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Myofascial Pain and Dysfunction

The Trigger Point Manual

JANET G. TRAVELL, M.D.
Emeritus Clinical Professor of Medicine
The George Washington University School of Medicine
Washington, D.C.

DAVID G. SIMONS, M.D.
Clinical Professor
Department of Physical Medicine and Rehabilitation
University of California, Irvine
Clinical Chief
Electromyography and Electrodiagnosis Section
Rehabilitation Medicine Service
Veterans Administration Medical Center
Long Beach, California

Huntington Beach 714-969-1235

Illustrations by Barbara D. Cummings

WILLIAMS & WILKINS
Baltimore/London

Travell & Simons'

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The Trigger Point Manual

VOLUME 1. Upper Half of Body

Second Edition

DAVID G. SIMONS, M.D., FAAPM&R, M.S., DSC (HON.)

Clinical Professor, Rehabilitation Medicine
Emory University School of Medicine
Atlanta, Georgia

Clinical Professor
Department of Physical Medicine and Rehabilitation
University of California, Irvine

Formerly Clinical Chief
Electromyography and Electrodiagnosis Section
Rehabilitation Medicine Service
Veterans Affairs Medical Center
Long Beach, California

JANET G. TRAVELL, M.D.†

LOIS S. SIMONS, M.S., P.T.

Consultant, Myofascial Pain and Dysfunction

Illustrations by Barbara D. Cummings

with contributions by Diane Abeloff and Jason Lee

LIPPINCOTT WILLIAMS & WILKINS

A Wolters Kluwer Company

Philadelphia • Baltimore • New York • London
Buenos Aires • Hong Kong • Sydney • Tokyo

† Dr. Janet Travell's genius and medical insight identified in the first edition the clinical picture of individual myofascial pain syndromes and many perpetuating factors. In addition, we were most fortunate to have had the benefit of her advice in preparing some of this edition. She emphasized the importance of including a new chapter that covers the respiratory muscles and supplied unique pearls of clinical wisdom that sprinkle this revision.

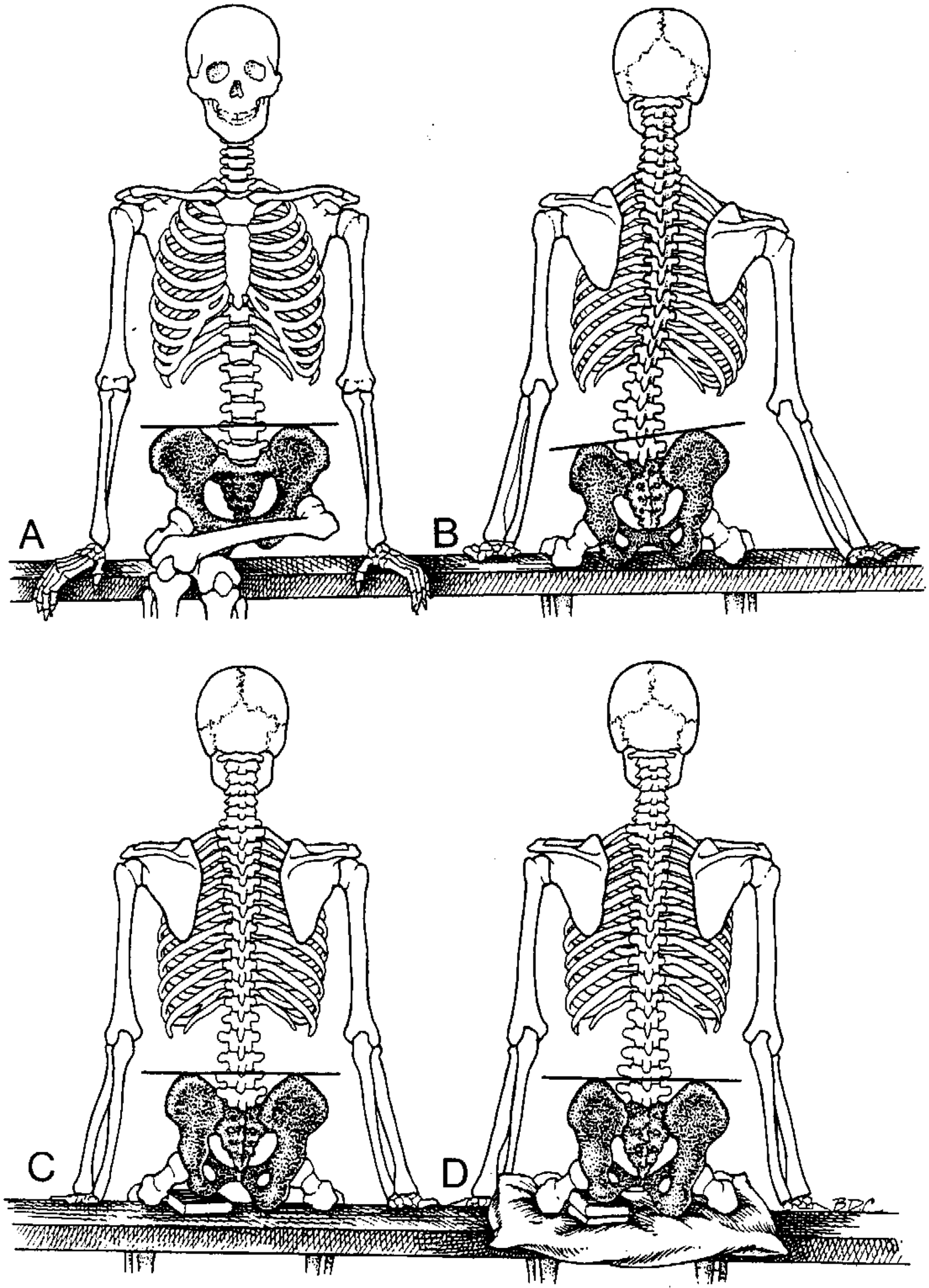

Figure 48.10. Effects of skeletal asymmetry due to a small hemipelvis on the left side are demonstrated by sitting on a flat level wood bench. *A*, crossing the leg on the short side over the opposite knee helps to level the pelvis. *B*, the tilted pelvis causes compensatory scoliosis, which tilts the shoulder-girdle axis. *C*, a small butt lift levels the pelvis on a hard surface. *D*, on a soft cushioned surface, a thicker butt lift is required to provide the same correction as that obtained on a hard surface.

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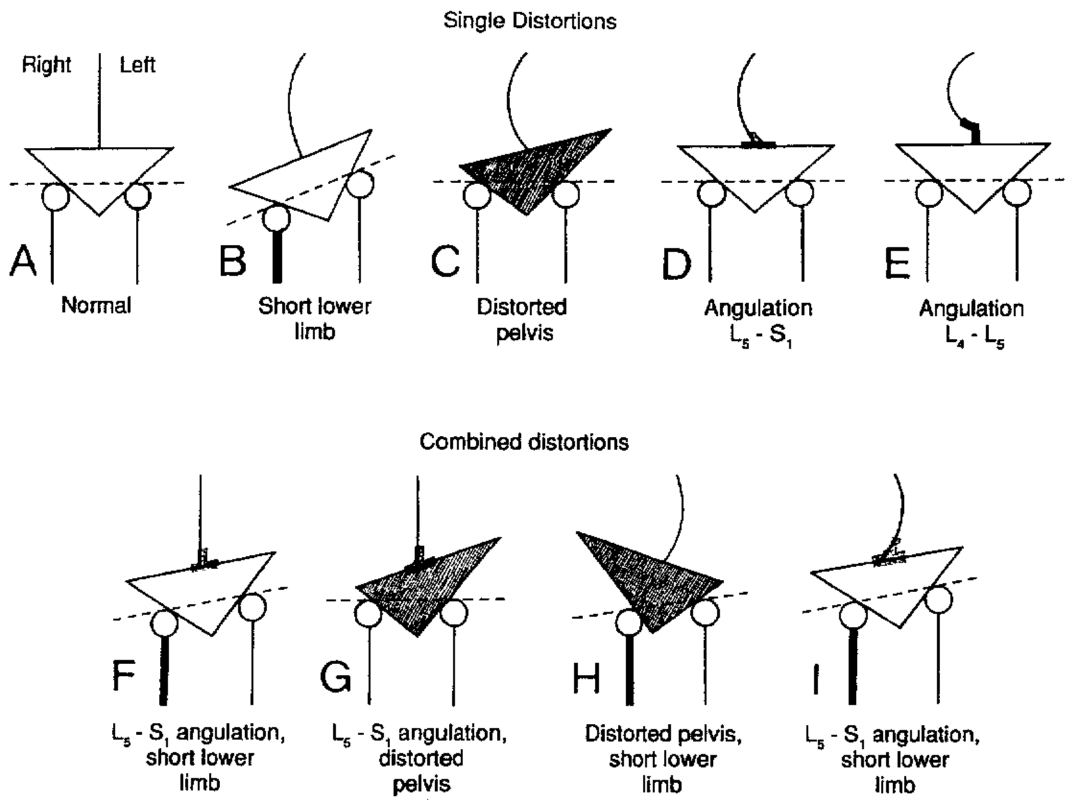

Figure 4.18. Single and combined distortions (skeletal asymmetries) of the lower limb, pelvis, and lumbar spine observed on radiographic examination. These asymmetries are usually structural where highlighted in *red*, but are likely to be compensatory (functional) and correctable where highlighted in *black*. The figures are facing the viewer. *A*, normal symmetrical lower limbs and pelvis with a straight vertical lumbar spine. *B*, shorter right lower limb, symmetrical pelvis, and compensatory spinal curvature. *C*, equal length of lower limbs, asymmetrical pelvis, and compensatory spinal curvature. *D*, equal length of lower limbs, symmetrical pelvis, angulation of L_5 to the right on a level sacral base, and compensatory spinal curvature. *E*, equal length of lower limbs, symmetrical pelvis, angulation to the right of L_4 on L_5 (may be of muscular origin) with compensatory curvature of the lumbar spine. *F*, combination of shorter right lower limb, symmetrical pelvis, and angulation to the left of L_5 on S_1. Since the two asymmetries neutralize each other, no compensatory spinal curvature results. *G*, lower limbs of equal length supporting an asymmetrical pelvis with neutralizing L_5-S_1 angulation to the left, which, similar to *F*, requires no compensatory spinal curvature. *H*, Strange combinations are sometimes seen. Here, the effect of a shorter right lower limb is overcorrected by an asymmetrical pelvis that tilts the sacral base to the left, which requires a compensatory spinal curvature. *I*, a surprisingly common combination is the shorter right lower limb supporting a symmetrical pelvis with an exaggerated deviation to the left of L_5 on S_1. This structural angulation produces a compensatory curvature of the spine that is opposite in direction to that produced by the limb-length inequality alone.

Each asymmetry illustrated occurs with nearly equal frequency on the opposite side of the body.

in the lower limbs. Spinal and pelvic asymmetries may be either structural or functional. Functional (compensatory) adaptations are reversible. Structural found between the plane of the sacral base and that of the endplate of the most inclined lumbar vertebra.[41]

Figure 4.18 illustrates common asym-

weight-bearing, recumbent X-ray films; standing radiographs are required to detect them. (Methods for obtaining suitable standing radiographs are presented later in this section.) In the standing position, an LLLI tilts the pelvis and sacral base downward on the side of the shorter limb (Fig. 4.18*B*), causing the lower lumbar spine to deviate toward that side. The compensatory lumbar scoliosis is convex toward the side of the shorter lower limb and restores equilibrium.

Northup[112] showed radiographically that if the foot of the long limb is not moved aside, but simply rests vertically on the ground while most of the weight is on the short limb, the compensating lumbar scoliosis becomes maximum. Bearing weight equally on both legs reduces the scoliosis. Standing with weight mainly on the long limb further reduces the scoliosis, but is uncomfortable because now the long limb must carry a major part of the weight of the short limb in addition to the rest of the body weight.

Edinger and Biedermann[22] illustrated radiographically the marked alternating lumbar scoliosis produced in normal subjects by placing a lift first under one foot and then under the other.

A tilted sacral base can also result from displaced intrapelvic articulations, for example sacroiliac (SI) joint displacement (Fig. 4.18*C*). Examination for this cause of asymmetry is covered in Chapter 2, page 17. Examination for other pelvic asymmetries is described elsewhere.[11,48,141] On the other hand, Friberg[38] found angulation of the sacral base without LLLI to be unusual among low back pain patients; it occurred in only 4 of 236 subjects.

Even with a level sacral base, a lumbar scoliosis can be caused by angulation of the spine at L_5-S_1 (Fig. 4.18*D*) or at L_4-L_5 (Fig. 4.18*E*).

Without radiographic analysis, combined asymmetries can be very confusing clinically. For example, a fixed angulation at the base of the lumbar spine can

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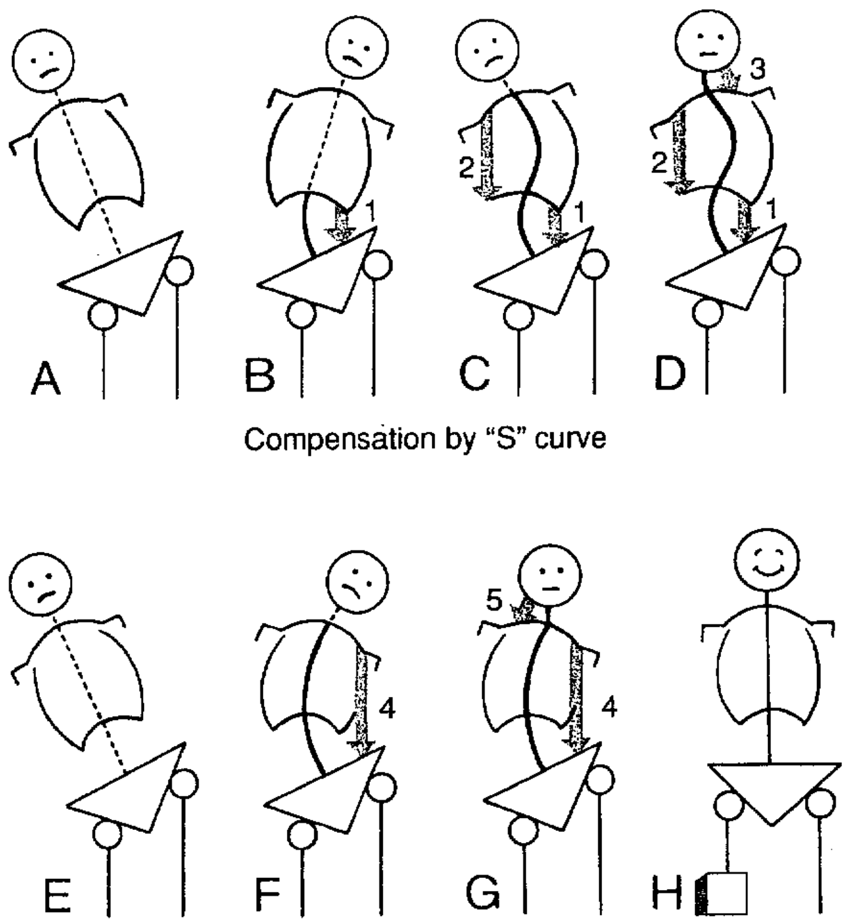

Figure 4.19. Muscular actions that produce either an "S" curve or a "C" curve functional scoliosis to compensate for a laterally tilted sacral base that is due to a lower limb-length inequality. *A* and *E* illustrate the instability and loss of equilibrium that would result if the effect of the tilted sacral base were not compensated for by muscular effort. *B*, compensation in the lumbar spine by the quadratus lumborum muscle. Force *1* brings the 12th rib and crest of the ilium closer together on the high side. The base of the thoracic spine is now tilted in the opposite direction from the tilt of the pelvis. *C*, compensation in the thoracic spine by lateral chest muscles. Force 2 pulls the shoulder girdle down on one side toward the lower thorax. The base of the cervical spine is now tilted in the opposite direction from the base of the thoracic spine, producing an "S" curve scoliosis. *D*, compensation in the cervical spine by lateral neck muscles. Force *3* places the head over the body's center of gravity, reestablishing equilibrium and leveling the eyes. *F*, compensation in the thoracolumbar spine by lateral torso musculature exerting Force *4* on the high side of the iliac crest, possibly assisted by the ipsilateral quadratus lumborum. This muscular action approximates the shoulder girdle and iliac crest on the high side. The base of the cervical spine is now tilted in the opposite direction from the tilt of the pelvis. *G*, final compensation by the lateral cervical muscles exerting Force *5* (similar to the compensation in *D* by the lateral cervical muscles, Force *3* above, but toward the other side of the body). *H*, elimination of need for compensatory scoliosis by correcting the lower limb-length inequality with a foot lift.

In the case of the "C" curve, the initial correction is made more directly by Force *4* in Figure 4.19*F* and *G* using the anterior fibers of the latissimus dorsi, which extend with excellent leverage from the humerus to the crest of the ilium. The iliocostalis could assist, but with less mechanical advantage.

Force 5 of Figure 4.19G is essentially the same correction as Force 3 of Figure 4.19*D*, but on the other side of the neck.

It becomes obvious that a tilted sacral base is a potent source of chronic overload for many muscles and this explains why time spent to understand the cause of the tilt and correct it is well worth the effort.

Lower Limb-length Inequality

This topic of LLLI was previously reviewed in Volume 1[150] under the heading Short Leg. Little of that material is repeated here. Instead, this analysis presents a further development of those concepts.

If LLLI is the only cause of the spinal curvature that overloads the quadratus lumborum and paraspinal muscles, its recognition and correction can be a simple process. The fact that asymmetries are often complex and difficult to assess should not lead one to miss the simple, easily correctable situations.

In terms of the compensatory load imposed on the quadratus lumborum muscle, it makes little difference why the sacral base is tilted. The postural overload demanded of the muscle to keep the head erect and the eyes level over the body's center of gravity will perpetuate its TrPs regardless of the cause. Since LLLI is considered the most common cause of functional lumbar scoliosis and is certainly the one most commonly discussed in the literature, this section reviews that extensive literature. Correcting a functional lumbar scoliosis plays an essential part in the successful management of quadratus lumborum TrPs.

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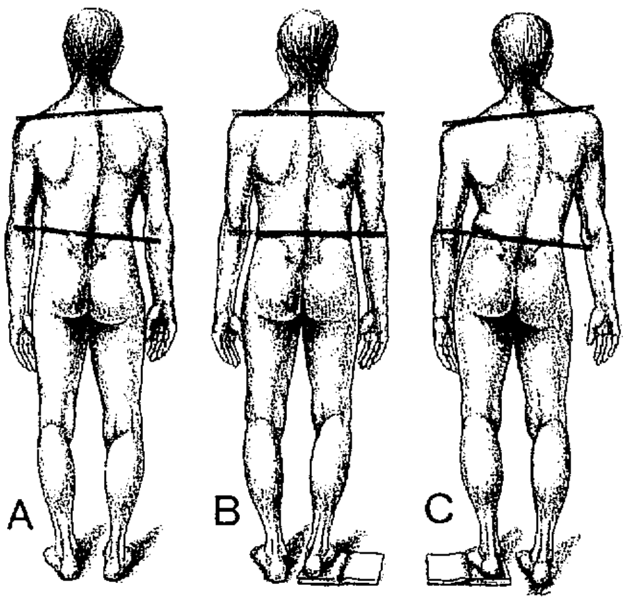

ıure 4.15. Testing a standing patient ɦ a C-curve scoliosis and sagging left ›ulder due to a shorter right lower b. *Black lines* show level iliac crests ɟ shoulder girdles when limb length quality is corrected by a right foot lift. *d lines* show the angles of the pelvic ɟ shoulder girdle axes when tilted. *A*, ɔorrected. Right hip, iliac crest, poste- · superior iliac spine (*dimple*) and but- k are lower than on the left side. The ɡulation of the shoulder girdle and the sway cause the right arm to hang ay from the body. This functional sco- ɨis tips the left shoulder-girdle axis ʍnward on the long side; the left scap- is lower. *B*, corrected. The lift re- red to level the pelvis and shoulder- ɖle axes and to correct the body ymmetry is more likely to measure 6 n (¼ inch) or less when the scoliotic ·ve is of this type. *C*, counter-cor- ɔted. The same foot lift placed under ɜ longer left limb exaggerates the pos- ·al distortions of *A*. This increased ymmetry uncomfortably stresses the ɹscles at once so that the patient ɜarly prefers *B* to *C*. The difference im- ɜsses the patient with the importance correction.

ıd then on the other, leveling of the pel- .s and stance symmetry improve when ɜ or she is standing on the longer limb, hereas standing on the shorter limb in- ·eases the malalignment. This becomes ·en more apparent when the patient ands on one foot and swings the free ıot back and forth as if walking. The ıorter limb swings freely, but swinging ɩe longer limb requires marked torso tilt ıward the side of the shorter limb in or- ɜr to allow the foot of the longer limb to .ear the floor.

By..asking the patient to walk in place, ·allin[64] observed and palpated the ilia ·hile observing the phenomenon previ- usly described, but from the point of iew of the longer limb. He detected a

with LLLI may exhibit this same limp during walking.[67]

Evidence of Body Asymmetry (Fig. 4.17)

A number of observations help identify the presence and direction of an LLLI in the standing subject. None are completely reliable alone, but their consistency or inconsistency helps one to recognize a simple or complex condition. The examination includes checking the standing patient for stance asymmetries (including all lower limb segments), lumbar scoliosis, iliac crest height, shoulder-girdle tilt, and related body asymmetries.

Stance asymmetries provide sensitive indicators of skeletal asymmetry that can

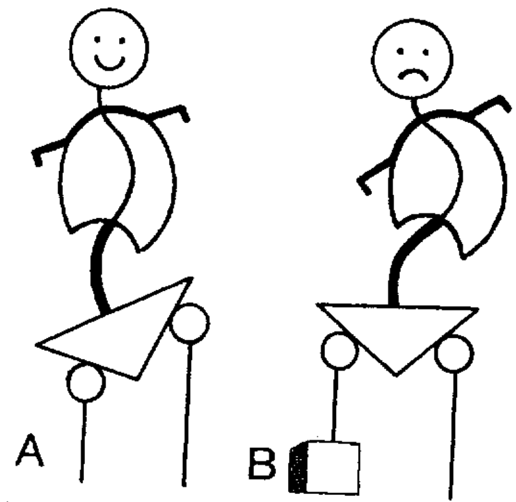

Figure 4.16. Aggravation of spinal curvature by correction of a difference in length of the lower limbs when the lumbar scoliosis is fixed (structural), not compensatory (functional). The *heavy spinal line* in the lumbar region indicates fixed scoliosis; the *thin spinal line* in the thoracic and cervical regions represents compensatory scoliosis. *A*, scoliosis with tilted pelvis and no correction of limb-length difference. *B*, aggravation of the functional scoliosis of the thoracic spine by correction of the limb-length inequality. Although a simple compensatory scoliosis due to a limb length difference may be correctable by a shoe lift, a fixed scoliosis, as seen here, may be aggravated by such a lift.

longer limb in front or to one side, thus placing more weight on the shorter limb.[67] This is readily apparent by simply observing the standing patient.

Uneven distribution of weight on the two limbs can be measured by instructing the patient to put "equal weight on both feet" while he or she stands on a pair of matching scales.[92,97] If one limb consistently registers at least 5 kg (2.3 lb) more than the other limb, the stance is abnormally asymmetrical.[97] This much difference in the scale readings can also be caused by articular dysfunction of the craniocervical junction.[97]

Functional **lumbar scoliosis** usually develops when there is LLLI. This is the most important asymmetry causing quad-

umn is, in fact, scoliotic ("cı rotation" described by St 1929).[137] The opposite situatio rotation of the vertebrae exaɡ clinical appearance of scolios curs. A radiograph reveals the of this situation, as demonstra ure 4.17*B* and *C*. This pheno been well described and illu Friberg[36,38] and by Grice.[59]

Comparison of the relative **the iliac crests** (and anterior o superior iliac spines) is one o convenient and commonly us tors of LLLI. It is often assume tive crest height and LLLI rela to tilt of the sacral base and th bra, which is the factor that is portant to the quadratus lumbo cle.[41] Unfortunately, measureme tive iliac crest height is *not reliab* to either LLLI or levelness of t base. Tilted iliac crests indicat asymmetry of some kind.

If the quadratus lumborum is and one iliac crest is unmistakab than the other, one should exa the presence of an innominate sl function;[58] this dysfunction can c idence of LLLI when there is no

Among 50 patients with an LLLI of mm (⅜ in) determined radiographically, of the iliac crests did not correspond t in 12 patients (24%).[16] Fisk and Baigent similar lack of reliability in 26% of 3 who had an LLLI. Inglemark and Li found, in 370 patients with back disor were studied radiographically, that 72 shorter limb and smaller hemipelvis on side. In these cases, determination base crest height could lead to an overestimat true LLLI. These authors[72] concluded tha estimation of LLLI using the relative hei iliac crests must be considered unsatisfa cause of poor reliability.

After studying the relative positions of rior and posterior superior iliac spines in