Analysis of Data from Cold Air used with Laser Incisions and Laser Skin Resurfacing

I. Laser Incision

A. Cold Air Effect

Using a paired comparison (Student's t-Test) of all the incisions, made with and without cold air leads to the following:

Day 3 Cold Air helps wound healing
Mean increase of 3.5 kg/sq. mm of wound tensile strength
p=0.048 for the difference

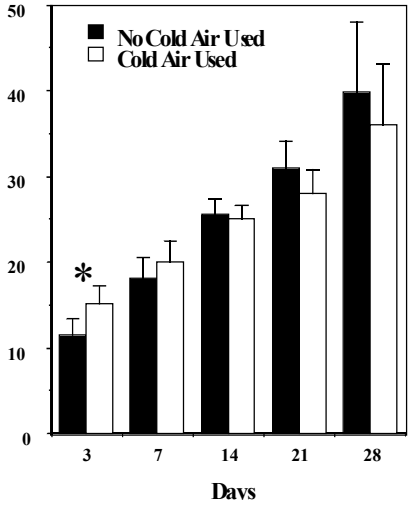
Day 7 Cold Air shows no difference in wound healing
Mean increase of 1.1 kg/sq. mm of wound tensile strength
p=0.70 for the difference (not significant)

Day 14 Cold Air shows no difference in wound healing
Mean decrease of 0.6 kg/sq. mm of wound tensile strength
p=0.79 for the difference (not significant)

Day 21 Cold Air shows no difference in wound healing
Mean decrease of 2.9 kg/sq. mm of wound tensile strength
p=0.26 for the difference (not significant)

Day 28 Cold Air shows no difference in wound healing
Mean decrease of 3.9 kg/sq. mm of wound tensile strength
p=0.71 for the difference (not significant)

Below is a histogram of the tensile strength as a function of the day for the two conditions (with and without the cold air). Only at day 3 is the difference statistically significant. The bar represent the mean tensile strength. The error bars are standard errors of the means.



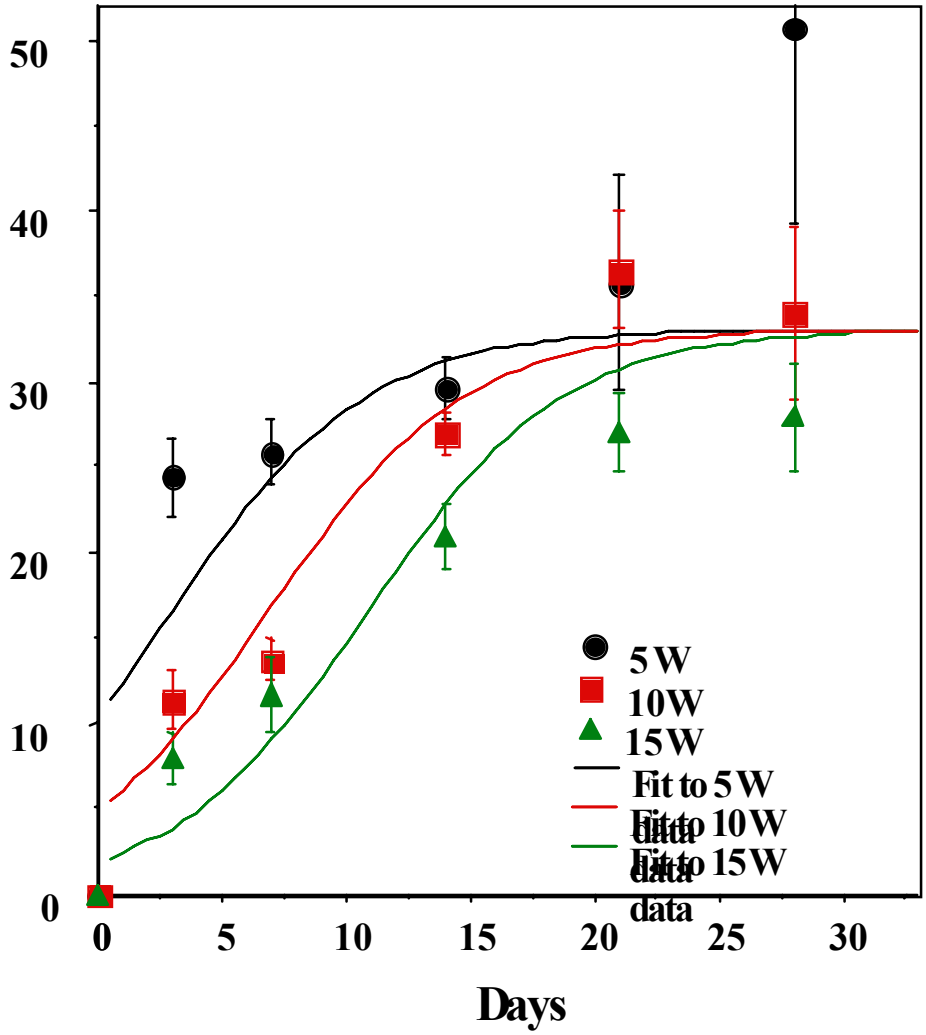
Thus, the cold air might decrease the inflammatory phase of wound healing, but it has a small change in overall would healing.

I. Laser Incision

A. Laser Intensity Effect

We considered the effect of the laser intensity on the wound healing strength. We used the laser at 5, 10 and 15 W. The differences were analyzed with a paired comparison (Student's t-Test). The incisions made with 5 W were stronger than those made with 10 W ($p=0.002$) and the incisions made with 10W were stronger than those made with 15 W ($p=0.0074$).

Below, we show the tensile strength at each time point for each laser intensity (5, 10 and 15W). The lines are fits to the data using a two-state model. We can see from the fits that wound healing is delayed (compared to the incisions made with 5W) by 4.9 days for the incisions made with 10 W and 9.9 days for the incisions made with 15 W.

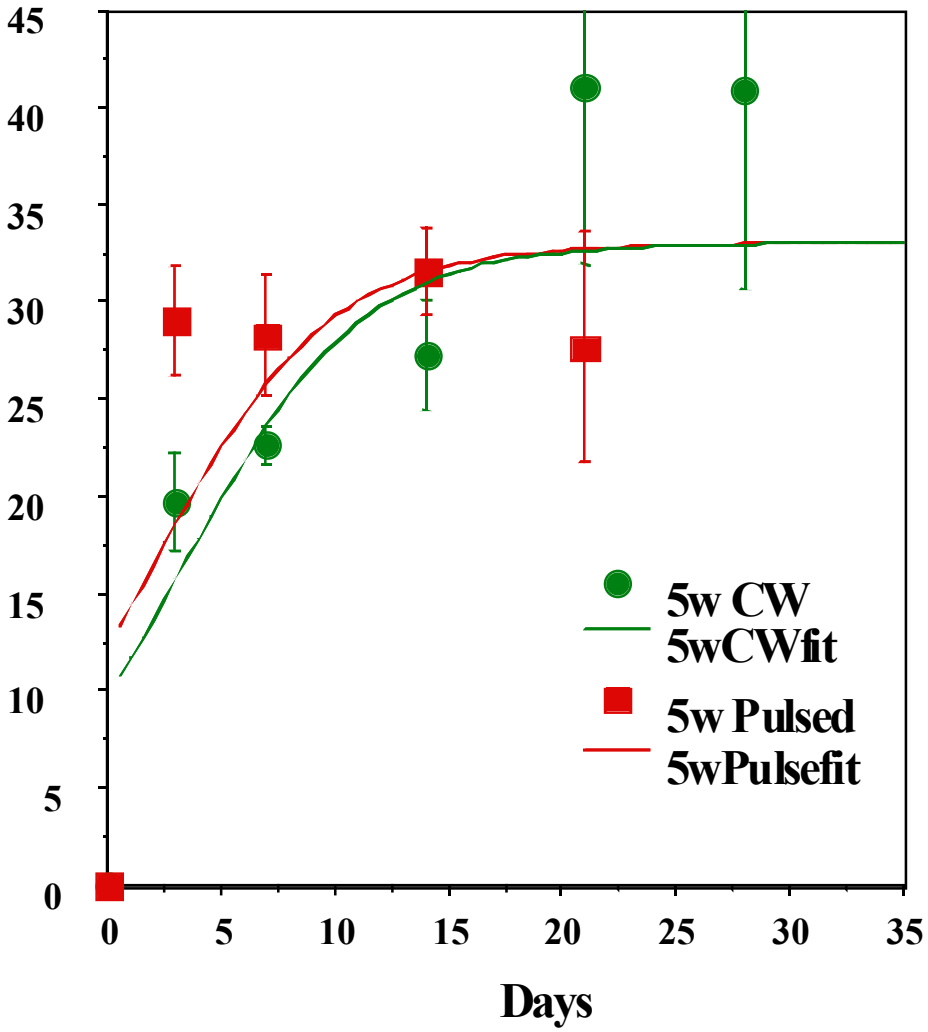


I. Laser Incision

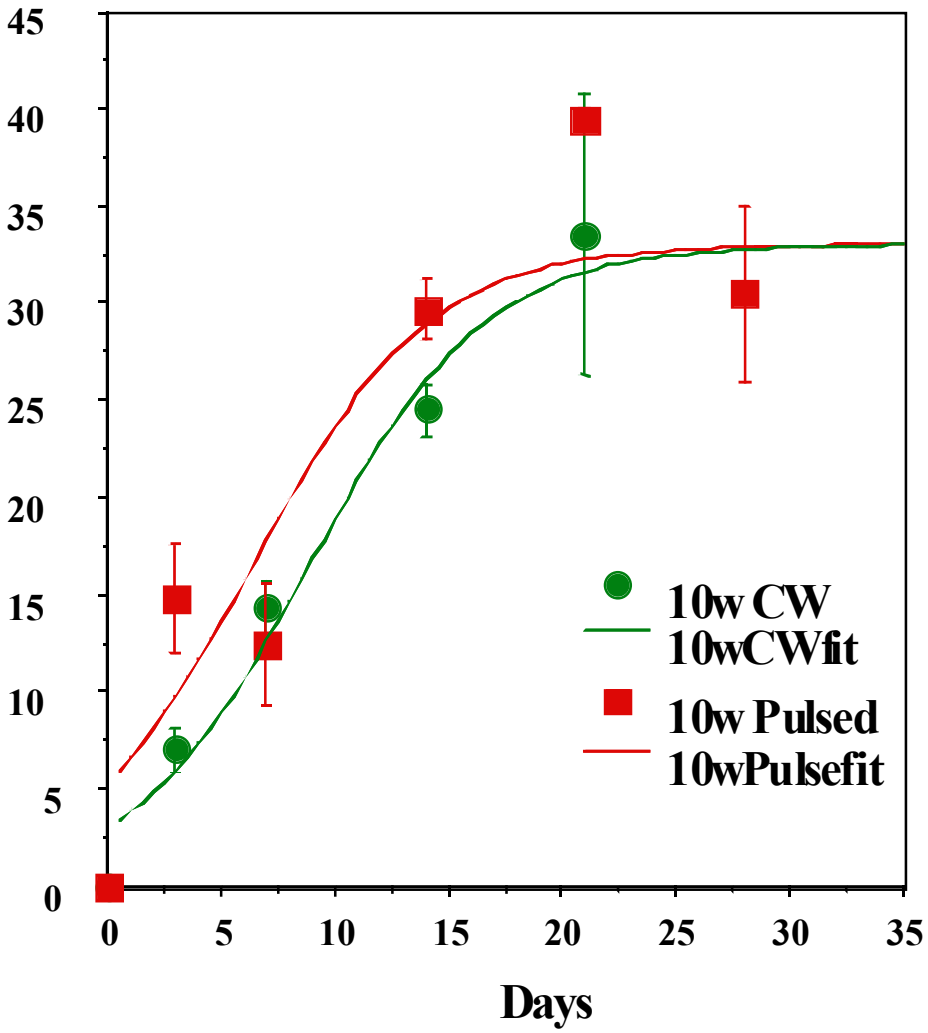
A. Pulsed or CW Laser

Using an ANOVA (factorial) data analysis of the tensile strength, we found the tensile strength for incisions as a function of day of wound healing and laser intensity were all stronger using the laser in a pulsed mode over the CW mode with a Bonferroni—Dunn corrected p-value of 0.002.

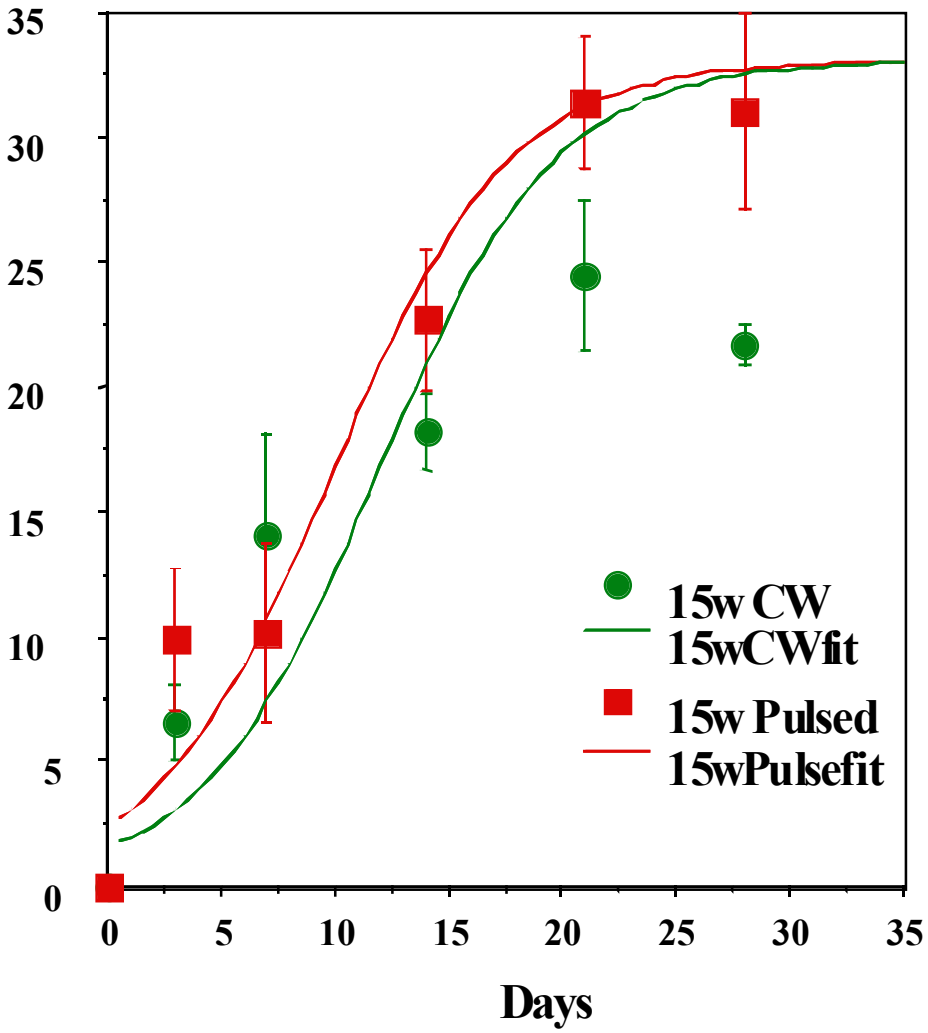
Using our two state model, the CW laser causes about a 1.7 day delay compared to the pulsed laser at the same intensity. This is shown on the next three figures.



The above graph shows the tensile strength of the incisions made with 5 W pulsed and CW as a function of the healing time. The straight lines are fits to the two state model. The fit shows the CW laser incisions show a delay in wound healing of 1.6 days compared to the pulsed laser wound healing.



The above graph shows the tensile strength of the incisions made with 10 W pulsed and CW as a function of the healing time. The straight lines are fits to the two state model. The fit shows the CW laser incisions show a delay in wound healing of 1.65 days compared to the pulsed laser wound healing.



The above graph shows the tensile strength of the incisions made with 15 W pulsed and CW as a function of the healing time. The straight lines are fits to the two state model. The fit shows the CW laser incisions show a delay in wound healing of 1.9 days compared to the pulsed laser wound healing.

II. Laser Skin Resurfacing

A. Cold Air Effect

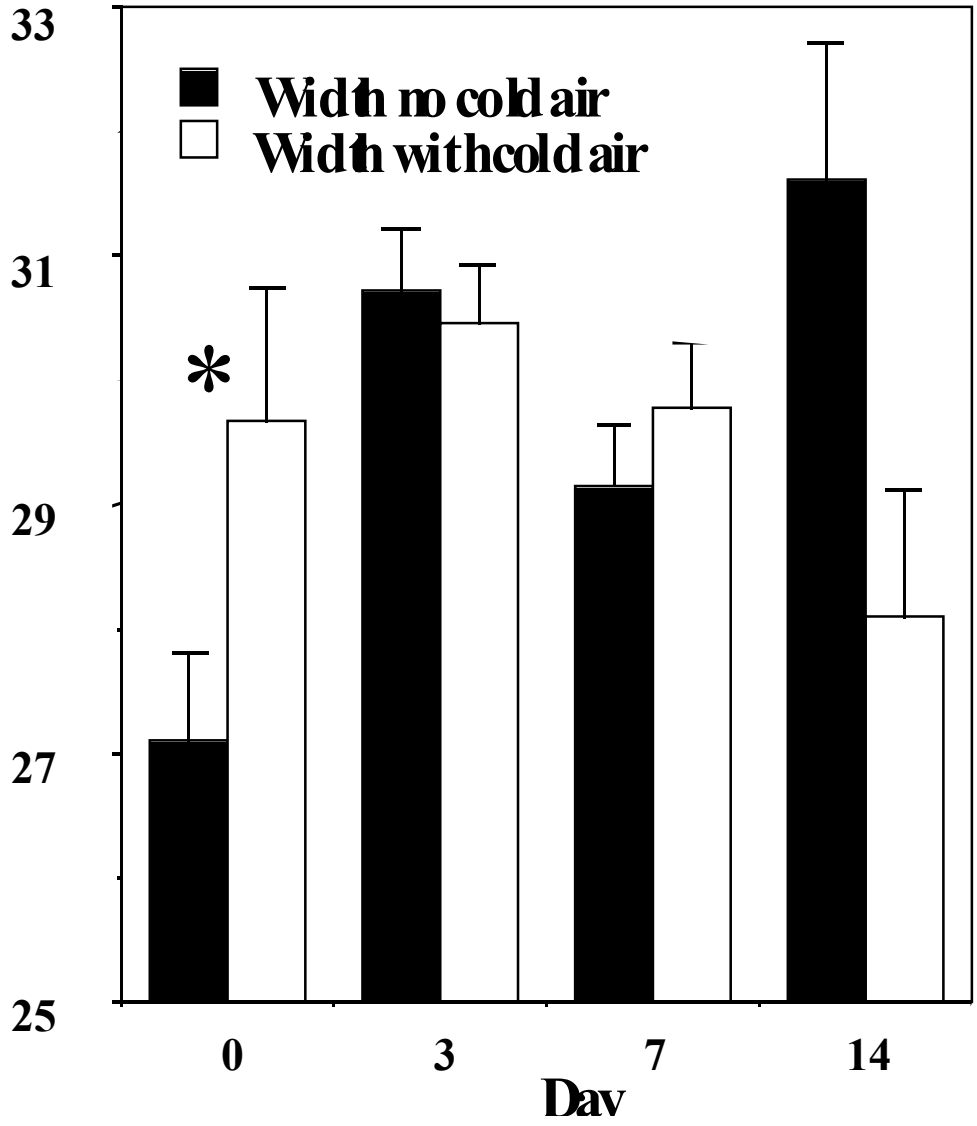
Used paired comparison (Student's T-test) of resurfacing made with and without cold air, we find there are no differences when looking at the tissue histology. We looked at the incision size:

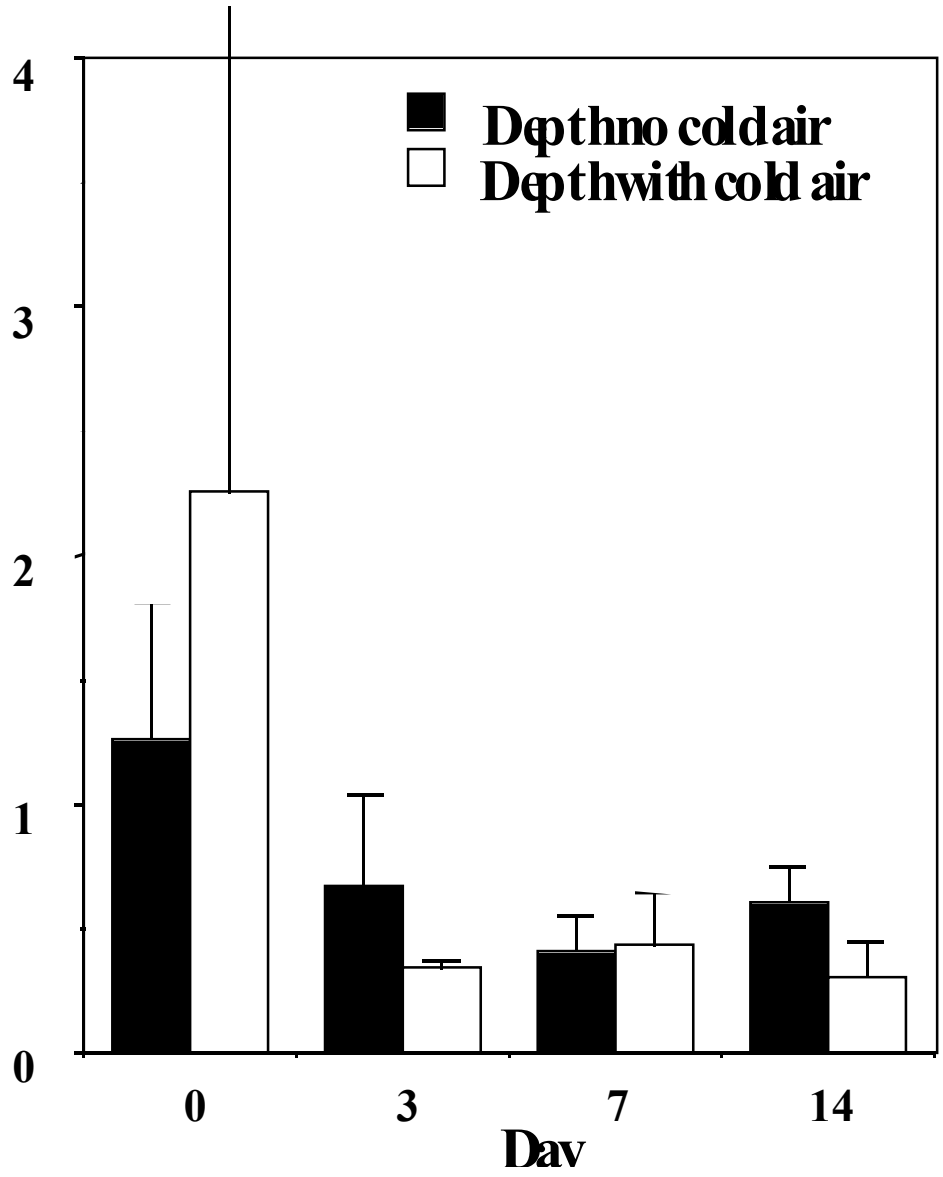
Width (without cold air) 29.1 μm +/- 0.4 μm
Width (with cold air) 29.1 μm +/- 0.6 μm
P-value for the paired difference = 0.79

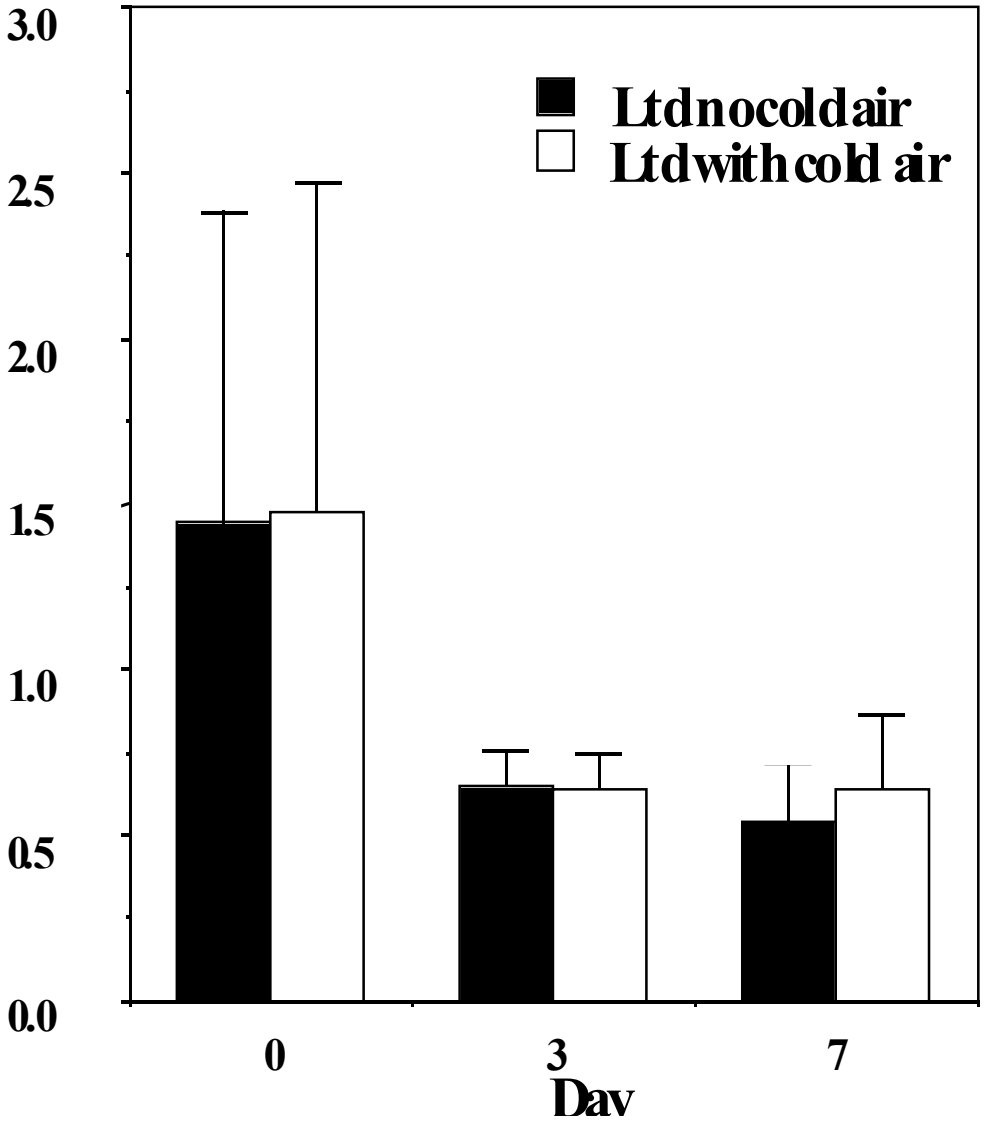
Depth (without cold air) 0.82 +/- 0.14 μm
Depth (with cold air) 0.88 +/- 0.19 μm
P-value for the paired difference = 0.72

Lateral thermal damage (without cold air) 0.99 +/- 0.14 μm
Lateral thermal damage (with cold air) 1.03 +/- 0.14 μm
P-value for the paired difference = 0.74

We show below the Width, the Depth and the Lateral thermal damage as a function of the wound healing day, with and without the cold air. The only difference that is statistically significant (using a Student's T-test with a paired comparison) was day zero for the width. The p-value = 0.036.


33
31
29
27
25
Width no cold air
Width withcold air
*
0
3
7
14
Dav

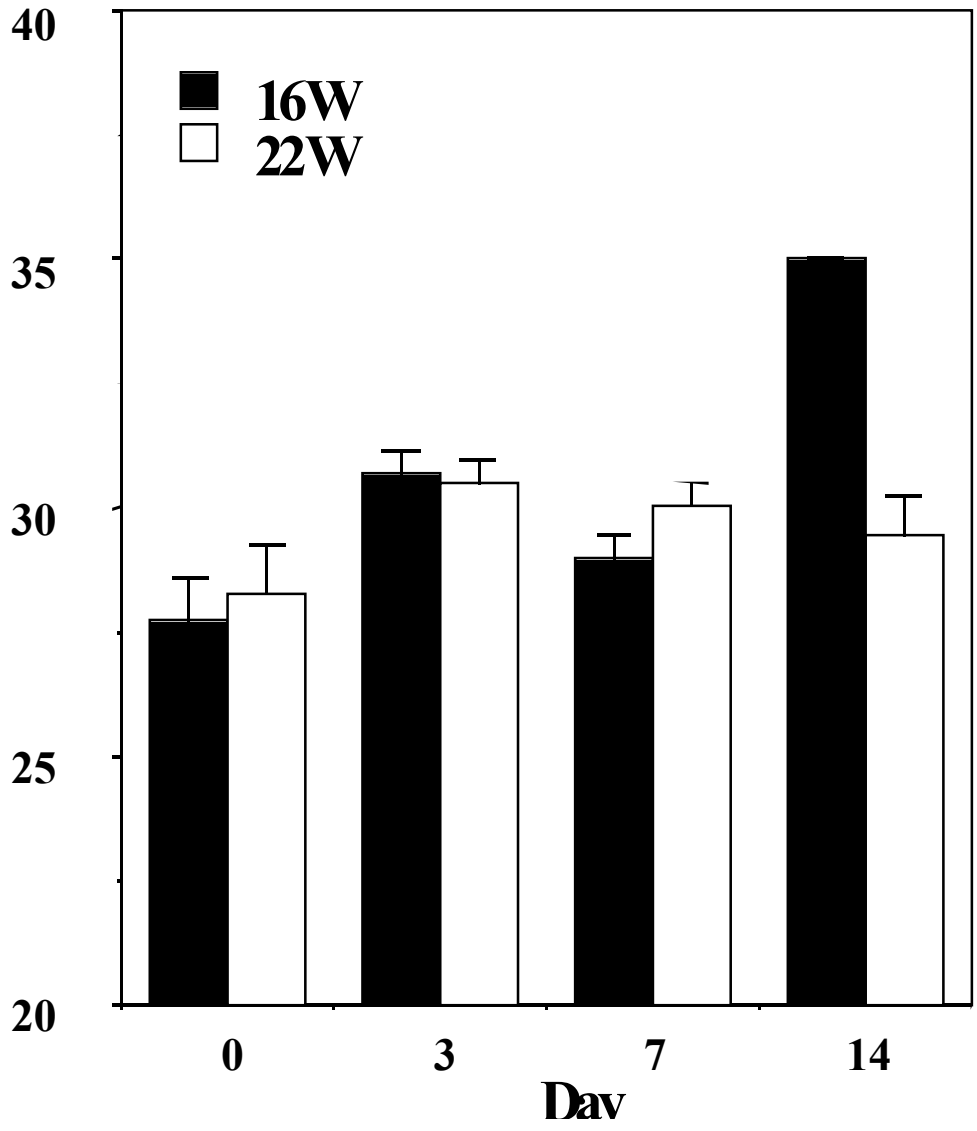

4
3
2
1
0
Dqpthno coldair
Dqpthwith cold air
0
3
7
14
Dav


3.0
2.5
2.0
1.5
1.0
0.5
0.0
Ltdnocoldair
Ltdwithcold air
0
3
7
Dav

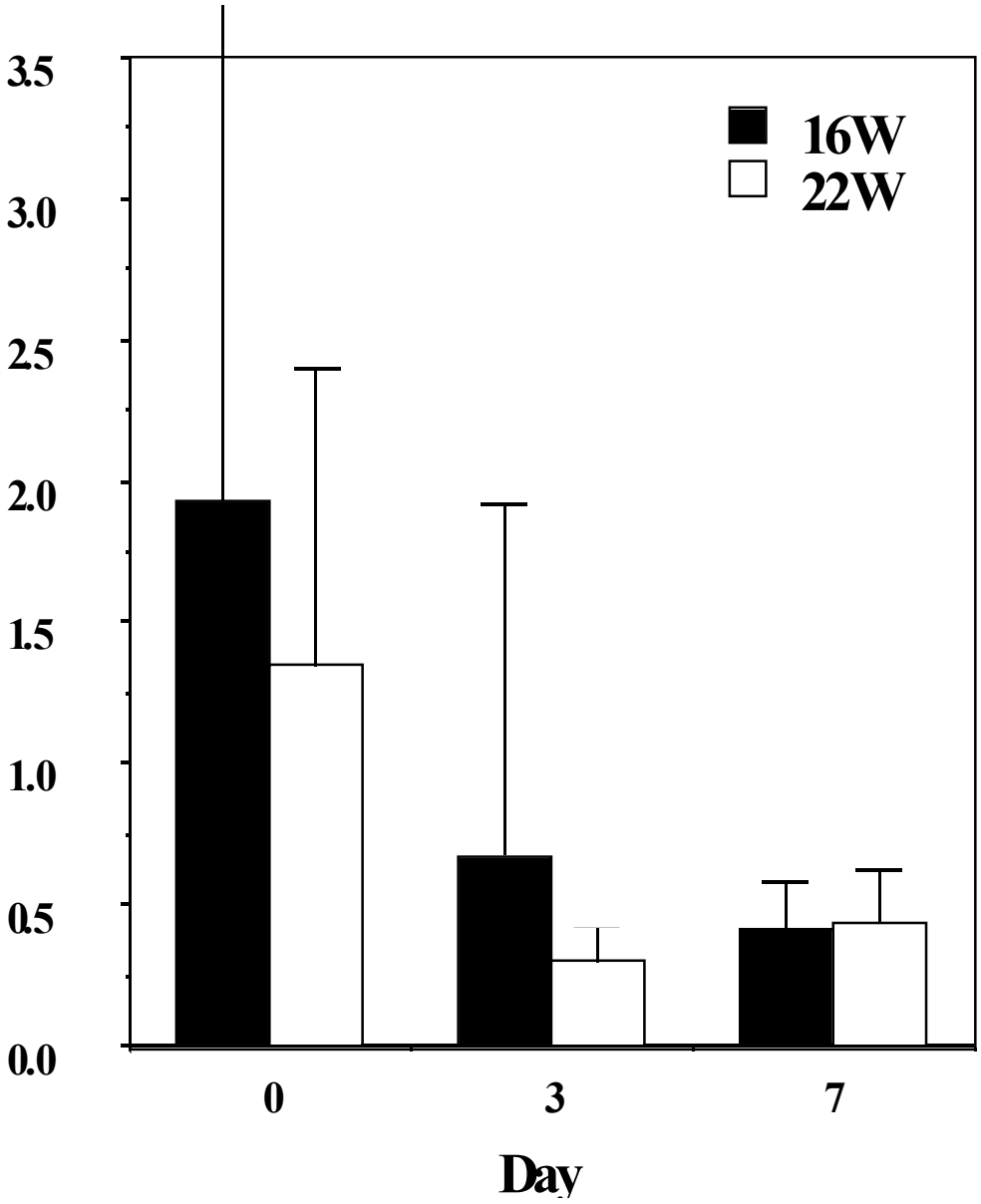
II. Laser Skin Resurfacing

A. Laser Wattage Effect

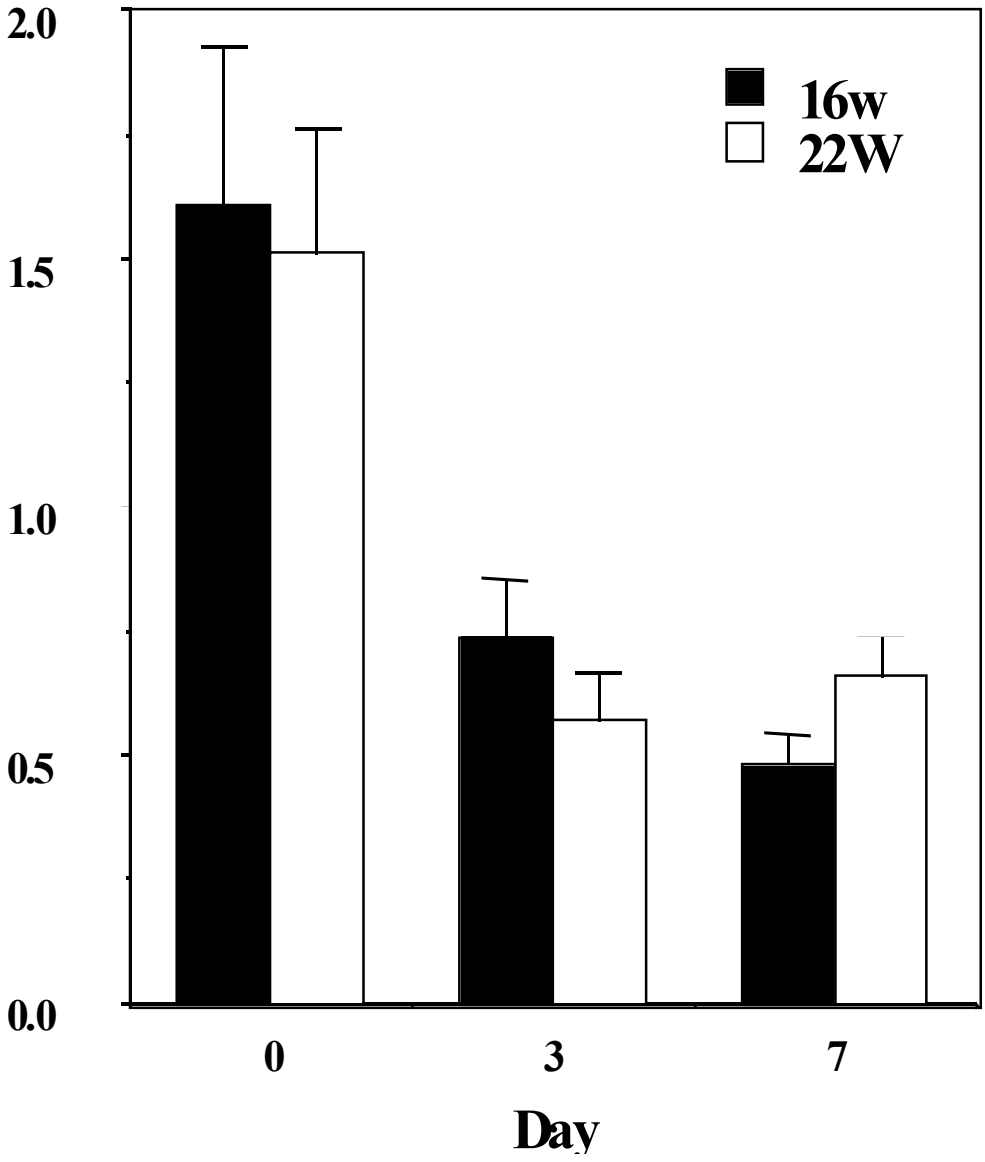
We compared using the laser at 16 W and 22 W. Looking at the histology, there is no difference between using these two laser fluences. Using an ANOVA factorial statistical comparison with a Bonferroni—Dunn correction factor, the p-value for the difference in the Width between 16W and 22W is 0.74



Using an ANOVA factorial statistical comparison with a Bonferroni—Dunn correction factor, the p-value for the difference in the Depth between 16W and 22W is 0.73



Using an ANOVA factorial statistical comparison with a Bonferroni—Dunn correction factor, the p-value for the difference in the Lateral thermal damage between 16W and 22W is 0.84

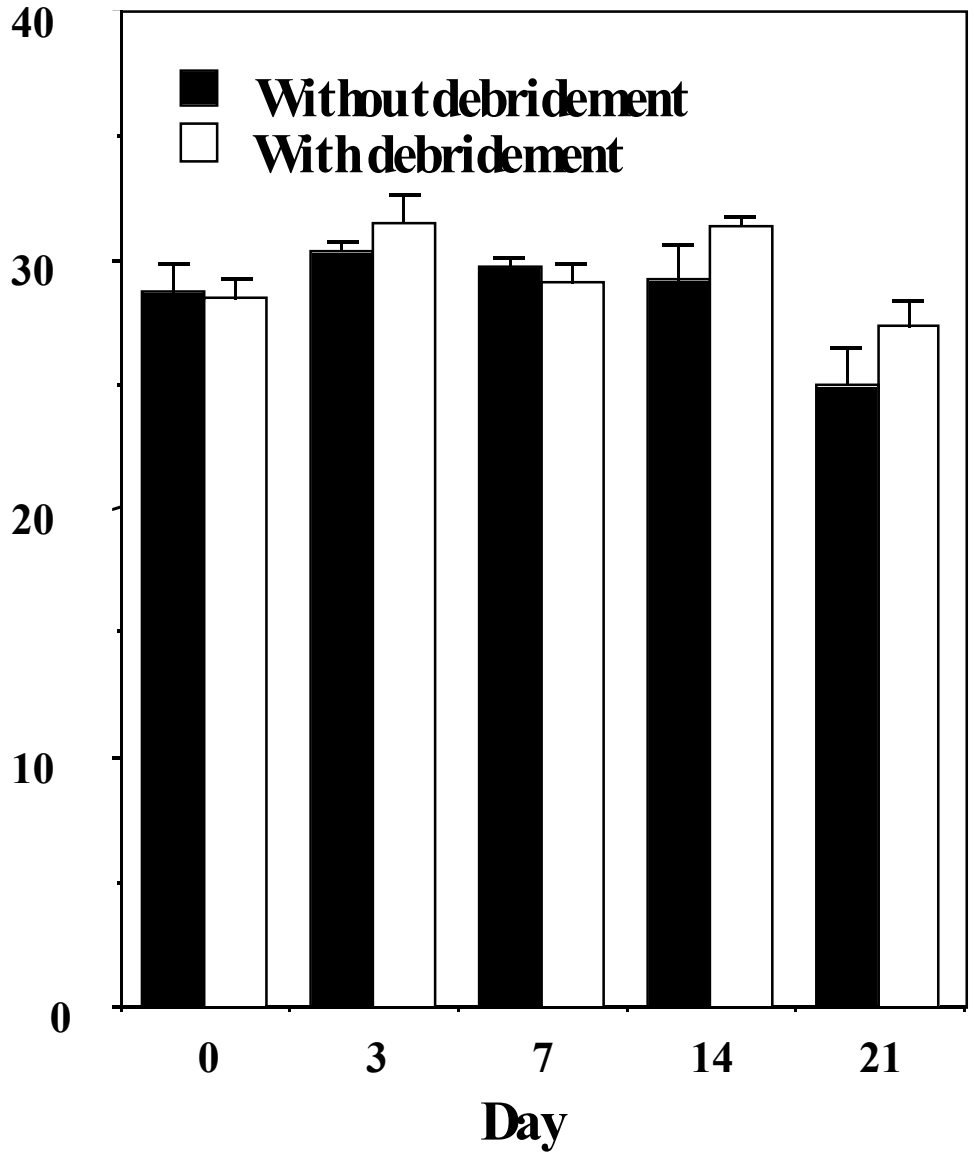


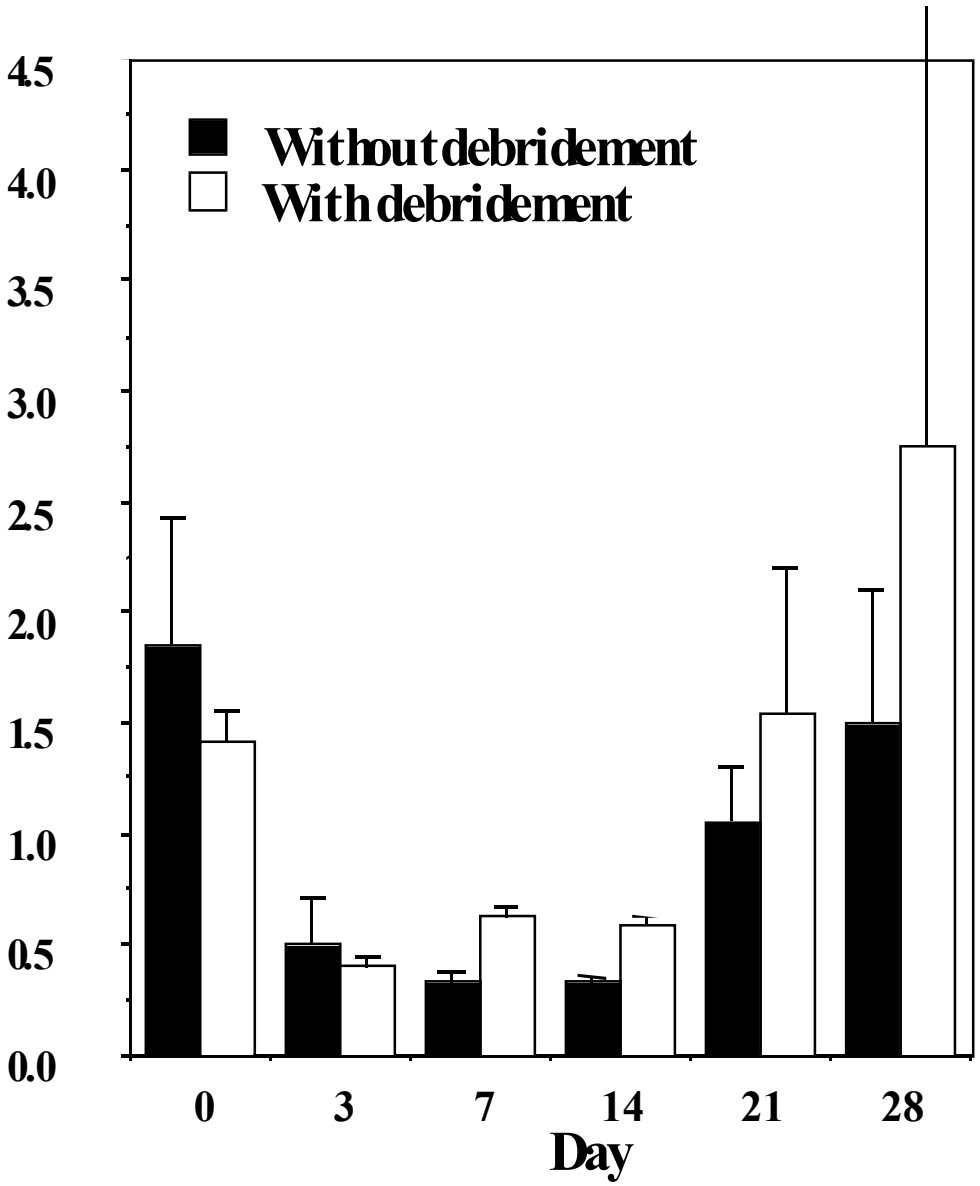
II. Laser Skin Resurfacing

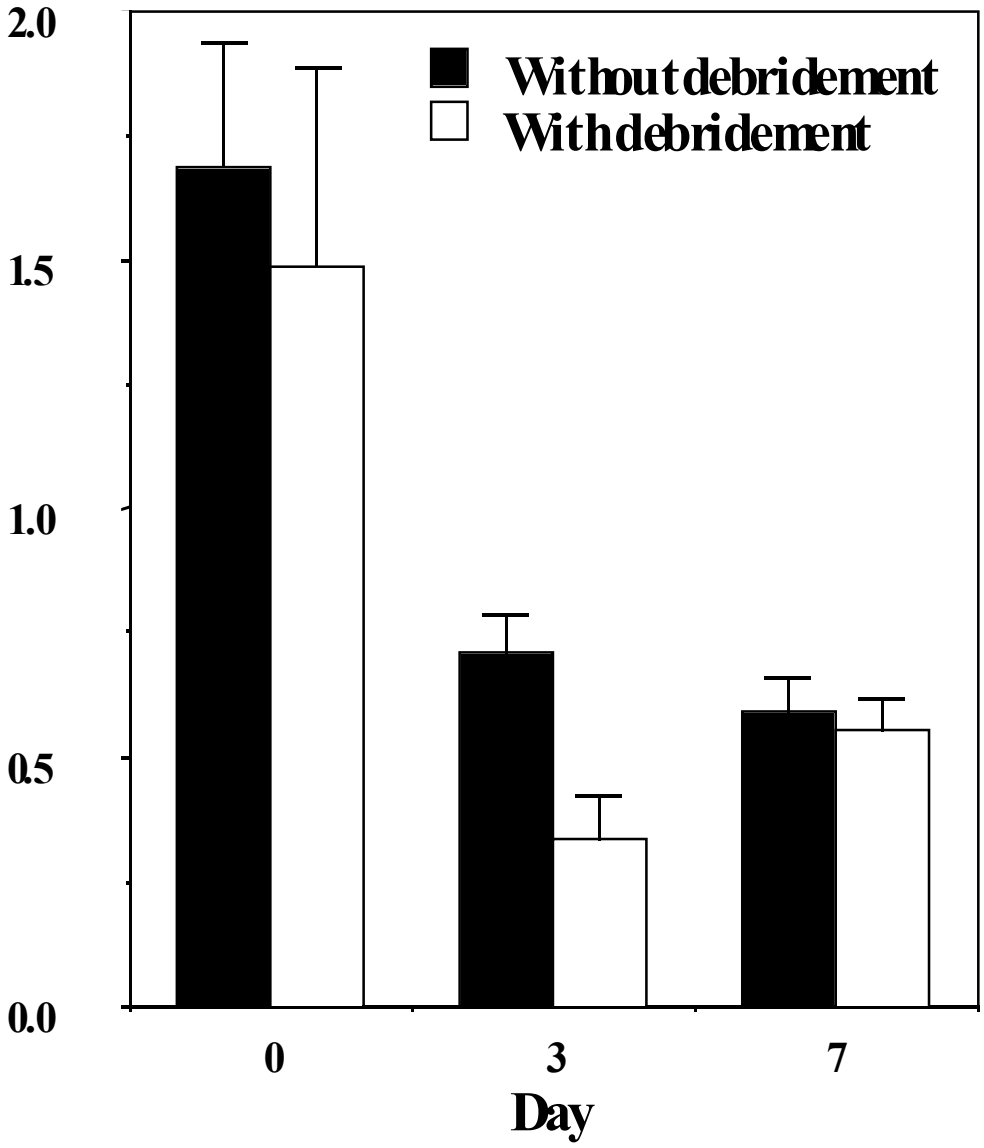
A. Amount of debridement

We compared debriding between three passes and not debriding between the passes. These data were nearly identical. Using a paired Student's T-test, we found the p-values
for Width was p=0.65, for Depth p=0.99 and for Lateral thermal damage p=0.96.

The next three figures with show the Width, the Depth and the Lateral thermal damage as a function of the day for areas that were debrided and compared to areas that were not debrided. You can see that there is not indication of any difference.


40
30
20
10
0
Without debridement
With debridement
0
3
7
14
21
Day


4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
Without debridement
With debridement
0
3
7
14
21
28
Day


2.0
1.5
1.0
0.5
0.0
Without debridement
With debridement
0
3
7
Day