

Office of David Marcarian, MA

13545 Erickson Pl. NE, Suite 200, Seattle, WA 98125

Phone: 206-357-6501 email: david@myovision.com Patient Name: Blast Jfirst

Test Performed: Lumbar DynaROM ROM-EMG Exam

Instrument Utilized: MyoVision Wirefree™ DynaROM ROM-EMG Evaluation

Electrode Attachments: Lumbar Paraspinals (approx... L1 and L5 bilaterally).

Patient Name: Blast Jfirst

Test Date: Jul 10, 2017

Interpretation By: David Marcarian, MA

Interpretation Date: Jul 14, 2017

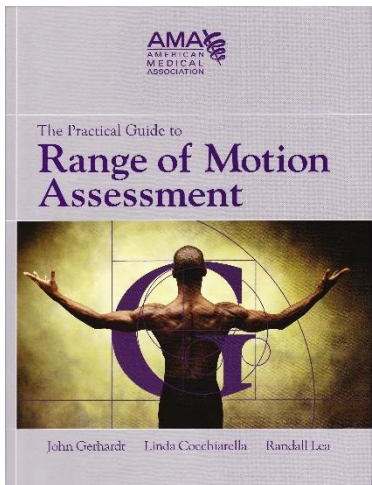


Figure 1 AMA ROM Text

Objective measurement of soft tissue injury utilizing DynaROM Lumbar Motion Evaluation Technology. Performed as demonstrated in the AMA Publication "The Practical Guide to Range of Motion Assessment"

The 5th and 6th edition's of the **American Medical Associations Guides to Evaluation of Permanent Impairment 5th Edition**, specifically reference the book (Figure 1) for the procedure performed for this evaluation. In the 5th edition of the "guides", the muscle guarding component as discussed in Box 15-1, Tables 15-2, 15-3 and 15-5. According to the 5th Edition of the AMA Guides to Impairment, Box 15-1: *"Muscle guarding is a contraction of muscle to minimize motion or agitation of the injured or diseased tissue. It is not true muscle spasm because contraction can be relaxed. In the lumbar spine the contraction frequently results in loss of the normal lumbar lordosis, and may be associated with reproducible loss of spinal motion."*

Muscle guarding is a physiological phenomenon in response to pain, and is not considered influenced by the patient's psychological state. DynaROM utilizes EKG

Technology to measure and graph muscle guarding bilaterally about the spine, and simultaneously measuring and graphing range of motion. Geisser et. al. 2005) found that by combining range of motion and muscle guarding measurement (dynaROM), sensitivity and specificity of range of motion measures were increased significantly. Range of Motion on its own is a poor indicator of pain, as many patients have normal range of motion with significant muscle guarding and pain, equal to 5-8% impairment according to the AMA's Permanent Guides to Impairment (5th edition). Unlike needle EMG used to evaluate for nerve damage by looking at a single motor neuron, the DynaROM measures the muscular guarding response in the region of interest. A pubmed search reveals over 9000 published studies on the technology utilized by the DynaROM for evaluating muscle guarding.

The system generates color graphs showing muscle activity and range of motion data for each range of motion. You may refer to the print out from the DynaROM System to review the raw data if needed. Each test typically requires that the patient performs between 2 and 3 trials of each range of motion with two practice motions prior to testing.



Electrodes are attached bilaterally at approximately L1 and L5 with a ground attached above the bony prominence of the scapula.

The ranges of motion evaluated in this interpretation include: Flexion, Extension, Left & Right Lateral Flexion and Left and Right Rotation.

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OVERVIEW OF TESTING METHODOLOGY

FLEXION RELAXATION RESPONSE EVALUATION

This is a study of the muscle activity of the Lumbar paraspinal region as the patient performs a series of three consecutive flexions. It is a reflex for muscles of the lumbar paraspinals to relax when the body is placed in a fully flexed position, as the body is "hanging" off ligaments (Sihvonen, et. Al. 1991). Readings should be relatively low in flexion (markers 1, 3 & 5).

Muscles which fire while in the fully flexed position correlate highly with pain and/or injury of the soft tissue.

Correlation of Traces &

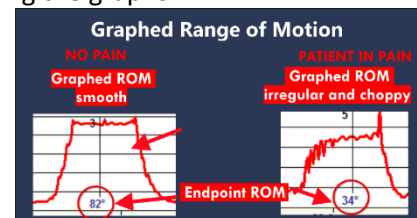
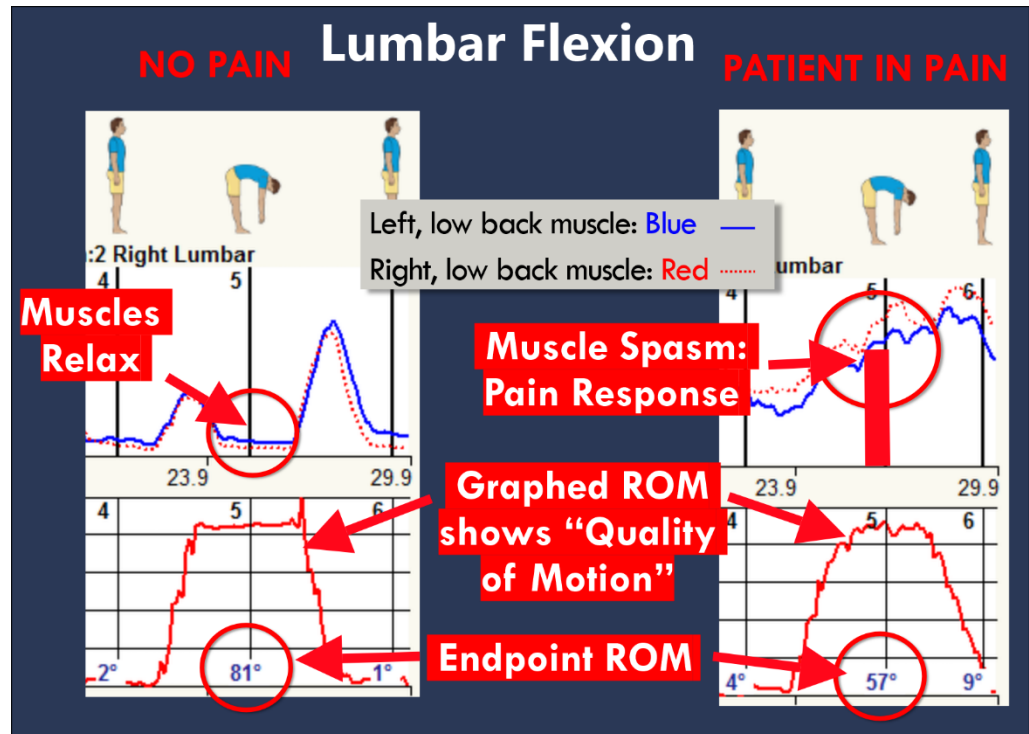
Irritability: Muscles typically

fire in a relatively smooth, fashion with left and right sides traces (red and blue lines) overlaying closely in plane motions (such as flexion and extension). With injury, it is common to see traces on the graph (left and right muscle activity) separate as one side fires at a higher amplitude to compensate for pain in this motion. Irritability or muscle fibrillation also a indicator of pain in motion. As the patient moves, if pain is induced, muscles are recruited which are not typically used to create this motion, leading to a random firing, or line graphs which lack smoothness. Muscle irritability/fibrillation is one variable taken into account when interpreting the graphs.

Quality of Motion: All motions Endpoint range of motion shows only the

degree to which a patient can bend. Just as one would compare a photograph to video, by graphing range of motion, we can see not only how far the patient bent, but how they moved. A patient without pain will move smoothly. Those in pain will display jerky, irregular and choppy motion as seen on the graph. This is a normal response to pain, and is commonly referred to as "ratcheting" in the literature.

Left/ Right LATERAL FLEXION; Left/Right ROTATION

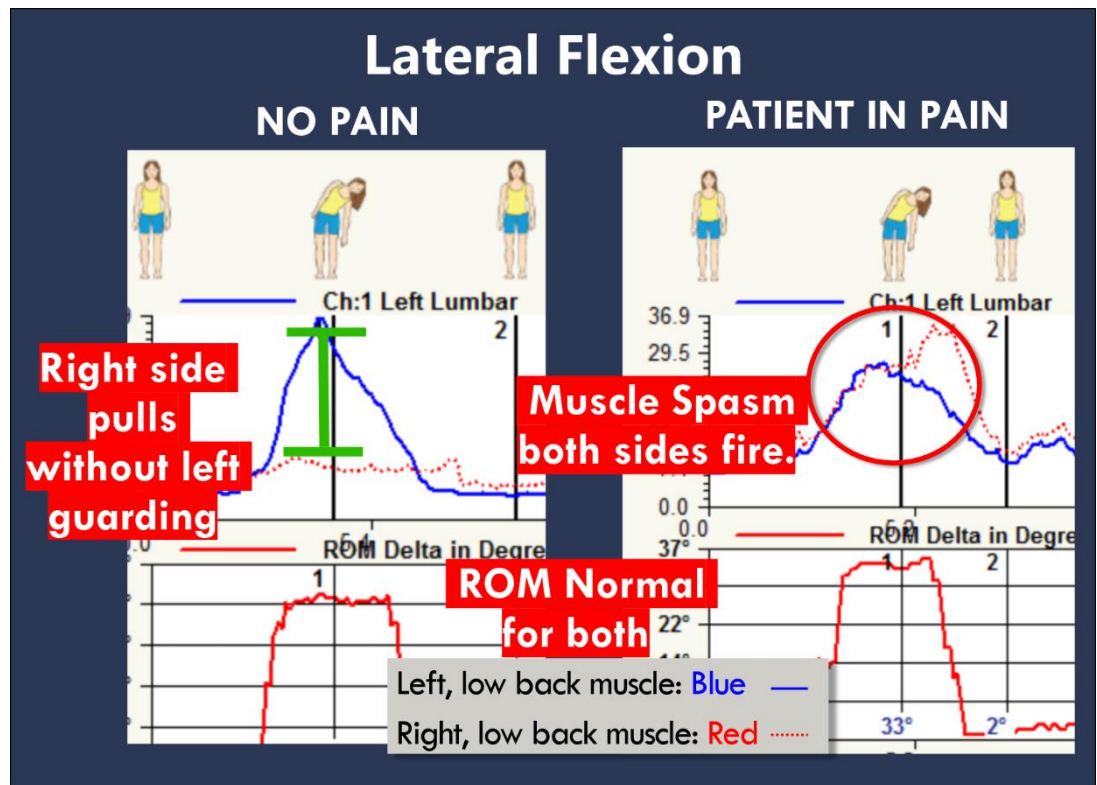


Level of Activity of Opposite Side (Muscle Guarding and Co-Contraction): In performing a left or right lateral flexion or rotation, only one side of the paraspinal muscles should engage, initiate and produce the motion. For example, in a left rotation, it is typical to see a large separation between the blue (left) and red (right) traces on the graph as the patient moves into the end range of motion. It is the body's natural defense mechanism to have muscles fire from the opposite side to brace and immobilize. If there is no pain in motion, there

would therefore be no recruitment of muscles from the opposite side, demonstrated as a large separation between blue and red lines in the graphs. There should be significant space between blue and red lines at the point where the patient has reached the full end point of the range of motion. **Irritability/fibrillation:** Muscles fire in a smooth fashion in normal individuals with little irritability or fibrillation. Soft tissue injury creates a state of abnormal motor functioning which appears as "jitter" or increased variability in the traces shown in the portion of the graph where muscle activity is displayed as the patient moves (the upper half of the graph).

Consistency: There are two ways to interpret consistency: In general, if the patient was given a "pre-measurement" training (e.g. performing 1-3 left motions prior to collecting data, consistency should be good from trial to trial (there are typically three trials in each graph). Consistency between these trials is seen in general in both healthy and unhealthy individuals. In severe pain, individuals will sometimes show a pattern of worsening consistency from trial to trial. In addition, if the patient test data improves from first to last trial, (there is an increases in the separation of left/right traces), this indicates the patient improves through stretching, decreasing the likelihood that the patient's pain is significant.

Symmetry of muscle firing: Left vs. right motion: The purpose here is to compare the left motion with the right. They should appear as mirror images. If the left (blue) reading is higher amplitude in the left rotation/lateral flexion, the right (red) reading should be higher amplitude in the right rotation/lateral flexion. If one muscle group fires consistently higher in both motions, this is most likely a learned guarding response, and an indication of a chronic condition.



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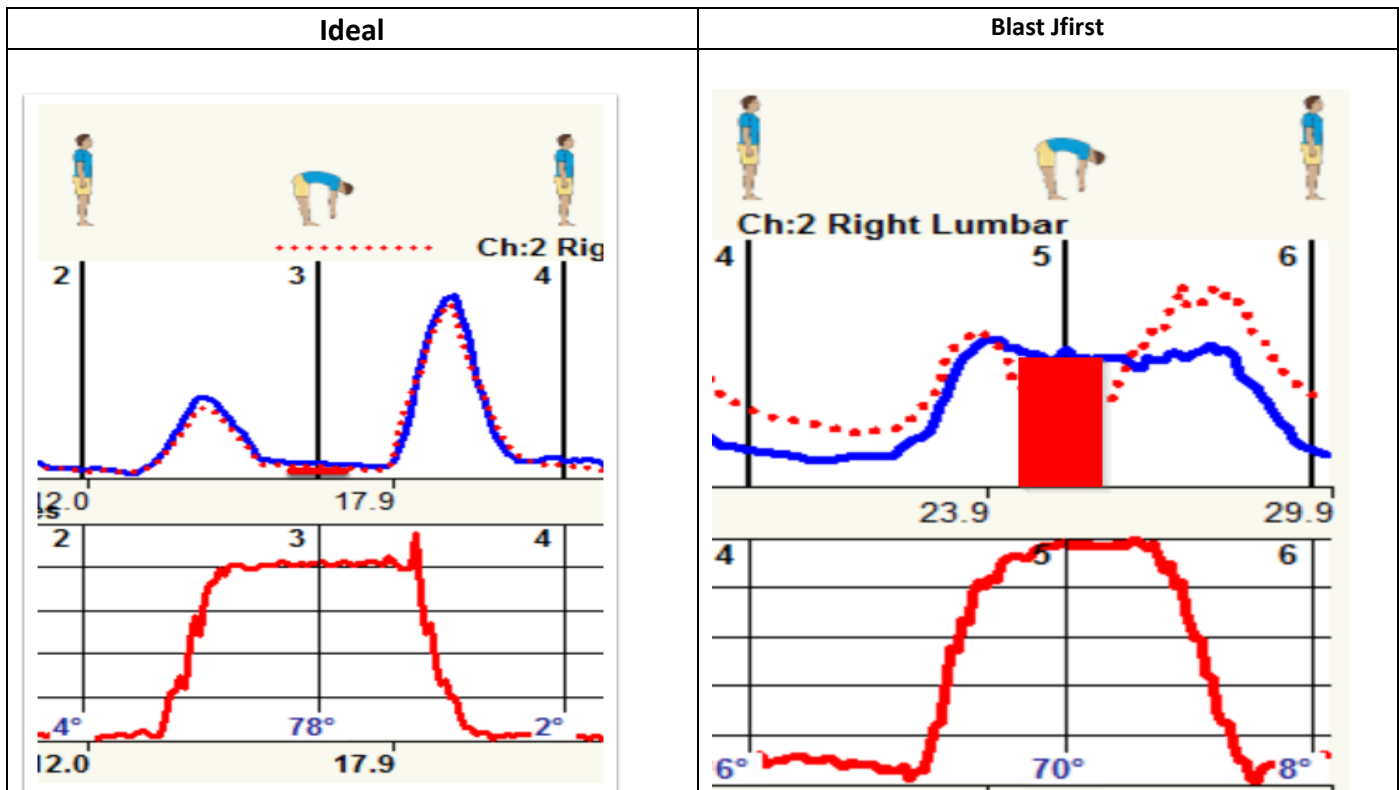
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Interpretation of Patient Test Results: Lumbar Flexion DynaROM

Interpretation: Severe with Fibrillation: The patient demonstrates lack of flexion relaxation and muscle guarding correlating highly with soft tissue injury and pain in this motion, and has significant muscle fibrillation indicating acute pain throughout this motion.

Flexion Range of Motion in Degrees. AMA: 50° Patient: 68°



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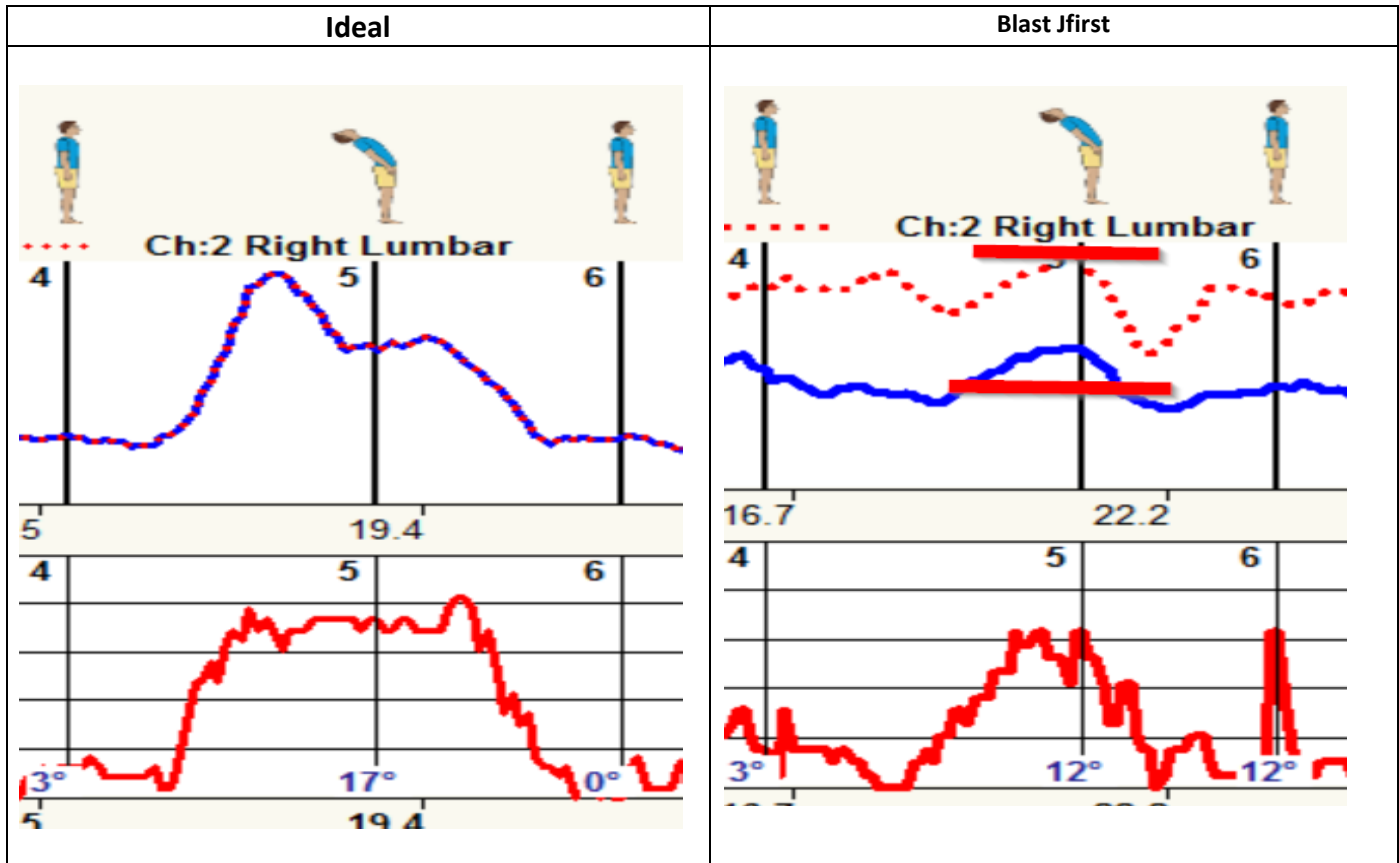
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Interpretation of Patient Test Results: Lumbar Extension DynaROM

Interpretation: Severe: The patient demonstrates a level of muscle guarding and range of motion which correlate with severe degree of soft tissue injury. This pattern is commonly seen with SI joint instability and correlates with a severe level of pain in this motion.

Extension Range of Motion in degrees: AMA: 20° Patient: 10°



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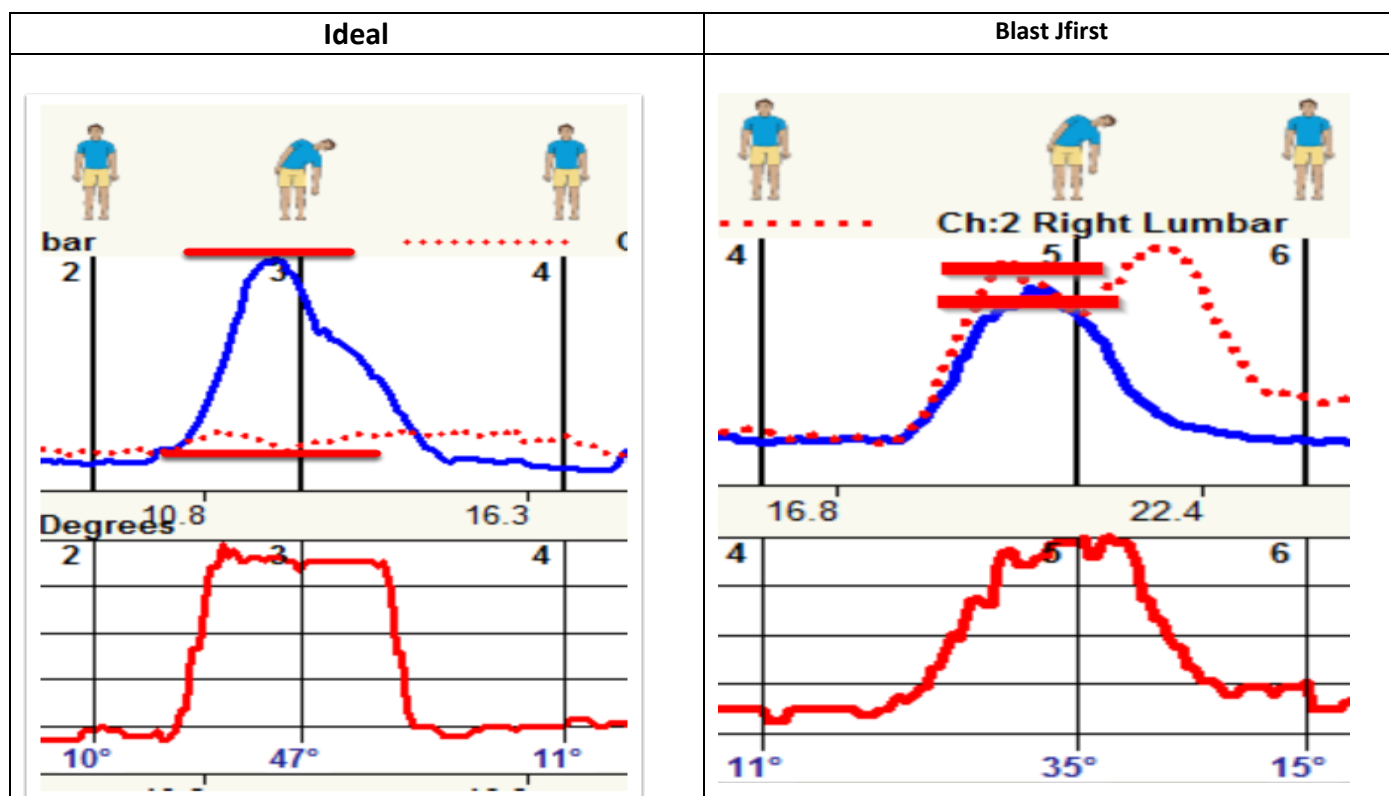
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Interpretation of Patient Test Results: *Lumbar Left Lateral Flexion DynaROM*

Interpretation: Severe: The patient demonstrates a pattern of muscle guarding which correlates with a severe degree of soft tissue injury and discomfort/restriction in this motion.

Range of Motion in Degrees. AMA: 30° Patient: 32°



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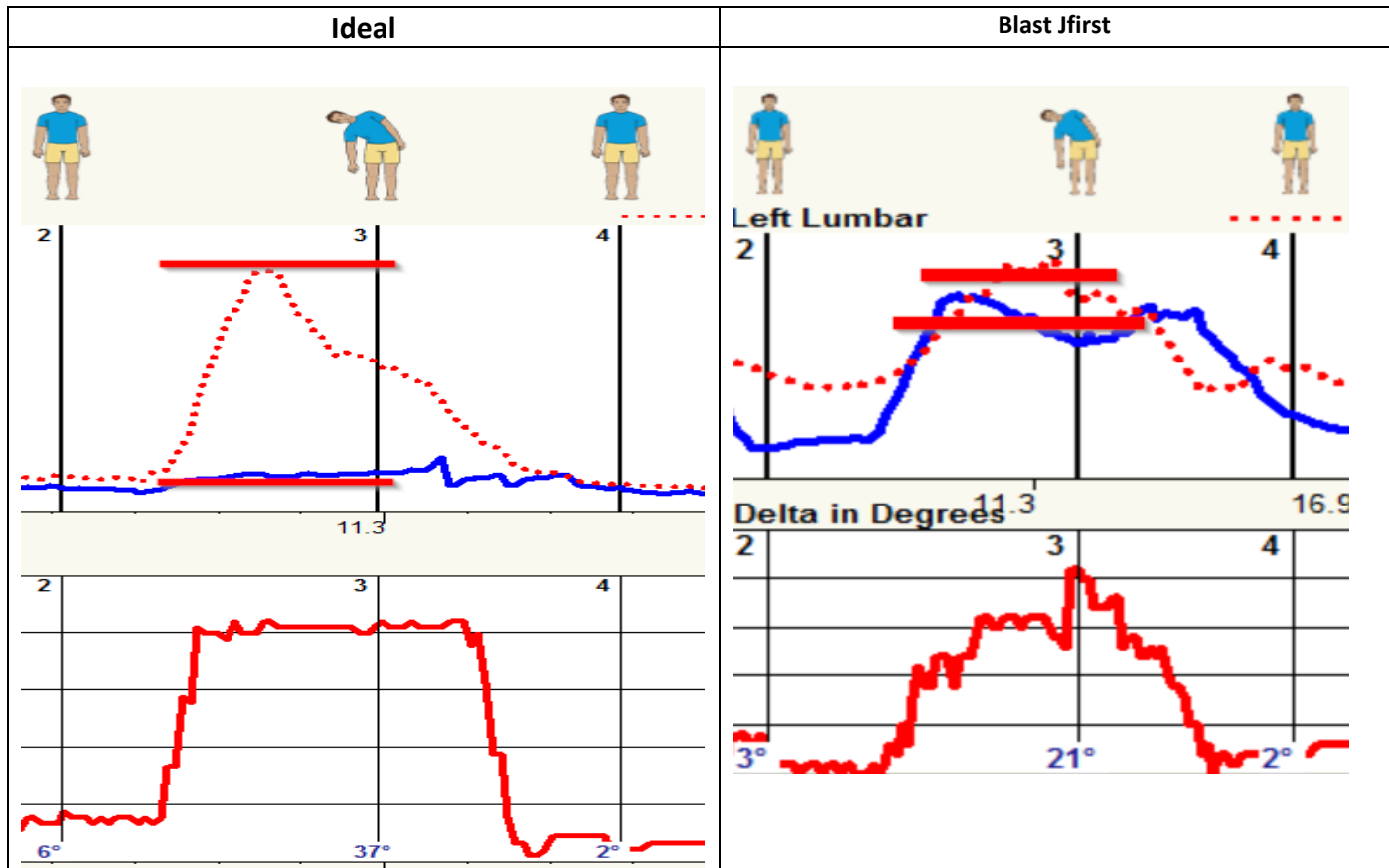
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Interpretation of Patient Test Results: *Lumbar Right Lateral Flexion DynaROM*

Interpretation: Severe: The patient demonstrates a pattern of muscle guarding which correlates with a severe degree of soft tissue injury and discomfort/restriction in this motion.

Range of Motion in Degrees. AMA: 30° Patient: 16°



Does left lateral flexion and right lateral flexion show opposite muscle groups firing?

Whichever line is higher in the left motion should be lower in the opposite motion (e.g if the left (blue) trace is higher in movement to the left, the right (red) trace should be higher in the motion to the right, and visa versa).

Comparison of Left vs. Right Lateral Flexion: GOOD SYMMETRY: When comparing left vs. right motion, the high trace in the left motion is the low trace in the right motion.

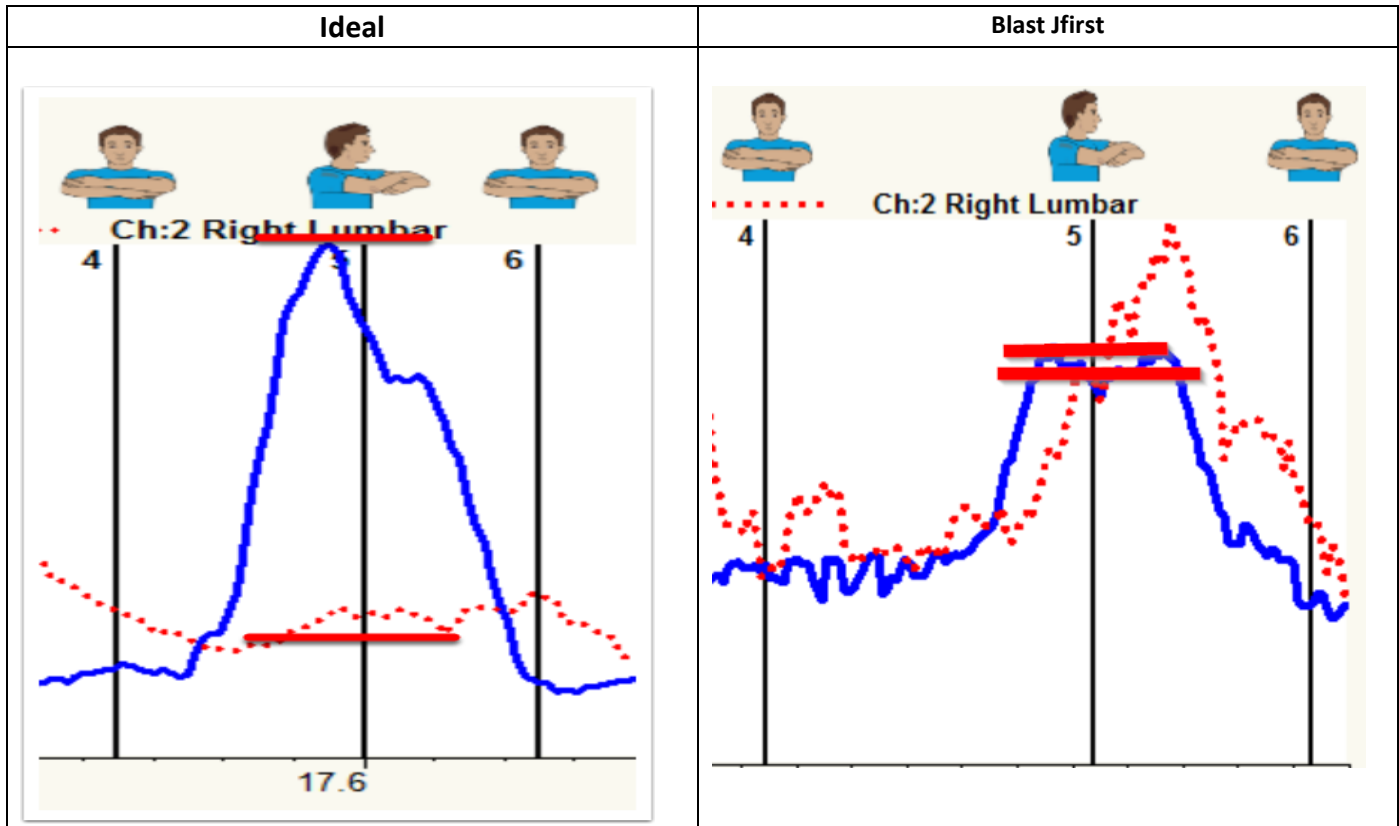
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Interpretation of Patient Test Results: *Lumbar Left Rotation*

Interpretation: Severe: The patient demonstrates a pattern of muscle guarding which correlates with a severe degree of soft tissue injury and discomfort/restriction in this motion.



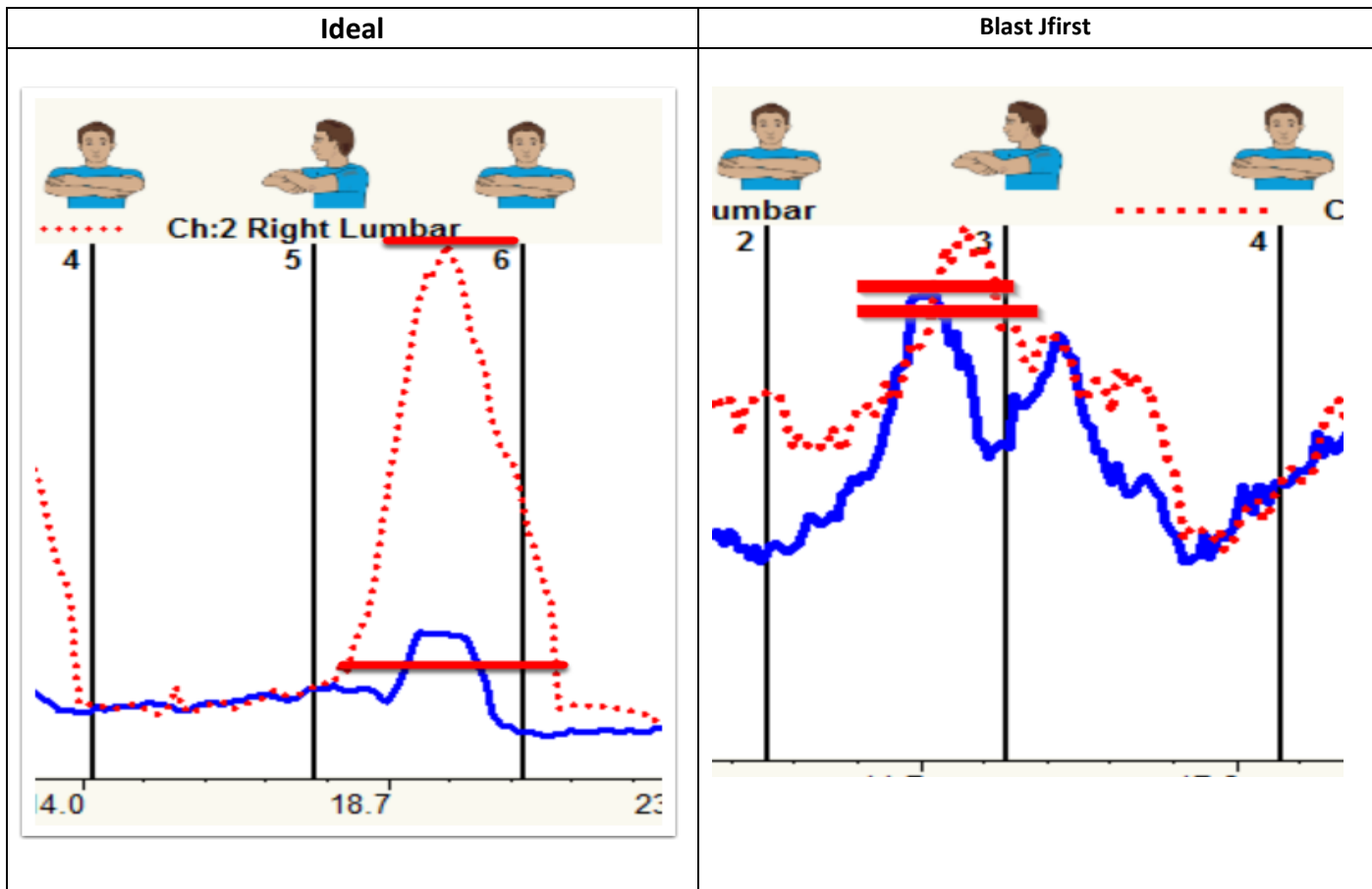
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Interpretation of Patient Test Results: *Lumbar Right Rotation*

Interpretation: Severe: The patient demonstrates a pattern of muscle guarding which correlates with a severe degree of soft tissue injury and discomfort/restriction in this motion.



Does left rotation and right rotation show opposite muscle groups firing?

Whichever line is higher in the left motion should be lower in the opposite motion (e.g if the left (blue) trace is higher in movement to the left, the right (red) trace should be higher in the motion to the right, and visa versa).

Comparison of Left vs. Right Rotation: GOOD SYMMETRY: When comparing left vs. right motion, the high trace in the left motion is the low trace in the right motion.

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CONCLUSION:

The purpose of this exam is to provide an objective means of evaluating for soft tissue injury by simultaneously measuring and graphing both range of motion and the muscular guarding response in response to motion. Muscle guarding is the body's natural response to pain in motion and can help establish validity of subjective complaints. By testing the patient in motion, a "stress test" of sort is created, which allows us to objectively evaluate levels of pain in motion.

Clinical Impression: Severe: The patient demonstrates a level of muscle guarding in one or more motions, which correlates highly with a severe level of soft tissue injury and discomfort/restriction in one or more of the motions.

This patient demonstrates severe muscle guarding in all ranges of motion. As muscle guarding is the body's natural defense mechanism in response to pain, this test data correlates with soft tissue injury as described in the 5th edition of the AMA Guides to the Evaluation of Permanent Impairment under Box 15-1, page. It is extremely unlikely, based upon the severity of muscle guarding, that this patient has much, if any, pain of a psychogenic origin. The patient's complaints of physical pain in motion are supported by the objective data gathered in this exam.

Important Information Regarding the Test Results

The information gathered from the sEMG is one of the many pieces of data used in determining a clinical profile and should not be used alone in the determination of injury or disability. Muscles often compensate for problems of the spine and do so in a manner that does not always directly reflect the exact location or even the general direction of the source. As an example, Lumbar problems often appear as abnormal muscle activity of the upper thoracic region. It is important to note that no single test can be used to determine injury. The DynaROM Motion ROM-EMG exam provides one piece of evidence used to develop a clinical profile.

Signed,



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REFERENCES

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