

## Use of Radio-Frequency Pulsed Energy in the Control of Postoperative Reaction in Blepharoplasty

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**Abstract.** This is a preliminary report of the use of a device to apply small pulses of radio-frequency energy to surgical wounds in order to improve wound healing. The device was applied to one eye in 21 patients who underwent bilateral blepharoplasty. There were no device-related complications. In 11 patients, edema and ecchymosis were noticeably less on the treated side within 24 hours of surgery. In 6 patients, ecchymosis and swelling were so slight that no difference between treated and untreated sides was visible. Two patients were noticeably worse on the treated side. Further studies will be conducted.

**Key words:** Blepharoplasty — Wound healing — Instrumentation

The first mention in the literature of the use of electricity for healing purposes was possibly Adams in 1799. He recalls the work of Dr. Adam Birch of St. Thomas's Hospital, London, in the 1780's using a Faradic stimulation to assist in the relief of pain and inflammation in a variety of skin conditions [1]. D'Arsonval, a French physiologist in the 1880's, first suggested that a biological system would interact at a molecular and ionic level with electromagnetic fields of various frequencies and encouraged the use of shortwave diathermy for physiotherapy [4]. In more recent times, Ginsberg [7] and Fenn [5] have demonstrated that a pulsed 27.12 megahertz device can aid in the resolution of soft tissue swelling and bruising. In the 1970's, both Wilson [9] and Bentall [3] confirmed that these observations were reproducible in clinical practice. Other means have also been developed of electrically stimulating bone repair in non-unions. Bassett [2], Fukada [6], and Watson [8] used differing devices, all of which in their final interaction with the tissues induce a

current in the tissues secondary to the electric and magnetic field. These devices are large and expensive.

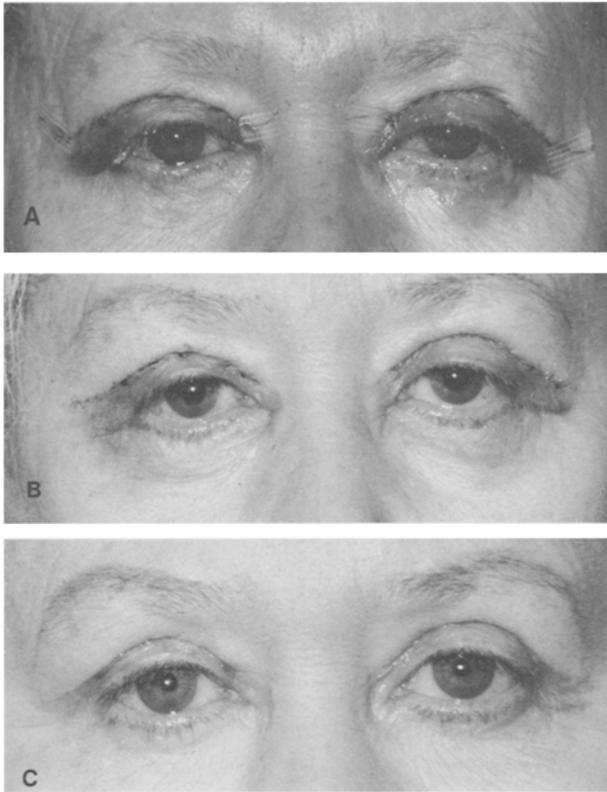
In the past 5 years, a small portable device has been developed by Bentall which has been used in studies on secondary wound healing and on rat abdominal wall tensile strength measurements. These controlled studies, using a placebo device as a control, demonstrated that there was enhancement in the acute wound healing process of 20-30% in these models. The human wound healing study using histological criteria pointed also to a more proficient wound healing process with less pleomorphism in the basal cell layer; almost normal palisading of the basal cells, which is not normally seen in wounds healing from secondary intention; and an almost normal height of re-epithelization compared with the thinned epithelium in the placebo group. These findings encouraged the present study to be undertaken to ascertain the possible clinical role of such a device.

The study reported here was designed to assess the possible benefit of such treatment to patients undergoing cosmetic surgery of the face. Blepharoplasty provided an excellent model, since the lids on each side can be compared for differences in the amount of ecchymosis and edema.

### Material and Methods

The device itself consists of a small oscillator tuned to 27.12 megahertz with a timer switching the oscillator so that small pulses of radio-frequency energy are emitted from the single turn coaxial coil. The shape of the pulse is square and is 100  $\mu$ sec long, there being 1,000 pulses per second. The power is from a small nickel-cadmium rechargeable 3.5-volt DC battery which draws 0.5 ma; the unit may be used for 5 days without recourse to recharging. The area of the coil is approximately 6 cm in diameter.

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**Fig. 1.** A patient who underwent upper and lower blepharoplasty on both right and left eyes. The right eye was treated with Bentall's device and illustrates the typical response noted in 11 out of 13 cases where sufficient ecchymosis and edema existed for comparison. In this case, although ecchymosis is similar in both eyelids, the degree of edema is obviously greater in the untreated left eye. This difference is most obvious 24 hours postoperatively, but the relative improvement is apparent throughout the period of observation. (A) One day postoperatively. (B) Three days postoperatively. (C) Six days postoperatively

In order to adapt this device to fit over the eyelid region, 2 wire loops were designed in the shape of a spectacle frame which can then be held in place with light padding and a 2-in crepe bandage. Only 1 loop is electrically active, the other providing a control. This device was applied at completion of surgery and removed after 24 hours. The device showed no indication as to which side was active, and this was only known to the manufacturer.

For the purpose of the preliminary report, 21 consecutive cases of blepharoplasty were treated. Photographs were taken 24 hours postoperatively when the bandage was removed, after 3 days when the sutures were removed, and after 6 days follow-up. Some cases were of upper and lower blepharoplasty, others of one set of lids only (Fig. 1). Some were operated on under local anesthetic and others under general. No attempt was made to subdivide this group, since a study of all the patients in a

consecutive series was considered to be the most valid basis for comparison.

## Results

Twenty-one patients were studied, and the postoperative course of all of them was uncomplicated by any contributory factors such as vomiting, coughing bouts, or trauma which might have influenced the result. Two cases were excluded because of displacement of the dressings by the patients. No patient complained of any unusual pain locally or headaches that might have been interpreted as related to the electrical treatment.

In 6 cases, ecchymosis and swelling was so slight that no difference was visible between the treated and untreated sides. In 11 cases, improvement was apparent, which was most obvious at 24 hours when treatment was ended. At this point edema, and to a lesser extent ecchymosis, was distinctly less on the treated side, and this improvement continued to be apparent after 6 days when the period of early follow-up ended. Two cases were judged to be worse on the treated side.

## Discussion

A patient's most immediate concern following facial cosmetic surgery is whether they will experience much bruising, swelling, or pain, and how long this will take to recover to a point when it will pass unnoticed during social contact. This series is small, but the results are so encouraging that reporting it seems justified. Of course, the study will continue and a much larger number of cases will be added to this study in the immediate future.

We are also now employing a similar device for incorporation in face and neck lifts, which is identical electrically but has two larger wire loops to cover the neck and sides of the face. Devices such as Bentall's have immense possible benefits to plastic surgery cases, not only in cosmetic cases but in so many situations where the rate of healing and reduction of edema and ecchymosis are of considerable importance. We look forward to reporting later on a much expanded series.

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