Osteogenesis

Using Direct current (DC) Electrostimulation for spinal fusion has shown to be inconsistent with 2 LOE-1 studies [1) 2)] supporting its efficacy particularly in high risk patients (smokers, those with multiple back surgeries, and multilevel fusions) and 2 LOE-1 studies showing no difference in the older patient population leaving DC only level B recommendation [3) 4)]. However, one meta-analysis supports continuous 24-hour delivery of 5 to 10 µA using 2 to 4 cathodes to be effective for spinal fusion [5)]. Therefore, more studies should be carried out to support DC for spinal fusion. Moreover, DC is effective as an adjunct to foot and ankle surgery with only a level C recommendation. Because of LOE-4 being solely reported, more evidence is required because of a wide range in follow-up (9-20 weeks), small patient population, and large differences in number of surgical inventions before DC was used (range, 1-5). No studies for DC fulfill the criteria for randomized prospective double-blind clinical trial because it would involve implantation of a placebo stimulator, which is against the regulation of human research; therefore, its effect on bone healing remains questionable leaving DC only as a recommendation C for nonunion. LOE-4 supports using DC for the application of enhancing nonunions, and bone healing rates were not affected by the presence of previous osteomyelitis or the presence of previously inserted metallic fixation devices [6)]. Furthermore, rate of unions were not significantly different compared to rates after bone graft surgery [7)]. A LOE-4 study showed 10 years after DC stimulation that all fractures had remained united with normal bone remodeling, illustrating that DC is safe and effective in the long term [8)]. However, despite its effectiveness and availability, DC has fallen out of favor compared to IC and CC. Furthermore, IC and CC are noninvasive techniques affected by patient compliance unlike DC.

Results of a study demonstrate that novel osteogenic spinal instrumentation supports interbody fusion through the focal delivery of Direct current (DC) Electrostimulation. With further technical development and scientific/clinical validation, osteogenic spinal instrumentation may offer a unique alternative to biological scaffolds and pharmaceutical adjuncts used in spinal fusion procedures [9)].

Distraction osteogenesis

Distraction osteogenesis

Osteogenesis imperfecta

Osteogenesis imperfecta.

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