Short- and Long-Term Quality of Life and Neurologic Outcomes After an Endoscopic Endonasal Transpterygoid Approach

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Introduction

The endoscopic endonasal transpterygoid approach (ETPA) is a minimally invasive approach to the lateral skull base. It can be classified based on the extent of bony removal, vidian nerve dissection, and Eustachian tube sacrifice (CPK classification). The main transient or permanent neurologic approach-related deficits are: keratoconjunctivitis sicca (vidian nerve injury), trigeminal neuropathy or neuralgia (injury to the trigeminal nerve), trismus (injury to the inferior alveolar nerve and pterygoid muscle dissection), abducens palsy, hearing loss (secondary to Eustachian tube injury), and palatal numbness (injury to greater palatine nerve). Postoperative radiation can exacerbate neurologic sequelae and impair symptom resolution. We aim to describe the evolution of these neurologic deficits over time in patients undergoing an ETPA as well as how they affect quality of life and functional status.

Methods and Materials

This is a retrospective review of patients who underwent a unilateral or bilateral ETPA for tumor resection from April 2014 until October 2023. Patients with follow up less than 60 days from surgery or postoperative radiotherapy when received were excluded. We analyzed how pre-operative deficit, radiation and approach type affect symptom evolution. Secondly, we studied how each neurologic sequela affects functional status and quality of life.

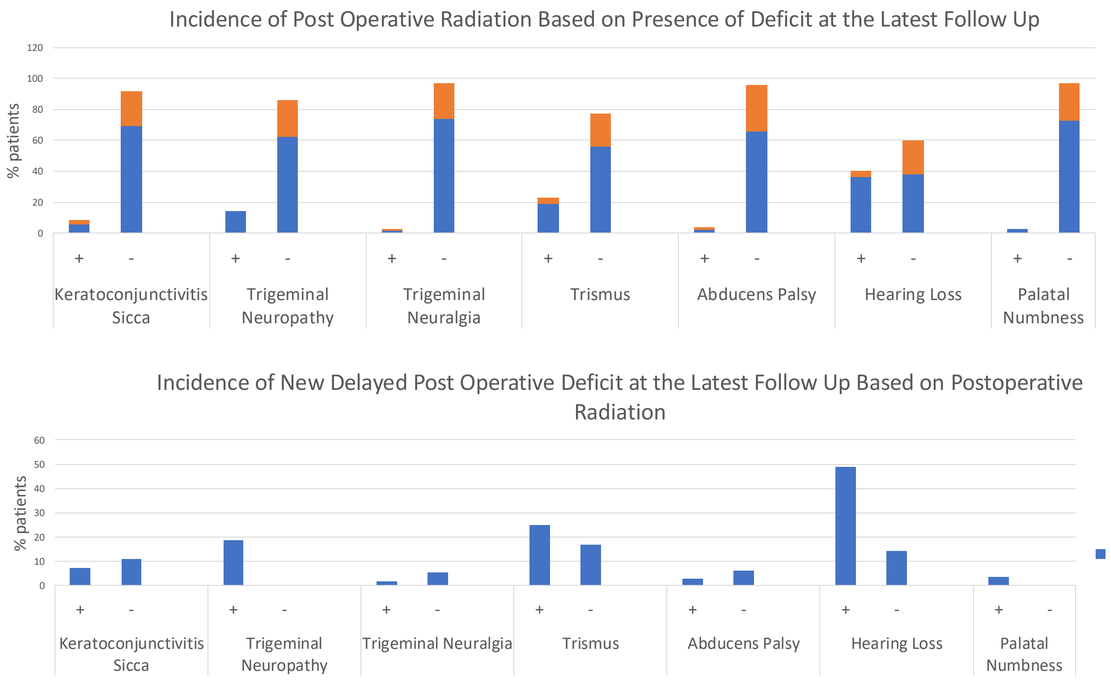
Figure 1. Evolution of presenting and new post-operative symptoms at different time points (pre-operative, early* and delayed** post-operative).

Deficit	% Resolution Post Op
Dry Eyes	25% (1/4)
Trigeminal Neuropathy	50% (10/20)
Trigeminal Neuralgia	50% (2/4)
Trismus	100% (6/6)
Abducens Palsy	42.3% (11/26)
Hearing Loss	47.6% (10/21)
Palatal Numbness	33.3% (1/3)

Table 1. Extent of resolution of pre-operative symptoms.

Deficit	Early* Post Op Incidence	Delayed** Post Op Incidence	% Resolution at Latest Follow Up
Dry Eyes	4.2% (3/72)	6.9% (5/72)	25% (2/8)
Trigeminal Neuropathy	23.2% (13/56)	1.8% (1/56)	42.9% (6/14)
Trigeminal Neuralgia	5.6% (4/72)	0% (0/72)	50% (2/4)
Trismus	14.3% (10/70)	15.7% (11/70)	23.8% (5/21)
Abducens Palsy	8% (4/50)	2% (1/50)	60% (3/5)
Hearing Loss	12.7% (7/55)	30.9% (17/55)	8.3% (2/24)
Palatal Numbness	19.2% (14/73)	0% (0/73)	85.7% (12/14)

Table 2. Incidence and extent of resolution of new post-operative symptoms.



Results

- Patients undergoing type E ETPA were significantly more likely to develop new palatal numbness, trismus and hearing loss.
- Of the new neurologic symptoms after ETPA, palatal numbness is the most likely to resolve, with hearing loss being the least likely to resolve by the latest follow up.
- Persistence of symptom at last follow up was significantly related to presence of the symptom pre-operatively for all but palatal numbness and hearing loss.
- Postoperative radiotherapy and undergoing an E type of approach significantly impacted symptom resolution for hearing loss.
- New delayed hearing loss was also significantly more likely to develop in patients radiated after their ETPA.
- At the 12 months follow up: dry eyes significantly lowered pain scores; trigeminal neuropathy significantly lowered pain, general activity, mood, relationship, walking and enjoyment of life scores; trigeminal neuralgia significantly lowered pain and mood scores; and hearing loss significantly lowered general activity, mood, work and relationship scores.
- Presence of palatal numbness and abducens palsy at 12 months postoperatively did not significantly affect any of the quality of life metrics analyzed.
- Preoperative and early postoperative mean KPS were significantly lower compared to postoperative KPS at the latest follow up. There was no significant difference between pre-operative and early postoperative KPS for our patient cohort.

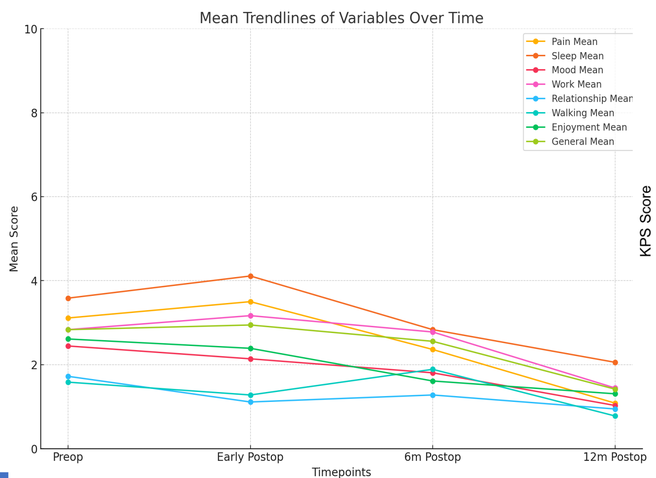


Figure 2. Evolution over time of quality of life metrics before and after undergoing an ETPA. The score represents how significantly each category is affected.

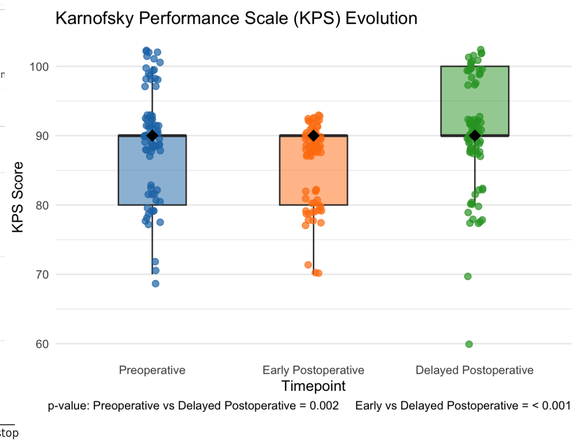


Figure 3. Karnofsky performance status before surgery, early* post-operative, and delayed** post-operative follow ups.

Correlation at 12 months	Statistical	Dry Eye	Trigeminal Neuropathy	Trigeminal Neuralgia	Palatal Numbness	Abducens Neuropathy	Hearing Loss
Pain	Pearson's r	0.42	0.47	0.56	-0.19	0.09	0.19
	p-value	**0.01**	**<0.001**	**<0.001**	0.27	0.60	0.26
Sleep	Pearson's r	-0.05	0.06	-0.01	-0.18	0.40	0.26
	p-value	0.78	0.26	0.96	0.30	0.33	0.13
General activity	Pearson's r	-0.15	0.42	0.44	0.15	-0.05	0.65
	p-value	0.40	**0.01**	0.01	0.37	0.77	**<0.001**
Mood	Pearson's r	-0.20	0.45	0.48	-0.10	-0.14	0.45
	p-value	0.24	**0.01**	**<0.001**	0.56	0.43	**0.01**
Work	Pearson's r	-0.14	0.31	0.04	0.14	-0.14	0.71
	p-value	0.43	0.07	0.84	0.43	0.43	**<0.001**
Relationships	Pearson's r	0.02	0.54	0.28	0.25	0.02	0.58
	p-value	0.93	**<0.001**	0.10	0.14	0.93	**<0.001**
Walking	Pearson's r	0.01	0.43	0.20	-0.14	0.25	0.24
	p-value	0.97	**0.01**	0.24	0.41	0.15	0.16
Enjoyment of Life	Pearson's r	-0.03	0.33	0.08	0.03	0.09	0.29
	p-value	0.86	**0.05**	0.65	0.84	0.62	0.88

Table 3. Correlation Matrix of Postoperative Neurological Deficits and Quality of Life Measures at 12 Months.

Conclusions

Understanding the evolution over time of these neurologic deficits allows for data-driven patient counseling regarding the incidence and likelihood of resolution of neurologic deficits both pre- and post-operatively in patients undergoing an ETPA. Furthermore, early multidisciplinary planning can occur to optimize management of each deficit. We also demonstrated that there is not a significant decline in the patients' functional status by the latest follow up compared to their preoperative status, and that each symptom can impact a patient's quality of life to various degrees.

***Early Post-operative = 2 week follow up**
****Delayed Post-operative = Latest follow up (at least 2 months)**

Contact

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References

1. Kasemsiri P, Solares CA, Carrau RL, et al. Endoscopic endonasal transpterygoid approaches: anatomical landmarks for planning the surgical corridor. *Laryngoscope*. 2013; **123**: 811-815. https://doi.org/10.1002/lary.23697.
2. Ji-Eun Choi, Yang-sub Noh, Kyung Eun Lee, Yong Gi Jung, Seung-Kyu Chung, Hyo Yeol Kim, Doo-Sik Kong, Do-Hyun Nam, Sang Duk Hong. Morbidities Associated with the Endoscopic Transnasal Transpterygoid Approach: Focusing on Postoperative Sequelae, *World Neurosurgery*, Volume 137, 2020, Pages e43-e51, ISSN 1878-8750. https://doi.org/10.1016/j.wneu.2019.12.023.
3. Caballero N, Welch K, Lininger L. Complications Associated with a Transpterygoid Approach to Meningoencephalocele Repair. *Journal of Neurological Surgery Part B: Skull Base*. 2012;73:A121. doi:10.1055/s-0032-1312169