

# Chronic Cluster Headache – SCS 10 kHz stimulation and ONS a treatment option

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## Learning objective

Cluster headache (CH) (IHS 3.1) is a primary headache disorder belonging to the trigemino autonomic cephalgias. It is characterized by recurrent extreme severe headaches (15-180 minutes, 1-8/day) on one side of the head, typically around the eye and accompanied vagal activation with lacrimation, nasal congestion, conjunctival injection. Incidence is 0.1% in the general population, female/male 1:7. Conventional treatment includes medical prophylaxis and attack treatment. There is an episodic and chronic course (CCH) (10-15%). About 1% with CCH are refractory to medical treatment (rCCH).

Neuromodulation techniques like DBS, ONS, SPGS and VNS to treat CCH have been described and used.

The french ONS registry group describes a >50% attack frequency reduction in 70% patients, mean follow up 43.8 month (1).

In a recent meta analysis (2023) DBS and ONS were found to be superior to medical treatment, VNS and SPGS. The response rate of ONS was 57.3% and DBS 77%, pooled data (2).

ONS in combination with SCS 10kHz-stimulation or either alone, has not yet been described. Real world data of five consecutive rCCH patients is presented.

## Patients and results ONS plus SCS

	Patient	m/f	age	Baseline: VAS / attacks per day	System HFX	Electrode position
1	D. F.	m	40	10/ 4-5x strong attacks per week, 1-2 medium attacks per day	SCS/ONS	cervical C2, ONS
2	I. M.	m	47	10/ permanent headache, 2-4 severe attacks per day	SCS/ONS	cervical C2, ONS
3	F. B.	m	58	5-10/ permanent headache, attacks daily	SCS/ONS	cervical C2, ONS
4	AZ.-S.	f	30	10/ 1-4 attacks per day	SCS	cervical C2
5	M. K.	m	41	10/ 4-6 attacks per day	SCS/ONS	cervical C2, ONS

Table 1: Patient characteristics

	Patient	m/f	age	Trial end	1Mt.	3Mt.	6Mt.	9Mt.	12Mt.	24Mt.
1	D. F.	m	40	85%	85%	75%	75%			
2	I. M.	m	47	80%	75%	100%	95%	75%		
3	F. B.	m	58	75%	70%	0%	80%	80%		
4	AZ.-S.	f	30	90%	90%	10 - 30%	0%	0%	0%	0%
5	M. K.	m	41	0- max. 50%	failed trial					

Table 2: Results 2020 -2022



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### Abreviations neuromodulation

ONS occipital nerve stimulation  
SCS spinal cord stimulation  
DBS deep brain stimulation  
VNS vagal nerve stimulation  
SPGS sphenopalatine ganglion stimulation

## Discussion / Conclusion

In this small case report study 3/5 rCCH patients experienced a 75% pain reduction, attack reduction to 0-3 per day or an end of their attacks.

Prophylactic medication and attack medication was reduced.

All patients were staying in their job without further sick leave.

2/5 rCCH patients failed trial or did not respond over a longer period because of positive coping with psychosocial stress that wasnt obvious in the beginning despite specific psychological assessment. System dysfunction was the failure of single ONS lead poles. This was clinically not relevant.

SCS 10kHz-stimulation alone or in combination with ONS shows superior results compared to ONS alone and equal results as DBS but is less invasive. An explanation can be the direct stimulation of the trigeminovervical complex (TCC).

Next step:

More controlled trials should be performed to find out if SCS without ONS could be equally efficient as the combination resulting in less operative trauma and system dysfunction to evaluate the best stimulation patterns for the TCC.

### References

1. Leplus A. Neurosurgery 2021
2. Membrilla JA. J Neurol. 2023

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