Efficacy and Safety of Occipital Nerve Stimulation and Occipital Surgical Decompression for Migraine - A Systematic Review

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BACKGROUND

Despite various medical options, many patients with migraine experience limited improvement.

Interventional approaches like occipital nerve stimulation (ONS) and occipital surgical decompression (OSD) are gaining attention as potential options for patients refractory to medical therapy.

OBJECTIVES

We conducted a systematic review to evaluate the efficacy and safety of ONS and OSD for the treatment of migraine .

METHODS

We performed a comprehensive search from various databases from Jan 1990- May 2021 using keywords including occipital nerve surgery, occipital nerve stimulation, and migraine.

Studies were included if mean change in headache frequency, intensity, and complication rate were reported. Studies were excluded if indications were not migraine and if interventions were not in the occipital region.

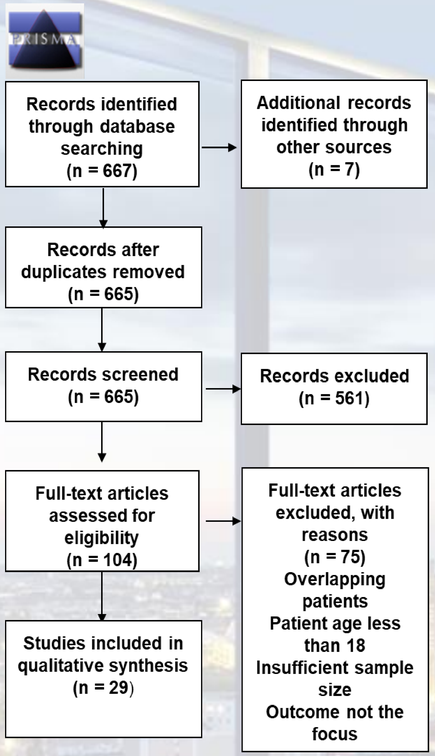
RESULTS

A total of 29 studies comprising 1378 patients with migraine with mean age of 45.81 years were included.

19 and 10 studies reported the efficacy and safety of ONS and OSD, respectively, with most studies demonstrating improvement of headache frequency and headache intensity.

The ONS group included six randomized controlled trials, and none of the OSD studies included a controlled group.

FIGURE AND TABLES



Study	Study design	Sample	Age (mean)	Female	Intervention	Follow up	Risk of bias
Gobel 2020	prospective	32	45.77	25.00	ONS	11.5	High
Ashkan 2020	prospective	112	45.9	79.00	ONS	3	High
Raoul 2020	retrospective	4/60	58	NA	ONS	12	High
Rodrigo 2019	retrospective	12	46	9.00	ONS	10.1	Moderate
Rodrigo 2017	prospective	37	46.9	33.00	ONS	112.8	Low
Liu 2017 (1st arm)	RCT	22	37.5	18.00	ONS	1	Moderate
Mekail 2016	RCT	14	NA	NA	ONS	3	Low
Miller 2016	prospective	35/53	NA	NA	ONS	39	Moderate
Dodick 2015	RCT	157	44.9	124.00	ONS	13	Low
Slotty 2015	RCT	8	NA	NA	ONS	0.25	Moderate
knife 2015	case series	8	45.5	8.00	ONS	3	Low
Bono 2015	RCT	54	41	48.00	ONS	1	Moderate
Notaro 2014	case series	17	51.12	15.00	ONS	12	Moderate
Palmisani 2013	retrospective	17/25	49	18.00	ONS	36	High
kiss 2012	retrospective	10	46.5	8.00	ONS	33	High
Saper 2010	RCT	28	41	22.00	ONS	3	Moderate

Study	Study design	Sample	Age (mean)	Female	Intervention	Follow up	Risk of bias
Afifi 2019	retrospective	47	NA	NA	OSD	8	High
Rapasio 2019	retrospective	78	NA	NA	OSD	21	High
Ascha 2017	retrospective	14	NA	NA	OSD	44.04	High
Lin 2016	prospective	9	51.3	8.00	OSD5	2	Moderate
Gfrerer 2014	retrospective	21	NA	NA	OSD	12	High
Lineberry (1st arm) 2015	retrospective	194	44.33	169.00	OSD	NA	High
Lineberry (2nd arm) 2015	retrospective	282	44.64	247.00	OSD	NA	High
Lee (1st arm) 2013	retrospective	111	44.7	96.00	OSD	6	Moderate
Lee (2nd arm) 2013	retrospective	118	45.3	103.00	OSD	6	Moderate
Chmielewski 2013	retrospective	55	45.9	49.00	OSD	18	Moderate
Ducic 2009	retrospective	206	45	168.00	OSD	12	Moderate
Guyoron 2009	prospective	11	47.9	NA	OSD	12	Moderate

RESULTS

ONS- The pre-treatment headache intensity ranged from 7.4±1.6 - 9.8±0.7 which improved to 2.0±1.22 - 9.0 ± 1.0 . Headache frequency ranged from 8.25±2.04 - 29.37±18.3 pre-treatment and improved to 3.0±4.06 – 26.23± 8.26 post-treatment. Significant improvement of headache with more than 50% change in frequency or intensity was in the range of 8.33%-100%. Complications were reported in 13 out of 19 studies, with lead migration being a common issue (up to 10.8% -70%)

OSD- The pre-treatment headache intensity ranged from 6.5±2.0 - 9.2±1.0, which improved to 2.6±2.5 – 4.7 ± 3.1 post-treatment. Headache frequency improved from 9.5±5.4 – 18.5±10.4 pre-treatment to 3.7±6.0 – 9.9 ± 9.8 post-treatment. Significant improvement of headache was reported in the range of 71.4%-94.9% .

Six out of ten studies reported data on complication. Paresthesia was the most common post-treatment complication (9.5%-88.7%).

DISCUSSION

We attempted a meta-analysis. However, probable selection bias, a lack of control groups in most studies, and the heterogeneity of outcome measurements precluded formal meta-analysis.

Future studies should utilize commonly accepted standardized outcome measures, including headache frequency, headache intensity, and complications.

CONCLUSION

Despite the fact that most studies reported improvement in headache frequency and intensity in patients with migraine, the variability in outcome measures and the moderate-to-high risk of bias, especially in the OSD group were major limitations

More well-defined, objective-based RCT with standardized endpoints including descriptive adverse reporting is warranted.