

# Effect of Erbium:YAG Laser Treatment on Scar Pain

R Cork, L Alexander, C Shepherd, A Porrata, N Ming

## Citation

R Cork, L Alexander, C Shepherd, A Porrata, N Ming. *Effect of Erbium:YAG Laser Treatment on Scar Pain*. The Internet Journal of Anesthesiology. 2003 Volume 8 Number 2.

## Abstract

Scar pain has persisted as a significant problem for patients who have undergone surgery or suffered trauma. The pain may vary from what is described as irritation or itching to severe neuropathic pain. Recent work by dermatologists using lasers to treat scars for cosmetic reasons has revealed that there has been pain relief from the cosmetic laser treatment. This study examined the effect of a single erbium:YAG laser treatment on 23 patients with chronic (>6 months) scar pain. Assessment was at one month and four months post treatment. Results showed a significant and persistent decrease in McGill Pain Scale, Itch Visual Analog Scale, and Pain Intensity Scale. Treatment of chronic scar pain with readily available cosmetic lasers may be of significant benefit to patients who have not responded to standard injection therapy.

This research was funded by the Department of Anesthesiology, LSU Health Sciences Center—Shreveport.

Presented in part at the Joint International Laser Conference, September 21-23, 2003, Edinburgh, Scotland.

## BACKGROUND AND OBJECTIVE

Scar pain may persist chronically after surgery or accidental trauma. Entrapment of neurons by collagen has been considered the most probable cause.<sup>1</sup> Treatment has included infiltration with local anesthetic agents, steroids, electrical stimulation, and needles, all of which usually provide only short-term relief. An incidental finding in a study of cosmetic laser treatment of scars showed significant pain relief for four patients who also had pain.<sup>2</sup> The objective of this study was to examine the effect of a single treatment with an erbium:YAG laser on chronic scar pain.

## STUDY DESIGN/MATERIALS AND METHODS

After approval by the IRB at LSUHSC-Shreveport and informed consent, 23 patients with a history of chronic (>3 months) scar pain were studied. Demographic data collected included age, weight, height, sex, Fitzpatrick Scale (skin color), type of injury (accidental vs surgical), and location of scar. The Fitzpatrick Scale assesses skin color: A score of 1 represents very light skin, and a score of 5 represents very dark skin. Baseline assessments included McGill Pain Score (Figure 1), including sensory and affective pain descriptors, VAS pain scale, VAS itching scale, and a 5-point numerical intensity scale (0=none, 1=mild, 2=discomforting,

3=distressing, 4=horrible, and 5=excruciating).

## Figure 1

Figure 1: McGill Short Form.3 Yellow are sensory attributes; orange are affective attributes.

	None	Mild	Moderate	Severe
Throbbing	0)	1)	2)	3)
Shooting	0)	1)	2)	3)
Stabbing	0)	1)	2)	3)
Sharp	0)	1)	2)	3)
Cramping	0)	1)	2)	3)
Gnawing	0)	1)	2)	3)
Hot-Burning	0)	1)	2)	3)
Aching	0)	1)	2)	3)
Heavy	0)	1)	2)	3)
Tender	0)	1)	2)	3)
Splitting	0)	1)	2)	3)
Tiring-Exhausting	0)	1)	2)	3)
Sickening	0)	1)	2)	3)
Fearful	0)	1)	2)	3)
Punishing-Cruel	0)	1)	2)	3)
Score Calculation	0 x ____ = ____	1 x ____ = ____	2 x ____ = ____	3 x ____ = ____

All patients were treated with an Er:YAG laser (NaturaLase™, Focus Medical, Bethel, CT)(Figure 2), wavelength 2.94 nm, fluence 1.29 J/cm<sup>2</sup>, spot size 8 mm, with 2 pulses per second, and 50% overlap. Assessment was at one month and four months post-procedure. Data were analyzed with repeated-measures analysis of variance, and a priori level of significance was defined at p<0.05.

Figure 2

Figure 2a: NaturaLase™ Erbium:YAG Laser



Figure 3

Figure 2b: NaturaLase™ Erbium:YAG Laser Handpiece



RESULTS

For the study population, age (mean±SEM) was 42±2, 14 females, 9 males, 16 with surgical scars, 57 with accidental scars. All scars were non-erythematous and flat. Duration of scar pain was 8.2±2.0 years. Other population variables are shown in Table I.

Figure 4

Table 1: Patient Population

Population Variable		Mean ± SEM Or Number
Age (yrs) (mean±sem)		41.8 ± 2.5
Weight (kg)		87.8 ± 4.1
Height (cm)		169.8 ± 1.6
Sex		
Male		9
Female		14
Fitzpatrick Class		
I		0
II		9
III		9
IV		4
V		1
Type of Injury		
Accidental		7
Surgical		16
Location of Scar		
Head/Neck		5
Chest		5
Back		3
Abdomen		5
Extremities		5

At both one month and four months after treatment, McGill Scale decreased ( $p<0.001$ ) (Figure 3), pain VAS decreased ( $p<0.001$ ) (Figure 4), itching VAS decreased ( $p<0.05$ ) (Figure 5), and intensity decreased ( $p<0.001$ ) (Figure 6).

Figure 5

Figure 3: Effect of Erbium:YAG Laser on McGill Pain Scale

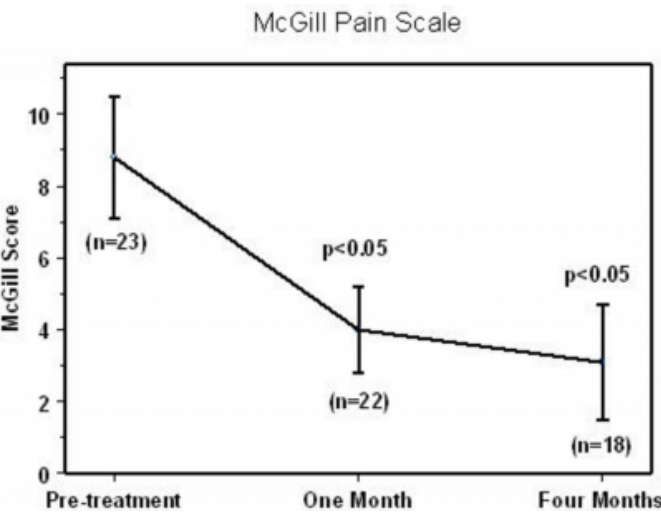


Figure 7

Figure 5: Effect of Erbium:YAG Laser on Visual Analog Itch Scale

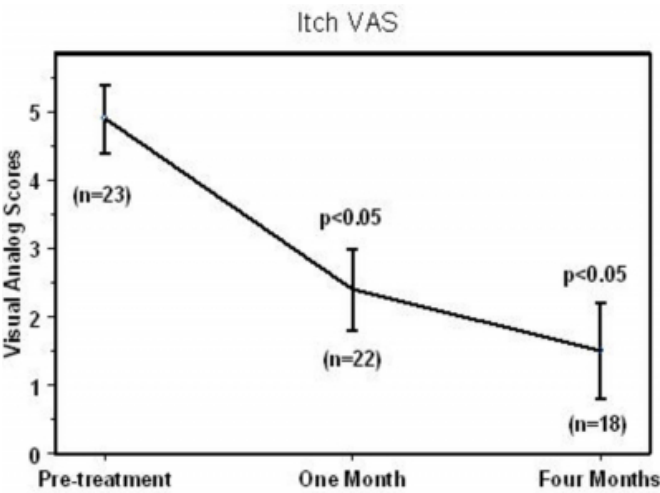


Figure 6

Figure 4: Effect of Erbium:YAG Laser on Visual Analog Pain Scale

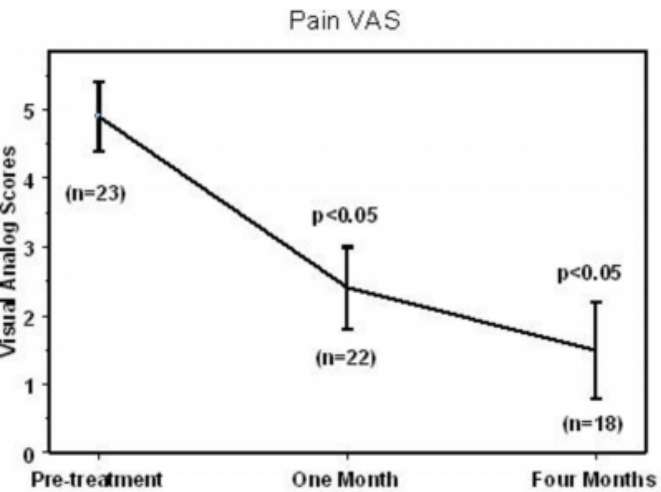
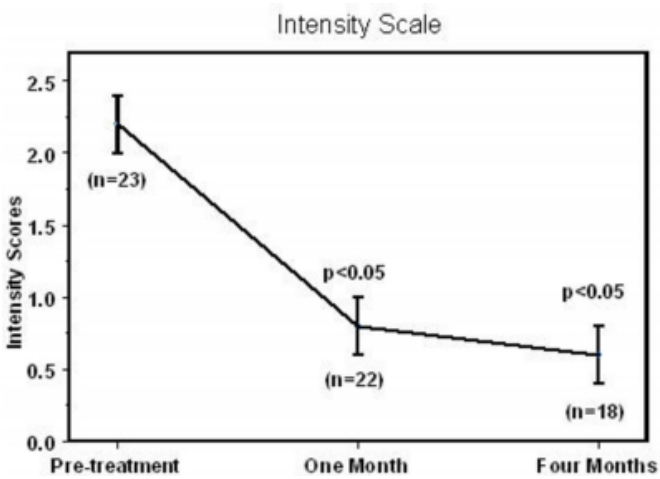


Figure 8

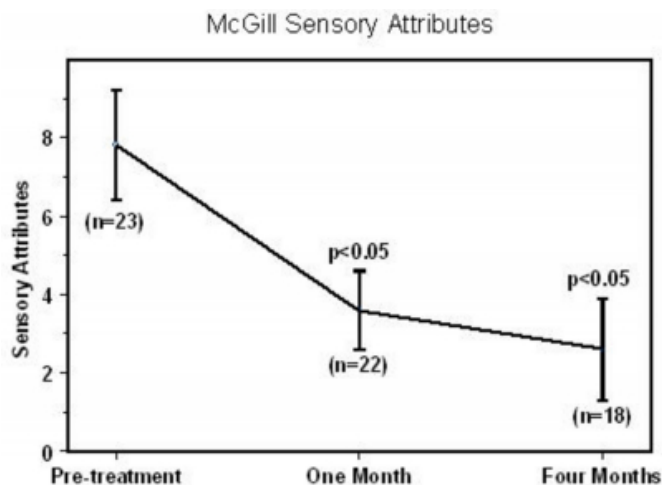
Figure 6: Effect of Erbium:YAG Laser on Intensity Scale



McGill affective scores did not change significantly during follow-up ( $1.0 \pm 0.4$  to  $0.6 \pm 0.3$ ); McGill sensory scores decreased significantly ( $p < 0.05$ )(Figure 7).

**Figure 9**

Figure 7: Effect of Erbium:YAG Laser on McGill Sensory Attributes



There was no effect of type of injury (accidental vs surgical) or scar location. Men were taller ( $p<0.05$ ), darker ( $p<0.05$ ), and perceived more baseline pain ( $p<0.05$ ) than women (Table II).

**Figure 10**

Table 2: Sex Differences (All at p

	Males (n=9)	Females (n=14)
Height (cm)	175±2	166±1
McGill Baseline	13.4±3.5	5.8±1.3
McGill Sensory Baseline	11.9±2.8	5.1±0.9
Pain VAS Baseline	6.2±0.5	4.0±0.7
Fitzpatrick Class	3.3±0.3	2.6±0.2

## DISCUSSION

When Manuskiatti, et al, studied the cosmetic effects of lasers on scars, they noted in passing that four of the patients

they studied had complained of scar pain prior to the cosmetic treatment, but that after the treatment, the scars not only looked better, but the pain had vanished.<sup>2</sup> They used a 585-nm pulsed-dye laser in their study. Kotani, et al,<sup>1</sup> hypothesized that nerve ending were entrapped by the formation of scar, causing the scar pain. If this is true, the laser could be simply destroying the collagen and causing it to regrow in a manner such that it no longer constricts the nerve ending. Recently, Martin has proposed that the laser may reduce directly chronic inflammation at the cellular level.<sup>4</sup> Whatever the physics and physiology, cosmetic lasers are ubiquitous, and their potential application by anesthesiologists and pain medicine specialists to treat chronic scar pain represents a real breakthrough in this difficult area of pain medicine.

## CONCLUSION

The Erb:YAG laser shows significant promise as a treatment modality for chronic scar pain.

## References

1. Kotani N, Kushikata T, Suzuki A, Hashimoto H, Muraoka M, Matsuki A: Insertion of intradermal needles into painful points provides analgesia for intractable abdominal scar pain. *Regional Anesthesia & Pain Medicine*. 26(6):532-8, 2001 Nov-Dec.
2. Manuskiatti W, Fitzpatrick RE, Goldman MP: Energy density and numbers of treatment affect response of keloidal and hypertrophic sternotomy scars to the 585-nm flashlamp-pumped pulsed-dye laser. *Journal of the American Academy of Dermatology*. 45(4):557-65, 2001 Oct.
3. Melzack R: The short-form McGill pain questionnaire. *Pain*. 30(2):191-7, 1987 Aug.
4. Martin R: Laser-accelerated inflammation/pain reduction and healing. *Practical Pain Management*. 3(6):20-25, 2003 Nov/Dec.

**Author Information**

**Randall C. Cork, M.D., Ph.D.**

Department of Anesthesiology, LSU Health Sciences Center

**Lori Alexander, B.S., M.B.A.**

Department of Anesthesiology, LSU Health Sciences Center

**Clifton Shepherd, M.D.**

Department of Anesthesiology, LSU Health Sciences Center

**Alejandro Porrata, M.D.**

Department of Anesthesiology, LSU Health Sciences Center

**Norbert Ming, M.D.**

Department of Anesthesiology, LSU Health Sciences Center