Is the Stability of a Standard Stable Reference Stable Enough?

Umarevathi Gopalakrishnan1, Lodd Mahendra2

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The dogmatic approach of following the past principles has made many significant features of science go unnoticed and unquestioned. One such is the concept of immutability of the anterior contour of the sella turcica. For many decades, we have been using the anterior contour of sella turcica as a stable reference structure to study the growth of the craniofacial skeleton.1 This was based on the usage by Björk and Skieller. But on analyzing the various studies on the growth and disease of the pituitary gland and its influence on the size and morphology of sella turcica, it seems that the anterior contour of the sella turcica may not be a stable parameter of reference. This article is an attempt to throw light on the intricacies of the association between pituitary gland and sella turcica.

A twin study2 published on the morphology of the sella turcica gave insights that even within a monozygotic twin pair the morphology of sella varied, indicating the possibility of environmental influence on its morphology. There are literature reports of enlarged sella turcica in cases with pituitary tumors (adenomas, meningioma, prolactinoma, and craniopharyngioma), cystic lesion (Rathke’s cleft cyst and mucocoele), aneurysm, pituitary hyperplasia (primary hypothryroidism), acromegaly, gigantism, and Nelson syndrome3–9 whereas smaller sella turcica in primary hypopituitarism, growth hormone deficiency, Williams syndrome, and Cushing’s syndrome due to adrenocortical adenoma.10–14 The fossa enjoying a unique relationship with the possibility of the pituitary gland dictating the remodeling of the fossa was suggested by Harry Israel as early as 1970.15

A prior publication by the present authors16 hypothesized the pituitary gland to be the functional matrix of the sella turcica collecting literature evidences in favor of the same. There are literature evidences of the gland being formed before the formation of sella turcica.8,17–20 The article by Sheng and Westphal17 gave histological evidences showing the pituitary gland is formed before being saddled by the sella turcica and secreting hormones20 as early as the 8th week, indicating possibility of pituitary being the primary determinant of growth of sella. With regard to the size correlation, radiological images of sella turcica were used for diagnosing pituitary dimensions before the advent of MRI.21–25 Di Chiuro and Nelson22 have shown a close correlation between pituitary gland and sella turcica when three dimensions of sella were measured. Not only the gland but the associated vascular plexus,15 connective tissue,26 and abnormal cerebrospinal fluid (CSF) influx22,28 were all reported to influence the size of sella turcica. A deficient sella diaphragm allows the influx of CSF, which in turn is reported to enlarge the sella.27 There are clear evidences of gradual pituitary enlargement during pregnancy29–31 of up to 45%. Van Wyck and Grumbach32 have noted that sella was responding to dimensional changes of the pituitary gland. While referring Van Wyck’s study Harry Israel15 quoted, “They demonstrated contiguity of gland and fossa in a pathologic sequence where end organ disease, altered feedback, pituitary expansion and then corrective treatment in that order incorporated enlargement and demineralization of the pituitary fossa followed by a decrease in its size toward normal.” Prenatal pathological conditions affecting morphology of the pituitary and sella turcica were studied by Inger4 and he concluded that malformations in the pituitary gland might secondarily cause malformations in the sella turcica. We have clear evidences in the literature giving insights of the adaptability of the sella turcica based on the demands laid on it by the pituitary gland.

The orthodontic significance of this stems from the fact that the anterior contour of sella is considered as a stable reference structure for growth superimpositions. Studies by Björk,33,34 and Riolo et al.34 suggested that the anterior contour of the sella turcica does not undergo any major structural alterations after the 6th or 7th year of life. The adaptable nature of sella has not been addressed in the orthodontic literature so far. Now that we know of a possibility that the sella turcica size and morphology may be influenced by the physiological and pathological alterations in the pituitary gland, the future use of the anterior contour of sella as a stable reference structure for superimpositions should be reconsidered.

REFERENCES


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