

Results

This study included 30 patients presenting with carpal tunnel syndrome (CTS). They were 20 females (66.6%) and 10 males (33.4%) with ages ranging from 30-50 years (mean \pm SD 41.2 ± 4.5).

The control group included 20 subjects. They were 13 females (65%) and 7 males (35%) with ages ranging from 30-50 years (mean \pm SD 38.8 ± 5.0).

- **Table (1):** Shows comparisons between our patients and control group as regards to nerve conduction study (NCS).
- **Table (2),** shows comparisons between our patients and control groups regarding age and sex.
- **Table (3),** shows that there is no significant differences among groups regarding age ($P>0.05$), body mass index (BMI) ($P>0.05$) and sex distribution.
- **Table (4),** shows that there is no significant differences among groups regarding the basic clinical findings pain ($P>0.05$), numbness ($P>0.05$), paresthesia ($P>0.05$), night awakening times ($P>0.05$), weakness ($P>0.05$) and the global symptoms score($P>0.05$).
- **Table (5),** shows that there is no significant differences among groups regarding the basic nerve conduction study (NCS) including: distal motor latency ($P>0.05$), distal sensory latency ($P>0.05$), wrist- palm nerve conduction velocity ($P>0.05$), compound muscle action potential

amplitude ($P > 0.05$) and sensory nerve action potential amplitude ($P > 0.05$).

- **Table (6) and figure (1)**, shows comparisons between different clinical parameters before and after treatment in acupuncture group (I). There is a statistically significant decrease in score or severity of these parameters after treatment ($P < 0.05$).
- **Table (7) and figure (2)**, shows comparisons between NCS in the acupuncture group (I) before and after treatment. There is a statistically significant improvement of NCSs after treatment ($P < 0.05$) except for the amplitude of the CMAP ($P > 0.05$).
- **Table (8) and figure (3)**, shows comparisons between different clinical parameters before and after treatment in US plus TENS group (II). There is a statistically significant decrease in score or severity of these parameters after treatment ($P < 0.05$).
- **Table (9) and figure (4)**, shows comparisons between NCS before and after treatment in US plus TENS group (II). There is a statistically significant improvement of NCSs after treatment ($P < 0.05$) except for the amplitude of the CMAP ($P > 0.05$).
- **Table (10) and figure (5)**, shows comparisons between different clinical parameters before and after treatment in the surgery group (III). There is a statistically significant improvement of these parameters after treatment ($P < 0.05$).
- **Table (11) and figure (6)**, shows comparisons between NCS before and after treatment in surgery group (III). There is a statistically significant improvement of NCS after treatment.

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- **Table (12) and figure (7)**, shows comparisons between different clinical parameters among the studied groups after treatment. The surgery group (III) had the most significantly higher paresthesia and GSS after treatment when compared with the other two groups (I and II).
- **Table (13) and figure (8)**, shows comparisons between NCS among the studied groups after treatment. There are no statistically significant differences these among groups after treatments ($P > 0.05$).

Table 1: Comparisons between our patients and control groups regarding nerve conduction studies (NCS).

| | | Patients | Controls | Student t test | |
|-------------------------------|---------------|------------------|-----------------|----------------|----------|
| | | | | t | P |
| DML msec | Mean \pm SD | 5.2 \pm 0.85 | 3.6 \pm 0.62 | 7.43 | 0.0001** |
| DSL msec | Mean \pm SD | 4.03 \pm 0.62 | 2.44 \pm 0.43 | 10.65 | 0.0001** |
| W-P SNCV m/sec | Mean \pm SD | 41.33 \pm 4.05 | 56.7 \pm 3.42 | -13.9 | 0.0001** |
| CMAP mv | Mean \pm SD | 6.59 \pm 0.8 | 7.45 \pm 0.52 | -4.03 | 0.0001** |
| SNAP μv | Mean \pm SD | 15.5 \pm 2.7 | 21.0 \pm 3.07 | -6.6 | 0.0001** |

** = Highly significant difference.

This table shows that there are highly significant differences between our patients and control group in nerve conduction studies (NCSs).

Table 2: Comparisons between our patients and control groups regarding age and sex.

| | | Patients | Controls | Student t test | |
|-------------|-----------|--------------|-------------|-----------------|------|
| | | | | t | p |
| Age (years) | Range | 30.0-50.0 | 30.0-50 | 0.1 | 0.92 |
| | Mean ± SD | 39.57 ± 5.04 | 39.4 ± 6.75 | | |
| | | | | Chi-square test | |
| Sex | ♂ | 10 | 6 | X2 | P |
| | ♀ | 20 | 14 | 0.061 | 0.8 |

This table shows that our patients are age and sex matched with the control group.

Table 3: Demographic characteristics of the studied cases (n=30)

| | | ACU (n=10) (I) | US pus TENS (n=10) (II) | SRG (n=10) (III) | ANOVA | |
|-------------------------|-----------|--------------------------|--------------------------------------|----------------------------|-----------------|------|
| | | | | | F | P |
| Age (years) | Range | 32.0 – 45.0 | 30.0– 50.0 | 33.0-48.0 | 0.3 | 0.74 |
| | Mean ± SD | 39.0 ± 4.6 | 39.1 ± 6.3 | 40.6 ± 4.4 | | |
| BMI(kg/m ²) | Range | 23.77-31.22 | 23.66-31.25 | 23.78-31.22 | 0.19 | 0.83 |
| | Mean ± SD | 26.68±2.91 | 27.15±2.22 | 26.5 ± 2.03 | | |
| | | | | | Chi-square test | |
| Sex | ♂ | 4 | 3 | 3 | X2 | P |
| | ♀ | 6 | 7 | 7 | 0.3 | 0.86 |

This table shows that there are no significant differences among the studied groups regarding age, BMI (body mass index) and sex distribution.

Table 4: Basic clinical findings in the studied groups (n=30)

| | | ACU (n=10) (I) | US plus TENS (n=10) (II) | SRG (n=10) (III) | ANOVA | |
|--------------------|---------------|-----------------------|-----------------------------------|------------------------|-------|-----|
| | | | | | F | P |
| Pain | Mean \pm SD | 3.200 \pm 1.316 | 3.500 \pm 1.269 | 3.100 \pm 1.197 | .27 | .76 |
| Numbness | Mean \pm SD | 4.900 \pm 1.449 | 3.800 \pm 1.751 | 4.200 \pm 1.398 | 1.30 | .28 |
| Paresthesia | Mean \pm SD | 2.600 \pm .966 | 2.700 \pm 1.059 | 3.500 \pm .849 | 2.62 | .09 |
| Awakening | Mean \pm SD | 2.800 \pm 1.398 | 3.200 \pm 1.686 | 3.400 \pm .966 | .48 | .61 |
| Weakness | Mean \pm SD | 4.300 \pm 2.002 | 3.600 \pm 2.458 | 4.200 \pm 1.475 | .35 | .70 |
| GSS | Mean \pm SD | 17.800 \pm 6.088 | 16.800 \pm 7.036 | 18.400 \pm 4.695 | .18 | .83 |

This table shows that there are no significant differences among groups regarding the basic clinical findings.

GSS = global symptoms score.

Table 5: Basic NCSs in the studied groups (n=30)

| | | ACU (n=10) (I) | US plus TENS (n=10) (II) | SRG (n=10) (III) | ANOVA | |
|--------------------------------|---------------|-----------------------|-----------------------------------|------------------------|-------|-----|
| | | | | | F | P |
| DML msec | Mean \pm SD | 5.160 \pm .753 | 5.130 \pm .942 | 5.390 \pm .899 | .26 | .76 |
| DSL /msec | Mean \pm SD | 4.140 \pm .680 | 3.860 \pm .540 | 4.100 \pm .668 | .57 | .57 |
| W-P SNCV/ m/sec | Mean \pm SD | 39.300 \pm 5.313 | 43.000 \pm 2.000 | 41.700 \pm 3.591 | 2.34 | .11 |
| CMAP mv | Mean \pm SD | 6.490 \pm 1.061 | 6.850 \pm .651 | 6.420 \pm .640 | .81 | .45 |
| SNAP μv | Mean \pm SD | 15.400 \pm 2.503 | 15.200 \pm 2.616 | 15.900 \pm 3.281 | .16 | .85 |

This table shows that there are no significant differences among groups regarding the basic NCSs.

(**DML**: Distal motor latency, **DSL**: Distal sensory latency, **W-P SNCV**: Wrist- palm nerve conduction velocity, **CMAP**: Compound muscle action potential, **SNAP**: Sensory nerve action potential).

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Table 6: Comparisons between clinical parameters before and after treatment in the acupuncture group (I).

| | | Before ttt | After ttt | Student t test | |
|-------------|---------------|--------------------|-------------------|----------------|----------|
| | | | | t | P |
| Pain | Mean \pm SD | 3.200 \pm 1.316 | 1.600 \pm .699 | 3.39 | .003** |
| Numbness | Mean \pm SD | 4.900 \pm 1.449 | 2.200 \pm 1.229 | 4.49 | 0.0001** |
| Paresthesia | Mean \pm SD | 2.600 \pm .966 | 1.400 \pm 1.075 | 2.62 | .017* |
| Awakening | Mean \pm SD | 2.800 \pm 1.398 | 1.200 \pm 1.032 | 2.9 | 0.009** |
| Weakness | Mean \pm SD | 4.300 \pm 2.002 | 1.600 \pm 1.264 | 3.60 | 0.002** |
| GSS | Mean \pm SD | 17.800 \pm 6.088 | 8.000 \pm 2.943 | 4.58 | 0.001** |

*= Significant difference

**= Highly significant difference.

This table shows statistically significant improvements of clinical parameters after treatment in acupuncture group.

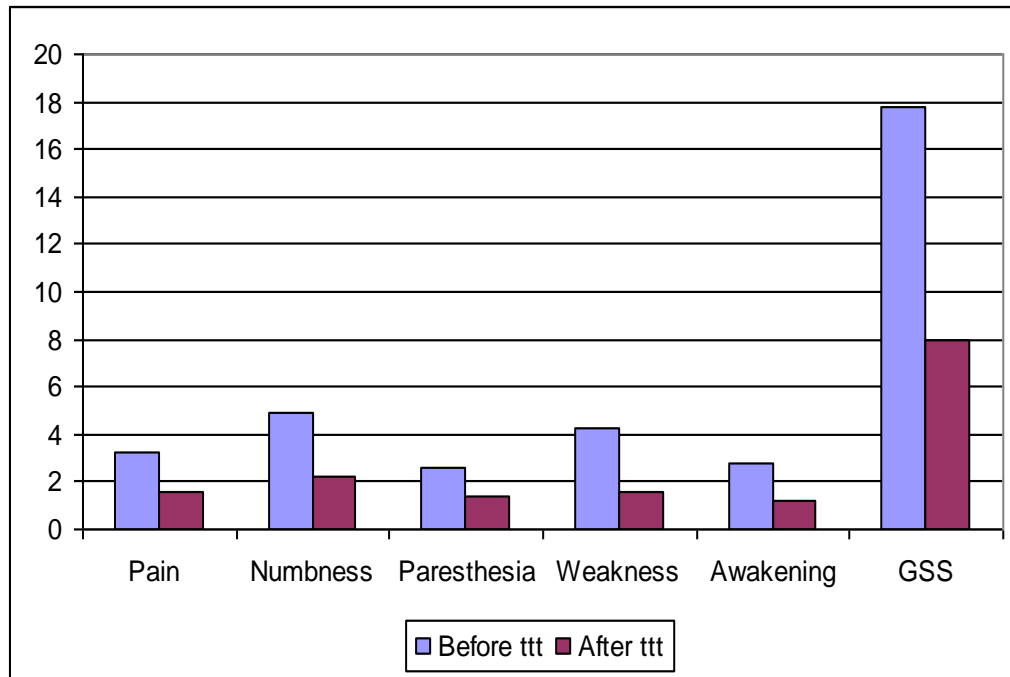


Figure 1: Comparisons between clinical parameters before and after treatment in acupuncture group (I).

Table 7: Comparisons between NCSs in the acupuncture group (I) before and after treatment.

| | | Before ttt | After ttt | Student t test | |
|------------------|---------------|--------------------|--------------------|----------------|--------|
| | | | | t | P |
| DML/msec | Mean \pm SD | 5.160 \pm .753 | 4.430 \pm .590 | 2.41 | .027* |
| DSL/msec | Mean \pm SD | 4.140 \pm .680 | 3.340 \pm .589 | 2.81 | .012* |
| W-P SNCVm/sec | Mean \pm SD | 39.300 \pm 5.313 | 45.100 \pm 2.806 | -3.05 | .007** |
| CMAP mv | Mean \pm SD | 6.490 \pm 1.061 | 6.470 \pm 1.064 | .04 | .96 |
| SNAP μ v | Mean \pm SD | 15.400 \pm 2.503 | 17.800 \pm 2.044 | -2.34 | .03* |

*= Significant difference

**= Highly significant difference.

This table shows statistically significant improvement of NCSs after treatment in acupuncture group (I) except for CMAP amplitude.

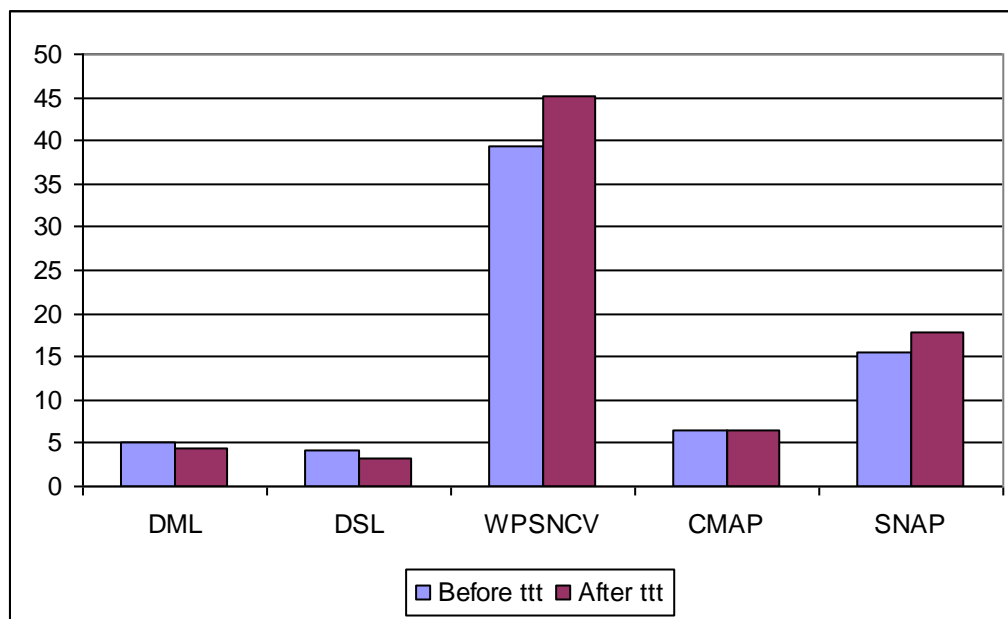


Figure 2: Comparisons between NCSs in the acupuncture group (I) before and after treatment.

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Table 8: Comparisons between clinical parameters before and after treatment in US plus TENS group (II).

| | | Before ttt | After ttt | Student t test | |
|--------------------|---------------|--------------------|-------------------|----------------|--------|
| | | | | t | P |
| Pain | Mean \pm SD | 3.500 \pm 1.269 | 2.100 \pm .994 | 2.74 | .013* |
| Numbness | Mean \pm SD | 3.800 \pm 1.751 | 2.000 \pm 1.247 | 2.64 | .016* |
| Paresthesia | Mean \pm SD | 2.700 \pm 1.059 | 1.300 \pm 1.059 | 2.95 | .008** |
| Awakening | Mean \pm SD | 3.200 \pm 1.686 | 1.800 \pm 1.135 | 2.17 | .043* |
| Weakness | Mean \pm SD | 3.600 \pm 2.458 | 1.800 \pm 1.398 | 2.01 | 0.049* |
| GSS | Mean \pm SD | 16.800 \pm 7.036 | 9.000 \pm 4.546 | 2.94 | .01* |

*= Significant difference

**= Highly significant difference.

This table shows statistically significant improvement of different clinical parameters after treatment in US plus TENS group (II).

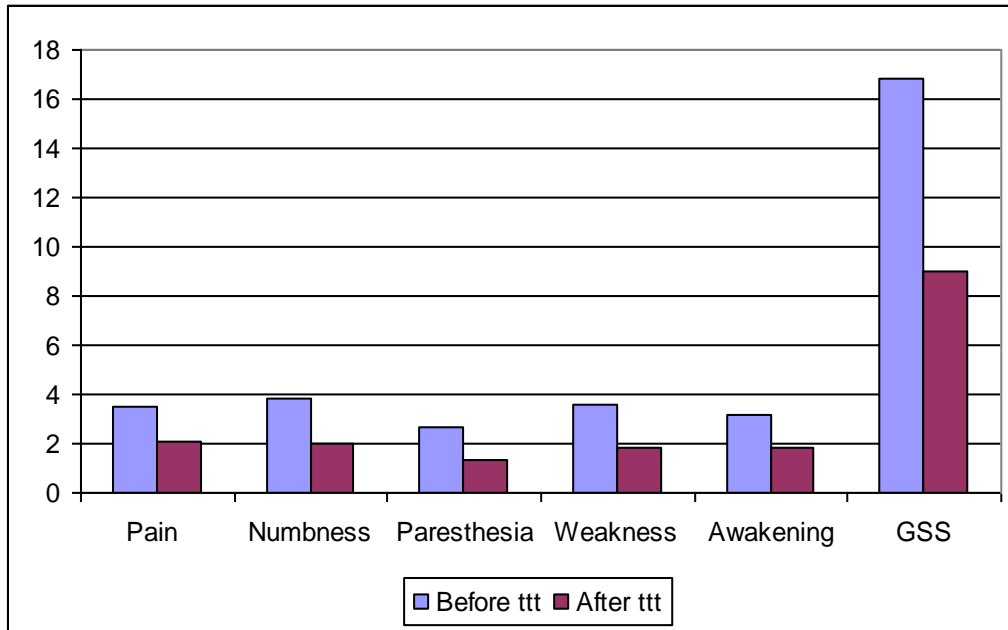


Figure 3: Comparisons between clinical parameters before and after treatment in US plus TENS group (II).

Table 9: Comparisons between NCSs before and after treatment in US plus TENS group (II).

| | | Before ttt | After ttt | Student t test | |
|------------------|---------------|--------------------|--------------------|----------------|--------|
| | | | | t | P |
| DML/msec | Mean \pm SD | 5.130 \pm .942 | 4.020 \pm .509 | 3.27 | .006** |
| DSL/msec | Mean \pm SD | 3.860 \pm .540 | 3.320 \pm .537 | 2.24 | .038* |
| W-P SNCVm/sec | Mean \pm SD | 43.000 \pm 2.000 | 47.100 \pm 2.685 | -3.87 | .001** |
| CMAP mv | Mean \pm SD | 6.850 \pm .651 | 7.230 \pm .452 | -1.51 | .14 |
| SNAP μ v | Mean \pm SD | 15.200 \pm 2.616 | 19.100 \pm 2.846 | -3.19 | .005** |

*= Significant difference

**= Highly significant difference.

This table shows statistically significant improvement of NCSs after treatment in US plus TENS group (II), except for CMAP amplitude.

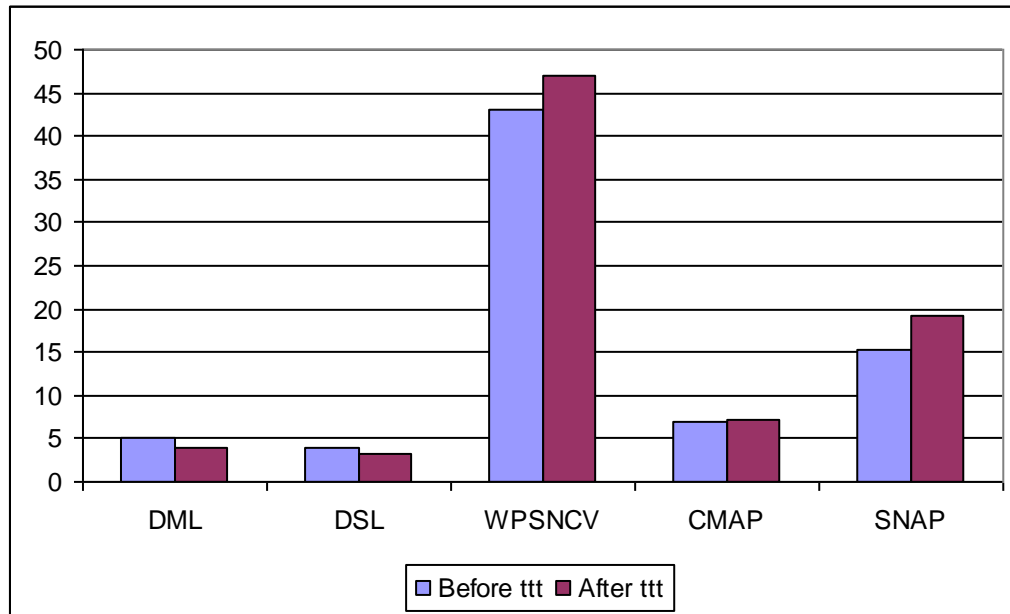


Figure 4: Comparisons between NCSs before and after treatment in US plus TENS group (II).

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Table 10: Comparisons between clinical parameters before and after treatment in surgery group (III).

| | | Before ttt | After ttt | Student t test | |
|--------------------|---------------|--------------------|--------------------|----------------|--------|
| | | | | t | P |
| Pain | Mean \pm SD | 3.100 \pm 1.197 | 2.200 \pm .632 | 2.10 | 0.049* |
| Numbness | Mean \pm SD | 4.200 \pm 1.398 | 2.900 \pm .875 | 2.49 | .024* |
| Paresthesia | Mean \pm SD | 3.500 \pm .849 | 2.400 \pm .699 | 3.16 | .005** |
| Awakening | Mean \pm SD | 3.400 \pm .966 | 2.200 \pm 1.135 | 2.54 | .02* |
| Weakness | Mean \pm SD | 4.200 \pm 1.475 | 2.300 \pm 1.159 | 3.20 | .005** |
| GSS | Mean \pm SD | 18.400 \pm 4.695 | 12.000 \pm 2.582 | 3.77 | .001** |

*= Significant difference

**= Highly significant difference.

This table shows statistically significant improvement of clinical parameters after treatment in surgery group (III).

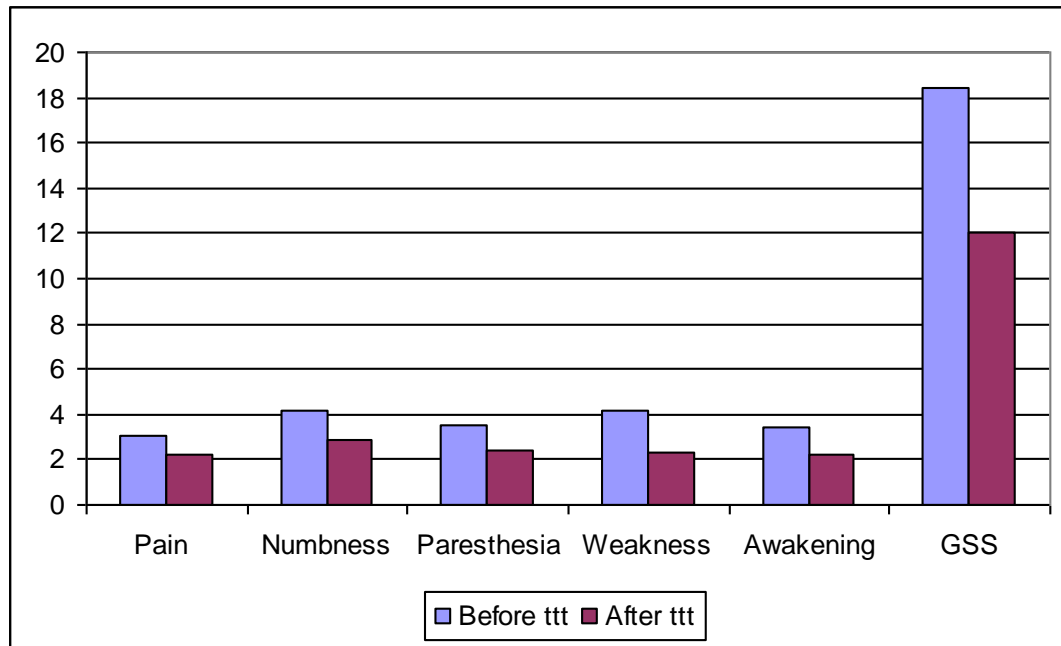


Figure 5: Comparisons between clinical parameters before and after treatment in surgery group (III).

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Table 11: Comparisons between NCSs before and after treatment in surgery group.

| | | Before ttt | After ttt | Student t test | |
|-------------------------------|---------------|--------------------|--------------------|----------------|--------|
| | | | | t | P |
| DML/msec | Mean \pm SD | 5.390 \pm .899 | 4.070 \pm .639 | 3.77 | .001** |
| DSL/msec | Mean \pm SD | 4.100 \pm .668 | 3.440 \pm .478 | 3.78 | .001** |
| W-P SNCVm/sec | Mean \pm SD | 41.700 \pm 3.591 | 46.700 \pm 4.029 | 2.53 | .021* |
| CMAP mv | Mean \pm SD | 6.420 \pm .640 | 7.01 \pm 0.52 | -2.27 | 0.036* |
| SNAP μv | Mean \pm SD | 15.900 \pm 3.281 | 19.800 \pm 3.392 | -2.61 | .018* |

*= Significant difference

**= Highly significant difference.

This table shows statistically significant improvement of NCSs after treatment in surgery group (III).

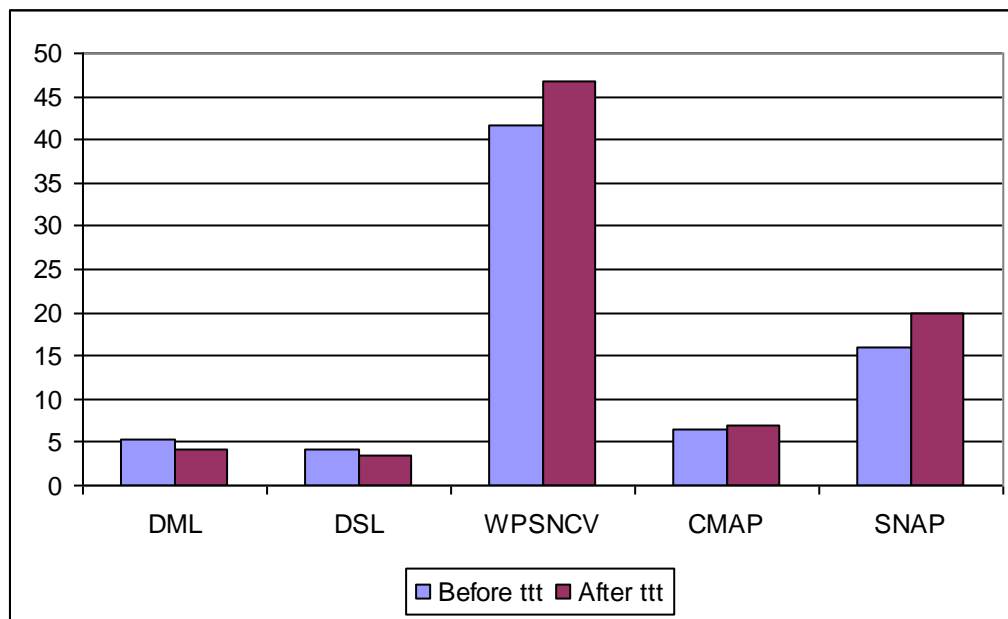


Figure 6: Comparisons between NCSs before and after treatment in surgery group (III).

Table 12: Comparisons between clinical parameters among the studied groups after treatment.

| | ACU (I) | US plus TENS (II) | SRG (III) | ANOVA | |
|--------------------|---------------|----------------------|----------------|-------|------|
| | | | | F | P |
| Pain | 1.600 ± .699 | 2.100 ± .994 | 2.200 ± .632 | 1.65 | .21 |
| Numbness | 2.200 ± 1.229 | 2.000 ± 1.247 | 2.900 ± .875 | 1.74 | .19 |
| Paresthesia | 1.400 ± 1.075 | 1.300 ± 1.059 | 2.400 ± .699 | 4.01 | .03* |
| Awakening | 1.200 ± 1.032 | 1.800 ± 1.135 | 2.200 ± 1.135 | 2.08 | .14 |
| Weakness | 1.600 ± 1.264 | 1.800 ± 1.398 | 2.300 ± 1.159 | .79 | .46 |
| GSS | 8.000 ± 2.943 | 9.000 ± 4.546 | 12.000 ± 2.582 | 3.61 | .04* |

*= significant difference.

This table shows that surgery group had the most significantly higher paresthesia and GSS score after treatment when compared with the other two groups.

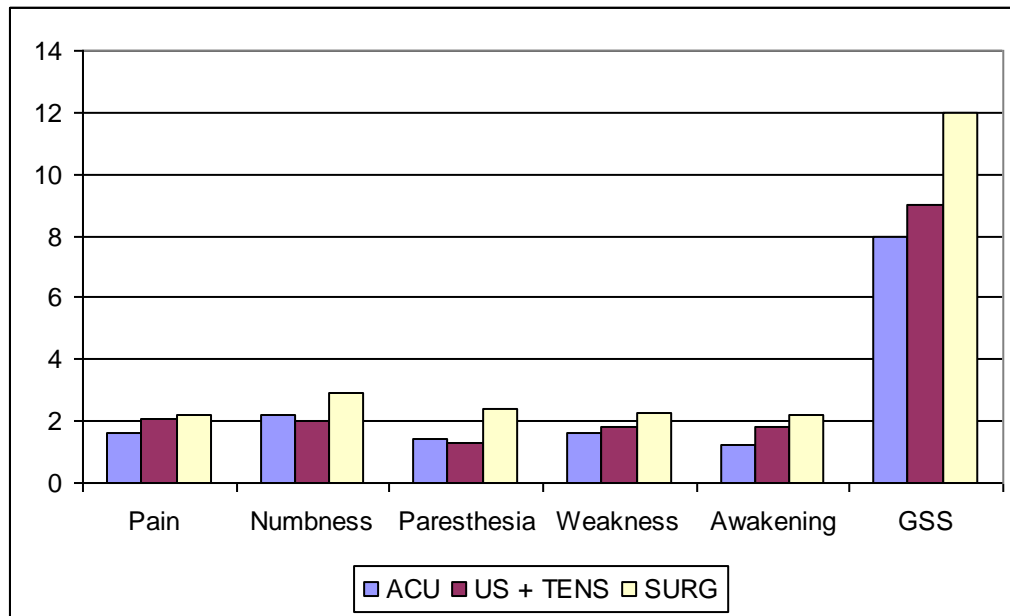


Figure 7: Comparisons of clinical parameters among studied groups.

Table 13: Comparisons between NCSs among the studied groups after treatment

| | ACU (I) | US & TENS (II) | SRG (III) | One Way ANOVA | |
|--------------------------|-------------------|-------------------|----------------|---------------|------|
| | | | | F | P |
| DML/msec | 4.430 ± .590 | 4.020 ± .509 | 4.070 ± .639 | 1.47 | .24 |
| DSL/msec | 3.340 ± .589 | 3.320 ± .537 | 3.440 ± .478 | .14 | .86 |
| W-P SNCVm/sec | 45.100 ± 2.806 | 47.100 ± 2.685 | 46.700 ± 4.029 | 1.07 | .35 |
| CMAP mv | 6.470 ± 1.064 | 7.130 ± .421 | 7.01 ± 0.52 | 2.35 | 0.11 |
| SNAP µv | 17.800 ± 2.044 | 19.100 ± 2.846 | 19.800 ± 3.392 | 1.29 | .28 |

This table shows no statistically significant differences among the studied groups after treatment regarding NCSs.

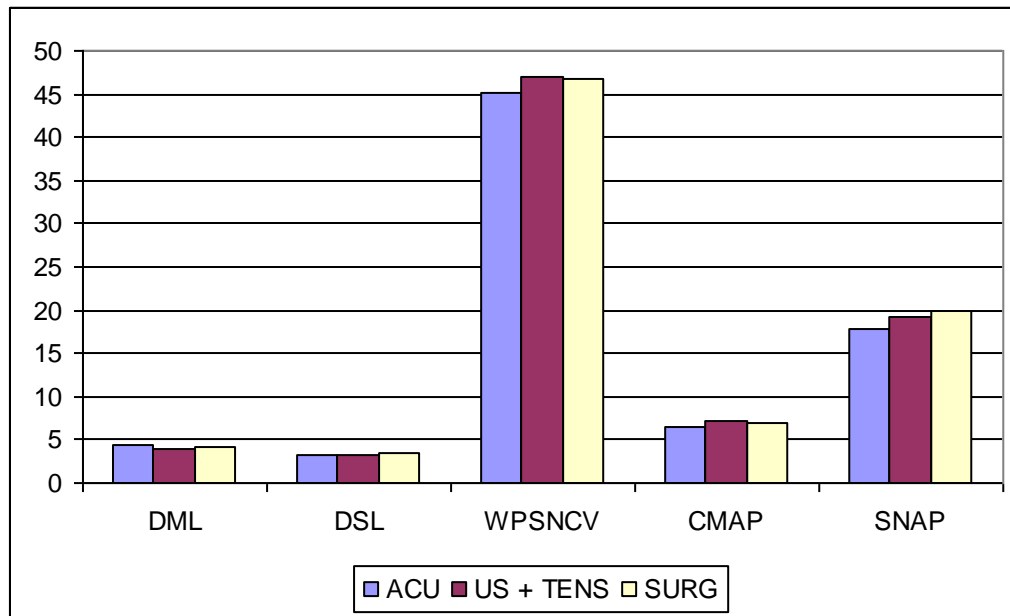


Figure 8: Comparisons between NCSs among the studied groups after treatment.