

# A Prospective Survey of Patient Experiences After Laser Skin Resurfacing



## Results From 2½ Years of Follow-up

R. Sonia Batra, MD, MSc, MPH; Carolyn I. Jacob, MD; Lori Hobbs, MD; Kenneth A. Arndt, MD; Jeffrey S. Dover, MD, FRCPC

**Background:** Laser skin resurfacing (LSR) is a common cosmetic surgical procedure, yet there are no prospective long-term studies on patients' perceptions of their procedure.

**Objective:** To prospectively document patients' subjective experiences after LSR.

**Design:** Twenty-seven consecutive patients who underwent combination carbon dioxide/erbium:YAG full-face laser resurfacing for acne scarring or photodamage were surveyed at postoperative days 1 and 3, within 1 week, at 3 weeks, 6 weeks, 3 months, and 30 months and asked standardized questions.

**Setting:** Referral-based academic practice.

**Results:** One day after LSR, 10 patients (37%) were concerned about the outcome, and 3 (11%) considered it a

"terrible" experience. At 2.7 days after the procedure, 23 patients (85%) would recommend LSR, and after 3.7 days, 24 (89%) would have the procedure again. At 3 months, the patients' mean rating of appearance was 2.3 (0-3 scale), and all 27 (100%) felt that their appearance had been improved by LSR. After 30 months, 18 patients (75%) would recommend the procedure, 17 (71%) would have LSR again, 21 (88%) felt that their appearance was improved, and final appearance was rated 1.8 (0-3 scale). Patients undergoing LSR to treat acne scarring were as satisfied as patients treated for photodamage.

**Conclusions:** Data on the evolution of patient perspective after LSR can improve patient preparation. This may help the surgeon and patient achieve shared, realistic expectations for the postoperative period and for long-term results.

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From the Department of Dermatology, Stanford University School of Medicine, Stanford, Calif (Dr Batra); Department of Dermatology, Northwestern University Medical School, Chicago, Ill (Dr Jacob); Division of Dermatology, Charles R. Drew University of Medicine and Science, Los Angeles, Calif (Dr Hobbs); Department of Dermatology, Harvard Medical School, Boston, Mass (Dr Arndt); Section of Dermatologic Surgery and Cutaneous Oncology, Yale University School of Medicine, New Haven, Conn (Drs Arndt and Dover); Department of Medicine (Dermatology), Dartmouth Medical School, Hanover, NH (Drs Arndt and Dover); and SkinCare Physicians of Chestnut Hill, Chestnut Hill, Mass (Drs Arndt and Dover). The authors have no relevant financial interest in this article.

**L**ASER SKIN resurfacing (LSR) for the rejuvenation of facial skin is a popular procedure among the public and among medical practitioners. Since the development in the early 1990s of pulsed and scanned carbon dioxide lasers for precise resurfacing and the more recent erbium:YAG (Er:YAG) laser resurfacing methods, the procedure has been the subject of many articles on preoperative, intraoperative, and postoperative technique.<sup>1-5</sup> While most articles discuss the procedure from the perspective of practitioners, relatively little has been written about the subjective patient experience.

One retrospective survey of patient experiences describes preliminary observations on short-term follow-up after carbon dioxide laser resurfacing.<sup>6</sup> However, with studies of this type, recall bias often plays a role in responses, with patients either selectively focusing on the negative or glossing over more difficult experiences as they come to appreciate the final outcome.<sup>7</sup> A prospective analysis of pa-

tients' experiences after LSR has not to our knowledge appeared in the literature. We sought to follow closely our patients' subjective impressions after the procedure to gather quantitative data that could be used to better prepare future patients.

## METHODS

Twenty-seven consecutive patients who had full-face combination carbon dioxide/Er:YAG laser resurfacing procedures performed between August 1, 1999, and November 5, 1999, at the Beth Israel Deaconess Medical Center Cosmetic Surgery and Laser Center, Chestnut Hill, Mass, were eligible for inclusion in the study and were prospectively evaluated. No patients refused to participate.

All patients came for consultation concerning treatment of facial rhytids, photodamage, or acne scarring. After a complete dermatologic examination and analysis by the primary surgeon (J.S.D.), when LSR was determined to be the optimal treatment option, the procedure was described in detail to the patient by the surgeon and staff. Prior to setting a procedure date, patients were given the option to speak with a member of the office staff who had

**Table 1. Survey Questions for Patients' Attitudes After Laser Skin Resurfacing**

Questions at All Visits	Additional Questions at 30 Months
Attitudes postoperatively:	Insufficient result in specific area?
Worried about outcome?	Scarring?
Restful postoperative experience?	Hypopigmentation?
Procedure worthwhile?	Pigment irregularity?
Discomfort?	Ectropion?
Pain?	Infection?
A terrible experience?	Easy skin trauma?
Met expectations?	Sensitivity to topicals/creams?
Recommend procedure to others?	Improvement between 1 to 2 years?
Have procedure again?	
Appearance compared with before the procedure (worse, same, better)*	
Overall appearance, rated 0-3 (poor, fair, good, excellent)†	
Other comments?	

\*Asked at 6 weeks and at 3 and 30 months.

†Asked at 3 and 30 months.

undergone LSR in the previous year. Patients were also shown before-and-after photographs at various postoperative time intervals to prepare them for their likely appearance at different postoperative dates. Patients were advised to take 2 weeks off after the procedure to recuperate.

All patients were treated preoperatively with 0.025% retinoic acid cream or 10% glycolic acid cream for at least 6 weeks. Prophylactic antibiotic and antiviral therapy were begun 24 hours before the procedure and continued for 7 days and 10 days, respectively. Patients underwent full-face carbon dioxide laser resurfacing with 2 to 3 passes of an Ultrapulse laser (Coherent Medical Group, Palo Alto, Calif) with a computer pattern generator used at standard facial and eyelid settings followed by 1 to 2 full-face passes with an Er:YAG laser (Continuum Biomedical, Santa Clara, Calif). Between passes of the carbon dioxide laser, patients' skin was gently cleaned with isotonic sodium chloride solution, and debris was removed with sterile gauze.

The procedure was performed using intravenous sedation as well as local and regional nerve blocks. After the procedure, an occlusive silicone dressing (Silon-TSR; Bio Med Sciences Inc, Bethlehem, Pa) was applied for 3 days postoperatively. Patients were instructed to begin soaks with ice water through the mask for periods of 20 to 30 minutes at 2- to 3-hour intervals while awake and increase to 3- to 4-hour intervals followed by application of Aquaphor Healing Ointment (Beiersdorf Inc, Wilton, Conn) once the dressing was removed. By 7 to 10 days after the procedure, soaks were replaced with gentle cleansing, and patients switched to application of a moisturizer-sunscreen.

Patients were prospectively surveyed by clinicians other than the primary surgeon (R.S.B., C.I.J., and/or L.H.) regarding their subjective experiences after the procedure. They were seen on postoperative days 1 and 3, within 1 week, and at 3 weeks, 6 weeks, and 3 months. At each visit, patients were asked each question verbally by a clinician in simple, nontechnical English and allowed to ask for clarification of the intent or meaning of a particular question if necessary. For example, hypopigmentation was described as an area of skin lighter in color than the surrounding skin, and ectropion was explained as a pulling down, scarring, or rolling outward of the lower eyelid. Patients were questioned at each visit and were allowed yes, no, or numeric responses only. Responses were recorded by the clinician and tracked for individual patients. The postoperative date on which a re-

sponse changed was calculated as the mean date after LSR that a response reversed from yes to no or vice versa. Patients were contacted by telephone an average of 30 months (mean, 898 days; range, 849-940 days) after the date of their procedure by one clinician (R.S.B.) and asked the same standardized questions. After 30 months, 3 patients were lost to follow-up, so data were collected from 24 (89%) of 27 patients.

Questions were modeled after the retrospective study by Goodman<sup>6</sup> and covered the patients' immediate postoperative attitudes, discomfort, pain, and overall sentiment toward the LSR experience. Duration of discomfort and pain was calculated as the mean date that patients answered no when asked whether they were feeling any discomfort or pain. Patients were asked at each session if their expectations had been met, based on what they had predicted their experience would be at that postoperative interval. Patients were asked at 6 weeks and at 3 and 30 months whether their outcome was worse, the same, or better than prior to the procedure and at 3 and 30 months to rate their overall appearance on a scale of 0 to 3 (poor, fair, good, or excellent, respectively). Patients were asked to rate their appearance only at the later follow-up dates after they had reepithelialized and they had a sense of their final results. A summary list of questions is given in **Table 1**.

Commercially available software (Microsoft Excel; Microsoft Corp, Redmond, Wash) was used for data compilation and management, and a software package (Stata, version 6.0; Stata Inc, College Station, Tex) was used for statistical analysis. Two-sample *t* tests for paired data were used to compare paired samples, and *t* tests for independent samples assuming equal population variances were used to compare groups. In all cases, a 2-tailed *P* value less than .05 was considered significant.

## RESULTS

Twenty-five women and 2 men underwent combination carbon dioxide/Er:YAG full-face laser resurfacing and were surveyed prospectively. The primary indication for resurfacing was rhytids and/or photodamage in 14 patients (52%) and acne scarring in 13 patients (48%). The mean (SD) age of patients was 50.4 (10.8) years. On postoperative day 1, 10 patients (37%) were very worried about the outcome, and 3 (11%) considered the procedure "a terrible experience." On the other hand, 14 (52%) stated that they were not worried at all about the procedure or outcome. Twenty-six patients (96%) answered affirmatively when asked whether they were experiencing discomfort, and this response changed to the negative a mean of 12.1 (10.9) days postoperatively. Twenty patients (74%) reported pain, and the mean duration was half as long, 6.2 (5.9) days, as the duration of discomfort.

Patients' attitudes toward the procedure were tracked prospectively. Short-term patient responses are summarized with the mean number of days it took for a response to become positive in **Table 2**. Patient responses changed from no to yes for an increasing number of questions over time.

After 3 months, All 27 patients (100%) felt that they looked better than they did prior to the procedure, and patients' mean (SD) rating of their overall appearance was 2.3 (0.6) on a 0-to-3 scale that represented poor, fair, good or excellent. Satisfaction was lower after 30 months. **Table 3** summarizes a comparison of responses between 3 and 30 months. There were significant reductions in the percentage of patients who felt that the re-

**Table 2. Short-term Evolution of Patient Responses After Laser Skin Resurfacing**

Question	No. (%) of Patients Giving Affirmative Response	Affirmation Time*
Procedure worthwhile?	27 (100)	2.5 (3.1)
Recommend procedure to others?	23 (85)	2.7 (5.1)
Procedure again?	24 (89)	3.7 (5.8)
Met expectations?	23 (85)	6.1 (11.2)
Restful experience?	22 (82)	7.6 (5.0)

\*Mean (SD) number of days after the procedure that the patient response changed from no to yes.

sults met their expectations and in patient rating of overall appearance. Two very dissatisfied patients answered no to most questions at all evaluations and rated their final appearance as poor. Inclusion of these results did not skew the data in a statistically significant manner.

Long-term complications were also assessed. Six patients (25%) had some pigment irregularity while 4 (17%) felt that their skin was more sensitive to topical preparations than before the procedure. Two patients (8%) felt that their skin was more easily traumatized than before LSR. One (4%) had persistent hypopigmentation. No patients reported ectropion, scarring, or infection. Two patients (8%) felt that their skin tone and appearance had continued to improve between 1 and 2 years after LSR.

Long-term satisfaction at 30 months was analyzed based on indication for the procedure and compared between photodamage and acne scarring groups. These results are summarized in **Table 4**. Responses did not differ significantly between the 2 groups except that a significantly higher percentage of patients in the photodamage group felt that they had specific areas of insufficient results. There were no significant differences in pigmentary change, skin trauma, or skin sensitivity between photodamage and acne scarring groups.

#### COMMENT

A number of recent articles address objective postoperative morbidity such as erythema, crusting, swelling, and infection rates after LSR.<sup>8-10</sup> However, little has appeared on the subjective experience of patients undergoing LSR. The aesthetic surgery literature has highlighted the importance of examining the patient perspective. Multiple articles have shown that the most important factor in the outcome of cosmetic surgery is not the technical success of the surgery but the patient's perception of the outcome.<sup>11,12</sup> The subjective experience of a patient after any procedure is in turn influenced by a number of factors, including the patient's expectations, motivations, preconceptions, and fears.<sup>13</sup>

Patients who undergo cosmetic procedures tend to represent a highly demanding subset. An important component of success in LSR therefore lies in the surgeon's judgment in aligning the patient's wishes with the therapeutic and surgical limitations. This study was

**Table 3. Comparison of Affirmative Patient Responses 3 and 30 Months After Laser Skin Resurfacing\***

Question	3 mo	30 mo	P Value
Met expectations?†	23 (85)	13 (54)	.01
Recommend procedure to others?	23 (85)	18 (75)	.49
Procedure again?	24 (89)	17 (71)	.16
Appearance better than before procedure?	27 (100)	21 (88)	.10
Overall appearance (0-3 scale)?†	2.3	1.8	.04

\*Except as otherwise indicated, data are number (percentage) of patients.

†Statistically significant.

**Table 4. Comparison of Patient Affirmative Responses After 30 Months by Indication for Laser Skin Resurfacing\***

Question	Indication		P Value
	Rhytids	Acne Scarring	
Met expectations?	6 (55)	7 (54)	.97
Recommend procedure to others?	9 (82)	9 (69)	.50
Procedure again?	9 (82)	8 (62)	.30
Appearance better than before procedure?	9 (82)	12 (92)	.89
Overall appearance (0-3 scale)?	1.7	1.9	.75
Insufficient result in specific area?†	7 (64)	3 (23)	.05

\*Except as otherwise noted, data are number (percentage) of patients.

†Statistically significant.

undertaken to investigate the evolution of patient experiences and responses after LSR to refine the art of patient preparation and thereby improve the patient-physician relationship.

Our data indicate that during the first 3 days after the procedure, the period when the patient is most likely to feel pain or observe erythema, crusting, or swelling,<sup>10</sup> patients experienced the greatest discomfort, and most were unwilling to recommend LSR to others or consider undergoing the procedure again themselves. In addition, patients' views of the results were obscured by an occlusive dressing for the first 3 postoperative days, possibly fueling concern. Most patients' attitudes changed between 2 and 4 days after the procedure, with all patients stating that the procedure was worthwhile at an average of 2 to 3 days postoperatively. In contrast to immediately after the procedure, by the eighth postoperative day, responses changed such that 22 patients (82%) considered the time thereafter "restful." More detailed preparation for the immediate postoperative period may help to alleviate patient anxiety and increase the likelihood of meeting patient expectations earlier.

Several results of long-term follow-up were intriguing. While patient responses remained very positive, satisfaction decreased over time. The mean patient rating of overall appearance and the percentage of patients who felt their results met their overall expectations decreased between 3 and 30 months. Three patients (12%) changed their responses from yes to no when asked



whether their appearance had been improved by LSR (difference not statistically significant).

This trend toward decreased satisfaction could be explained by several factors. At 3 months, collagenesis and dermal remodeling are still occurring.<sup>14</sup> One study found the most rapid rise in clinical improvement scores after 1 month, 69%, and an 11% increase in improvement between 6 and 18 months.<sup>14</sup> Patients surveyed at 3 months may have expected continued improvement at a rate comparable to that seen immediately postoperatively and been disappointed if their improvement reached a plateau. Residual edema may have temporarily improved appearance at 3 months and may explain the higher patient ratings of results than at 30 months. In addition, several patients commented that they had not expected "new wrinkles" after the procedure, which may reflect unrealistic expectations that LSR would halt the aging process rather than help "reset the clock" to an earlier time. Patients with rhytids tended to focus on particular areas that they felt were not sufficiently improved despite positive answers about their overall result. This may reflect excessive attention to perceived problem areas that might be unlikely to be satisfied by any outcome of the procedure.

Nonetheless, lower patient ratings of appearance between 3 and 30 months may also represent a real decline in results. Although a prior study based on clinician assessment showed an improvement in clinical appearance after LSR between 6 months and 18 months postoperatively,<sup>14</sup> some data suggest that the degree of clinical improvement declines over time. One study that showed improvement in histologic criteria such as epidermal thickness, rete pattern, and reduced solar elastosis at 24 months also showed lower clinical reductions in perioral and periorbital wrinkles at 24 months than at 2 months.<sup>15</sup> Another study based on blinded clinician assessments of digital photographs of 211 patients undergoing LSR found the greatest improvement in rhytids between 6 weeks and 3 months, with some relapse in all sites at 12 months. Regions with dynamic rhytids such as the perioral region showed higher recurrence, while the most lasting results were in the cheeks.<sup>16</sup> These results are similar to our data at 30 months in that 10 (42%) of our patients commented on "insufficient results" that were almost all in dynamic areas. Although the overall aesthetic results of LSR remained good after 30 months, with 21 patients (88%) reporting improved appearance, 18 (75%) willing to recommend LSR, and 17 (71%) willing to undergo LSR again, the decline in satisfaction between 3 and 30 months may represent a real reduction in clinical improvement over time. Adjunctive use of botulinum toxin, collagen, or nonablative laser therapy may help to preserve and prolong LSR results.

Prior to undertaking the survey at 30 months, our hypothesis was that patients with acne scarring were more likely to have psychological issues and might be less satisfied than those with rhytids. In fact, a significantly higher percentage of patients in the photodamage groups were more likely to feel that certain areas, such as perioral or periorbital, were not sufficiently improved. Although it is possible that patients undergoing LSR for rhytids represented a more demanding subset, these patients were also more likely to experience a relapse in dynamic rhytids over time.

The long-term rates of complications were comparable to other studies of carbon dioxide resurfacing patients.<sup>17</sup> The 4 patients (17%) reporting increased sensitivity to topical preparations and 2 (8%) reporting increased skin fragility may have represented an atopic subset. A prior study found that among patients reporting sensitivity after carbon dioxide LSR, 78.6% had allergic tendencies or asthma prior to the procedure.<sup>18</sup> Further study of laser-induced stimulation of cytokine release from epidermal Langerhans cells may help to elucidate the sensitivity phenomenon in susceptible patients.

These findings emphasize the importance of patient preparation during the preoperative visit and ongoing dialogue with the patient after LSR. Patients with unrealistic expectations of what the procedure can actually accomplish will most benefit from preoperative screening and counseling.<sup>19</sup> A future study might evaluate how different approaches to patient preparation or presentation of varying degrees of detail preoperatively influence a patient's perception of the short- and long-term outcome. Our analysis shows the trajectory that patients' perceptions are likely to follow. This information may be especially valuable in the first 3 days postoperatively when a patient is most vulnerable. In addition, insight into patients' long-term expectations for LSR may help to adequately address patient concerns. Once the surgeon has an impression of the patient's desire for information and understands the likelihood that it will engender comfort rather than fear, judicious use of these data can help prepare patients for what to expect and reassure them after their procedure.

Nonablative photorejuvenation has become more popular in the past 1 to 2 years related to the concern that LSR requires "too much downtime." However, for many patients, LSR provides the best opportunity for an optimal cosmetic outcome. To educate patients about the therapeutic options, long-term data on the experience of the "average" patient undergoing LSR will be helpful. It is critical that the physician and patient have shared, realistic expectations concerning outcome both with respect to what the patient will experience at any given time postoperatively and how LSR will ultimately meet the patient's needs. Application of this information on patient responses after LSR may help to achieve this goal.

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Corresponding author: Jeffrey S. Dover, MD, FRCPC, 1244 Boylston St, Suite 302, Chestnut Hill, MA 02467 (e-mail: jdover@skincarephysicians.net).

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#### News and Notes

**D**ates of 2004 ABD examinations. In 2004, the certifying examination of the American Board of Dermatology (ABD) will be held at the Holiday Inn O'Hare International in Rosemont, Ill, on August 15 and 16, 2004. The deadline for receipt of applications is March 1, 2004. The recertification examination of the ABD will be administered May 1 to June 15, 2004. The deadline for receipt of applications for the recertification examination is January 1, 2004.

A certification process has been developed for the subspecialty of pediatric dermatology. The first examination will be administered on October 4, 2004. Deadline for receipt of applications is April 1, 2004.

The examination for subspecialty certification in dermatopathology will be held in the fall (date to be announced) at the testing center of the American Board of Pathology in Tampa, Fla. The deadline for receipt of applications is May 1, 2004.

The in-training examination for dermatology residents (administered at dermatology residency training centers in the United States and Canada) will be held on April 15, 2004.

For further information about these examinations, please contact Antoinette F. Hood, MD, Executive Director, American Board of Dermatology, Henry Ford Health System, 1 Ford Place, Detroit, MI 48202-3450; phone: (313) 874-1088; fax: (313) 872-3221; e-mail: [abderm@hfhs.org](mailto:abderm@hfhs.org); Web site: [www.abderm.org](http://www.abderm.org).