ORIGINAL PAPER
DOI: 10.5603/OJ.2021.0039

Visual outcomes after endoscopic pituitary adenomas surgery: our experience

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ABSTRACT

BACKGROUND: Pituitary adenomas are the most common cause of sellar tumors after the third decade of life. They can lead to visual impairment due to a close anatomical relationship with the optic chiasm. The purpose of this study is to evaluate visual outcomes after endoscopic pituitary adenoma surgery in patients from Egas Moniz hospital between January 2013 and August 2020.

MATERIAL AND METHODS: Patients with pituitary adenoma with pre- and post-surgical ophthalmological evaluation were retrospectively included. Pre- and post-surgical visual parameters, clinical, imaging, histological, and surgical data were selected, and a descriptive analysis was performed. Pre- and post-surgical visual parameters were compared using Statistical Package for the Social Sciences (SPSS). Improvement criteria were defined: pre-surgical visual complaints > post-surgical visual complaints; visual acuity (VA) (LogMAR) pre-surgical > VA (LogMAR) post-surgical; pre-surgical chromatic vision > post-surgical chromatic vision; visual field mean sensitivity (MS) post -surgical > visual field MS pre-surgical + 1; visual field temporal mean sensitivity (MST) post-surgical > visual field MST pre-surgical + 1; visual field nasal mean sensitivity (MSN) post-surgical > visual field MSN pre-surgical + 1.

RESULTS AND DISCUSSION: Of the total 18 patients included, 11 (68,8%) fulfilled all improvement criteria, and 14 (82.4%) fulfilled at least one. These results go with the current scientific evidence that pituitary adenoma resection in patients with pre-surgical visual symptoms considerably improves these symptoms.

CONCLUSION: Standardization of visual evaluation may be a key point to identify prognostic factors for visual function recovery after surgery.

KEY WORDS: pituitary adenomas; endoscopic surgery; visual function

Ophthalmol J 2021; Vol. 6, 241–244

INTRODUCTION

Pituitary adenomas account for approximately 15% of all brain tumors. They are the most common cause of sellar tumors after the third decade of life, representing 90% of all sellar masses, with a majority of prolactinomas [1, 2]. Most of these tumors are intrasellar. However, they may extend to the suprasellar and parasellar regions and invade adjacent structures such as the cavernous sinuses and the bone of the sella turcica and clivus [3].

Clinically, they may be asymptomatic or with classic syndromes of hyper- or hypopituitarism and symptoms due to local mass effects, such as headaches, vomiting, dizziness, diplopia, or visual

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disturbance. Visual impairment is primarily due to suprasellar tumor extension with compression of the optic chiasm leading to visual field defects such as the classical bitemporal hemianopia, visual acuity or color perception reduction, and optic nerve atrophy [3]. Potential mechanisms of axonal injury from a compressive lesion include direct disruption of conduction along the axon, impaired axoplasmic flow, demyelination with impaired signal conduction, and ischemia from compression or stretching [4].

Several different visual field deficit patterns have been reported, and all relate to the position of the growing tumor relative to the optic nerves and chiasm [5]. For pituitary adenomas treatment, surgery is the gold standard, except for prolactinomas, which are mainly treated with dopamine agonists [6]. Visual field defects are recognized as one of the primary indications for surgery on pituitary tumors [2]. There are two main surgical approaches for resecting pituitary adenomas: transcranial (open) approach and endoscopic endonasal approach (EEA) [6]. Nowadays, the latter is widely accepted and adopted as proven to be a safe and effective technique in terms of tumor resection and improvement of visual defects, with reported success rates ranging from 50% to 90% [3].

The purpose of this study is to evaluate visual outcomes after endoscopic pituitary adenoma surgery in patients from Egas Moniz hospital between January 2013 and August 2020.

MATERIAL AND METHODS

This is a quantitative, observational, cross-sectional, retrospective study from Egas Moniz Hospital, Lisbon, Portugal. Authors included patients with pituitary adenoma with pre- and post-surgical ophthalmological evaluation, including visual acuity (LogMAR) and chromatic vision assessment, fundoscopy, visual field (Octopus®) testing, and optical coherence tomography (Heidelberg®) retinal nerve fibers and macular thickness evaluations (Tab. 1). Pre and post-surgical visual parameters, clinical, imaging, histological, and surgical data were selected and subjected to statistical analysis using SPSS. A descriptive analysis was performed for each parameter with measures of central location (mean/median) and dispersion (standard deviation) for quantitative variables. For qualitative variables, absolute and relative frequencies were calculated. Pre and post-surgical parameters were compared using the T-test and Wilcoxon test as appropriate. A statistically significant p-value was defined as < 0,05.

Table 1. Inclusion and exclusion criteria

Inclusion criteria
Pituitary adenoma with pre- and post-surgical ophthalmological evaluations
Visual acuity evaluation (LogMAR)
Chromatic vison assessment
Fundoscopy evaluation
Visual field (Octopus®) testing
Optical coherence tomography (Heidelberg®) retinal nerve fibers and macular thickness evaluations
Exclusion criteria
Sellar tumors not pituitary adenomas

Table 2. Patient and tumor characteristics

Patient and tumor characteristics	Total population (n = 18)
Age (years)	57.4 (±16.5)
Male (n)	10 (55.6%)
Average pre-surgical lesion diameter [mm]	33.1 (±9.2)
Aggressiveness (Ki-67)	2.3 (±1.1)
Pre-surgical visual complains (n)	14 (77.8%)
Average time of pre-surgical visual complains (months)	12.8 (±14.4)

RESULTS

Eighteen patients fulfilled our inclusion criteria. Of the 18 patients, 10 (55.6%) were male, with an average age of 57.4 (±16.5) years old. Fourteen (77.8%) patients had pre-surgical visual complaints for an average of 12.8 (±14.4) months, mostly painless and progressive vision loss 6 (33.3%) and blurred vision 6 (33.3%) (Tab. 2). Before surgery, most patients (38.9%) showed already contact and/or opto-chiasmatic lesion, with an average lesion diameter of 33.1 (± 9.2) mm.

The most common histological diagnosis was gonadotrophic adenoma (44.4%), with a low mean aggressiveness (Ki-67) of 2.3 (± 1.1). A statistical significance was found in the difference between the paired samples (pre- *vs.* post-): opto-chiasmatic relationship, right eye visual acuity, right eye visual field mean sensitivity, right eye temporal visual field mean sensitivity, left eye visual field sensitivity, left eye temporal mean sensitivity, and left eye nasal vis-

Table 3. Pre- and post-surgical results comparison

Variable	Mean Pre surgical (SD)	Mean Post surgical (SD)	p value
Opto-chiasmatic relationship with the lesion	2.1 (± 1.1)	1 (±1.5)	0.047
VA RE (LogMAR)	0.350 (±0.48)	0.056 (±0.09)	0.027
VA LE (LogMAR)	0.375 (±0.52)	0.169 (±0.27)	0.080
VFMS RE	15.7 (±8.1)	22.5 (±6.3)	0.010
VFMST RE	10.9 (±9.9)	20.1 (±8.1)	0.005
VFMSN RE	20.0 (±7.5)	23.9 (±5.8)	0.106
VFMS LE	16.9 (±8.7)	21.7 (±6.3)	0.021
VFMST LE	13.8 (±10.6)	19.1 (±8.4)	0.034
VFMSN LE	19.8 (±7.9)	23.8 (±5.0)	0.038
MCTN RE	601.6 (±44.4)	593.9 (±49.0)	0.346
MCTT RE	591.5 (±38.4)	592.4 (±39.9)	0.650
MCTN LE	598.1 (±45.5)	594.8 (±51.0)	0.327
MCTT LE	586.3 (±39.4)	587.8 (±43.9)	0.702
RNFL RE	79.0 (±14.1)	79.2 (±15.9)	0.964
RNFLT RE	48.6 (±12.4)	48.4 (±14.7)	0.947
RNFLN RE	54.5 (±13.2)	53.8 (±18.2)	0.830
RNFL LE	75.0 (±14.5)	75.8 (±19.6)	0.854
RNFLT LE	47.7 (±16.8)	47.3 (±18.7)	0.854
RNFLN LE	49.7 (±13.0)	51.9 (±20.5)	0.559

SD — standard deviation; VA — visual acuity; RE — right eye; LE — left eye; VF — visual field; MS — mean sensitivity; T — temporal; N — nasal; MCT — macular central thickness; RNFL — retinal nerve fiber layer

- Pre-surgical visual complaints > Post-surgical visual complaints
- VA (LogMAR) pre-surgical > VA (LogMAR) post-surgical
- Pre-surgical chromatic vision > Post-surgical chromatic vision
- Visual field MS post-surgical > Visual field MS pre-surgical + 1
- Visual field MST post-surgical > Visual field MST pre-surgical + 1
- Visual field MSN post-surgical > Visual field MSN pre-surgical + 1

FIGURE 1. Visual improvement criteria

ual field mean sensitivity (Tab. 3). Concerning improvement in tested variables (Fig. 1), 11 (68.8%) patients improved in all variables, and 14 (82.4%) improved in at least one (Tab. 4).

DISCUSSION

Unfortunately, our sample did not have statistical strength to establish correlations between the clinical, imaging, histological, and ophthalmological evaluated criteria and the probability of improvement after surgery.

Table 4. Visual improvement

	Improvement N (%)	Total N (%)
At least one criteria	14 (82,4)	17 (100)
In all criteria	11 (68,8)	17 (100)

Following resection of pituitary adenomas in patients with baseline visual field deficits, visual fields appear to recover in 3 stages:

- rapid recovery (minutes to days);
- delayed recovery (weeks to months);
- late recovery (months to years).

Rapid recovery was attributed to alleviating the conducting blockade, while delayed/late recovery was due to remyelination and restoration of axonoplasmic transportation, resulting in a recovery of the retinal ganglion cells [5].

According to current scientific evidence, patients with preoperative visual symptoms considerably improve after surgery. A 2017 systematic review showed that of 18–84% patients with pituitary adenoma with pre-surgical visual complaints, 67.5% improved visual acuity and 80.8% in the visual field after surgery [7].

The major limitation of our study is the small number of patients and some data missing that disabled us from establishing prognostic factors, as some studies advocate. In a retrospective study of 73 patients, Barzaghi et al. noted that the significant factors for complete recovery of the visual field after pituitary adenoma surgery included lower visual field mean defect before surgery, younger age, and small tumor diameter. The same study indicates that neither gender nor the symptom onset-surgery time was associated with postoperative prognosis [2]. Other authors highlight duration of symptoms, age, visual deficit, retinal nerve fiber layer thickness, and surgeon experience as significant prognostic factors for complete recovery after surgery [3, 5–7].

CONCLUSION

Our results are in concordance with the reported literature. A prospective study with standardization of visual evaluation could provide information on postoperative prognosis.

REFERENCES

1. Snyder R, Fayed I, Dowlati E, et al. Pituitary Adenoma and Craniopharyngioma Collision Tumor: Diagnostic, Treatment Considerations, and Review of the Literature. World Neurosurg. 2019; 121: 211–216, doi: 10.1016/j.wneu.2018.10.048, indexed in Pubmed: 30326307.
2. Lee DK, Sung MiS, Park SW. Factors Influencing Visual Field Recovery after Transsphenoidal Resection of a Pituitary Adenoma. Korean J Ophthalmol. 2018; 32(6): 488–496, doi: 10.3341/kjo.2017.0094, indexed in Pubmed: 30549473.
3. Fredes F, Undurraga G, Rojas P, et al. Visual Outcomes after Endoscopic Pituitary Surgery in Patients Presenting with Preoperative Visual Deficits. J Neurol Surg B Skull Base. 2017; 78(6): 461–465, doi: 10.1055/s-0037-1604169, indexed in Pubmed: 29134164.
4. Kerrison JB, Lynn MJ, Baer CA, et al. Stages of improvement in visual fields after pituitary tumor resection. Am J Ophthalmol. 2000; 130(6): 813–820, doi: 10.1016/s0002-9394(00)00539-0, indexed in Pubmed: 11124302.
5. Uy B, Wilson B, Kim WiJ, et al. Visual Outcomes After Pituitary Surgery. Neurosurg Clin N Am. 2019; 30(4): 483–489, doi: 10.1016/j.nec.2019.06.002, indexed in Pubmed: 31471055.
6. Shen M, Chen Z, Shou X, et al. Surgical Outcomes and Predictors of Visual Function Alterations After Transcranial Surgery for Large-to-Giant Pituitary Adenomas. World Neurosurg. 2020; 141: e60–e69, doi: 10.1016/j.wneu.2020.04.151, indexed in Pubmed: 32353541.
7. Muskens IS, Zamanipoor Najafabadi AH, Briceno V, et al. Visual outcomes after endoscopic endonasal pituitary adenoma resection: a systematic review and meta-analysis. Pituitary. 2017; 20(5): 539–552, doi: 10.1007/s11102-017-0815-9, indexed in Pubmed: 28643208.