



Confidence intervals of the areas under the ROC curves were used to test for significant difference between prediction with V-sNCT and neurological examination at  $p < 0.05$ . Also, relative risk and 95% confidence intervals were calculated for abnormal epidurogram, given an abnormal V-sNCT or an abnormal neurological examination at L5 and S1. Visual analog scores (VAS) were compared using Student's paired t-test. Significance was  $p < 0.05$ .

### Results

Forty-nine patients were studied, 28 males and 21 females. Age (mean $\pm$ SEM) was  $49 \pm 2$ , weight  $86 \pm 3$  kg, height  $172 \pm 1$  cm. Twenty-five patients had undergone previous back surgery; all had a diagnosis of lumbar radiculitis. VAS pain scores prior to procedure were  $8.6 \pm 0.2$  and one month after the procedure VAS pain scores were  $4.4 \pm 0.4$  ( $p < 0.05$ ). V-sNCT test results and epidurograms for a patient with an S1 lesion are shown in Figure 1 and Figure 2. Sensitivity, specificity, and predictive value for V-sNCT predicting nerve root pathology were 94.6%, 70.2%, and 91.0%, respectively, and an ROC curve was calculated (see Figure 3). Area under the ROC curve is  $0.82 \pm 0.04$  ( $p < 0.001$ ; 95% CI 0.76-0.90) for V-sNCT, compared to  $0.67 \pm 0.04$ ; 95% CI 0.60-0.74) for neurological examination ( $p < 0.05$ ).

Figure 1. V-sNCT and epidurogram prior to lysis of adhesions at S1. Note hypoesthesia of right S1 on the V-sNCT graph is correlated with lack of filling of the right S1 root on epidurogram.

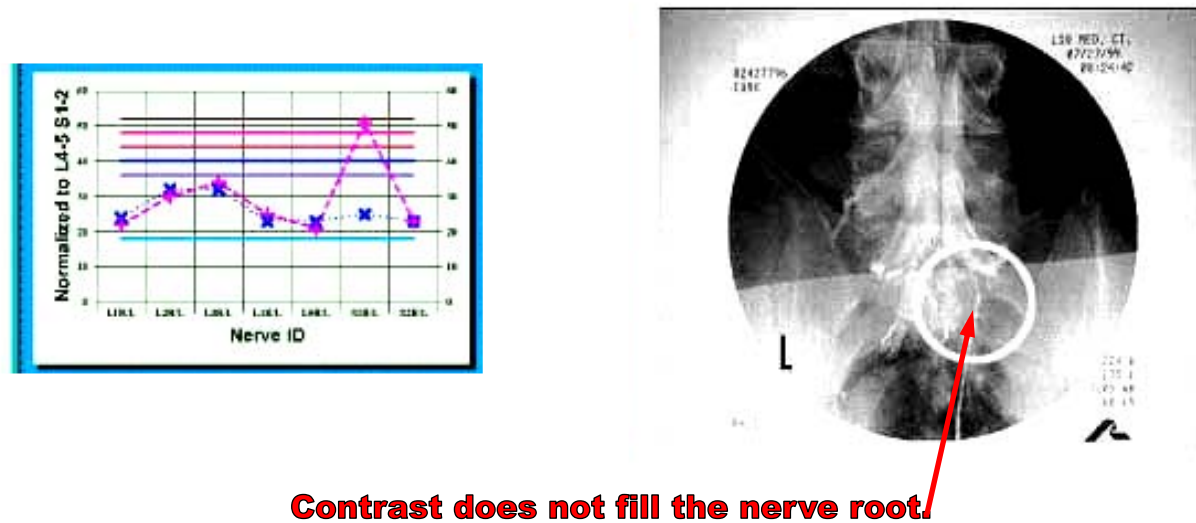


Figure 2. V-sNCT and epidurogram after lysis of adhesions at S1. Note that V-sNCT has returned to normal and right S1 nerve root fills with contrast.

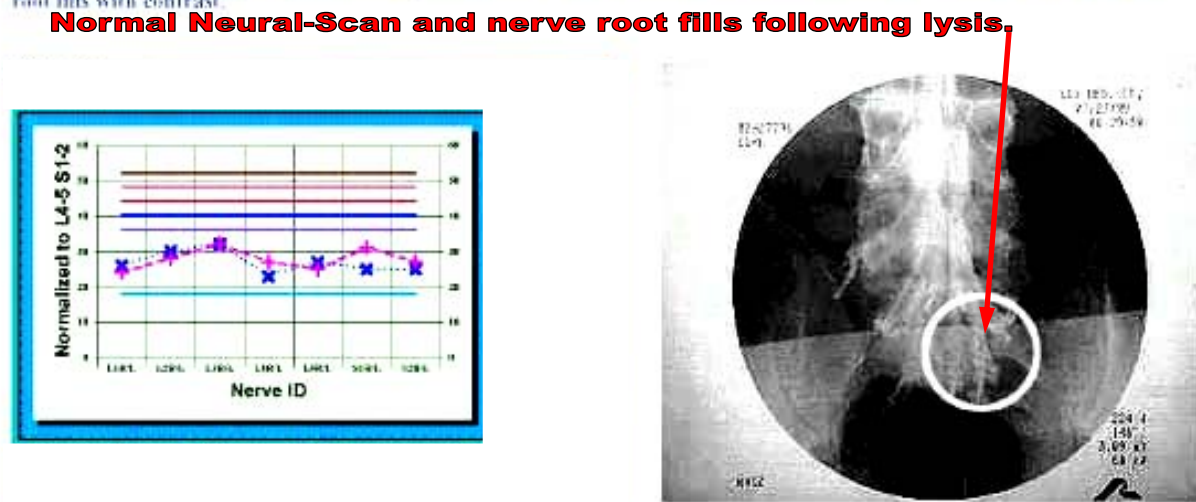


Figure 3. Receiver Operating Characteristic (ROC) curves comparing the effectiveness of V-sNCT and neurological examination in predicting nerve-root pathology. Better predictors are indicated with movement of the reference line to the upper left.

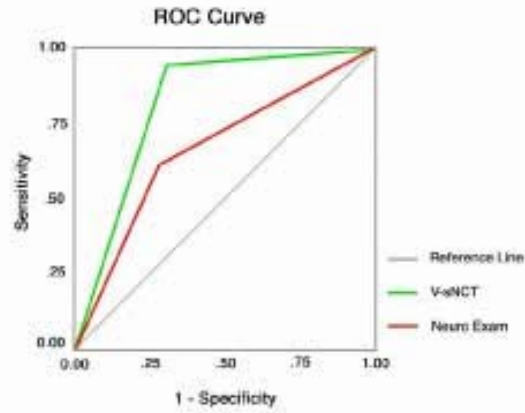
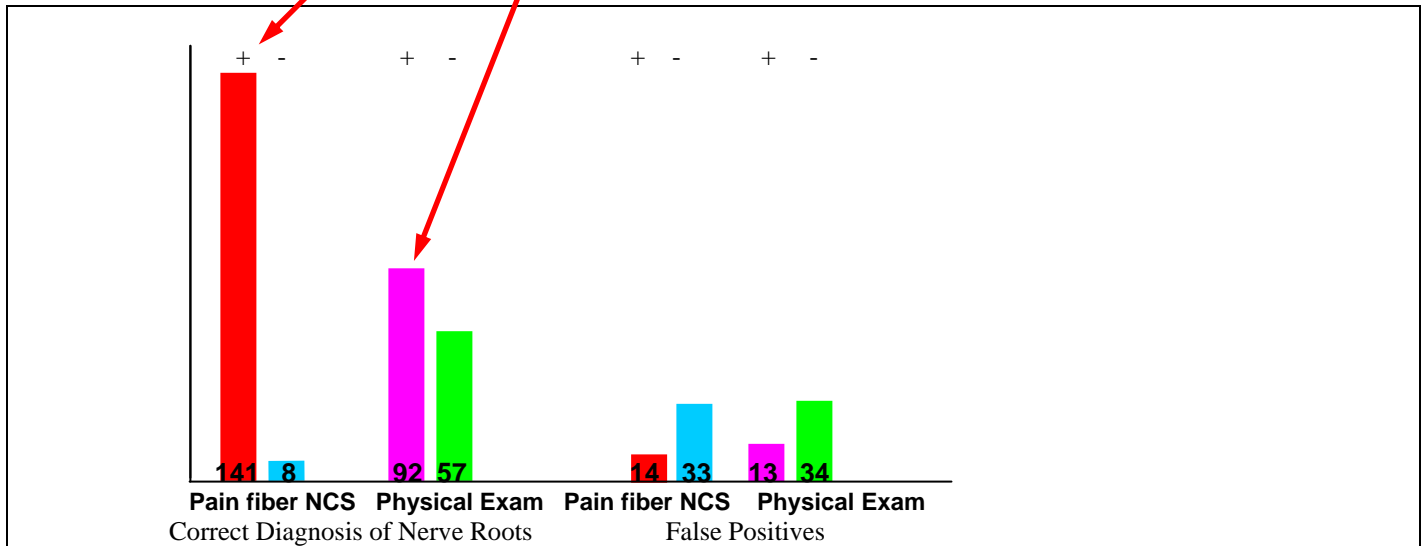


Figure 4. Predicting nerve-root pathology

**Pain fiber NCS 94.6% vs. 61.7% Physical Neurological Exam**



	V-sNCT	Neurological Examination
Sensitivity	94.6%	61.7%
Specificity	70.2%	72.3%
Predictive Value	91.0%	87.6%
Area under Curve (ROC)	0.82±0.04 (0.76-0.90)*	0.67±0.04 (0.60-0.74)
Relative Risk	4.67 (2.50-8.69)*	1.40 (1.17-1.66)

\*p<0.05, compared to Neurological Examination

### Discussion

Voltage-actuated sensory nerve conduction threshold (V-sNCT) is a direct quantitative sensory test which provides a reproducible functional assessment of the peripheral sensory nervous system by measuring that voltage intensity which initiates membrane potential changes to propagate nerve impulses. This study used the Medi-Dx 7000 to test the V-sNCT. A predecessor, the Neurometer assesses sensory function by measuring current output, which varies with changes in skin resistance. Although sensitivity with V-sNCT was superior to neurological examination, specificity was no different than the neurological examination. However, both the V-sNCT and neurological examination give the clinician the ability to test various branches of the peripheral nerves, which may result in further definition of the location of entrapment/pathology to specific nerve segments.

### Conclusion

The purpose of this study was to compare the sensitivity and specificity of V-sNCT for the presence of nerve-root adhesions visible on epidurogram. Voltage-actuated sensory nerve conduction threshold provides the pain-management specialist with a sensitive and specific tool for prediction of nerve-root pathology. Advantages of V-sNCT include simplicity, decreased test time, small intra-patient variability, and decreased sensitivity to changes in skin resistance. It is a better predictive test than the neurological examination because it is a more sensitive test. In addition, because the patient is blinded to the V-sNCT results, it may be a very good test for malingering. This study demonstrates that prediction of nerve-root pathology with V-sNCT is superior to prediction of nerve-root pathology from neurological exam alone.

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