

Leading Research Paper
Distraction Osteogenesis

Preliminary investigation into the effects of electrical stimulation on mandibular distraction osteogenesis in goats

I. E. El-Hakim¹, A. M. A. Azim²,
M. F. A. El-Hassan³, S. M. Maree⁴

¹Oral and Maxillofacial Surgery Department, School of Dentistry, Ain Shams University, Cairo, Egypt and King Abdul Aziz University, Jeddah, KSA; ²Oral Pathology Department, School of Dentistry, Ain Shams University, Cairo, Egypt; ³Oral and Maxillofacial Surgery Department, School of Dentistry, Al-Azhar University, Assute, Egypt; ⁴Oral and Maxillofacial Surgery Department, School of Dentistry, Ain Shams University, Cairo, Egypt

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Abstract. Craniofacial distraction osteogenesis (DO) was found to be a procedure with low preoperative and postoperative morbidity. Direct current electrical stimulation is used clinically to treat different orthopaedic problems. It provided a significant increase in new-bone formation, and a higher mechanical strength of healing.

The purpose of this study was to test the effect of electric current on distraction osteogenesis and to establish the best period to apply an electric current during the different distraction phases.

Twelve healthy adult goats were subjected to a vertical osteotomy in the symphyseal area. A distraction device was fixed to the bone. Animals were divided into two groups, Group I (three goats) and group II (nine goats). In group I, the device was activated 1 mm per day for 10 days; while in group II, the device was activated 1 mm per day for 10 days with the application of direct electric current stimulation of 10 μ A either during the first 3 days of latency in a continuous mode (ESL group), or during the first 3 days of the activation period in a continuous mode (ESA group); or during the first 3 days of the consolidation period in a continuous mode (ESC group). After the activation period was completed, the distraction device left in place for additional 15 days for bone consolidation in all animals. Animals were then sacrificed, the mandible was harvested, and the distracted areas were removed and processed for mechanical and histological studies. The results of this study suggested that direct current electrical stimulation display synergism on mandibular distraction when this stimulation applied to the distraction zone during activation or consolidation periods.

Key words: distraction osteogenesis; electrical current stimulation; bone healing.

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