these abnormalities may produce tenderness or pain.**

Altered Muscle function

- Grieve (1981): dysfunction often involves muscle imbalance which may give clinical pattern of postural disturbance.

- Example:
- tightness: erector spine, iliopsoas, and hamstring
- Weakness: abdominal muscles, glutei, anterior tibial muscles. Increased lumbar lordosis and limitation of hip and knee extension.

Example

Sedentary lifestyle:

- Overuse of postural muscles
- Phasic muscles become weak and disuse
- Shortening of postural muscles
- Streching of phasic muscles
- Muscle imbalance may cause abnormal loads on joints and other structures, abnormal pattern of movement, muscle fatigue, and loss of coordination.

Abnormal mechanical loading

- Mechanical loading is good for ur back.
- Abnormal, localised stress concentration cause pain.
- Even small forces on small area (pricking with a pin).
- Small changes in posture and spinal loading over time generate stress concentration.
- Abnormal posture cause change in orientation of adjecent vertebrae.

Abnormal mechanical loading

- Muscle spasm and high forces in antagonistic muscles increase the compressive forces and loading on the spine.

- Sustained loading cause creep which may alter anatomic relationship.

Disturbed lumbar motion

- Dynamic pattern of movement is important:
- Change in balance of lumbar and pelvic movement, or between flexion and extension.

- What happens during movement and how various components work and interact.

- Mental process can affect spinal movement and loading:

Disturbed lumbar motion

- Study of spinal load in 60 subjects:
- Impact of simple or complex mental decisions before and during lifting;

- Simultaneous, more complex and faster decisions led to poorer muscle coordination, greater loads on the spine:

- Greater psychosocial stress could increase biomechanical load and risk of injury or dysfunction.

Examples

- They were Examples of pain from normal mus. And joints, u don’t need structural damage. Pain from musculoskeletal dysfunction

- Electric kettle: electrician to fix the hardware

- PC: software problem.

An explanation for patients

Summary

An explanation for patients

- Back pain is a symptom, not a disease. Most back pain is not due to any serious disease or damage in your back
- Back pain is usually a symptom of *physical dysfunction*. Your back is simply not moving and working as it should. It is unfit or out of condition
- Recovery and relief of pain depend on getting your back moving and working again and restoring normal function

Clinical consequence (1)

- What is the clinical consequence of this approach?

- **Diagnosis?**
- Basically what are you looking for?
- Which structure? or which function?
- X ray?
- MRI?
- ROM?

Clinical consequence (2)

- **Prognosis:**

- 1) Duration of back pain:
- Injury is followed by healing
- Dysfunction may be self sustaining, may persist indefinitely.

- 2) However dysfunction does not involve any permanent change. So it is **always** reversible.

- There is **always** the potential for recovery by restoring normal function

Clinical consequence (3)

- **Intervention:**
- Mobilization?
- Manipulation?
- Stretching?
- Strenghening?
- Exs?

Introduction

- On rare occasions someone comes along who challenges the way we view our world.
- New eyes
- “The eye can only see what the brain knows”.
- Stalker: I apply this knowledge for every patient assessment in my practice.
- She is the first who categorized pain disorders to movement impairment categories.

- Diagnose and treatment of movement impairment syndromes gives the clinicians the necessary information to diagnose the various impairment with confidence.

- It provide the researchers the grounding to perform the necessary investigation to expand the diagnostic categories and treatment protocols for body regions not discussed in this book.

- Stimulus for other researchers

- “I have seen this clinical scenario many times”

Sahrmann

- Frequently the obvious answer to a problem is overlooked: hand washing

- similarly using medical treatment of the symptoms for MSP instead of mechanical cause.

- Alignment and movement pattern
- Postural alignment is the basis of movement patterns.

- Sit straight!
- Stand straight!

- Today the slouched and slumped position is acceptable. And we sit more than past.

Exercise

- Is advocated
- But every day activities (repeated movement) is neglected.

- In faulty alignment optimal movement is difficult.

- We sit more than past

- Kyphotic posture in old women. But young women don’t try to prevent increase of thoracic curve.

- (from Waddell: altered pattern of movement and functional instead of structural).

- Wolff law: Bones adopt the shape of the forces that impose on them.

- The tissues controlling the alignment and stability of the joints are also influenced by the forces placed on them.

Sedentary lifestyle

- Sedentary lifestyle:
- lack of physical demand:
- not well developed MS as it should be:
- predisposing to injury,
- predisposing to mechanical injury from repeated movement of everyday activities.

Established pattern

- Once a pattern of behavior is established it becomes a prevailing pattern, it repeated over and over.

- At work:
- Turning to work on computer
- Turning to answer to tel.
- Turning to adjoining counter

- A mother turns toward the backseat
- Mothers get in and out of their cars repeatedly.

Cont.

- Dentist work on the same side of patient
- Cardiologist repeatedly bend over to use stethoscope
- Golfer and racquet player repeatedly swing …..
- Even sleeping on the same side

can induce alignment changes.

Purpose of the workshop 1

- Describe the changes induced in movement patterns and tissues by everyday activities.

- The proposed thesis is that correcting these movement pattern ***reduce pain*** and ***prevent*** them.

  (responsibilities of patients to correct body mechanics instead of relying on drugs)

Movement impairment syndromes of the shoulder, low back and hip will be described.

Purpose of the workshop 2

- Describe how the basic tests of PT combined with observation of alteration in normal anatomy and kinesiology can be used to organize a classification system on movement impairments.

- The focal premise is that joints develop a directional susceptibility to movement which then becomes the weak link and most often the site of pain

This workshop

- section 1:historical and professional events that led to movement system and impairment.

- section 2:concepts and principles, the adaptation of tissues by repeated motions and sustained postures, directional susceptibility to movement, three models of movement system

- section 3:LBP

In the future

- Section 4: hip
- Section 5: shoulder
- Section 6: examination for lower and upper quarter impairment: contributing factors that should be addressed in treatment

book

- Chapter 7: Exercise program and explanation

- Chapter 8: illustrated Exs. Can be copied. During the examination, the exercise should be determined

introduction

- Evolution of physiotherapy from a technical field to a professional discipline.

- The advancement of which continues to demand major changes in the practice of the profession.

Three eras

- In each the treatment of one anatomic system has been predominant

- Stemming from the prevalence of a physical disability caused by a specific medical problem.

1) Focus on dysfunction of peripheral neuromuscular and musculoskeletal system

- Result of war injury and polio
- Pt diagnosis: MMT
- Direction of treatment: relationship between loss of muscle function and impairrment of movement .

polio

- Acute phase: controversy
- Maintaining ROM: stretching exs and braces

- Recovery phase: strengthening exs of affected and unaffected muscles.

2) Focus on central nervous system dysfunction

- Stroke, head and spinal cord, CP,
- Not previous diagnosis and treatment: spasticity
- Treatment based on clinical experiences and beliefs
- This era changed the relationship between diagnosis and treatment
- Mechanism of motor control

Focus on joint dysfunction

- 1980
- Assessment and treatment based on joint dysfunction in musculoskeletal pain.

- Accessory joint motion.
- Departure from standard PT (modalities to reduce inflammation and general exs to strengthen the muscles)

Philosophical change

- **Instead of relief of the pain by the modalities, we try to find the source of the pain by evaluating the accessory joint motion to identify soft tissue or joint restriction as a source of dysfunction.**

- However:

- **Because periarticular tissues and joint considered as primary problem, minimal consideration was given to the role that muscle and motor control plays in causing dysfunction.**

Another development

- Classification of patients by directing him to perform movement of the spine to determine movement associated with pain.

Current era: focus on movement system

- 1990
- Musculoskeletal pain.
- **Treatment that addresses muscular, neurologic or skeletal problem in isolation is inadequate.**

- ***Movement is the central focus.***

- APTA: movement dysfunction is the basic problem addressed by our intervention.

movement

- Is the action of physiologic system
- Components: musculoskeletal, neurologic, cardiopulmonary, metabolic system.
- Sahrmann initial interest in neurologic dysfunction.
- Research is required but they are based on accepted anatomic and kinesiologic relationship.

examination

- Consists of:
- 1) observing movement based on kinesiologic principles

- 2) testing muscle length and strength

- Movement system balance (MSB) because of the importance of precise and balanced movement to the health of the movement system

MSB

- MSB diagnostic and treatment scheme organises basic information into syndromes.
- Name of syndrome identifies the primary dysfunction and direct treatment.
- subject of research studies that will further refine, modify, or refute the basic assumptions or syndrome descriptions.

MSB

- The MSB diagnostic and treatment scheme organizes basic information into syndromes or diagnostic categories and identifies the factors that contribute to the syndromes.

- The name of the syndrome identifies the primary dysfunction, or the movement impairment, and directs treatment.

Movement as a cause of pain syndromes

- Maintaining or restoring precise movement of specific segments is the key to preventing or correcting musculoskeletal pain.

- The loss of precise movement can begin a cycle of events that induces changes in tissues that progress from microtrauma to macrotrauma.

alignment

- Ideal alignment facilitates optimal movement.

- If alignment is faulty before motion is nitiated,
- correction is necessary to achieve the ideal configuration that must be retained throughout the motion.

Concepts and principles

- The concepts and principles explain how repeated movements and sustained postures alter tissue characteristics, which eventually change the pattern of movement and, if less than ideal, can cause impairments.

- The practice of PT is based on exercises that include repeated movements and sustained postures designed to affect tissues positively.

- not all repeated movements and sustained postures are structured for a positive utcome.

- As an instance sedentary individuals.

- When movements are faulty, negative changes occur in soft
- tissues and in bony structures. The eventual result of injury
- to these tissues is musculoskeletal pain or a movement
- impairment syndrome.

- A model was developed to provide a guide to the impairments produced by movement.

- The kinesiologic model

- The impairments of soft tissues induced by repeated movements and sustained postures eventually cause a joint to develop a susceptibility to movement in a specific anatomic direction. The susceptibility of a joint to motion increases the frequency of accessory and physiologic movements and is believed to cause tissue damage. Identification of the joint's *directional susceptibility to movement (DSM) is the focus of the organization* and naming of diagnostic categories.

- Need for classification.

Examination format

- to identify the DSM and the factors that contribute to the presence of a dysfunction, a standardized examination is used.
- Because the trunk provides the support for the limbs and their muscular attachments, its alignment affects all other body segments.
- Faulty alignment of the head, cervical spine, and shoulders cannot be corrected without correcting the alignment of the trunk and pelvic girdle.
- The alignment of the hip, knees, and joints of the ankles and feet, as well as the distribution of forces exerted on these joints, are also greatly affected by the alignment of the trunk and pelvis.
- Therefore a biomechanical examination of any specific anatomic region must incorporate movements of the trunk and extremities to assess their effects on the site of interest.

Corrective exercises

- **Examination provides the basis for determining corrective exercise. When the patient fails a part of the examination, the test item or a modification of the item is used as part of his or her therapeutic exercise program.**

- **The treatment program also includes instructing the patient in maintaining optimal postures and using correct movement patterns for daily activities.**

- Routine daily movements that are repeatedly performed incorrectly result in the pain syndrome. These impairments in basic movement patterns must be identified, and correct performance patterns must be practiced.

- Corrective exercises are designed to help patients improve neuromuscular control of a specific muscle and movement, but they do not ensure that under more dynamic conditions, the correct patterns will be used. Patients will return to their former patterns unless they understand the importance of preventing motion in their joint's DSM.

- Patients must be specifically trained to move correctly during all activities and to maintain correct alignment in static positions, such as sitting and standing. Because the program
- must be performed daily and requires continual attention to body mechanics, performance is the responsibility of the patient.

- Therefore home programs are the primary method of treatment with weekly reassessments performed by the therapist of both the effectiveness of the program and the quality of patient performance.

- **The examination can also identify signs of muscle and movement impairments before the development of symptoms and thus can be used to design preventive programs. Educating a person about his or her specific musculoskeletal impairments and how to correct these before pain develops is part of a preventive program.**

Movement impairment syndromes definition

- **Painful muscloskeletal of unknown origin:**
- **Regional musculoskeletal disorder,**
- **Regional : lack of an underlying systemic disease, supporting the belief that local mechanical trauma is the causative agent.**
- **Other common terms used to describe localized pain are:**
- **musculoskeletal disorders,**
- **musculoskeletal dysfunction,**
- **myofascial syndromes,**
- **overuse syndromes,**
- **cumulative trauma, and**
- **repetitive strain injuries.**
- **Pain from major trauma to bones or from bone tumors or systemic diseases, such as rheumatoid arthritis, does not fall into this category.**

definition

- **In this text the term movement impairment syndrome is used synonymously with musculoskeletal pain (MSP).**

- **These syndromes are defined as localized painful conditions arising from irritation of myofascial, periarticular, or articular tissues. Their origin and perpetuation are the result of mechanical trauma, most often microtrauma.**

- **Microtrauma is often ascribed to overuse, which is the repeated use or an excessive load that causes stress that exceeds the tissue's tolerance to withstand injury**

definition

- Excessive load can occur during a single episode of performing an activity or during repeated movements.

- Repeated use can occur in relatively short duration, such as a single episode of throwing a ball for 1 hour, many years after the cessation of a similar activity.

- Repeated use can also occur in long duration, such as the baseball player who performs the same activity everyday for many days.

- **Another cause of microtrauma is the development of tissue-damaging stress as a result of a deviation in the ideal arthrokinematics and the resulting movement impairment.**

- Although the management described in this book is primarily applied to overuse syndromes, the treatment concepts described can be applied to any disease that causes changes in joints and muscles, such as rheumatoid arthritis. Because the concepts are applicable whenever disease affects the biomechanics of the musculoskeletal system, the standard examination and similar treatment are recommended for all patients, even those with neurologic dysfunction. However, additional factors
- must be considered in applying these principles when there is known dysfunction of the skeletal or nervous system.

prevalance

- Patients with pain originating from the musculoskeletal system constitute the largest group of individuals receiving PT.

- more than 60% MSp:
- 25% were treated for low back pain,
- 12% for cervical pain,
- 12% for shoulder pain,
- and 12% for knee or hip pain.

prevalance

lower back is the most common site of musculoskeletal pain.

- Two factors explain why the majority of PT patients have MPS:

- One factor is the high incidence of these syndromes in the general public;
- the second factor is that exercise and the correction of body mechanics are logical forms of treatment for conditions in which movement most often increases symptoms.

- This text discusses how movement associated with pain is impaired or causes additional stress to tissues that are already injured, thus contributing further to the trauma.

Diagnosis and management

- the cause of mechanical MPS is poorly understood.

- Even after the condition has progressed sufficiently to allow identification of specific tissue damage by radiologic or neurologic examinations, diagnosis can remain inconclusive or misleading.

- **Studies, particularly of low back syndromes, have shown positive radiologic findings without clinical symptoms and negative radiologic findings with clinical symptoms.**

Diagnosis and management

- Although specific pathologic abnormalities may be present, they may not be the cause of the pain. Therefore diagnostic labels in the early stages of a painful condition may be relatively nonspecific, (e.g., low back pain or shoulder impingement).

Diagnosis and management

- Management is most often based on symptomatic treatment of the presumed tissue inflammation, rather
- than on the correction of the mechanical cause of the
- tissue irritation.

- Because these conditions usually affect the quality of life rather than the quantity of life, little investigative attention has been directed to movement impairment syndromes when compared with other disease processes, such as cardiovascular, metastatic, and neurologic diseases.

Diagnosis and management

- Management of many mechanically induced movement impairment syndromes has proven difficult, because diagnosis is often based on patient **self-reporting** symptoms rather than on objective tests.

- The subjective nature of these reports and the difficulty in relating specific tissue abnormalities to symptoms make diagnosis and treatment a difficult challenge to the practitioner. **Relating the consistency of pain behavior**
- **to specific movements is a useful guide to deciphering**
- **the mechanical and subjective factors contributing to**
- **the MPS.**

Diagnosis and management

- To provide effective treatment, the therapist must
- (1) develop a reasonable hypothesis of causal and contributing factors,
- (2) perform a specific and systematic examination to identify those factors,
- (3) formulate a diagnosis to direct PT treatment,
- (4) provide a well-designed treatment strategy based on the diagnosis and contributing factors, and
- (5) evaluate the outcome of treatment.

Structures Affected

- Structures that are the source of symptoms are myofascial, periarticular, articular, and neurologic.
- Pain indicates that either mechanical deformation or an inflammatory process is affecting the nociceptors in the symptomatic structures.
- Although various soft tissues can be identified as the sources of pain, a more important and often ignored consideration should be to answer the question**, "What caused them to become painful?“**
- The variety of affected tissues suggests different sources, but a parsimonious explanation suggests a common cause. **The likely cause is mechanical irritation or stress.**
- Entrapment, impingement, or adhesions that are also mechanical causes of irritation can affect myofascial tissue, as well as nerves and nerve roots.

Structures affected

- **Identifying the symptomatic tissue, if possible, is only one step and not always a necessary step to correct a painful condition.**

- **For example, although the supraspinatus tendon can be identified as the source of a specific shoulder pain, the reason it became painful needs to be identified to alleviate and prevent the recurrence of the pain.**

- **One commonly used explanation is that physical stress from repetitive motion is the cause of mechanical irritation of the tendon. A more useful explanation is that motion at the glenohumeral joint is impaired-an acquired alteration in arthrokinematics -thus creating mechanical irritation of the tendon that would not have occurred if the joint motion had been optimal. Identifying the specific characteristics of the impairment in glenohumeral motion is more informative than identifying the supraspinatus tendon as the painful structure.**

- **Knowledge of the impairment provides information that can be used to limit its progression, achieve correction of the impairment, eliminate the present pain, and prevent future recurrence of the problem.**

Treatment Approaches Based on Intervention

- Variations in belief about underlying causative factors
- have led to three basic approaches to PT treatment of
- MSPs:

- One approach focuses on the symptoms,

- Another focuses on both the source of symptoms and restrictive tissues,

- and the third focuses on the cause of the symptoms
- and contributing factors.

Treatment Approaches Based on Intervention

- The symptom-focused approach presumes that the painful tissue is the source of the problem.

- Tissue is inflamed and relief of the inflammation will resolve the problem. In this situation the nonspecific stress that causes tissue irritation arises primarily from **fatigue** that occurs when abnormal stresses are imposed on a structure over a prolonged period, resulting in tissue breakdown. **Overuse**, defined as activity that exceeds tissue tolerance, can also be a factor that results in the breakdown of tissue or produces an inflammatory response.

- Management in this approach is directed at eliminating the destructive stress by rest and providing antiinflammatory treatment to allow the affected tissue to heal. An exercise program to strengthen the affected tissues is the next step in treatment after a resolution of symptoms.

Treatment Approaches Based on Intervention

- The symptom source and restricted tissue approach focuses on treating the source of the symptoms, such as the painful supraspinatus tendon in a reduced subacromial space, and correcting restrictive tissues, especially those contributing to accessory joint motion impairments.

- Any deficits in joint movements, particularly those that are painful, are treated by mobilization or manipulation.

- When accessory joint mobility is within normal limits and painless after treatment, then subsequent movement will continue to be normal and the condition will be alleviated.

Treatment Approaches Based on Intervention

- The third approach, and the one advocated in this text, emphasize more on identifying the cause. This approach presumes that the problem occurred because patterns of movement were impaired before joint movement became painful or restricted.

- Restricted joint motion is considered the consequence rather than the cause of movement faults. In the case of supraspinatus tendonitis, the movements of the scapula during shoulder flexion and abduction are usually restricted. If the scapula does not sufficiently abduct or upwardly rotate to achieve 60 degrees of upward rotation, the subacromial space will be reduced and the tendon will become irritated.

- Although the pain is at the glenohumeral joint
- in this example, the movements of the entire shoulder
- girdle complex must be examined. Pain around the
- glenohumeral joint is often a result of scapular motion
- impairment; therefore treatment should be directed at
- scapular muscular control rather than just at the musculature of the glenohumeral joint.

- The MSB examination attempts to identify all the factors contributing to movement pattern impairments of the shoulder girdle. These factors are alignment and neuromuscular performance.

- The supraspinatus tendon would not be the focus of treatment by direct application of modalities unless clear signs of inflammation are present; rather, the primary treatment would be alleviating the mechanical source of the problem.

- The purpose of treatment in this approach is to correct factors predisposing or contributing to movement pattern impairments, thus alleviating the stress on the painful tissues and allowing inflammation to subside.

- By avoiding direct treatment of symptomatic tissues, the change in symptoms can be used to assess and monitor the effectiveness of movement correction achieved with the exercise program.

Cause identification versus symptom reduction

- When the patient has an understanding of how to control the factors producing his symptoms, he or she can assume an **active role in treatment and prevention** and not become dependent on **passive treatment** from the health care system.

- Addressing the movement source of pain contributes to a more complete and enduring correction than using an approach in which the pain is relieved by temporary measures (e.g., physical or chemical agents) and the patient remains uninformed about the cause and ways to prevent recurrence.

need for classification

- Naming the syndromes

Chapter 2

Concepts of principles of movements

Kinesiologic model

Pathokinesiologic model

Kinesiopathologic model

Base element impairments of the muscular system

Base element impairments of the skeletal system: structural variations in joint alignment

Modulataor element impairments: nervous system

Biomechanical element impairment

Multiple impairments of the components of movement

Support element impairment

Kinesilogic model
Composition of the Model

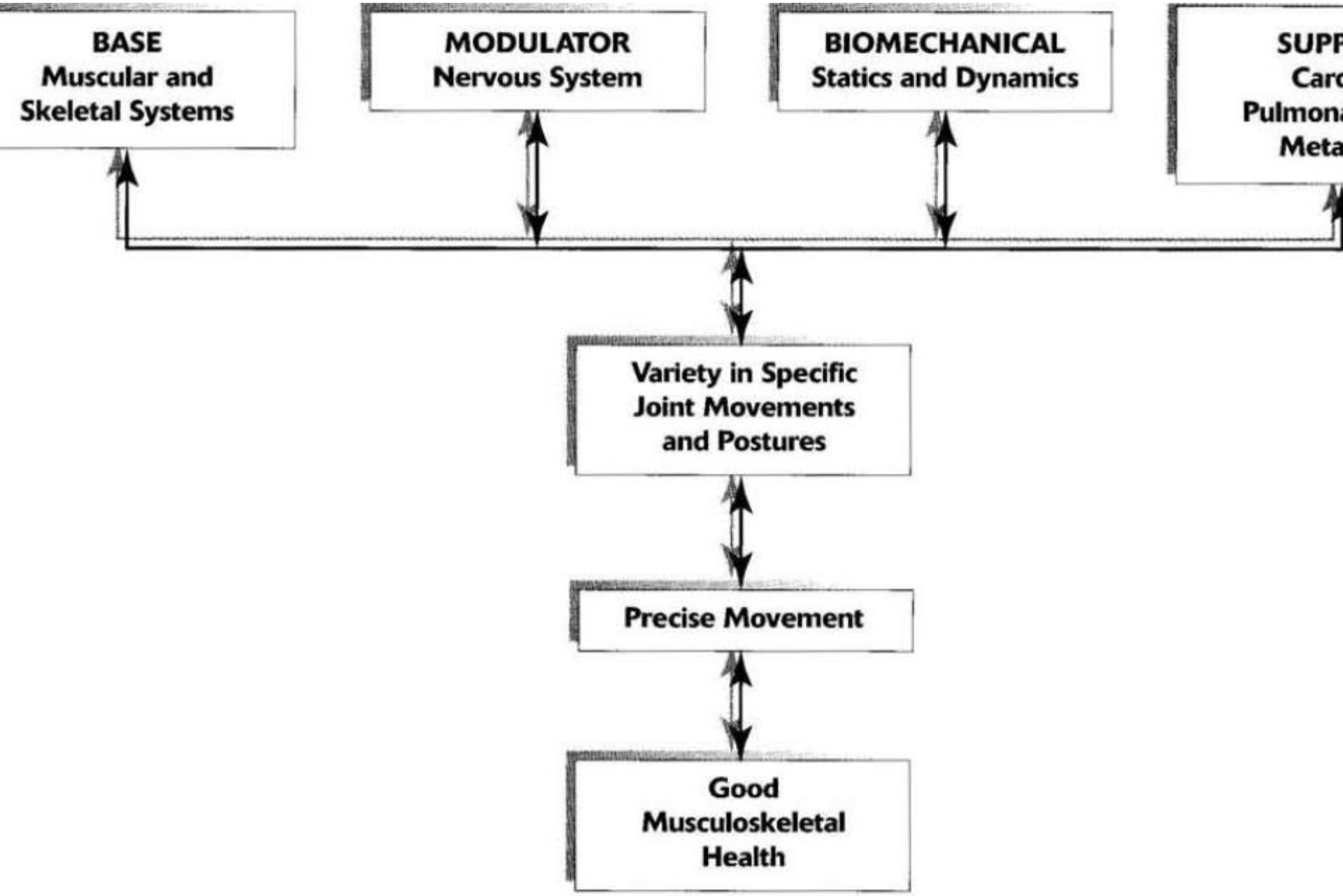
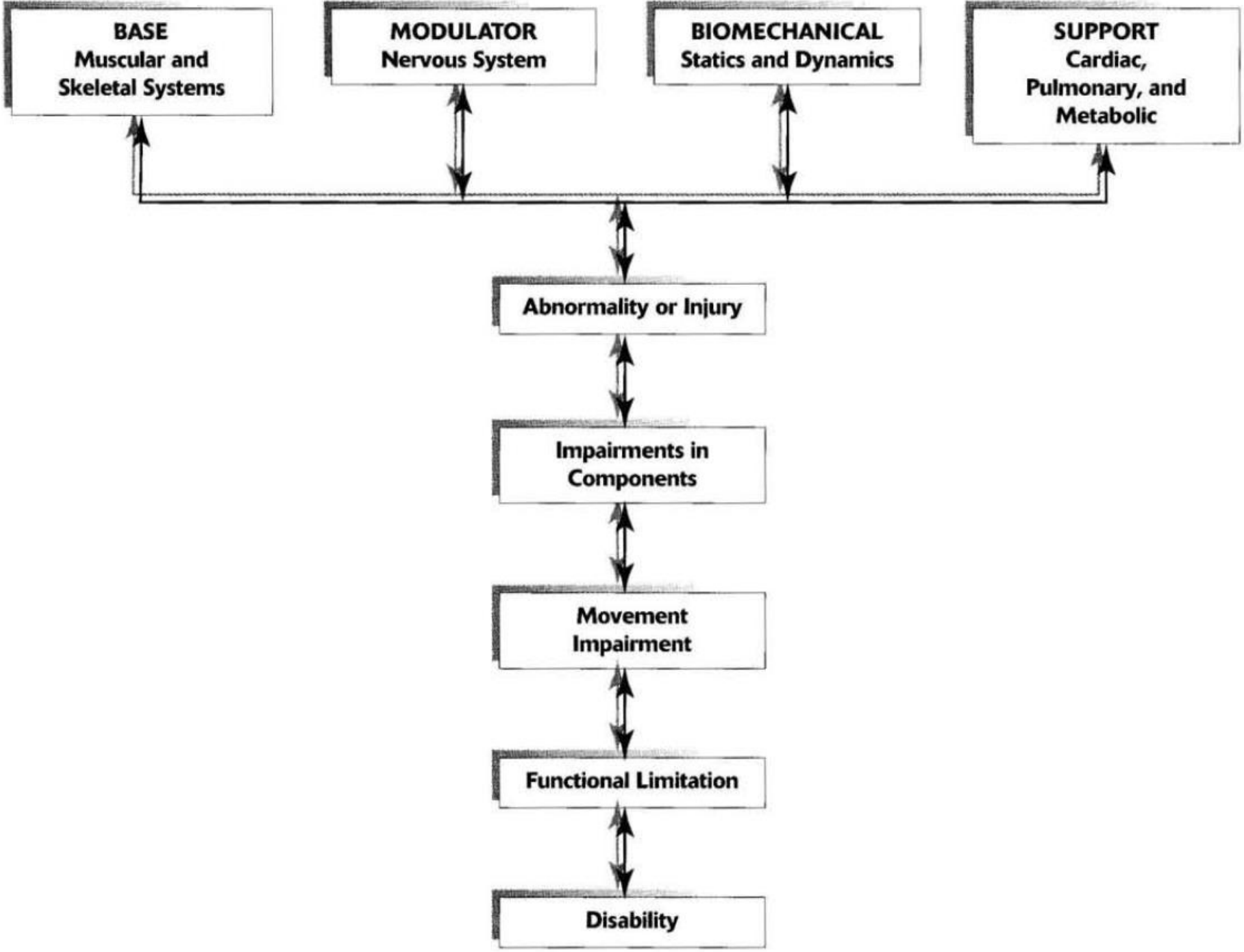

BASE
Muscular and
Skeletal Systems
MODULATOR
Nervous System
BIOMECHANICAL
Statics and Dynamics
SUPP
Card
Pulmona
Meta
Variety in Specific
Joint Movements
and Postures
Precise Movement
Good
Musculoskeletal
Health

Figure 2-1

Clinical Relevance of the Model

Pathokinesiologic model
Composition of the Model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Statics and Dynamics
SUPPORT
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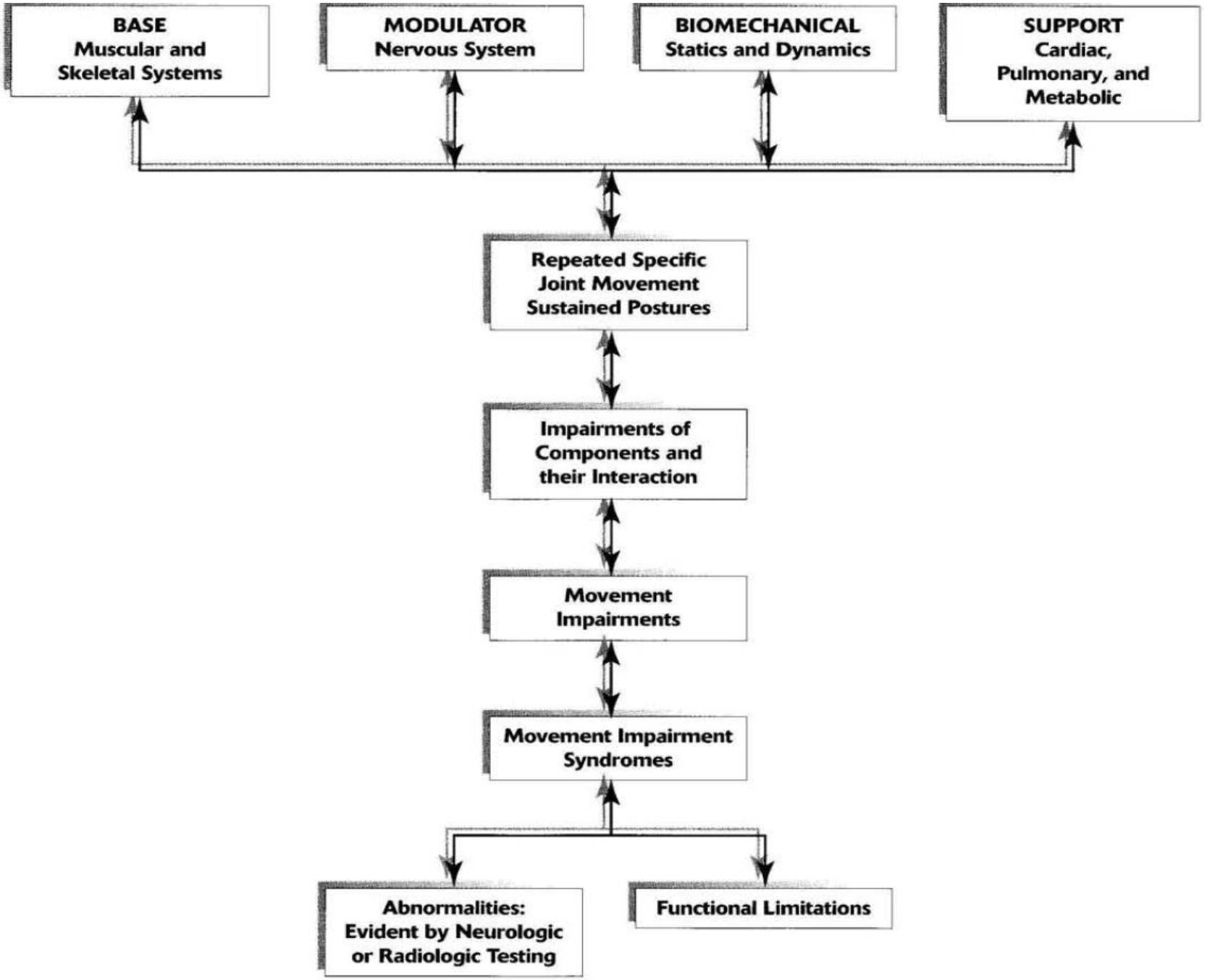
Pulmonary, and
Metabolic
Abnormality or Injury
Impairments in
Components
Movement
Impairment
Functional Limitation
Disability

Kinesiopathologic model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Joint Movement
Sustained Postures
Impairments of
Components and
their Interaction
Movement
Impairments
Movement Impairment
Syndromes
Abnormalities:
Evident by Neurologic
or Radiologic Testing
Functional Limitations

Figure 2-7

Kjnesiopathologic Rationale for the Model

- A common belief is that movement impairments are the result of pathologic abnormalities, but the thesis of this text is that movements performed in daily activities can also cause impairments that eventually lead to pathologic abnormalities. Therefore a different model is proposed to characterize the role of movement in producing impairments and abnormalities.

- The empirical basis of this model stems from observations that repetitive movements and sustained postures affect musculoskeletal and neural tissue. The cumulative effect of repetitive movements is tissue damage, particularly when the movements deviate from the optimal kinesiologic standard for movement.

Tribology

- maintaining precise movement patterns to minimize abnormal stresses is highly desirable.

- A useful criterion for assessing precise or balanced movement is observing the path of instantaneous center of rotation (PICR) during active motion.

- Anatomic and kinesiologic factors that determine the PICR and the pattern of joint movement are (1) the shape of joint surfaces, (2) the control by ligaments, and (3) the force-couple action of muscular synergists.

- with normal or ideal movement of joints, the question arises, "What is the cause of deviations in joint
- movement when a pathologic condition or specific injury is not the problem?" Suggested causes of deviations
- in joint movement patterns are *repeated movements* and *sustained postures associated with daily activities*
- of work and recreation.

- For example, baseball pitchers and swimmers perform repeated motions and commonly experience shoulder pain. 16,31

- Prolonged sitting has been cited as a factor in the development of back pain. 52

- Cyclists who spend 3 hours riding their bicycles in a position of lumbar flexion have a reduced lumbar curve when compared with control subjects who do not ride bicycles.

- Therapists and other clinicians involved in exercise prescription believe that *repeated movements can be used therapeutically to produce desired increases in joint flexibility, muscle length, and muscle strength, as well as to train specific patterns of movement.*

- Thus these individuals should also accept the idea that *repeated motions oj daily activities, as weU as those activities oj fitness and sports, may also induce* ***undesirable changes*** *in the movement components.*

- *Stretching* and strengthening exercises performed for **shorter than 1 hour are believed to produce changes in muscular and connective tissues.** However, repeated movements and sustained postures associated with everyday activities
- that are performed for **many hours each day** may eventually induce changes in the components of the movement system.

- The inevitable result is the **development of movement impairments, tissue stress, microtrauma, and eventually macrotrauma**.

- In accordance with this proposed theory, the effects of repeated movements and
- sustained postures **modify the kinesiologic model so that it becomes a kinesiopathologic model**, that is, a study of disorders of the movement system.

Clinical Relevance of the Model

- The kinesiopathologic model serves as a general guide
- for identifying the components that have been altered
- by movement.

- Identifying the alterations or suboptimal functions of components provides a guide to prevention, diagnosis, and intervention.

- If there is suboptimal function of any component of an element, operationally defined as an impairment, it may be considered a problem and corrected before the client develops musculoskeletal
- pain.

- If the impairment is not corrected and the repeated movements continue, the sequence of movement impairment leading to microtrauma and macrotrauma progresses with the consequence of pain and, eventually, identifiable tissue abnormalities.

- If pain is present, the kinesiopathologic model can be used to identify all the contributing factors that must
- be addressed in a therapeutic exercise program.

- Reversal of the deleterious sequence requires the identification
- and correction of the movement and component impairments. **More important than developing a therapeutic exercise program, the performance of present functional activities that cause pain must be identified and corrected.**

How do repeated movements and sustained postures cause changes in the component systems?

- Characteristic of muscular system of rapid adaptation considers **advantageous**, however, changes in strength can also be **detrimental** and may contribute to movement impairments.

- Muscles become longer or shorter as the number of sarcomeres in series increases or decreases. Everyday activities can change the strength and length of muscles that alter the **relative participation of synergists and antagonists and eventually the movement pattern.**

Muscle change

- Muscle strength, lenth, stiffness

- Weakness in sport distance runner
- Muscles commonly found to be weak:
- Lower terapez, external oblique, gluteus maximus, posterior gluteus medius,

Example

hip ext by gluteus max and piriformis (dominant muscles): more control of femor on acetabulum)

- In distance runner: weakness of iliopsouas and gluteus maximus
- tensor fascia lata (TFL), rectus femoris, and hamstring muscles often become stronger and more dominant

Hamstring strain or hip problems: stress on Ant joint capsule

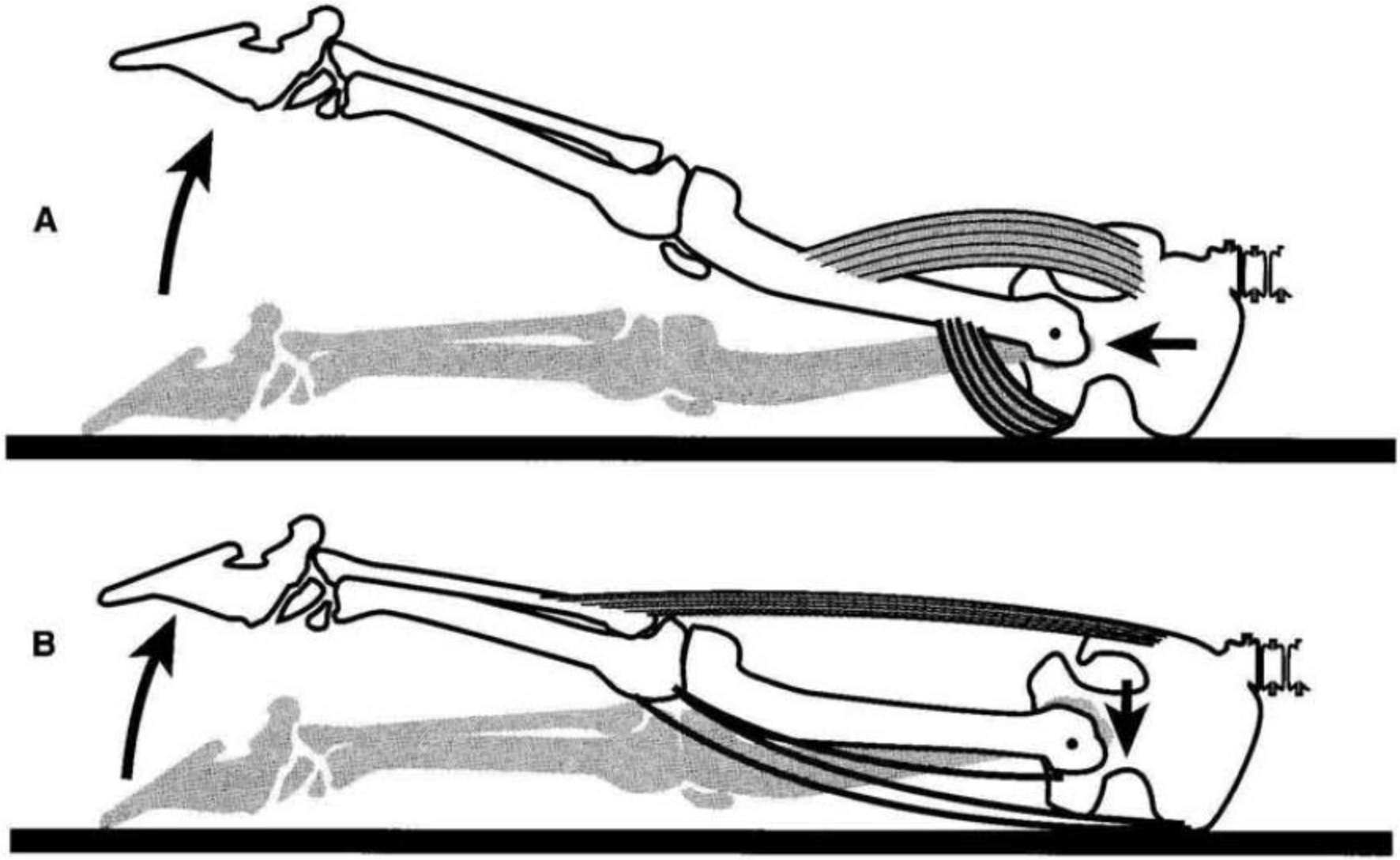


Figure 1-8

Hip extension in prone. *A,* Normal hip extension with constant position of femur in acetabulum; *B,* Abnormal hip extension because of anterior glide of femoral head.

Why this happens?

- Normal pattern can become altered.

- Piriformis and Gluteus max attach to greater trochanter and inter trochanteric line of the femor. Gluteus also attach to the tibia distally.

  hamstring muscles, with one exception, originate from the ischial tuberosity and insert into the tibia. (The exception is the short head of the biceps femoris muscle, which attaches distally on the femur.)

- Because the hamstring muscles, do not attach into the femur, they cannot provide precise control of the movement of the proximal
- end of the femur during hip extension.

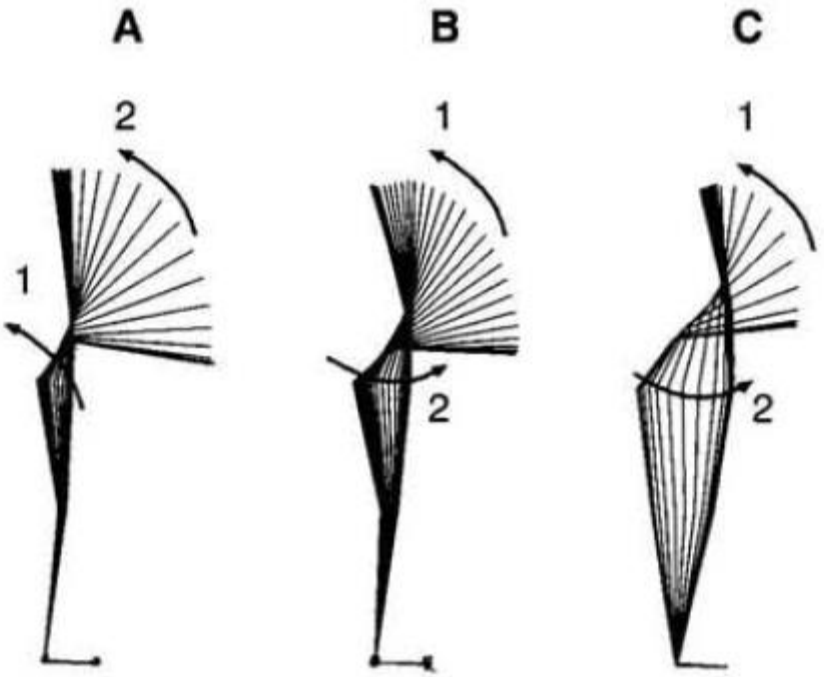
Base element impairment of the muscular system: muscle strength

- Gluteus maximus verus hamstring.

or

- Return to an upright position: (figure)
- swaying the hip forward: weak gluteus max

- We should treat the pattern not strenthening the muscle alone.



Return from forward bending using three different strategies. Optotrak depiction of movement of markers placed at the head of the fifth metatarsal, ankle joint, lateral epicondyle of the knee, greater trochanter, iliac crest, and tip of shoulder. *A,* The motion is initiated by hip extension, followed by immediate and continuous lumbar extension, and is accompanying the rest of the hip motion. *B,* The motion is initiated by lumbar extension and followed by hip extension. *C,* In the forward-bending position, the subject is swayed backward with the ankles in plantar flexion. The return motion is a combination of ankle dorsiflexion and hip extension by forward sway of the pelvis. (Courtesy of Amy Bastian, PhD, PT.)

Muscle length

- 1: prolonged elongated position:
- ankle dorsiflexors in bed rest

- 2: injirious strain: forceful eccentric contraction

- 3: sustained streching: during immobilization.

examples

- Bedrest is prescribed: dorsiflexors

- Sleeping: stretch of posterior gluteus medius particularly in women with broad pelvis who regularly sleep on her side

- Sleeping: stretch of lower trapez and rhomboid lower shoulder pushing forward: scapula abduct and tilt forward

  (especially if the arm is heavy and chest is large)

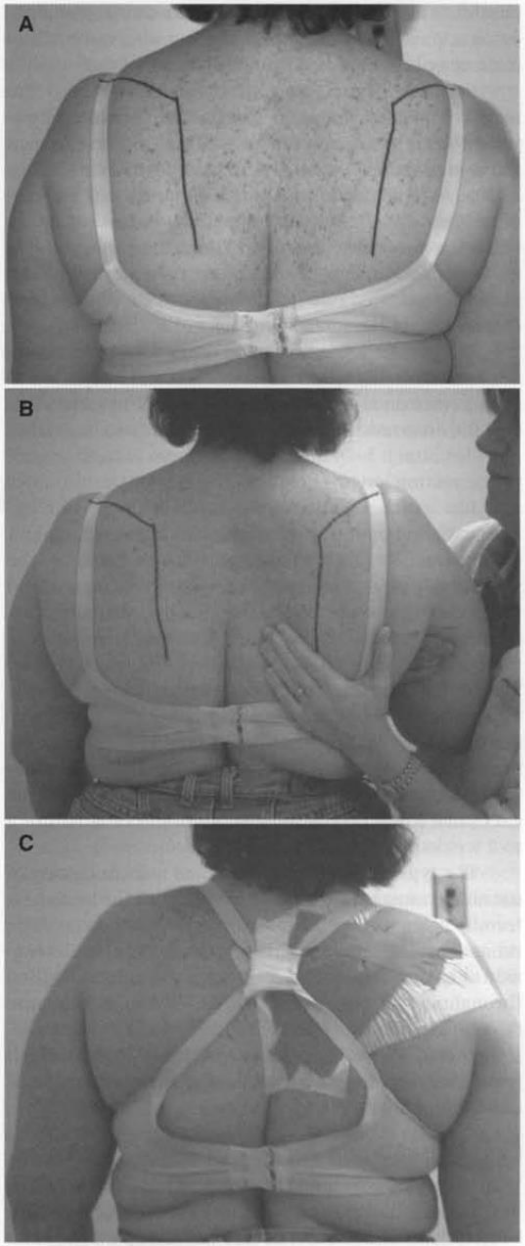


Figure 2-14

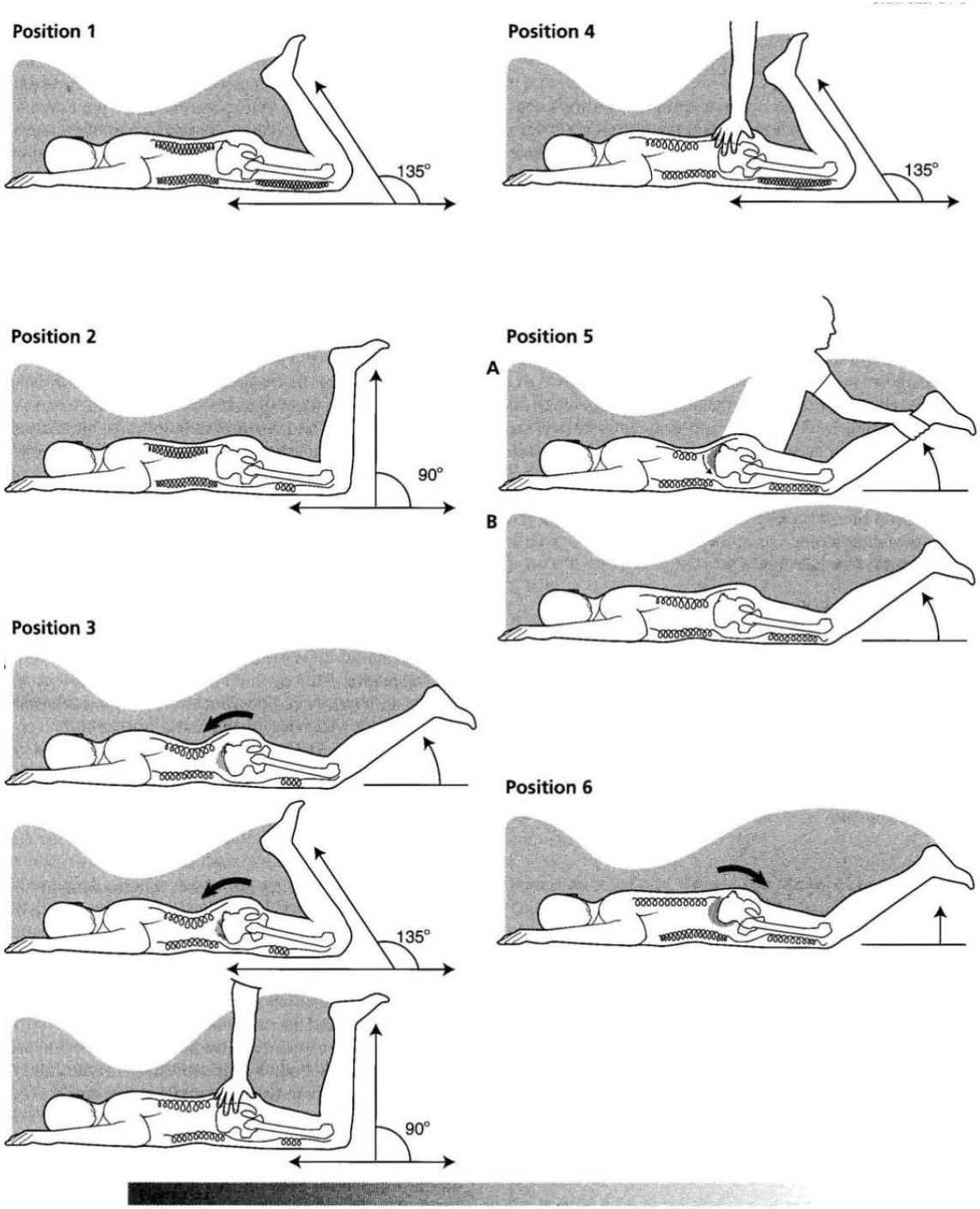
Strain of right thoracoscapular muscles. *A,* Right scapula was abducted and tilted anteriorly. *B,* Right shoulder was passively supported in the correct alignment to alleviate the strain on the scapular adductor muscles. When the patient relaxed the muscles, her pain was alleviated. *C,* Bra straps were taped together to bring the straps closer to the neck and to reduce downward pull on the lateral aspect of the shoulder.

Compensatory relative flexibillity

- Hypertrophy increase the stiffness of muscle.
- Increased stiffness of one muscle group can cause com pensatory movement at an adjoining joint that is controlled by muscles or joints with less stiffness.
- Example: if lumbar is flexible in extension and latissimus dorsi is stiffer, lumbar extends when shoulder flexion.

figure

- 1. normal length of rectus femoris
- 2. Short rectus femoris (stop at 90 degree, wiyhout lumbopelvic compensation)
- 3. *Stiff and short rectus femoris muscle with lumbopelvic compensation*
- *4. Stiffness, not shortness, of rectus femoris muscle with lumbopelvic compensation*
- *5. Stiffness of rectus femoris muscle with automatic lumbopelvic stabilization.*
- *6. Deficient lumbopelvic counter stabilization*


Position 1
135°
Position 4
135°
Position 2
90°
Position 5
A
B
Position 3
135°
90°
Position 6

Movement impairment syndrome of the lumbar spine

What we talk about

- Normal alignment
- Motion of the lumbar spine
- Muscular actions of the lumbar spine
- Movement impairment syndrome of the lumbar spine

introduction

- **Reasons for spinal dysfunction:**
- Cumulative microtrauma caused by *impairments in alignment, in stabilization, and in movement patterns of the spine*

- *When dysfunction occurs, the major objective is the identification of the direction of the alignment, stress, or movement of the spine that consistently elicits or increases thepatient's symptoms.*

- *Reproducible* motions of the spine or extremities can produce the symptoms that elicit stress or movement. The site of the symptoms is particularly susceptible to movement because it becomes more flexible than the other sites at which motion also occurs. This susceptibility to
- movement further exaggerates the flexibility of the site because it is repeatedly subjected to motion.

introduction

- Most movements involve the participation of multiple
- segments,

- Movement follows the principles of mechanics. Among
- those principles is the law of physics, which states that
- *movement takes place along the path of least resistance.*

- When a system is multisegmented, as in the case
- of the human movement system, the greatest degree of
- motion occurs at the most flexible segment.

…introduction

- Thus most spine dysfunctions occur because of excessive relative flexibility, particularly at specific segments,

- compensatory motion at the most flexible segments.

- Although a specific problem exists in the vertebral column (e.g., facet hypertrophy, disk degeneration, spondylolisthesis, nerve impingement, bulging disk), correction of the impairment performance of trunk muscles helps reduce the abnormal stresses that led to the problem.

- Once the appropriate trunk muscle control and lower extremity muscle flexibility are achieved, most often back pain subsides without direct treatment to the spine itself. After the correction is made, the spine is no longer subjected to the traumatic stresses.

Introduction

- The keys to preventing and alleviating spinal dysfunction
- Are:

- (1) to have the trunk muscles hold the vertebral column and pelvis in their optimal alignments and

- (2) to prevent unnecessary movement.

- To achieve these goals, the muscles must be the correct length and strength and be able to produce the correct pattern of activity.

During movement of the extremities, optimal isometric contraction of the trunk muscles is needed to appropriately stabilize the proximal attachments of the limb muscles.

Introduction

- ***Normal alignment of the Lumbar spine***
- **Standing**
- **Normal Position**
- **Lordosis**
- **Pelvic tilt**
- **Apt**
- **ppt**

- Sitting:
- Ppt
- Lumbar curve: flat back
- (fig 3-11)
- Increase pressure on the disk
- If increase inward curve in sitting, pressure on the disk decrease.

impairment

- Line of gravity and activity of lumbar spine
- Not using backrest: iliopsoas implies additional compressive force and anterior shear force.
- Sitting on the edge of the chair: using hip flexors
- Short feet don’t touch the ground: anterior pull on the pelvis and spine.

impairment

- Sit leaning to one side on short arm rest
- A markedly kyphotic thoracic spine sit in lumbar ext: hip slides forward to flatten the lumbar spine. A pillow behind the lumbar spine is helpful.
- A tall man with long tibia sits with knees higher than hips and flexes the lumbar, needs to adjust chair to keep them in the same horizontal plane. Or he can use a pillow on his seat.
- A man with a large abdomen sits in lumbar flx, he should use a chair that is higher in the back than front not placing hips in more than 90 degree flx.. ???

Movement Impairment syndromes of *the low back*

- The syndromes are named for the alignment, stress, or movement direction that most consistently produces pain.

- Not all patients have positive test findings for only one direction of movement, and some tests are more sensitive than they are specific.

- The intensity of the symptoms when movement is in a particular direction, the decrease of symptoms when movement is corrected,

- and the consistency of a movement direction that either increases or decreases the symptoms are all weighing factors in the tests that determine the appropriate diagnostic category

Diagnostic Categories (in order of observed frequency)

- Rotation-extension
- Extension
- Rotation
- Rotation-flexion
- Flexion

- Because of the variability of test results, *the examination* is *combinatorial rather than algorithmic. Thus* the therapist uses many tests to confirm or disconfirm a diagnosis, rather than using one test to serve as the key decision point.

- The purpose of an examination is to identify the diagnostic category and the contributing factors.

- For example, side bending is a test used to place the patient in a category, but testing the strength of the abdominal muscles is performed to identify a contributing factor, since weakness of the abdominal muscles is not specifically related to one diagnostic category.

prevalence

- In a study by Van Dillen and associates,53 over 50% of the 169 patients tested are categorized as having an extension-rotation syndrome; the next largest group is categorized as having an extension syndrome. Patients

Lumbar Rotation-Extension Syndrome With or Without Radiating Symptoms

- Symptoms and Pain:

- Changes in one part must be accompanied by changes in other parts of the motion segment because of their intimate relationship. Thus attempting to reduce undesirable stresses or movements is more effective than treating only one part of the motion segment in an exclusive manner.

rotation-extension syndrome

- The specific pain problems or radiologic
- diagnoses that commonly coincide with the
- rotation-extension syndrome are the following:

- 1. Facet syndrome
- 2. Spinal stenosis
- 3. Spondylolisthesis
- 4. Spinal instability
- 5. Degenerative disk disease
- 6. Osteoarthritis of the lumbar spine
- 7. Herniated intervertebral disk

FACET SYNDROME

- Typically the complaints are an ache with prolonged inactivity, an improvement with an increase in activity, but perhaps a return of symptoms after activity.

- There can be transient sharp pains with sudden movements. The patient may report radiating symptoms, but they are not in a radicular pattern

SPINAL STENOSIS

- Spinal stenosis is a narrowing of the spinal canal or the intervertebral foramen, which leads to vague and unusual symptoms. This disorder is caused by the combination of disk degeneration, arthritis, and subluxation.

- Mostly inpatient who is 65 years or older, but you can find it in patients who are 40 years.

- classic characteristics of spinal stenosis are the presence of symptoms when standing or walking and almost immediate reduction of symptoms when sitting.

- The patient with spinal stenosis can usually stand and walk with minimal symptoms when they lean on a support to decrease the weight on the spine and increase the weight on the arms and upper torso (e.g., grocery cart).

SPONDYLOLISTHESIS.

- Spondylolisthesis is the forward slippage of one vertebra in relation to another.

- The patient with spondylolisthesis usually has back pain when maintaining one position and transient pain when changing positions. The most intense site of pain is usually in the back.

SPINAL INSTABILITY

- Characteristically, the patient with spinal instability has pain with changes in position,

- but he or she cannot stay in one position for periods of time and tends to move frequently to achieve relief of the symptoms.

- Sitting is often worse than standing for symptom production.

DEGENERATIVE DISK DISEASE

- When the water content of the nucleus diminishes and the gelatinous properties are lost, the disk material becomes fibrocartilage; the fluid is no longer under pressure and does not function as a shock absorber.

- When the annulus remains intact, the mechanical stresses on the dysfunctional disk can cause back pain.

- The lumbosacral joint is the most frequent site of disk degeneration. A narrowing of the disk and the resulting change in the disk space contribute to **segmental instability because the stabilizing ligaments are no longer taut**. Pain is often worse when arising in the morning and may radiate into the lower extremities, although not along dermatomal pathways.

OSTEOARTHRITIS OF THE LUMBAR SPINE

- The lumbar spine is a common site for degenerative changes in the patient older than 50 years of age. The patient with osteoarthritis of the lumbar spine usually complains of pain and stiffness when arising in the morning or when remaining stationary for a prolonged period, especially with sitting.

- Usually symptoms improve with some activity, but extensive activity can increase symptoms. The patient may report radiating symptoms into the buttocks and the anterior thigh.

HERNIATED INTERVERTEBRAL DISK

- Mechanical or chemical
- Saal et al: chemical release of phospholipase A2 from the nucleus which affects the nerve root.
- Age: 25-50. more in men than women. More in L4-L5 and L5-S1
- When radiating symptoms follow dermatomal patterns, a neurologic examination is indicated.

screening

- Screening for nonmachanical sources of musculoskeletal pain should be the first part of the examinations for all patients.

Movement impairments

- The causes of symptoms are extension and rotation motions.
- So examination designed to assess as many positions, stresses and movements in these directions as possible.
- When the test motion causes pain or increase symptoms, the movement is corrected to confirm.

Standing position

- The following tests are performed in this position:

- Back against the wall
- Forward bending
- Return from forward bending
- Lateral flexion
- Rotation
- Single leg stance

Standing position

- **..Back against the wall:**

  Pain relief by flattening the back

.Forward bending:

May relieve symptoms, stretch of nerve may accompany the motion, so it is sensitive, not specific.

..Return from forward bending:

Often the patient return by extending the lumbar spine early in the pattern, rather than smooth motion of extending the hips

(Fig 2.12)

..Lateral flexion:

- Due to association of sidebending and rot. Any increase of symptoms in side bending is considered a positive sign for rotation.
- In addition to increase the symptoms, **shape** of the spine and ROM are also assessed.
- If the spine does not curve but bend from a single point, a potential sign of rotation of the spine toward the side of lat.flx. (fig 3.33) ROM to this side should be limited. (3-18)
- Confirm test: stabilize the side of trunk just above iliac crest to prevent movement at the one site. Decreasing the symptoms is a positive sign for rotation. When stiffness of contralateral muscles causes angulation…

.Rotation

- Stabilize the pelvis and rotate to one side and then to other side. Greater range to the side of suggested spinal rotation supports that lumbar is rotated. (fig 3.34)

- Single leg stance:

- The patient is asked to stance on one leg while flex the other hip to 90 degrees. Rotation of lumbar spine and pelvis considered positive. Or hip adduction. (fig 3. 35). Why?

Supine position

- Following tests in this position:

- **Hip flexor muscle length**
- **Active hip and knee flx**
- **Hip abduction/lateral rotation from flexion**
- **Passive hip flx with knee ext.**
- **Shoulder flx to 180 degrees**

.Hip flexor muscle length

- Compensatory motion when pelvis tilts anteriorly while the hip is passively extended.

- Shortness of TFL and rectus femoris without pelvic motion is not positive sign for ext syndrome. (Due to lack of compensatory lumbopelvic motion).

- Positive test of shortness: knee held toward the chest, stabilization by abdominal muscle, hip stays in flx and don’t cause pelvic tilt anteriorly. (similar to position 2 in fig 2.21)

..Active hip and knee flx

- Pelvic rotation that increases syptoms.
- Pelvic rotates toward the side of hip flx.

- Confirm: Therapist stabilizes the pelvis and assess the effects on symptoms

..Hip abduction/lateral rotation from flexion

- *As the knee moves laterally the pelvis rotates* toward the moving lower limb during the first 50% of the motion. Symptoms may increase during this motion.

- Stabilizing the pelvis and assisting the limb as it moves laterally decreases symptoms. A decrease in symptoms is attributed to eliminating the rotation in the spine, eliminating the stress on the spine with the iliopsoas lengthening, or both.

.Passive hip flx with knee ext. (SLR)

- . *A positive test for neural tension* is radicular pain into the leg before 60 degrees of hip flexion. she is instructed to completely relax the lower extremity.

- Often the symptoms are eliminated, indicating that the cause of the radiating symptoms is the stress on the spine from the contraction of the hip flexors, not a tethered nerve.

- *Shoulder flexion to 180 degrees*

- can cause lumbar extension, and an increase in the low back symptoms.

Side lying position

- The following test:
- 1. hip lat. Rot
- 2. hip abduction with associated lat. Pelvic tilt
- 3. hip adduction

Hip lat. rot

- 1. Test is positive for rotation when pelvic rotate

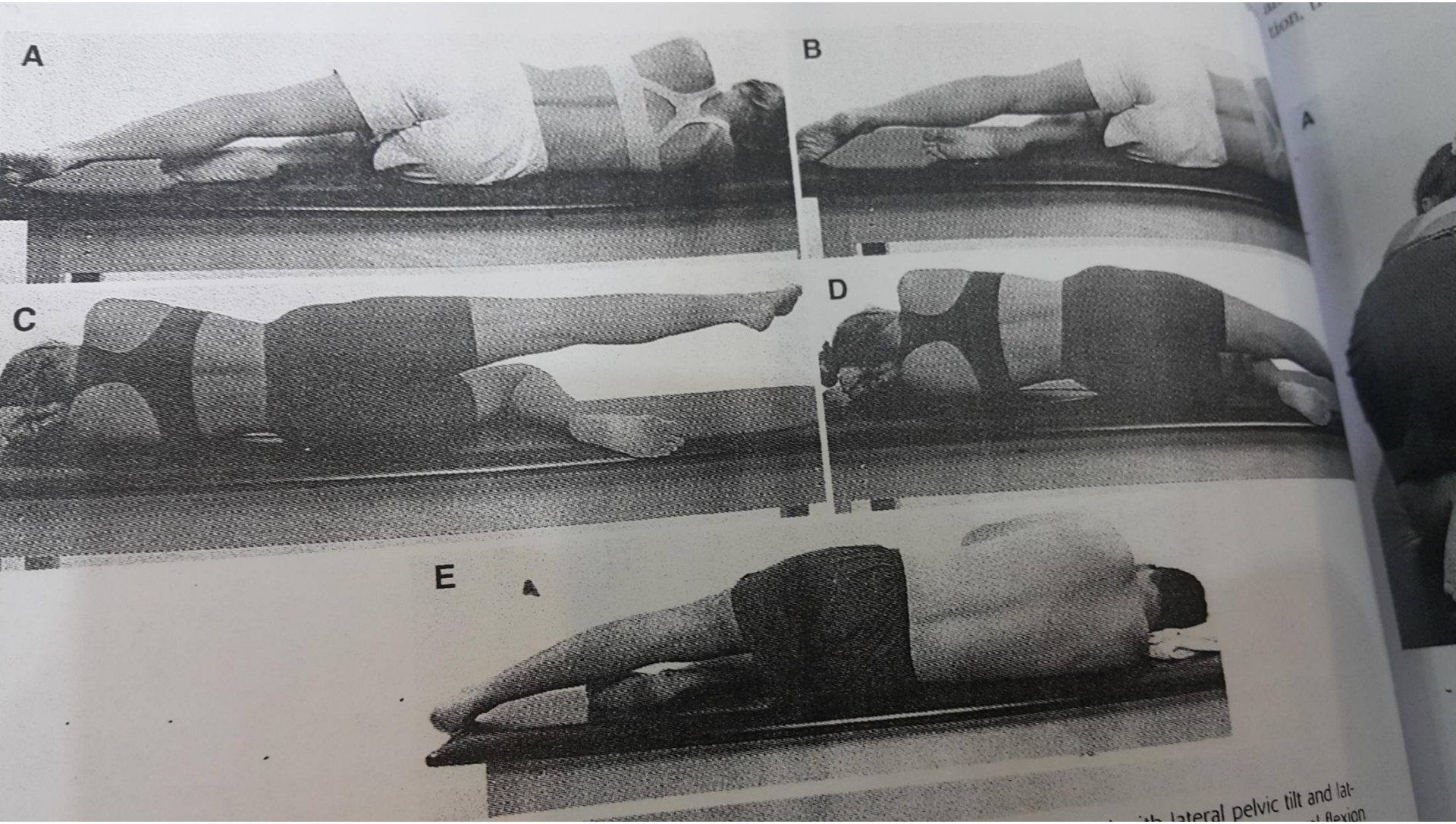
- 2. hip abduction with associated lat. Pelvic tilt

  Test is positive for rotation if patient report pain.

  Because of contraction of iliopsoas or quadratus lumbrum which both attach to transverse process

Hip Adduction

- Test is positive for rotation when there is pelvic tilt laterally rather than isolated hip adduction. Lat pelvic tilt is accompaied by lat. Flx of the spine


A
B
C
D
E

Prone Position

The following tests are performed

(1) knee flexion,

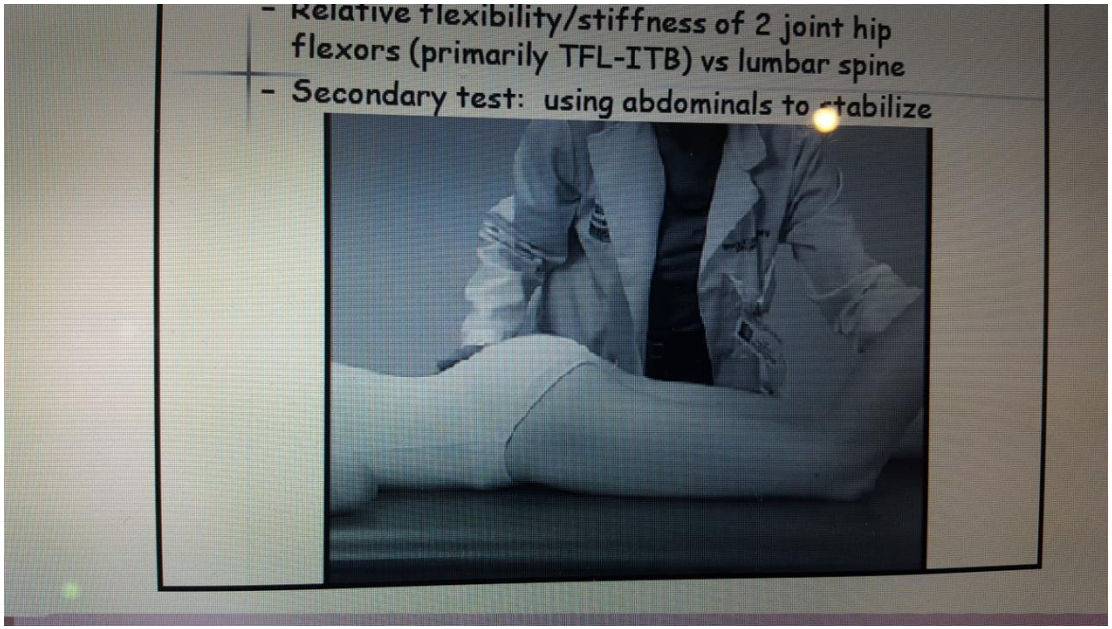
(2) hip rotation

(3) hip extension

Knee Flx

- Test is positive if pelvis tilts anteriorly with associated lumbar ext. and increase symptoms.

- Confirm: stabilize the pelvis



Hip Rotation

- Rot of pevis, rotation of spine, incease syptoms. (due to insufficient hip rotation)
- Confirm: pelvis is stabilized
- Either medial or lat. Rotation but lateral rot is more common.

Hip Extension

- Spine extends or rotates excessively.
- It can elicit symptoms

- Confirm: a pillow under the abdomen and contraction of abdominal muscle.

- Don’t do it if in prone lying has symptoms, or extension syndrome is the diagnosis or if symptoms are ever.

Quadruped Position

- 1. position effect
- 2. rocking backward
- 3. rocking forward
- Shoulder flx

Position Effect

- Minimal pain in this position and use to alleviate symtoms.

- Minimize the compression, four point support.

Rocking Backward

- Symptoms decrease due to flx.
- If spine is rotated, rotation may increase as the patient rocks backward.

- In some patients rotation and lat pelvic tilt and spine

Rocking Backward

- Pushing with hands not using hip flexors to reduce symptoms

Rocking Forward

- Increase symptoms
- Don’t do it if symptoms are severe
- Don’t use it as an exercise

Shoulder Flx

- Rotation of the spine so that one side is ½ inch higher than the other side is a positive test for rotation

- Confirm: contract abdominal muscles and stabilizing the trunk manually to reduce the rotation

Sitting Position

- Position effect
- Knee extension

Sitting Position

- Increase in symptoms with exaggerating lumbar curve
- Confirm: patient is supported in the flat lumbar spine position

- When the patient is short, the feet may not touch the ground an anterior tilt occurs on the pelvis. Hip flexor or back extensors contract .

- Make sure patient is completely relax and back is supported to assess the effect of extension stress.

Knee Extension

- If pelvis or spine rotate as the knee is extended the test is positive for rotation.

- Increase symptoms if positive nerve tension sign
- Confirm: repeat the test while the therapist stablizes the spine

Walking

- Gait: During walking the pelvis often rotates excessively or lumbar extension is exaggerated during the stance phase to toe off.

- Confirm: Contract the abdominal muscles and placing both hands on his iliac crests to eliminate symptoms

Alignment: Structural Variations and Acquired Impairment

- 1. Standing position:
- Lumbar lordosis
- Thoracic kyphosis
- Paraspinal asymmetry
- Hip joint, Flexion, Retrotorsion, or Antetorsion
- Supine position
- Side lying position
- Prone position
- Sitting position

Lumbar lordosis:

- If standing is painful and patient has abnormal lumbar curve, this is positive for lumbar ext. as a cause of pain.

- To confirm: back against the wall to flatten the lumbar curve, hip and knee flx, muscles relax.
- Reducing the symptoms is positive for extension.

- **Thoracic kyphosis** can be associated with lordosis
- During back against the wall, shoulder and upper spine will be forwarded.

..Paraspinal assymetry

- One side of lumbar is ½ inch larger than the other is a positive sign for rotation.

- Previous tests to confirm lumbar rotation.

Supine position

- Pain is positive for the syndrome. However it is sensitive but not specific. Pillow under the knee is not sufficient to make it specific but relaxing the iliopsoas by passively flexing the hip. Reducing symptoms is positive for this syndrome.
- **Side lying:**
- Lumbar spine in lat flx especially in women. Pain is a positive sign for rotation. Place pillow under the waist reduce the pain.
- **Prone:** pain is positive for Ext. place a pillow under abdomen the reduce the curve. Reducing symptoms is positive for ext.
- **Sitting discussed before**

Relative flexibility and stiffness impairment

- Lumbar spine is flexible into Ext and Rot because the following factor:

- 1. Hip flexors are stiffer than the abdominal muscles which tilt the pelvis posteriorly.

- 2 Hip abductors are stiffer than lateral abdominal muscles.

- 3. the TFL is stiffer than the abdominal muscles that contro rotation of the pelvis

- 4. latissimus dorsi is stiffer than the abdominal muscles.

Muscle and recruitment pattern impairment

- During stand up straight recruitment of back extensors are dominant than the abdominal muscles.
- During return from forward bending back extensors are dominant than hip extensor.
- In sitting from curl up, hip flexors are dominant than abdominal muscles.

summary

- Most common in CLBP
- Not all tests are positive.

treatment

- Diagnosis direct the intervention.
- Primary strategy is eliminating the alignment, stress or movement in the symptom producing direction.
- No movement in opposite direction except in sever.

treatment

- Rotating the lumbar spine during activities such as reaching the computer, the telephone, or a file drawer. They don’t realize that they are rotating.

- Patient sit on the edge of the chair, using hip flexors to maintain the position.

- He should sit back with spine supported, a slight inward curve, hip and knee at the same height, feet on the floor.

- Leaning to one side or resting on one forearm is lat.flx for tall people. This is rotation.

treatment

- Sport such as golf: hip is fixed, trunk rotates.
- Hip rotational Flexibility is essential.
- It is not the case for volleyball and tennis

- All positive tests become the exercises which should be done correctly. They should not elicit symptoms. Otherwise omit it till next visit.

treatment

- Standing:

- One hip adducted: laterally flex the spine and should be avoided.
- Lordosis should be corrected by isometric contraction of abdominal muscles to slightly tilt the pelvis posteriorly.

- If standing is painful put lumbar spine against the wall.

treatment

- Sitting: discussed before
- Rolling: in supine, slide the hill to flx hip and knee, then the other extremity, roll in one piece so that arm and trunk move at the same time of pelvis and legs.
- Don’t use hip flexors

Sit to stand

- Move to edge of the chair, by pushing with the hands, with the hips alinged over the knees, stand straight, avoiding any back extension.
- Use armrest to push up from the chair.

- When sitting down, he may need to lower his body using the hands.

Stair climbing

- Determine which phase increase the symptoms:
- First phase is flexing the hips, abdominal contraction before lifting the foot reduces the pain. Otherwise one step at a time
- Next phase is raising the weight, if he extends the lumbar, he should lean forward and placing the weight on handrail.
- **Walking:** walk slowly, to reduce compression on spine. Limit pelvic rotation by smaller steps.

Exercises

- In hook lying position, hold his knee to his chest, slide the other leg into extension while contracting abdominals.

- In side lying with a pillow between the knees to control medial rotation, rotate the hip laterally while keeping the pelvis stationary.

- In prone, a pillow under the abdomen, contract the abdominal and flx the the knees one by one monitoring the pelvis.

exercises

- In standing: back against the wall, his feet far from the wall to allow hip and knees flex, now he can flat the lumbar spine, then contract the abdominal wall, and extend the hips and knees, slides up the wall.

Case presentation

- A man 63 years old, employed in a large business,

- Back pain extending to posterior tigh and leg
- Sport man: horse riding
- Radiologic: DDD and stenosis
- Surgery is advised

Thank you