

The Effects of Home Interferential Therapy on Post-Operative Pain, Edema, and Range of Motion of the Knee

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Objective: We studied the effects of home interferential current therapy (IFC) on postoperative pain, range of motion, and edema in subjects undergoing anterior cruciate ligament (ACL) reconstruction, meniscectomy, or knee chondroplasty.

Design: Randomized, double-blind, placebo-controlled prospective study.

Setting: A tertiary care outpatient orthopaedic clinic/ambulatory surgery center.

Subjects or Participants: Eighty-seven subjects were separated into three groups based on their type of knee surgery and within each group randomized into a treatment or placebo group.

Interventions: All subjects received home IFC units. Subjects randomized to treatment group received a working IFC unit. Placebo subjects received units that were previously set to deliver no current.

Main Outcome Measurements: Post-operative edema at 24, 48, and 72 hours, and weeks 1-8; range of motion at 1, 3,

6, and 9 weeks; pain immediately after surgery, at 24, 48, and 72 hours, and weeks 1-7; and amount of pain medication taken at days 1-10 were compared between treatment and placebo groups.

Results: All IFC subjects reported significantly less pain and had significantly greater range of motion at all post-operative time points. ACL and meniscectomy IFC subjects experienced significantly less edema at all time points, while chondroplasty subjects experienced significantly less edema until 4 weeks postoperatively.

Conclusions: These findings indicate that home IFC may help reduce pain, pain medication taken, and swelling while increasing range of motion in patients undergoing knee surgery. This could result in quicker return to activities of daily living and athletic activities.

Key Words: Interferential current—Electrotherapy—knee—Rehabilitation—Postoperative
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INTRODUCTION

The use of electrical stimulation has been reported as early as A. D. 46 when torpedo fish, which can generate 100 to 150 Volts,¹ were shown to relieve pain.² The fish was placed directly on the subject's head to treat headaches, under the foot to treat arthritis, and ingested for the treatment of asthma. In the late 19th century, methods were developed to safely use electricity to treat patients.¹ In 1965, Melzack and Wall developed the gate theory for pain modulation,³ which helped to establish that external neuronal stimulation could be used to relieve pain.¹ Today, the goals of electrical stimulation include strength augmentation, pain control, wound healing, reduction of edema, fracture healing, and iontophoresis.⁴ Several different electrical stimulation modalities are used to accomplish these goals.

Interferential current therapy (IFC) was developed in the 1950s by Nemec, an Austrian physicist,⁵ and is based on the crossing of two different medium-frequency sine

waves usually between 4000 and 4100 Hz. The two currents create waves which interfere constructively (resulting in increased amplitude) and destructively (resulting in no wave) to produce a beat frequency.⁶ This effect is called amplitude modulation.⁷ The beat frequency can be changed by adjusting each medium frequency wave. Medium frequency currents encounter low skin resistance and can therefore penetrate into the deeper tissues. These currents have less effect on cutaneous nerves and superficial muscle-nerve complexes than low-frequency currents.^{6,8} Therefore, the use of two waves at approximately 4000 Hz minimizes skin impedance and allows for deep penetration into the tissues. The resultant beat frequency between 0-150 Hz has supposed beneficial effects via decreasing inflammation in and around the joint, which include decreased pain, decreased edema, and increased range of motion.

Few clinical studies have been used to evaluate the benefit of IFC to subjects. One investigation found subjects treated with IFC for low back pain displayed a lower level of disability and less pain.⁹ Another study found no effect of IFC on subjects with soft tissue shoulder disorders.¹⁰ There has yet to be a published study specifically evaluating the use of IFC for post-operative knee patients. The purpose of this study was to compare range of motion, pain, and edema in post-operative knee

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