Passive gross motion testing: Part I. Its role in physical examination

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Passive gross motion tests should play a significant role in the physical examination, but usually they do not. They are initial-impression tests, especially appropriate during the physical examination when all body systems are first screened. The somatic system, however, receives only a cursory examination if the full significance of its neuromusculoskeletal function is not recognized by the physician, and if the major goals in testing are limited to measurement of structural geometry and motion range. Skilled use of palpation, within a format of simple passive gross motion tests for asymmetry of regional response to motion, will evoke signs of somatic dysfunction as an early step in diagnosis of somatic components in a disease process. Positive findings of somatic dysfunction provide evidence of disturbed somatosomatic and viscerosomatic reflex activities. The physician’s attention thus is alerted to postural problems and to critical regions within the somatic system where there are major segmental dysfunctions that should appear on the problem list for consideration in total patient management.

Passive gross motion testing is familiar to all physicians as one aspect of the physical examination used to evaluate function of the somatic system. Gross motion testing, as the term implies, is not confined to a single joint but is more regional in extent. Examples in the seated position are head-and-neck rotation or trunk sidebending, or supine straight leg raising. Whether any such test is completely passive may beg the point. The term “induced gross motion” may be more accurate, since it correctly implies that the physician induces the movement and directs the specific motion desired.

A finding of asymmetry of gross motion, especially passive, seldom has a high priority for clinical consideration when a physical examination is performed. Clinical significance often is relegated to minor categories such as handedness, which is of little consequence as a factor in health and disease, or recent athletic activity, which arouses transient interest only. Since the physician’s frame of reference for body motion tends to emphasize joints and the anatomic concepts of their muscular, ligamentous, and other connective tissues, interest in motion asymmetries tends to be greater in some of the specialized fields of orthopedics, and physical medicine and rehabilitation. For the general practitioner performing a routine physical examination, positive findings of asymmetries from gross motion tests that are asymptomatic will seldom be the basis for itemizing on the problem list.

Active gross motion testing may be used somewhat more frequently by physicians than passive. In the standing position, for example, the patient is verbally directed to forward bend to screen for scoliosis, or to reach down the side of the thigh toward the knee for evaluating spinal sidebending. These tests usually involve no palpatory or proprioceptive skills on the part of the examiner. The patient is observed at the end of the motion arc for limitation of range and/or asymmetry; this is a geometric measurement, made visually.

In addition to limited range and asymmetry, subjective pain is also a criterion for a finding in both active and passive gross motion testing. In fact, pain on motion often receives more clinical attention than a visual finding of limited range. One of the reasons may be that the criteria for normal range of motion vary for each body region, for each kind of motion being tested, as well as for sex, age, and somatotype. Because of this lack of definitive criteria for range, motion testing may be omitted entirely from a physical examination unless a presenting symptom or an incident of trauma focuses the examiner’s attention. Even then, gross motion tests may be set aside for more local examination of a specific joint or muscle in question.
The premise offered here is that gross motion tests should play a significant role in the physical examination. They often do not because (1) they are only used within a limited conceptual framework, (2) they suffer from a lack of criteria and standards for a positive finding, and (3) they tend to be omitted in the sequence of initial screening tests where, appropriately, they can provide an early impression of somatic function and dysfunction. Concepts will be examined briefly to enlarge the frame of reference for clinical gross motion testing. Passive motion tests will be given major consideration because they are potentially more useful; active motion will not be considered in any detail at this time. Types of passive gross motion tests will be outlined and palpatory criteria established for a positive finding. Suggestions will be made for a system of recorded findings and a frame of reference will be presented for the diagnosis of dysfunction in the somatic system.

Concepts
The concept of a regional physical examination is an important one. The following principles are involved. Each body region is examined by the use of tests appropriate to an initial screen. Tests are chosen to sample appropriately all major systemic functions and, as a result, they begin to summarily provide for an evaluation of total body performance. Findings from these initial-impression tests seldom define a problem in detail; rather, they contribute a set of cues about disturbed functions that deserve further definitive testing. Screening tests serve another important role. They distinguish the normal and set it aside to narrow the field of the physician's concern in problem solving. Omitting screening tests removes large body regions and/or important body functions preemptorily from consideration; this removal potentially limits the physician's holistic approach to the patient.

Does the physician give consideration to structural support and body mobility as functions of a somatic system that have impact on health and disease? If so, a significant first impression of postural alignment and motion function can be provided even when one uses visual observation alone. Just the patient's movements and positions during interview convey a continuing expression of somatic performance that reflects many cues about body dysfunction; observation of guided active motion tests may add to these impressions. However, if neuromusculoskeletal (nmsk) tissues are recognized as a significant sensory/motor intermediary for the body's response to environmental stress, and a significant reflector of problems in other visceral systems, then additional palpatory tests and criteria for quality of nmsk function are essential. To assess these roles of nmsk tissues, passive gross motion tests sample the somatic performance at all spinal reflex levels. Palpatory findings of regional asymmetry and regional resistance to movement provide a first impression of dysfunction within the somatic system. They narrow attention to those problem regions where spinal segmental dysfunction manifests reflex disturbances, both somatosomatic and viscerosomatic. Visual observation of range is not sensitive enough to elicit initial cues about these kinds of findings during the physical examination, and when negative findings on a limited visual assessment are taken as reflecting normal, then the entire system and its function may be set aside from further consideration in the physician's evaluation.

To monitor the activity of the live-body response to passively induced motion requires additional conceptual considerations. The key word is "activity." There is a singular distinction between findings on testing for motion asymmetries of the patient in the office, and findings of anthropometric studies of range of motion in the laboratory on an unembalmed cadaver during the short period in which the body stays flexible but without life. The latter ranges can be expressed in an anatomic template of bones and joints and connector tissues. For the former, a positive finding mirrors the control mechanisms of nmsk reflex activity continually responding during life to the changing of bony position in space, of tissue tensions, and of muscle length and muscle tone taking place during posture and movement.

These mechanisms of response are operating whether the motion is actively generated or passively induced. In procedures of passive motion testing, however, there is greater opportunity to measure this physiologic response. The examiner's palpatory perception can more sensitively elicit characteristics of the response mechanism by monitoring from the initial onset, during the motion, and at the end, without being confined solely to visual measurement of end points after the response has taken place.

A few clinical examples will suggest the wide applicability of these concepts. Neuromuscular tensions associated with cephalalgias provide a basis for the presence of asymmetric head-and-neck motion on physical examination. The brachial plexus tension of upper extremity neuritis will be reflected in a general limitation of cervical mobility, especially with asymmetry in sidebending. The musculoskeletal congestion accompany-
ing upper respiratory problems is often evident in resistance to head forward bending. Chronic tissue changes following thoracic spine trauma will appear in the form of limited and asymmetric thoracic cage respiratory excursion having special implications to patients with respiratory problems. Low back disabilities that begin to challenge midline posture are quickly sensed with findings of asymmetric lateral and/or rotational testing at the hips with the patient in the standing position.9 Lumbo-sacroiliac dysfunction, from developmental, traumatic, or reflex sources, is reflected in many musculoskeletal tests, but one commonly positive finding is an asymmetry present when comparing the lateral swing of the legs (together) to right and left; the patient is supine and the operator supports the legs at the ankles. Important to a wide variety of patient problems, the general location and degree of dysfunction in the nmsk system can become quickly apparent during selective motion tests that are applicable to the physical examination.

Types of tests
The selection of any set of passive gross motion tests to sample even minimally body mobility can be somewhat arbitrary. In principle with the screening nature of the physical examination, however, the selection needs to provide the following: (1) an initial impression of motion performance for each region of the body; and (2) a sampling of major movement patterns of the body. The following sample set is chosen from a wide variety of tests that are applicable to address specifically these two needs:

Rotary kinds of spinal motion can be introduced through the head and neck, as illustrated in Figures 1 and 2, and through the shoulders, as shown in Figures 3 and 4; these are tested with the patient seated. Figure 5 illustrates rotary motion introduced at the level of the hips while the subject is standing. Translatory motion, side-to-side, can be introduced at the femoral trochanters with the patient standing (Fig. 6) and by lateral swing of the legs with the patient supine (Fig. 7). These can be supplemented with passive elevation of arms overhead while the patient is supine (Fig. 8) to complete a sample of motion for each spinal and extremity region. Substitutions are practical as long as the principle is addressed. In actual practice during a physical examination, a quick screening of structure and tissues of the somatic system is also used to complement the motion screening. (The physician decides whether one or more motion tests are needed to screen effectively any particular region.) A cluster of positive findings involving all three—structure, tissue, and motion—alerts the physician to closer examination of that region.

Technique* is an important factor in passive motion testing. A motion test is introduced by a skilled operator who controls a specific direction of simple motion in testing, rather than a more complex torsion, for example. Patient cooperation is gained by the physician's briefly describing the procedure and asking the patient to allow the movement, that is, to go along with it and not offer resistance that will interfere with test results. Going through several preliminary motions often will gain the patient's confidence in the procedure.

Placement of hands is light, to avoid having the patient react to uncomfortable pressures. For example, when the patient is seated, the operator does not grasp the patient's head as if he or she was going to do the turning; the operator's active role is merely to initiate and guide the motion. Light contact also complements the operator's need to sense response to motion throughout the test. In testing to compare rotation right with left, hand placements should be sufficiently similar during each test to standardize the demand for motion equally in opposing directions.

Position of the operator should be comfortable and flexible to minimize any additional proprioceptive sensory interference to reception of the palpable cues.11 At the same time, the movements introduced by the operator should not challenge the patient's sense of balance without the operator supplying an element of coordinated support. Postural challenge will evoke responses from the patient that will reflect a false positive.

Criteria and recording
Criteria for a positive finding from passive motion testing are palpatory. Once the operator has developed the palpable sense of a normal resistance barrier typically present at the end point of a gross motion range, he or she applies this measure with respect to timing and quality; to go beyond this point would require additional operator force. For example, with the patient in the supine position, do the legs (supported together at the ankles by the operator's hands to just clear the table level) swing easily to right and left without encountering abnormal degrees of resistance? Is the end point encountered sooner in one direction than the opposing direction? Palpable cues are more sensitively measured by the hands with the eyes closed.

*Readers interested in further description and demonstration of the techniques involved are referred to videotape MVC646, “Gross Motion Testing,” by Drs. Beal and Johnston. Available for rental or purchase through Instructional Media Center, Marketing Services, Michigan State University, East Lansing, Michigan 48824.
(or diverted). Does the quality of end point retain a normal sense of resiliency or slight give, or is it perceived as a hard, firm barrier? This change in the quality of the end point reflects changes in the tissue properties that are responsible for controlling end-of-range.

If a finding of resistance to movement is variable on repeated tests, a subjective factor of resistance on the part of the patient may be responsible. Or, the finding may be slight in degree, with a transient quality that is reflected in the palpable cue's not being consistently perceived.

The findings on physical examination should be recorded in an easily reproducible manner that quickly summarizes findings after the examination, and is still meaningful when reviewed after an interval of time. For recording gross motion test findings, Figure 9-A illustrates a simple format involving use of arrows on a body outline to indicate the direction-of-motion test that has resulted in a finding of resistance to motion. A consistent finding can be noted as slight or marked to indicate intensity. A quick glance at Figure 9-B reveals several findings from a real patient's examination regarding complaint of left sciatic pain. They provide an immediate point of reference for the physi-
Fig. 7. Lateral swing of the legs (to the left). Fig. 8. Arms overhead.

Fig. 9-A. Use of directional arrows with a bar (↑↓) as symbols to indicate direction of barrier when asymmetry is present in any of eight tests for regional response to motion. Fig. 9-B. Findings of passive gross motion asymmetry from a patient record.
cian, not only to justify further appropriate steps in diagnosis but also to gauge efficacy during a treatment program.

Function and dysfunction
The response of a patient during passive gross motion testing will be individual in each patient tested. That individuality is expressed as the sum of the responses of the participating parts for the given region. Obviously, bones have no motors of their own; they move when acted upon. In this sense there is no dichotomy between posture and movement. Whether it is a single postural position or a movement reflecting a sequence of changing positions that is evaluated, position is still the result of the balance of forces acting on each individual, nonmotive part of the structural complex. Although the actual forces at rest and those during active and passive motion testing will be different, the mechanism of the response will be the same.

The practical difference in performing active and passive motion tests, however, is that the active muscular contraction in active motion tests may intrude on the ability to palpate.

The purpose here is not to detail a study of the forces at play, but rather to recognize in principle how posture is achieved; that is, by forces acting on each individual bone, causing motions in certain directions, and bringing about the cessation of that motion. Palpation of a region's response to motion identifies the summation of these responses of individual parts, and when an individual part or parts are dysfunctional, that dysfunction is reflected in the overall response to the induced gross movements in which that part or parts should be actively participating, but cannot. A positive finding of asymmetry will identify a region of the somatic system where segmental parts can then be individually examined to define the locus of major dysfunction. Passive gross motion tests provide one of the first steps in the logical process of evaluation of the somatic system in health and in disease.

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