

agement, evidence for its effectiveness is not conclusive. Due to this lack of optimal evidence TENS is not a treatment that is typically covered by insurance and is often restricted for use in RCTs. Previous health technology assessments and society led meta-analyses have found no benefit for TENS in patients with chronic pain (350,351). Some have criticized the recent society meta-analysis for a paucity of RCTs and the fact that the assessment did not compare the effectiveness of TENS with other nerve stimulation therapies (NSTs).

Studies comparing exercise therapy to passive therapies such as TENS, low-level laser therapy, ultrasound, thermal therapy, and ultrasound found no statistically significant difference between the exercise therapy and the other therapies, including TENS, but there was some serious limitations and inconsistencies in this low-quality evidence (337). Two studies comparing TENS with acupuncture or percutaneous electrical nerve stimulation (PENS) found that TENS was better for controlling pain but three studies comparing the same modalities found that PENS and acupuncture were better for controlling pain in the short-term (337). The evidence quality was very low in showing that PENS and acupuncture are better than TENS at providing short-term pain relief. Another study compared TENS to a new biphasic TENS in regards to pain and functional outcomes and found no difference. Five other studies comparing TENS with sham TENS or PENS found no significant difference between the groups. Only one study showed a significant benefit of TENS for pain relief compared to sham at short-term follow-up. All of this comparison data comparing TENS to PENS and sham was of low-quality.

Overall, the meta-analysis by van Middlekoop (337) found no difference between TENS and other treatments in regard to pain or functional outcomes when TENS was compared to other active interventions. The authors also noted that the findings of the Cochrane review from Khadilkar et al, when compared to their meta-analysis, were very similar in that they both conclude that TENS is not supported in the management of chronic low back pain (337,352).

A meta-analysis from Wu et al (353) showed the efficacy of TENS was similar to that of controls for providing pain relief and that other types of NSTs were more effective than TENS for providing pain relief. The only benefit they found for TENS was that it was better than control treatment in improving functional disability in the short-term (353).

The overall results of the Wu et al meta-analysis of RCTs comparing the effectiveness of TENS to controls

and other NSTs suggest that TENS does not improve symptoms of lower back pain, but could offer short-term improvement of functional disability (353).

4.4.7 Chiropractic Treatments

The efficacy of spinal manipulative therapy (SMT) for treating chronic low back pain is debated and the recommendations for use are heterogeneous. In some health systems SMT is treated as a first line option, but in others it is most often recommended along with other spinal treatments or not recommended at all (354,355). There is also at least one recent review of guidelines that suggests that SMT should be considered as a second-tier treatment option after exercise and behavior therapy (356).

In most reviews, SMT is considered to represent any manual treatment of the spine. Mobilizations of the spine are typically low velocity or passive movement techniques as opposed to manipulation which uses a high velocity thrust applied to a synovial joint near the end of the range of motion (357). This thrust often produces an audible pop or crack that results from cavitation of the joint.

There are many theories as to the mechanism of action of SMT and most of the hypotheses can be separated into neurophysiological and biomechanical categories (358,359). The biomechanical theory proposes that SMT acts on a spinal lesion to reduce the mechanical stresses and the neurophysiological theory suggests that SMT affects the primary afferent neurons from the paraspinal musculature and the neurons that control pain processing (360,361).

In a Cochrane review by Rubinstein et al (362), the authors found that there was moderate quality evidence indicating that SMT was no different than other treatments for short-term pain relief but that it produced a small improvement in function. They also found high-quality evidence that indicated that SMT had a small positive effect for short-term pain relief and small to moderate positive effects for improvement in function when compared to other nonrecommended therapies (362). These results were similar for intermediate and long-term outcomes. One study with a low risk of selection bias found no increased risk of adverse events associated with SMT. Most of the adverse events seen with SMT were transient and of mild to moderate severity (362). Overall, the authors found that SMT produces similar clinical results when compared to recommended therapies for patients with chronic low back pain and seemed to be better than