

## Introduction

Spinal peripheral nerve sheath tumors (PNSTs), including schwannomas and neurofibromas, are a group of tumors originating from the nerve and its supporting structures. Standard surgical management for spinal PNST can include facetectomy allowing adequate tumor resection. Fusion is occasionally performed to maintain spinal stabilization. Herein, we conducted a retrospective cohort study investigating the factors for performing fusion in patients with PNSTs undergoing facetectomy.

## Methods

Our institutional tumor registry was queried for patients treated surgically for a primary diagnosis of spinal PNST between 2002 and 2016. Analysis focused on patients that underwent facetectomy with or without concomitant fusion. Addition of arthrodesis at the index procedure comprised the primary outcome. We also recorded baseline demographics, tumor characteristics and surgery-related variables. Logistic regression model was utilized to identify factors associated with increased risk for fusion.

### Summary of baseline demographics and tumor characteristics

Items	Non-adherence, No. of studies/ Total No. (%)		
	Core Journals in Neurosurgery (n=45)	Other Journals (n=72)	p-value
<b>STROBE Criteria (Out of 22)</b>			
Statement of specific objectives, n (%)	7 (15.6)	15 (20.8)	0.48
Address sources of bias, n (%)	27 (60.0)	39 (54.2)	0.54
Discuss external validity, n (%)	21 (46.7)	28 (38.9)	0.41
<b>RECORD Criteria (Out of 10)</b>			
Provide validation of population selection, n (%)	11 (24.4)	18 (25.0)	0.95
Discuss data cleaning methods, n (%)	16 (35.6)	24 (33.3)	0.81
Include supplemental information, n (%)	28 (62.2)	51 (70.8)	0.33
<b>JAMA Checklist (Out of 7)</b>			
Statement of compliance with IRB, n (%)	25 (55.6)	21 (29.2)	<b>0.005</b>
Report inclusion, exclusion, and outcome variables, n (%)	9 (20.0)	21 (29.2)	0.27
Discuss missing data, n (%)	21 (46.7)	38 (52.8)	0.52
<b>Total Criteria Scores</b>			
STROBE Score, median (range)	20 (19-21)	20 (19-21)	0.40
RECORD Score, median (range)	9 (8-9)	8.5 (8-9)	0.18
JAMA Checklist, median (range)	6 (5-7)	6 (5-6)	0.88

### Results of logistic regression for addition of fusion in patients that underwent facetectomy

Variable	UNIVARIATE		MULTIVARIABLE*	
	OR (95% C.I.)	p-value	OR (95% C.I.)	p-value
Age	0.99 (0.96 - 1.02)	0.55	-	-
Sex	0.75 (0.25 - 2.16)	0.26	-	-
Tumor size	1.02 (0.99 - 1.07)	0.26	-	-
Pre-existing deformity	4.26 (0.63 - 84.75)	0.20	-	-
Total vs subtotal facetectomy	9.0 (2.01 - 64.2)	<b>0.009</b>	6.75 (1.47 - 48.8)	<b>0.025</b>
2+ vs 1 level of facetectomy	2.05 (0.40 - 15.2)	0.421	-	-
Cervicothoracic vs other region	9.0 (1.51 - 172.9)	<b>0.048</b>	6.0 (0.97 - 117.0)	0.10

\*adjusted only for significant variables in the univariate analyses: total vs subtotal facetectomy, cervicothoracic vs other spine region

## Results

A total of 163 patients were identified, of which 56 (32-facetectomy with fusion, 24-facetectomy alone) were analyzed. Median age was 48 years and 50% were females. Age, sex, race as well as tumor histology and size were evenly distributed between patients who received facetectomy alone and those who had facetectomy and fusion. In univariate regression, total vs subtotal facetectomy (OR 9.0, 95% C.I. 2.01-64.2, p=0.009) and cervicothoracic vs other spinal region (OR 9.0, 95% C.I. 1.51-172.9, p=0.048) were significantly associated with increased odds of performing immediate fusion. In multivariable analysis, only the effect of total facetectomy remained statistically significant (OR 6.75, 95% C.I. 1.47-48.8, p=0.025).

## Conclusions

The best surgical strategy for patients with spinal PNSTs needs to be further elucidated and individualized approach is recommended. We were able to identify factors that increased the likelihood of requiring upfront spine instrumentation through retrospective chart review. From this study largest cohort of spinal PNST, we conclude that total facetectomy and cervicothoracic involvement were highly associated with concomitant arthrodesis at the time of index surgery. Prospective randomized controlled studies with long-term follow-ups are needed to further guide surgeons in surgical planning of this complex and rare disease.

### Clinical and operative reported details in literature of facetectomy cases in managing spinal PNST

First author, year	Fc done, n (%)	Type of Fc		Fc levels <sup>†</sup>		Fc with fusion <sup>†</sup> , n (%)	Follow-up in months, mean
		Partial	Total	1	2+		
Ahmad, 2017 <sup>7</sup>	10 (22)	7	3	10	0	3 (30)	35
Huang, 2017 <sup>8</sup>	26 (100)			0	0	26 (100)	21.5
Ito, 2016 <sup>9</sup>	18 (100)			12	6	0 (0)	30
Phan, 2016 <sup>6</sup>	1 (100)	0	1	1	0	0 (0)	9
Jiang, 2015 <sup>5</sup>	9 (100)			9	0	9 (100)	34.2
Lee, 2015 <sup>4</sup>	2 (67)	2	0	1	0	1 (33)	NA
Nanda, 2015 <sup>3</sup>	18 (30)	11	7	0	0	6 (33)	40.5
Boetto, 2013 <sup>4</sup>	1 (100)	0	1	1	0	1 (100)	NA
Tomii, 2013 <sup>2</sup>	1 (5)			1	0	1 (5)	41.6
El-Sissy, 2013 <sup>10</sup>	7 (64)	7	0	1	0	0 (0)	NA
Chakravarthy H, 2012 <sup>11</sup>	1 (100)	0	1	1	0	0 (0)	18
Sasamori, 2012 <sup>12</sup>	1 (100)			1	0	1 (100)	46
Sima X, 2012 <sup>13</sup>	1 (100)			1	0	0 (0)	12
Thorat, 2011 <sup>14</sup>	11 (100)			11	0	6 (55)	20
Fernandez-Catballal, 2010 <sup>15</sup>	1 (100)	0	1	1	0	0 (0)	36
Lu DC, 2009 <sup>16</sup>	3 (100)	0	3	1	0	1 (33)	23
Sakaura, 2007 <sup>17</sup>	1 (100)			1	0	1 (100)	12
Ishikawa, 2002 <sup>18</sup>	1 (100)	1	0	1	0	0 (0)	NA
Summary	113 (52.8)			105 (94.6)	6 (5.4)	56 (50.5)	31.14

\*Fc: facetectomy;

<sup>†</sup> number of patients that underwent facetectomy is the denominator