

Title: Effects of hamstring-specific exercise in Failed Back Syndrome patients

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Summary:

Many patients with low-back pain who have not responded well to surgical treatment alone ("failed back syndrome") evidence pain about the lumbopelvic junction. These individuals are frequently neurologically intact, but evidence functional weakness in abdominal and hamstring muscles. Hamstring strength in these patients is generally good when tested sitting, but often profoundly impaired (with muscle cramping) when tested prone. The relationship between an anteriorly-rotated or forward-tipped hemipelvis and lumbopelvic dysfunction (pain) is well-recognized among physical therapists and chiropractors, but the association between effective hamstring function and healthy lumbopelvic alignment has not been described. A study was designed to evaluate the effects of hamstring-specific exercises in these patients.

Nine subjects (average age of 40 years; five females, four males) with history of back surgery and reporting ongoing, disabling low back pain (modified Oswestry score > 50), completed a prospective, sequence-randomized, cross-over controlled eight-week therapy program including four weeks of hamstring-specific exercises using a modified knee orthosis (Protonics®). The Protonics® device is designed to selectively isolate and recruit hamstring muscles by adding resistance to knee flexion. Study inclusion criteria included (1) low back pain of eight + months duration, (2) one or more years recovery from back surgery, and (3) presence of two or more findings on physical exam suggesting *lumbopelvic dysfunction* (LPD: defined as pain or tightness on Thomas Test, Ober's Test, SI provocation, isolated standing leg bend, or limitation in supine lumbopelvic rotation). Subjects were randomized to use the Protonics® (exercise device) during either the first or last four weeks of the eight-week program in addition to their usual program (medication, physical therapy, etc.). Exclusion criteria included presence of recognizable confounding variables such as change in medication, epidural steroid or other injection(s), other changes in therapy, incidental injury or illness, or patient unwillingness to either start (or stop) using the device as prescribed. Protonics® use was initiated on whichever side manifested the weakest prone hamstring curl, but was occasionally used on either side at the patient's and/or involved therapist's discretion.

Patients were examined at four week intervals, noting self-reported pain levels (using a modified version of the Oswestry Disability Questionnaire), total lumbar mobility (flexion, extension, and lateral side bending measures), combined straight leg raise (SLR), respective (prone) hamstring pull and (supine) abdominal strength measures, and total lumbopelvic dysfunction score. The latter is the sum of the above listed LPD tests, each respectively scored using "0" in the absence of pain or tightness, "1" for mild to moderate pain or tightness, and "2" for pain or tightness so severe that either the patient was unable to perform the test, and/or reported residual discomfort in the area after testing. An independent medical examiner (blinded to subject's program and Protonics® use) was employed to perform physical examinations at four-week and eight-week follow-up visits.

Changes in outcome measures during the four weeks of Protonics® use were compared (using two-tailed t-test) to those changes demonstrated during the four weeks without it. Results were as follows: self-reported pain levels decreased 34.0% with Protonics® use vs. 5.8% without. These changes were non-significant (NS) at $P > 0.05$ level when compared to respective baselines. Total lumbar mobility improved 22.1% with Protonics® vs. 9.5% without (NS). Combined SLR improved 9.4% with vs. 2% without ($P = 0.004$). Combined hamstring strength improved 18.3% with vs. 3.0% without ($P = 0.009$). Abdominal strength improved 48.9% with vs. 24.2% without ($P = 0.033$), and LPD score decreased 34.4% with Protonics® use vs. 6.9% without ($P = 0.022$).

Conclusions:

Hamstring-selective exercises appear to significantly improve SLR, abdominal and hamstring strength, while decreasing lumbopelvic dysfunction and reported pain in these patients. These data suggest that hamstring-selective exercises may help reduce impairment and weakness in "failed-back" patients who have residual lumbopelvic dysfunction findings on exam.