LOW BACK PAIN: MANIPULATE AND MOBILIZE IN THE RIGHT DIRECTION BASED ON EMG STUDIES

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INTRODUCTION

Low Back pain (LBP) with radiculopathy is a computer-page pathology. Manual Therapy is common treatment that might help LBP but it is based on the clinical expertise of the therapist. There is a need for an evidence-based method of selecting the direction of spinal mobilization or manipulation to avoid further nerve root compression. Soleus H-reflex (a golden electrophysiological procedure for nerve root function) has been used in our clinic for the last several years for that purpose (fig1&2).

PURPOSE OF STUDY

• To discuss the protocol of identifying the correct spinal posture
• for mobilization/manipulation in:
  • unloading (lying)
  • and loading (sitting & standing) positions.

HYPOTHESIS

• Spinal posture causing large H-reflex amplitude indicate neural decompression.
• Spinal posture causing depression of H-amplitude indicate neural compression.
• Manipulation/mobilization in the spinal posture with maximum (recovered) H-reflex may be the best treatment posture direction.
• Manipulation/mobilization in the spinal posture with depressed (inhibited) H-reflex may be the wrong treatment posture direction.

METHODS

PARTICIPANTS

• 2000 patients with LBP were tested & treated during our clinical procedures during the last 4 yrs.
• Subjects with LBP with radiculopathy (Right or left) tested during clinical studies.
• This is a descriptive retrospective study.
• Clinical & neurologic tests were completed.
• Soleus H-reflexes were tested for the right & left lower limbs during: Prone-lying & standing
• The limb side with the smallest H-reflex was identified (usually the symptomatic leg).
• Soleus H-reflex was tested in the symptomatic leg during different trunk postures (RSB, LSB, RR, LR, BB, FB, RSB + LR, LSB + RR)
• The trunk position resulting in maximum reflex recovery (OSP) and maximum reflex depression (USP) were identified.

**EXPERIMENTAL PROCEDURES**

• Patients were positioned on the treatment table in the OSP - lying position (fig.3)
• Manipulation (quick thrust) & mobilization (repetitive passive movement in the direction to promote the OSP) were carried out for 5 min.
• Pain intensity (VAS) of the limbs & back pain were measured.
• Patients were positioned in the OSP - sitting position (Please see fig.)
• Manipulation & mobilization were carried out to promote the OSP in the sitting position.
• Pain Intensity measured before and after intervention
• Gait symmetry/asymmetry were subjectively tested.
• Manipulation/mobilization in the OSP (unloading)

Manipulation using the pelvis & trunk in counteractive direction (quick thrust) to promote the OSP.(fig 3)
• Mobilization: use repetitive movement in same direction
• Manipulation and Mobilization in Partial Loading (PL) (sitting) (fig.4)
• The pelvis is holding/supporting the sacrum and lower lumbar region during sitting.
• Place the patient in OSP in sitting position (single or double axis).
• Operator hold subject’s shoulder/trunk (one hand) and pelvis
• with the other (fig.4)
• Use frontal strategy or back strategy (fig.5 & 6).
\textbf{DATA AND STATISTICAL ANALYSES}

- The peak-to-peak amplitude of 3-5 H-traces were averaged for each position.
• H-latency/msec. was measured.
• Pain intensity (before/after) for the symptomatic leg was measured (VAS). Two points or more was considered clinically significant.
• Gait symmetry/asymmetry was subjectively measured.

RESULTS
Case Studies-1

#1) A Patient with 19 mm disc (FO) (Fig.8)
FO is 40 YO female with a >10 yrs history of LBP and left leg pain (butt., thigh & calf), N &T in the foot (dorsum & sole) with leg weakness.
Clinical: severe reduction in ATR (L); SLR: 30 (R), 30 (L), Pain 7/10; SS: hyposthesia L5 & S1 (L); Gait: reduced tiptoe w. (L)
Imaging: L4-5: mild disc space narrowing with large extruded central to left paracentral disc herniation measuring 19 mm in craniocaudal dimension by 11 mm in AP diameter creating marked compression of the thecal sac with bilateral L5 nerve root compromise
EMG/NCV & H-Reflexes
Nerve conduction studies were WNL.
EMG: denervation in para-spinal muscles (L5/S1) and Sol., PL& TA (Left leg)
H-Reflexes: Significantly small amplitude of soleus H-reflex in the left lower limb during lying & standing postures (fig.9)
Vastus Radialis H-reflexes were normal amplitude & latencies in both lower limbs (fig.9)
Dynamic soleus H-reflex: OSP (decompression posture) was Right side bend + Left Rotation.
Unwanted spinal posture (USP- compression posture): Forward bend
  • By 6th session: Leg pain decreased to 2/10, reduced foot numbness, walk more symmetrically, can do daily shores for 30 min.
  • By 12th session: Referring Dr. (neurosurgeon who recommend surgery) admitted that patient improved 70% & does not need surgery.
  • She continued PT on & off + HEP to maintain the results.

Fig.8: MRI, F.O 9 mm disc hernia.

Fig. 9: A patient with 19 mm disc.
Case Studies-2

1. # 2): A patient with 8.4 mm. disc (SA)
2. Patient is 36 yo. with LBP. Left leg pain; Numbness & tingling (left foot sole) No weakness; Pain aggravated in previous 4 wks.
3. Pain (butt, thigh, calf & lat. foot); N&T in left foot; leg cramp
4. SLR: 80 (R) 50 (L) . Pain 6/10 SS: WNL
5. DTR: WNL Gait: limping on left leg
6. MRI: Large 8.4 mm left paracentral L5-S1 disc extrusion compress the left anterior thecal sac & displaces the left descending S1 nerve root. Moderate narrowing of the central canal. Subtle edema in L5-S1 interspinous ligament secondary to stress & grade 1-2 sprain (fig. 10)
7. H-(right)(lying-right panel; standing-left panel; Right leg up, left leg down) (Fig.10)
8. Reflex Testing:
9. Significant reduction in the soleus H-amplitude in the left (1.5 mv) compared to right (4 mv.), standing> lying. (fig.10)
10. Results of treatment (#2)

- Session 1: leg pain decreased from 6/10 to 4/10.
- Session 3: Leg pain decreased to 2/10. No more cramps.
- Session 4: no more numbness, no limping during gait.
- Session 6: Leg pain is 1/10. continue to do HEP and visit the office on and off to consolidate the results.
- Now he go to the gym. To improve endurance.

CUMULATIVE RESULTS

- All patients showed 30% reduction in radicular symptoms after 1st. Session of manipulation & mobilization.
- Manipulation & mobilization progresses from lying to sitting position in 3rd or 4th sessions accelerate the results.
- Exercises in the OSP & avoid USP as HEP progress the results to 70% reduction in radicular symptoms by 6th session resulting in symmetric gait.
- Patients were given the choice of doing HEP only or visit the office on & of to consolidate the results & return to normal.

DISCUSSIONS

- The reduced radicular pain & symptoms after manipulation in the OSP is probably due to nerve root decompression via increased opening of the intervertebral foraminae.
- Progressed manipulation/mobilization from unloading to partial to full loading, in the OSP, accelerated the results
(based on patient’s tolerance) via similar mechanism.

**CONCLUSION AND RECOMMENDATIONS**

- Manipulation & mobilization in the OSP could be an effective methods of manual therapy that accelerate recovery of radicular & spinal symptoms in patients with lumbosacral radiculopathy.
- We recommend applying this technology for rehabilitation of patients with lumbosacral radiculopathy up to 19 mm. disc.

**REFERENCES**

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