Acta Neurochirurgica (2019) 161:717–718
https://doi.org/10.1007/s00701-018-03784-2

LETTER TO THE EDITOR - PITUITARIES

No doubt: the invasion of the cavernous sinus is the limiting factor for complete resection in pituitary adenomas

Mahmoud Messerer[1] · Roy Thomas Daniel[1] · Giulia Cossu[1]

Received: 28 November 2018 / Accepted: 19 December 2018 / Published online: 10 January 2019

Dear Editor,

We read with great interest the paper of Serra et al. [1] describing a new radiological score to predict the extent of resection after trans-sphenoidal surgery for pituitary adenomas. This is based on the ratio between the maximal horizontal diameter of the adenoma and the minimal inter-carotid distance at the intra-cavernous horizontal segment C4. The authors describe a difference in gross total resection (GTR) rate among the different classes as defined by their score ($p < 0.05$ among classes I, II, and III), except between classes III and IV [1].

This classification may represent an interesting score for purely intra-sellar adenomas or in cases showing para-sellar extension but its application may be difficult in patients presenting a supra-sellar extension or an invasion of the sphenoid sinus. Indeed in the latter case, the maximal diameter would be in the sphenoid sinus and it would correspond to a grade III according to the authors. However, GTR is easily achievable in these particular cases through a direct access to the tumor, with no major surgical risks.

The shape of pituitary adenomas and the position of the adenoma within the sella may be extremely variable and to define the maximal diameter as one of the major predictors of the extent of resection may be an oversimplification. In fact, we were surprised to observe a different GTR rate between classes I and II, as GTR may be easily obtained in both cases [2] after a careful planning of the surgical approach.

The second pitfall of this classification is the inter-individual anatomic variability of the inter-carotid distance [3, 4], which may also depend on the pathology considered (kissing carotids in acromegalic patients, hypertension, and polycystic kidney disease) [5]. In these cases, the working corridor is enlarged by mobilization of the carotid arteries and excellent results can be achieved as well.

We are strongly convinced that surgical results are entirely dependent on surgeon's training and experience with endoscopic skull base surgery. It is well described in the literature that the limiting factor for the endoscopic resection of pituitary adenomas is the invasion of the cavernous sinus [2, 6]. Especially for functioning adenomas, the invasion of the cavernous sinus remains the most important predictive factor in determining a biological remission [7, 8]. In many cases, it is not easy to establish if a real invasion of the cavernous sinus is present as the cavernous sinus medial wall is extremely thin [9–11] and may be pushed by the tumor. We are convinced that only an intraoperative assessment may determine the true para-sellar extensions of the tumor, and thereby achieve (or not) a total excision. Therefore, in our opinion, the invasion of the cavernous sinus is not comparable to a supra-sellar extension and these two factors should not modify the score in the same way as illustrated in this paper [1].

The proposed pituitary score might be used in selected cases but its application should be carefully evaluated and it should not detract from the value of a precise analysis of the pre-operative MRI and its correlation with a good appreciation of the intraoperative endoscopic visualization of the tumor anatomy.

This article is part of the Topical Collection on *Pituitaries*

✉ Mahmoud Messerer
Mahmoud.messerer@chuv.ch

[1] Department of Neurosurgery, University Hospital of Lausanne, Lausanne, Switzerland

References

1. Serra C, Staartjes VE, Maldaner N, Muscas G, Akeret K, Holzmann D, Soyka MB, Schmid C, Regli L (2018) Predicting extent of resection in transsphenoidal surgery for pituitary adenoma. Acta Neurochir 160:2255–2262
2. Messerer M, De Battista JC, Raverot G, Kassis S, Dubourg J, Lapras V, Trouillas J, Perrin G, Jouanneau E (2011) Evidence of

improved surgical outcome following endoscopy for nonfunctioning pituitary adenoma removal. Neurosurg Focus 30:E11
3. Perondi GE, Isolan GR, de Aguiar PH, Stefani MA, Falcetta EF (2013) Endoscopic anatomy of sellar region. Pituitary 16:251–259
4. Rhoton ALJ (2003) The sellar region. In: Apuzzo MLJ (ed) Rhoton's Cranial Anatomy and Surgical Approaches. Lippincott Williams and Wilkins, Philadelphia, p 383
5. Sacher M, Som PM, Shugar JM, Leeds NE (1986) Kissing intrasellar carotid arteries in acromegaly: CT demonstration. J Comput Assist Tomogr 10:1033–1035
6. Dehdashti AR, Ganna A, Karabatsou K, Gentili F (2008) Pure endoscopic endonasal approach for pituitary adenomas: early surgical results in 200 patients and comparison with previous microsurgical series. Neurosurgery 62:1006–1015 discussion 1015-1007
7. Cossu G, Daniel RT, Pierzchala K, Berhouma M, Pitteloud N, Lamine F, Colao A, Messerer M (2018) Thyrotropin-secreting pituitary adenomas: a systematic review and meta-analysis of postoperative outcomes and management. Pituitary. https://doi.org/10.1007/s11102-018-0921-3
8. Starnoni D, Daniel RT, Marino L, Pitteloud N, Levivier M, Messerer M (2016) Surgical treatment of acromegaly according to the 2010 remission criteria: systematic review and meta-analysis. Acta Neurochir 158:2109–2121
9. Cossu G, Daniel RT, Francois P, Destrieux C, Messerer M (2018) Sphenoid mucocele with intracranial extension: an anatomic perspective. World Neurosurg 113:40–46
10. Destrieux C, Kakou MK, Velut S, Lefrancq T, Jan M (1998) Microanatomy of the hypophyseal fossa boundaries. J Neurosurg 88:743–752
11. Diao Y, Liang L, Yu C, Zhang M (2013) Is there an identifiable intact medial wall of the cavernous sinus? Macro- and microscopic anatomical study using sheet plastination. Neurosurgery 73: ons106–ons109 discussion ons110