Comparison of Clinical Efficacy and Computed Tomography Analysis of Lead Position Between Three-column and Five-column Paddle Leads Spinal Cord Stimulation for Failed Back Surgery Syndrome

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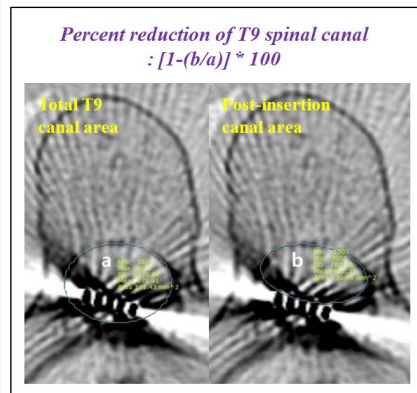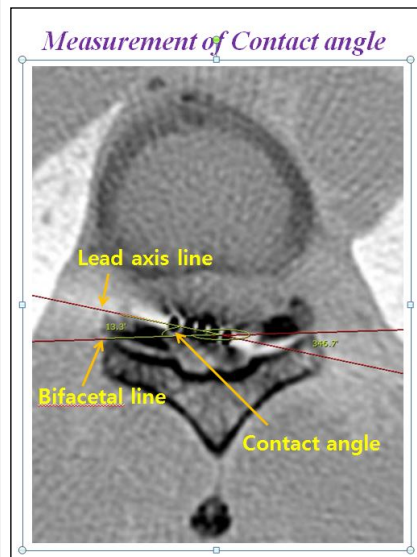
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Introduction

The authors investigated the difference in clinical outcome and the position of paddle lead spinal cord stimulation (SCS) between three-column and five-column paddle lead SCS in patients with FBSS
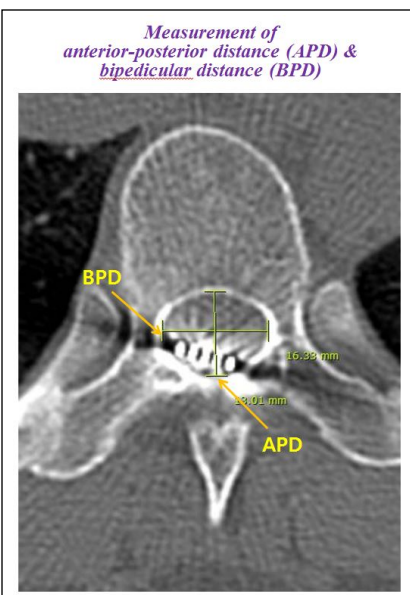
Methods

In 21 patientswho underwent paddle lead SCS at T9 (three-column [n=12] and five-column [n=9]) for FBSS, a 12-month follow-up numerical rating scale, percent pain relief, and CT assessment of contact angle and percent reduction of T9 canal area were investigated.

Measurement of Contact angle

Measurement of Contact angle

Lead axis line
Bifacetal line
Contact angle

*Percent reduction of T9 spinal canal : [1-(b/a)] * 100*

Total T9 canal area
Post-insertion canal area

Measurement of anterior-posterior distance (APD) & bipedicular distance (BPD)

BPD
APD

Results

There was no difference in paresthesia coverage of the painful area, trial success rate, clinical outcomes, and percent pain relief between the two groups(p>0.05).Although there was no statistical difference in the contact angles, the contact angle in the five-column group was generally greater than that of the three-column group (p=0.067). Overall reduction of 35.51 ± 4.76% in the T9 canal was observed and there was no difference between two groups (p>0.05) and no correlation between the contact angle and percent T9 spinal canal reduction (r= -0.247,p>0.05).

Conclusions

There was no difference in clinical efficacy of SCS using three and five-column paddle lead. Significant inclination of paddle lead in posterior epidural space and significant reduction in T9 canal area were observed.

Demographics, computed tomographic assessment, and clinical outcome of spinal cord stimulation at T9 using three-column paddle leads

Demographics, computed tomographic assessment, and clinical outcome of spinal cord stimulation at T9 using five-column paddle leads

Learning Objectives

to provide a real location of paddle lead for T8,9 epidural space and to help physicians to enhance the performance of paddle lead insertion and patient programming.

References

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Summary of demographics, statistical comparison between three-column and five-column SCS at T9

	Three-column	five-column	statistical significance (p value)
Number (n)	9	12	
Age	57.11±13.38	56.25±14.34	p=0.890 (independent t test)
Sex (F:m)	7:2	6:7	
NRS-11, preoperative	8.0±0.7	8.1±0.8	p=0.806(independent t test)
CT evaluation of location of lead within T9 canal			
No(n)	8	10	
APD	13.88±0.97	13.72±1.70	p=0.823 (independent t test)
BPD	16.79±1.45	16.21±1.42	p=0.405 (independent t test)
Canal ratio	0.830±0.555	0.856±0.144	p=0.643 (independent t test)
Contact angle (T9)	8.11±6.29	15.69±9.33	p=0.067 (independent t test)
T9 canal reduction	36.72±3.20	34.53±5.69	p=0.343 (independent t test)
Stimulation parameters			
No. of program	15 (1.67±1.00)	25 (2.08±1.08)	p=0.379 (independent t test)
Intensity (mA)	2.45±3.08	1.77±1.63	p=0.439 (independent t test)
Pulse width (usec)	282±220	314±91.4	p=0.518 (independent t test)
Frequency (Hz)	55±17.3	50±12.9	p=0.343 (independent t test)
Clinical outcome			
Trial success	9/9 (100%)	11/12 (92%)	p=0.05 (Fisher's exact test)
Lead revision	none	1/12 (8.3%)	p=0.05 (Fisher's exact test)
Paresthesia coverage (%)	86.44±5.13	88.50±6.92	p=0.463 (independent t test)
NRS-11, 12 mos	4.44±0.88 (n=11)	4.27±0.91 (n=9)	p=0.674 (independent t test)
Percent pain relief (%)	43.36±7.77 (n=11)	45.06±7.53 (n=9)	p=0.493 (independent t test)

APD; anterior-posterior distance (mm) of the spinal canal, BPD; bipedicular distance (mm) of the spinal canal, F; female, m; male, NRS-11; numerical rating scale 0-10,

Correlation analyses between contact angle and morphology of spinal canal, paresthesia coverage, and clinical outcomes

Pearson coefficient of correlation (r)

		Size and shape of T9 spinal canal				paresthesia coverage	percent pain relief
		APD	BPD	Canal ratio	coverage		
Contact angle	three-column (n=8)	0.419	0.196	0.193		-0.074	0.543
	five-column (n=10)	0.131	0.055	0.109		0.376	-0.409
	whole group (n=18)	0.191	-0.002	0.159		0.288	-0.11-