

## Treatment of Oropharyngeal Dysphagia by Lowering Nadir Pressure of the Upper Esophageal Sphincter

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### Objective

A cricopharyngeal muscle dysfunction (CPD) has been mainly treated by pneumatic dilatation, cricopharyngeal myotomy or botulinum toxin A(BTA) injection. The manometry of upper esophageal sphincter has been used as a complementary measure for videofluoroscopic swallowing study (VFSS) as diagnostic assessment tools for dysphagia. Previous studies focused on the resting(basal) pressure of upper esophageal sphincter in manometry. However, the correlation between the declining resting pressure and improved dysphagia still remains unclear. Only a few number of reports suggest the nadir(residual) pressure as a possible determinant of esophageal clearance. We reported four cases in which the nadir pressure were decreased or increased after BTA injections or pneumatic dilatations, trying to evaluate the value of a nadir pressure as an outcome predictor of dysphagia treatment.

### Cases

1) Patients 4 male patients ranging 52 to 69 years old, with each diagnosis of schwannoma(Number 1), nasopharyngeal cancer(Number 2), hemangioblastoma(Number 3), and ruptured Rt. frontal arteriovenous malformation(Number 4) were included in this study. The patient with nasopharyngeal cancer received radiotherapy and chemotherapy, but other three patients had operations. Dysphagia duration was ranged from 1 month to 2 years. 2) Methods Manometry, VFSS and diet parameters were evaluated at the time of pre- and post-treatments of CPD, respectively. Manometry results included basal and nadir pressures, relaxation time to nadir, and relaxation duration, etc. Resting pressure is calculated as the mean value of the pressure obtained after at least 10 seconds at resting position. Nadir pressure is defined as the lowest residual pressure during the state of swallow-induced relaxation. 3) Results There were no significant changes in basal pressures of the manometry between pre and post treatments in all patients. The nadir pressure of 2 patients (number 1 and 4) were decreased, and they consequently resulted in the improvement of swallowing function. One patient (number 2) showed increased nadir pressure after treatments, resulting in no improvement of dysphagia. A relaxation time to nadir and relaxation duration were also increased in the effective groups of number 1 and 4, but decreased in the ineffective group of number 2. The radiation induced fibrosis of pharynx was considered as a cause of poor treatment outcome of the number 2 patient. The patient with hemangioblastoma (number 3) was not evaluated with

manometry after treatments, but he already had showed the lowest nadir pressure before starting treatments, and dysphagia was improved fast up to normal.

### Conclusion

This study suggests that nadir pressure could be meaningfully valuable as a pre-treatment outcome predictor of interventions, and also as a post-treatment outcome predictor, although case studies clearly verifying this argument is currently lacking. Further large case studies will be needed.

Table 1. Demographics and clinical characteristics of the study population

Patient no.	Age	Gender	Diagnosis	Management	MMSE	Function	Days from dysphagia onset	Dysphagia therapy	Botox injection	Balloon dilatation
1	69	Male	Schwannoma	Operation	28	ID gait	66 days	O	1	X
2	52	Male	Nasopharyngeal cancer	CTx, RTx	30	ID gait	2 years	O	2	2
3	59	Male	Hemangioblastoma	Operation	23	ID gait	30 days	O	2	X
4	53	Male	Rt. Frontal AVM	Operation	30	ID gait	310 days	O	0	3

CTx, chemotherapy; RTx, radiotherapy

Table 2. Changes in manometry, VFSS, Diets between pre- and post-treatment

Patient no.	Manometry								VFSS					
	Basal Pressure (mmHg)		Nadir Pressure (mmHg)		Relaxation time to nadir (ms)		Relaxation duration (ms)		CPD grade		Aspiration type		Diet	
	pre	post	pre	post	pre	post	pre	post	pre	post	pre	post	pre	post
1	7.9	8.4	5.9	0.8	13	184	33	385	3	2	D1	LL	D1	SD
2	15.1	15.3	0.9	5.3	293	108	472	215	4	4	SL	D1	Tube	Tube
3	12.5	-	-0.9	-	102	-	793	-	4	1	D1	X	Tube	GD
4	14.3	13.7	10.3	1.4	243	527	539	907	2	2	D1	SL	D1	D3

VFSS, Videofluoroscopic Swallowing Study; CPD, cricopharyngeal dysfunction; D1, dysphagia diet 1; D3, dysphagia diet 3; SL, small liquid; LL, large liquid; SD, soft diet; GD, general diet; Tube, tube feeding;