Use of a nonablative radiofrequency device to rejuvenate the upper one-third of the face

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OBJECTIVE: To evaluate the use of the Thermacool TC nonablative radiofrequency device for rejuvenation of the upper one-third of the face, as determined by brow elevation.

STUDY DESIGN AND SETTING: Twenty-four patients in a facial plastic surgery office were treated with the nonablative radiofrequency device. The patients had pretreatment photos, in-office procedure, and follow-up photos. Brow elevation measurements were used to gauge efficacy of the procedure. These results were compared to an untreated, control group of 12 patients.

RESULTS: Compared to the control group, the post-treatment measurements were improved (P < 0.05). The post-treatment measurements were also improved from pretreatment baseline (P < 0.05). Subjective results obtained from patient satisfaction questionnaires did not correlate to the objective data. The data also showed that improvement in brow elevation was not uniform in each patient.

CONCLUSION: The Thermacool TC nonablative radiofrequency device for in-office rejuvenation of the upper one-third of the face procedure does provide brow elevation in a majority of patients; however, the majority of the study patients did not perceive benefit from the procedure. Patient satisfaction in facial plastic surgery must be an important part of the decision of whether or not to introduce a new device into a practice setting.

The trend in cosmetic surgery over the past few years has been a shift towards minimally invasive procedures with minimized recuperation intervals. Reflecting this trend, the number of noninvasive procedures, such as Botox, performed in facial plastic surgery offices has increased over the last decade.1 Traditional procedures for facial rejuvenation, including rhytidectomy, blepharoplasty, brow lift, and skin resurfacing, require a recovery period that is undesirable to many patients. Injectable agents and suture suspension procedures are minimally invasive techniques that are now seeing a resurgence in popularity, as their recovery times are diminished.2,3 Another technique that has been recently utilized for noninvasive facial rejuvenation involves radiofrequency ablation. Technological advances in radiofrequency ablation have allowed the dermis to be targeted; however, injury...
to the epidermis did occur. Recently, a novel nonablative radiofrequency technique has begun to receive a great deal of attention for its benefits on facial rejuvenation with minimized epidermal injury and recovery period. The initial reports revealed a more youthful appearance and elevation of the eyebrow in study patients. The purpose of this study is to objectively and subjectively evaluate the nonablative radiofrequency device (TheraCool TC system).

INTRODUCTION

Noninvasive techniques for facial rejuvenation including dermabrasion, laser, and chemical resurfacing have been used with success for diminishing facial rhytids and other integument irregularities. The long-term facial rejuvenation results required a short-term healing process of re-epithelialization and remodeling of the dermis. Fitzpatrick et al have shown that these three methods have similar histologic results. The goals of these resurfacing methods are to remove the epidermis and enter the papillary dermis. The injury causes a significant increase in the production of collagen precursors, such as procollagen type I and type III, and tenascin (a glycoprotein expressed during wound healing). The collagen I and III synthesis and increased fibroblast activity leads to deposition of new collagen, reorganization into more parallel bundles, and, once the re-epithelialization occurs, a thickened epidermis.

Thermage (Thermage, Inc., Hayward, CA, USA) has developed a technology that allows radiofrequency energy to heat the dermis, without removing the epidermis. The heat causes a thermal injury, which causes a healing response to be initiated. The nonablative device used in this study was the Thermacool TC system. The device is different than previous radiofrequency devices in that it uses capacitive coupling, rather than conductive coupling, to deliver the therapeutic energy. Conductive coupling is based on energy concentrated at the tip of an electrode being delivered to a target. This results in heat production at the skin surface in contact with the electrode, which can produce a thermal injury to the dermis and would necessitate injury to the overlying epidermis. Capacitive coupling disperses energy across a surface to create a zone of temperature increase. By cooling the epidermis prior to administration of energy, the Thermage system theoretically allows for a zone of heat production in excess of 65°C in the dermis, with temperatures ranging 35°C to 45°C in the epidermis. This heat zone allows the thermally sensitive collagen bonds in the dermis to exceed their denaturation threshold of 60°C. The device is reported to produce an immediate tightening of the skin, as well as collagen deposition and remodeling over time. The majority of patients are reported to see improvement within 4 to 12 weeks post-treatment. The device has been approved by the FDA for use in the periorbital region for treatment of rhytids. We report the results of 24 patients who were treated with the Thermacool TC device for elevation of brow position.

MATERIALS AND METHODS

Design

A prospective study was performed on 24 patients at a facial plastic surgery office. The study had Institutional Review Board (IRB) approval. The patients were not given any compensation for their participation, but they did receive the treatment free of charge. The study group agreed to have pretreatment and post-treatment photographs, as well as answer a questionnaire at the end of the study. A control group of 12 patients, who were subjects of another study that did not address the upper one-third of the face, were used for comparison purposes. The goals of the study were to objectively measure the amount of brow elevation following treatment, compare those results to the control group and to the pretreatment measures, and obtain a subjective measure of patient satisfaction with the procedure.

Treatment

The patients signed an informed consent for treatment and study participation. Prior to pretreatment photographs, the patients removed any jewelry and makeup. A topical anesthetic cream (Lidocaine 5%) was then applied to the forehead region from the zygomatic arch and superior eyebrow to the hairline, and then occluded. After a period of 45 to 60 minutes, the patient was brought into the treatment area, at which point the cream was gently removed. Ten patients were given an-
esthetic forehead blocks using an injectable anesthetic (Lidocaine 1%). The treatment area on all anesthetized patients was then marked with an inked grid provided by Thermage. Each 1-centimeter by 1-centimeter square corresponded to a single treatment site. The ThermaCool TC system used was the 330-W, 6-MHz, high-frequency generator with a 1-cm² tip. The single-use tips contain an integrated tissue contact force sensor, 4 temperature sensors, and an enable/disable button. After the treatment area was prepared/primed with a coupling fluid, which enhanced the radiofrequency energy, the tip of the hand piece was used to make contact with the skin. The tip size corresponds to a single 1-cm² treatment area marked on the patient’s forehead. The treatment sequence consists of a period of precooling, followed by a radiofrequency heating and cooling, and a postcooling period. One entire sequence takes approximately 6 seconds to complete. Contact with the patient’s skin is important for each of the 3 periods of treatment. The hand piece has a single button that initiates the activation of the sequence. The patient’s treatment sites are divided into 3 main regions: the mid-forehead, lateral forehead, and temporal regions. The device energy settings can be adjusted on the ThermaCool TC machine. The manufacturer recommendations for ideal treatment settings are a level of 16 for the mid-forehead, 14 for the lateral forehead, and 12 for the temporal region. The patients were informed that for maximum benefit, the sensation should feel as though the skin were heating just to the brink of pain, but then subside. The settings were adjusted based on each individual patient’s comfort level. Following the treatment, the subjects cleaned off their forehead and were examined for any side
effects. The patients then had at least one follow-up appointment for post-treatment photographs and a brief questionnaire was filled out.

**Main Outcome Measures**

Twenty-four patients completed the study. The photos were taken using a Nikon D1X digital camera and two strobe flash units, and all the patients were aligned properly, with Frankfort's line parallel to the floor. For each patient, a pre-treatment photo was printed next to a post-treatment photo. According to Fagien's recommendations for measurement of brow position, a horizontal midpupillary line was used as a reference. Three locations on the inferior eyebrow were evaluated on each side. The medial limbus, midpupillary, and lateral canthus were all used as vertical reference points (see Figs 1 and 2). A vertical line was then made to the inferior brow at each of the 3 points on both sides of the face. The exact measures from either side were recorded. The interpupillary distance was measured on each photo, and if differences existed, the post-treatment measurements were adjusted accordingly. In addition, the treatment energy levels were recorded. The different measurements were kept as separate values and not averaged, which meant each patient had 6 numbers for comparison. A statistician was used to provide validity to the results. The results were compared to the control group and pretreatment measures for each patient. Additional information was obtained from the study with respect to differences in brow elevation, ideal energy settings for maximal benefit, and complications that resulted from the treatment. The results of patients who were treated with the recommended energy settings were compared to those of patients who were not.

**Statistical Methods**

All statistical analyses were performed using SPSS for Windows (SPSS 10.1, SPSS Inc., Chicago, IL, USA). Descriptive statistics are reported for all variables. For continuous/ordinal scaled variables, we report the mean and standard deviation. For categorical variables we report the frequency and percent. We used a two-sample *t* test to compare continuous variables between groups. We used a paired *t* test to compare pre-op values to 1-month post-op values for treatment group 1. A two-sided *P*-value of 0.05 or less was considered statistically significant.

### Table 1. 1-, 2-, and 3-month post-treatment and control group measurements

<table>
<thead>
<tr>
<th>Average (mm)</th>
<th>R Lateral</th>
<th>R midpupil</th>
<th>R medial limbus</th>
<th>L medial limbus</th>
<th>L midpupil</th>
<th>L lateral</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1 month—)</td>
<td>0.71</td>
<td>0.80</td>
<td>1.05</td>
<td>1.01</td>
<td>0.91</td>
<td>0.93</td>
</tr>
<tr>
<td>(19 patients)</td>
<td>(−1.0−2.30)</td>
<td>(−1.20−2.70)</td>
<td>(−1.3−3.70)</td>
<td>(−1.30−3.70)</td>
<td>(−0.7−3.70)</td>
<td>(−0.7−2.70)</td>
</tr>
<tr>
<td>(2 months—)</td>
<td>0.97</td>
<td>1.03</td>
<td>1.05</td>
<td>1.23</td>
<td>0.90</td>
<td>1.06</td>
</tr>
<tr>
<td>(11 patients)</td>
<td>(−1.3−2.70)</td>
<td>(−0.3−3.30)</td>
<td>(−1.0−4.30)</td>
<td>(−1.30−5.30)</td>
<td>(−1.30−3.30)</td>
<td>(−2.0−3.30)</td>
</tr>
<tr>
<td>(3 months—)</td>
<td>1.0</td>
<td>1.53</td>
<td>1.38</td>
<td>1.74</td>
<td>1.64</td>
<td>1.30</td>
</tr>
<tr>
<td>(8 patients)</td>
<td>(0.0−2.40)</td>
<td>(0.20−3.20)</td>
<td>(0.0−2.80)</td>
<td>(0.0−3.20)</td>
<td>(0.1−3.30)</td>
<td>(−1.0−3.00)</td>
</tr>
<tr>
<td>Control</td>
<td>−0.2</td>
<td>0.10</td>
<td>0.2</td>
<td>0.10</td>
<td>0.1</td>
<td>−0.2</td>
</tr>
<tr>
<td>(12 patients)</td>
<td>(−1.5−0.60)</td>
<td>(−0.70−1.7)</td>
<td>(−0.80−1.90)</td>
<td>(−1.0−2.60)</td>
<td>(−1.50−2.50)</td>
<td>(−1.70−0.70)</td>
</tr>
</tbody>
</table>

### Table 2. Comparison of control vs 1st post-treatment measure statistical analysis, equal variances assumed

<table>
<thead>
<tr>
<th>1st post-treatment measure vs control</th>
<th>Mean difference (24 study vs 10 control)</th>
<th>Standard Error Mean</th>
<th>Significance (2-tailed) (<em>P</em> &lt; 0.05 is significant)</th>
</tr>
</thead>
<tbody>
<tr>
<td>R lateral</td>
<td>0.838</td>
<td>0.3219</td>
<td>0.014</td>
</tr>
<tr>
<td>R midpupil</td>
<td>0.854</td>
<td>0.3736</td>
<td>0.029</td>
</tr>
<tr>
<td>R medial limbus</td>
<td>0.867</td>
<td>0.4519</td>
<td>0.064</td>
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<tr>
<td>L medial limbus</td>
<td>0.992</td>
<td>0.4073</td>
<td>0.020</td>
</tr>
<tr>
<td>L midpupil</td>
<td>0.987</td>
<td>0.4331</td>
<td>0.029</td>
</tr>
<tr>
<td>L lateral</td>
<td>1.046</td>
<td>0.4640</td>
<td>0.031</td>
</tr>
</tbody>
</table>
Table 3. Comparison of pretreatment vs 1-month statistical analysis

<table>
<thead>
<tr>
<th></th>
<th>Standard Deviation</th>
<th>Standard Error Mean</th>
<th>Significance (2-tailed) (P &lt; 0.05 is significant)</th>
</tr>
</thead>
<tbody>
<tr>
<td>R lateral</td>
<td>1.095</td>
<td>0.251</td>
<td>0.027</td>
</tr>
<tr>
<td>R midpupil</td>
<td>1.121</td>
<td>0.278</td>
<td>0.010</td>
</tr>
<tr>
<td>R medial limbus</td>
<td>1.427</td>
<td>0.327</td>
<td>0.007</td>
</tr>
<tr>
<td>L medial limbus</td>
<td>1.290</td>
<td>0.296</td>
<td>0.003</td>
</tr>
<tr>
<td>L midpupil</td>
<td>1.302</td>
<td>0.299</td>
<td>0.007</td>
</tr>
<tr>
<td>L lateral</td>
<td>1.129</td>
<td>0.259</td>
<td>0.001</td>
</tr>
</tbody>
</table>

Table 4. Comparison of pretreatment vs 2-month statistical analysis

<table>
<thead>
<tr>
<th></th>
<th>Standard Deviation</th>
<th>Standard Error Mean</th>
<th>Significance (2-tailed) (P &lt; 0.05 is significant)</th>
</tr>
</thead>
<tbody>
<tr>
<td>R lateral</td>
<td>1.171</td>
<td>0.353</td>
<td>0.020</td>
</tr>
<tr>
<td>R midpupil</td>
<td>1.142</td>
<td>0.344</td>
<td>0.014</td>
</tr>
<tr>
<td>R medial limbus</td>
<td>1.369</td>
<td>0.413</td>
<td>0.030</td>
</tr>
<tr>
<td>L medial limbus</td>
<td>1.714</td>
<td>0.517</td>
<td>0.039</td>
</tr>
<tr>
<td>L midpupil</td>
<td>1.347</td>
<td>0.406</td>
<td>0.051</td>
</tr>
<tr>
<td>L lateral</td>
<td>1.561</td>
<td>0.471</td>
<td>0.054</td>
</tr>
</tbody>
</table>

Table 5. Comparison of pretreatment vs 3-month statistical analysis

<table>
<thead>
<tr>
<th></th>
<th>Standard Deviation</th>
<th>Standard Error Mean</th>
<th>Significance (2-tailed) (P &lt; 0.05 is significant)</th>
</tr>
</thead>
<tbody>
<tr>
<td>R lateral</td>
<td>0.782</td>
<td>0.276</td>
<td>0.009</td>
</tr>
<tr>
<td>R midpupil</td>
<td>0.968</td>
<td>0.342</td>
<td>0.003</td>
</tr>
<tr>
<td>R medial limbus</td>
<td>1.011</td>
<td>0.357</td>
<td>0.006</td>
</tr>
<tr>
<td>L medial limbus</td>
<td>1.261</td>
<td>0.446</td>
<td>0.006</td>
</tr>
<tr>
<td>L midpupil</td>
<td>0.981</td>
<td>0.347</td>
<td>0.001</td>
</tr>
<tr>
<td>L lateral</td>
<td>1.803</td>
<td>0.638</td>
<td>0.144</td>
</tr>
</tbody>
</table>

RESULTS

The 24 patients had at least one follow-up visit after the treatment, occurring between 4 and 12 weeks after treatment. The study group was comprised of 23 women and 1 man. The control group and study patients were compared to establish that both groups were similar in terms of their ability to raise their eyebrows. Not all patients had follow-up at the same interval, but measurements were done at 1, 2, and 3 months (see Table 1). The first post-treatment follow-up measurements were compared to the control group and the benefit was statistically significant (P < 0.05)(see Table 2). At 1 month, all 6 positions in brow position were statistically significant (P < 0.05) in comparison to the pretreatment values (see Table 3). The measurements were not averaged into one value, which could affect statistical analysis. In the first month after treatment, 31.6% (6/19) patients had improvement of at least 1 mm elevation in the brow position, and 21.1% (4/19) showed moderate benefit, which was defined as between 0.5 and 1 mm in brow elevation. The remaining 47.3% (9/19) showed slight to no improvement. In the second month, the left midpupillary and lateral canthus measurements were not statistically significant (see Table 4). The third-month measurements were all statistically significant, except for the left lateral canthus (see Table 5). The second-month follow-up measurements showed 54.5% (6/11) with improvement of greater than 1 mm. Twenty-seven percent (3/11) obtained moderate benefit at 2 months post-
treatment. The remaining 19.2% (2/11) showed little or no improvement. At the 3-month period, 8 patients had post-treatment photos, with 62.5% (5/8) having benefit of greater than 1 mm. Twenty-five percent (2/8) had moderate improvement, and the remaining 12.5% (1/8) showed no improvement (see Figs 3-8). The ideal treatment setting recommendations from the manufacturer were not tolerated by all 24 patients secondary to pain. Only 9 (37.5%) patients received all 3 treatment areas with the ideal energy; the other 15 could not tolerate the energy settings because of discomfort. However, there was no significant difference in the results seen when compared to the other 15 patients (see Table 6). In addition, the 10 patients who were anesthetized with nerve blocks did not receive added benefit from the procedure, and only 60% (6/10) tolerated the ideal energy settings.

When the data were analyzed, there were variations in the amounts of treatment benefits, not only between eyes, but in the 3 areas treated. The 3 values from the left and right eyes were averaged and those numbers were compared. In each of the 3 months, if the difference in change between eyes was greater than 1 mm, we considered that to be a significant difference in brow asymmetry. Of the 19 patients in the first month, 5 (26.3%) showed significant discrepancy between eyebrows. In the second month, only 1 out of 11 (9.1%) had significant asymmetry. Two of the 8 patients in the third month (25%) had significant difference from one eye to the other. The 3 areas of the brow were compared on either side to see if the medial or lateral portion of the brow was elevated differently. The results indicated that 14 of 19 patients in the first month (73.7%) had differences of elevation greater than 1 mm within the same eyebrow. In the second month, 9 of 11 (81.8%) had intra-brow asymmetry. The third
month showed all 8 patients (100%) to have disparities in brow elevation that were considered noticeable. The control group had 16.7% (2/12) that had asymmetry between the two eyebrows, and had only 33.3% (4/12) patients who had intra-brow differences. The results show that the medial portion of the brow tended to have increased elevation as compared to the lateral portion.

The patients were carefully examined for any complications from the study. Pain was not included as a possible complication. One patient (4.2%) had one treatment area that had a redness due to the cooling mechanism. During therapy, this patient indicated pain very early in the treatment sequence. The device was left in contact with the skin for the completion of the cycle. Almost no heat energy was transferred to the treatment site. The area was very cold to the touch and was treated with a small amount of nitropaste to improve vascularity. The area resolved without further sequelae.

Twenty-two patients completed a questionnaire at the end of their last follow-up visit. The first question was whether or not the patient was satisfied with the no-recovery-time procedure and ability to return to normal routine after leaving the office. The majority of the patients (81.8%) responded favorably. The 4 patients who were not happy with the treatment stated that it was too painful. The second question asked if the results were satisfactory, and if so how long did they last. Of the 22, only 8 (36.4%) thought the results were favorable. The average time the results lasted for the 8 patients was 3.88 months. The majority (63.6%) of the patients did not feel that the treatment improved their brow position. When asked if they would have the procedure again, the number of negative responders increased to 72.7%. The fourth question asked how much they would be willing to pay to have the procedure done. The
choices were $0, $500, $1000, $2000, and $3000. Sixty-four percent of the responders stated that they would not pay anything for the treatment. Thirty-two percent (7/22) stated they would pay $500, and one patient reported she would pay $1000.

**DISCUSSION**

Kilmer and Levinson first tested the Thermacool TC device on abdominal skin (unpublished). Five patients undergoing abdominoplasty were enrolled in a study. The protocol evaluated various treatment settings of the Thermacool TC for their effect on contraction of skin as well as histological changes evidenced with punch biopsies. The gross clinical effects showed that less than 1% of the treated skin showed any effect. Although no information was reported with respect to contraction, the histology showed thickened epidermis and dermal fibroplasia. Blistering was reported in all 5 patients, but only occurred in 0.1% of the treatment sites.

The results from the abdominal skin study led to a trial by Esperza, Barba, et al. who studied 45 patients treated in the periorbital region (unpublished). The majority of the patients (N = 26) were Fitzpatrick type IV (58%). Thirty-three patients received only 1 treatment, but 12 patients received up to 4 treatments. Data and photos were available in only one-half of the study patients. Some of the test patients had nerve blocks to help control discomfort. Of the 4147 treatment sites, 6 (0.1%) resulted in second-degree burns, which occurred in 2 (4.4%) different patients. The majority of patients (60%) in the study were listed as having clinical improvement, which included softening of rhytids and lifting of the eyebrows. They also reported hooding of the eyelids to be less noticeable. The patients did not have individual measurements reported, but one patient showed the left eyebrow raised 1.7 mm and the right eyebrow 2.4 mm. At 6 months, 14 patients com-
Table 6. Patients who received treatments with energy equal or greater than 16, 14, and 12 to those that did not (Done using equal variances assumed)

<table>
<thead>
<tr>
<th>9 Patients vs 15 Patients</th>
<th>R lateral</th>
<th>R midpupil</th>
<th>R medial limbus</th>
<th>L medial limbus</th>
<th>L midpupil</th>
<th>L lateral</th>
</tr>
</thead>
<tbody>
<tr>
<td>Significance (2-tailed)</td>
<td>0.361</td>
<td>0.545</td>
<td>0.479</td>
<td>0.570</td>
<td>0.948</td>
<td>0.353</td>
</tr>
<tr>
<td>&lt; 0.05 is statistically significant</td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

completed a 6-month visit. Twelve of the 14 (86%) indicated that they were satisfied with the results.

A recent multicenter study by Fitzpatrick, Geronemus, Goldberg, et al enrolled 86 patients to treat periorbital skin laxity and rhytids by treating the forehead and temporal region with a single Thermacool TC treatment (unpublished). Eighty percent of the study patients had a measurable change in their brow position. Fitzpatrick reported one patient as having brow elevation in the right eye of 1.7 mm and the left eye of 2.0 mm. However, when the 4 positions are examined individually, the right eye had measures of 1.9, 1.7, 1.8, and 1.6 mm, and the left eye had measures of 2.5, 2.2, 2.1, and 1.1 mm, thus revealing disparate brow elevations that varied by as much as 1.4 mm in the same eyebrow.

Upon reviewing the unpublished literature on the Thermacool TC and comparing patient results, several authors reported 1-mm or greater variations in brow elevation on the same side. Barba reported a patient with right eye measurements of 1.0, 1.8, 1.9, and 2.0 mm (1.65 mm average) and left eye measures of 1.6, 2.4, 2.8, and 2.8 mm (2.4 mm average). Burns reported a patient with difference between the right and left side of 0.8 mm. Koch supplied results from one patient that had right side measurements of 2.0, 2.2, 2.7, and 3.4 mm and left side 1.6, 2.3, 2.1, and 2.7 mm. The elevation from the treatment affected areas of both eyebrows differently, with measures varying by greater than 1 mm. Esparza reported findings from one patient to be 1.3 mm in the right and 2.4 mm in the left eyebrow. These variations in the measures of eyebrow elevation prompted our research to examine individual areas in some instances, not just averages of values.

The data collected in our study demonstrate a number of issues. The amount of energy delivered to the treatment areas did not appear to affect the amount of brow elevation. Even in the 10 patients who received nerve block local anesthetic (Lidocaine 1%), the results were not statistically different. The treatment did have statistically significant elevation of the eyebrow in the majority of patients, which were significant at 1, 2, and 3 months. We observed that the improvement increased as time progressed. This would be consistent with the hypothesis that there are initial benefits, as well as longer-term changes in the dermal collagen architecture. The additional reported benefits of the treatment, such as fine rhytid and acne scar reduction, were not addressed in this project.

Although there are clearly improvements in the amount of brow elevation, many of our patients demonstrated asymmetry, as seen in previous reports. The difference of greater than 1 mm elevation between each brow, and within the same brow, could be of significant aesthetic consequence in certain patients. For example, a patient who has 1 mm brow asymmetry prior to undergoing Thermacool TC treatment may have the higher side elevated at a different amount. This could exacerbate differences in brow position, as the operator cannot control the amount of elevation in any given situation with this nonablative device. Patients with significant pretreatment brow asymmetry may still benefit from traditional browlift techniques, which can more precisely control the degree of eyebrow elevation.

The subjective data yielded crucial information regarding the perceived benefit of the Thermacool TC treatment. In past studies, the results have described up to 80% measurable change in brow position. These results are consistent with our results, which showed upwards of 87.5% of patients at 3 months follow-up having at least 0.5 mm or greater eyebrow elevation, as confirmed by the photographs, which reveal improvement in brow position and eyelid hooding. However, the
subjective data do not correlate to the objective data that we found. The majority (81.8%) of patients were satisfied with the procedure itself and liked the ability to return to daily routine after leaving the office, thereby substantiating the trend in popularity of noninvasive rejuvenating procedures. The only patients who were not happy with the procedure were those who had pain that was not well tolerated during the procedure. However, when asked if they were satisfied with the results the majority (64%) were not pleased and saw no results. Those that did see results (36%) did not think that they lasted very long, with the average being under 4 months. Even more patients were not willing to have the treatment again, primarily because they did not see any results. The monetary cost patients would pay to have Thermage again was $0 for most patients (14/22), with 32% (7/22) stating they would pay $500 for the treatment. One patient stated she would pay $1000 for the procedure. These subjective data are very important because an objectively measurable result does not mean that the patient will see the improvement in appearance or brow position.

The complication rate was very low for our study. We did not have any blistering, long-lasting erythema, or induration that had been previously reported. When reviewing the prior case reports, one concern related to the depth of heat penetration from the ThermaCool TC tip. In the temple region, for example, the skin is very thin and the underlying temporal fat pad lies just superior to the zygomatic arch, which is a treatment landmark. In some of the photographs provided by the manufacturer, there appeared to be temporal wasting in a few test subjects. The physicians who performed the treatment did not report this as a complication. The fat pad could potentially have been injured either by direct thermal damage, or via thermally induced denaturation of the collagen bonds within the adipose tissue. The fat pad could develop changes relating to repeated treatment, which could lead to a wasted, cachectic appearance. Our recommendations are for lower treatment settings in the temporal region to avoid injuring the temporal fat pad and undesirable aesthetic consequences.

CONCLUSION

We determined that the ThermaCool TC nonablative radiofrequency device for in-office rejuvenation of the upper one-third of the face provides a measurable improvement in the majority of patients treated. Eyebrow elevation is not consistent with similar energy settings in different patients, and the majority of patients showed post-treatment asymmetry within various brow locations. The inability to precisely predict the effects of ThermaCool TC on brow position should be discussed with patients prior to the procedure. The patients were pleased with the convenience of this noninvasive procedure, but the majority did not perceive a cosmetic benefit. In evaluating facial rejuvenation procedures, patient satisfaction with treatment effects is of paramount importance. Lack of patient satisfaction with the outcome of this ThermaCool TC treatment may outweigh any objective measurement of improvement evidenced in this study.

REFERENCES