

# Postnatal sellar spine growth

## A case report and literature review

Takahiro Hosokawa, MD<sup>a,\*</sup>, Yoshitake Yamada, MD<sup>b</sup>, Yumiko Sato, MD<sup>a</sup>, Yutaka Tanami, MD<sup>a</sup>, Jun Kurihara, MD<sup>c</sup>, Eiji Oguma, MD<sup>a</sup>

### Abstract

**Background:** A sellar spine is a bony spur protruding anteriorly from the central portion of the dorsum sellae. Its etiology is an ossified notochordal remnant of the cephalic end of the notochord. It is presumed to be a congenital malformation based on magnetic resonance imaging (MRI) findings of sellar spine in a 4-year-old boy. A sellar spine should therefore be detectable at birth with or without ossification, and the posterior pituitary lobe should be displaced.

**Methods and Results:** Here we review the literature and report the first case of typical sellar spine in an 8-year-old girl who presented with precocious puberty, but her MRI taken at age 4 months for a febrile convulsion did not show a sellar spine or posterior pituitary lobe deformation. T1-weighted sagittal images at 8 years old showed a bony structure protruding anteriorly from the central portion of the dorsum sellae. The length of this lesion was 3.8 mm on computed tomography (CT) scanning at 9 years old, and it elongated to 4.7 mm on CT at 12 years old.

**Conclusions:** Based on the present case, we speculate that the sellar spine would be too small to detect early in development and would grow in size after birth. In this case, a sellar spine and precocious puberty were potentially associated due to deformation of the growing pituitary gland.

**Abbreviations:** CT = computed tomography, LH = luteinizing hormone, MRI = magnetic resonance imaging.

**Keywords:** developmental anomaly, pituitary abnormality, sella turcica, sellar spine

## 1. Introduction

Sellar spine was first described by Lang in 1977.<sup>[1]</sup> It is an anatomical variant characterized by an osseous spine that arises in the midline from the dorsum sellae and protrudes into the pituitary fossa. The incidence of this anomaly is relatively low, estimated at 1:5000.<sup>[2]</sup> The etiology of sellar spine is unclear, but there are several hypotheses: ossified notochordal remnant of the cephalic end of the notochord, ossified dural fold, and ossified vascular channel.<sup>[2]</sup> Magnetic resonance imaging (MRI) findings of sellar spine strongly support the theory of an ossified notochordal remnant.<sup>[3]</sup> As it has hitherto been observed in a 4-year-old boy,<sup>[2]</sup> it is believed to be a congenital malformation, with incomplete regression of the cephalic tip of the notochord.

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<sup>a</sup> Department of Radiology, Saitama Children's Medical Center, Saitama,

<sup>b</sup> Department of Diagnostic Radiology, Keio University School of Medicine, Shinjuku-ku, Tokyo, <sup>c</sup> Department of Neurosurgery, Saitama Children's Medical Center, Saitama, Japan.

\* Correspondence: Takahiro Hosokawa, Department of Radiology, Saitama Children's Medical Center, 2100 Magome, Iwatsuki, Saitama, Saitama 339-8551, Japan (e-mail: snowglobe@infoseek.jp).

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During development of the posterior lobe of the pituitary gland, the most cephalic notochordal segment regresses and finally pulls away from the posterior lobe. In case of a sellar spine, the persistence of a notochordal remnant within the fetal sella then forms the ossified sellar spine<sup>[2]</sup> and leads to deformity of the posterior lobe of the pituitary gland.<sup>[3–5]</sup> According to these hypotheses, a sellar spine should be detected due to a deformed posterior lobe of the pituitary gland at birth. However, so far, there has been no report of a sellar spine that was not observed on initial imaging studies.

## 2. Case report

The patient was an 8-year-old girl whose chief complaint was precocious puberty. Physical examination revealed thelarche.

**Table 1**

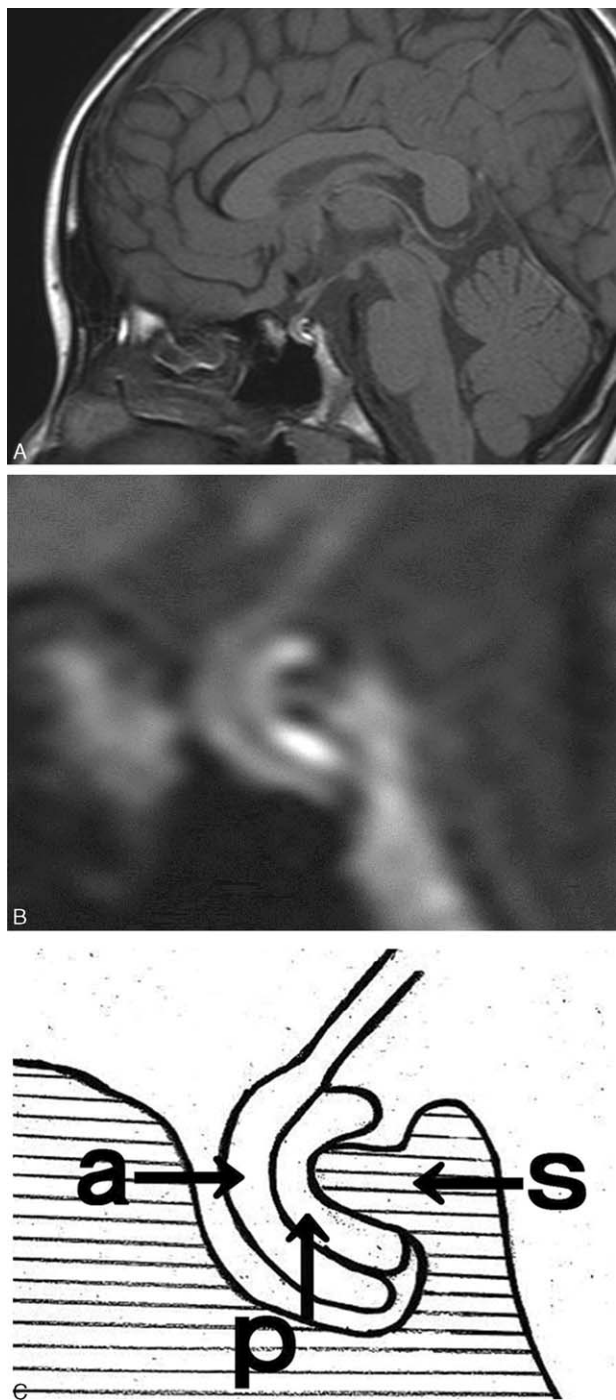
### Laboratory findings.

Resting laboratory findings	Normal range	
LH	0.1 mIU/mL	<5 mIU/mL
FSH	2.7 mIU/mL	<5 mIU/mL
GH	0.28 ng/mL	<5 ng/mL
Prolactin	7.0 ng/mL	<18.6 ng/mL
TSH	1.2 μU/mL	<5 μU/mL
Free-T3	3.9 pg/mL	2.77–5.27 pg/mL
Free-T4	1.33 ng/dL	0.78–2.20 ng/dL

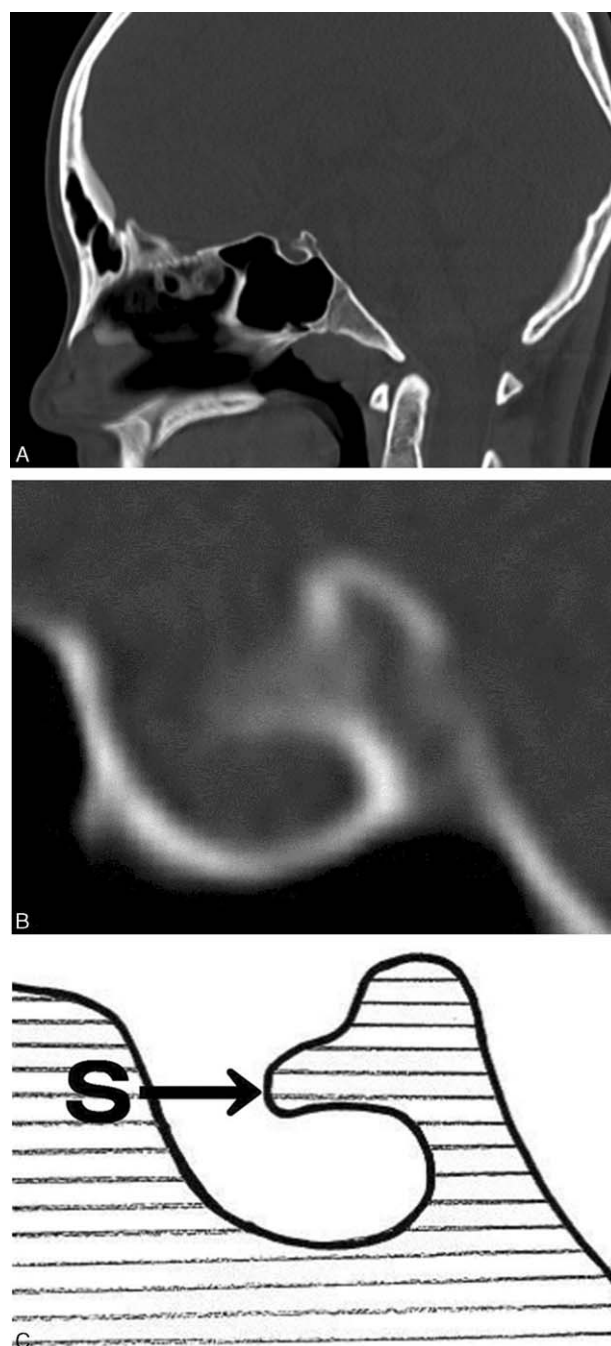
	Baseline	30 min	60 min	90 min	120 min
Result of LH-releasing hormone loading endocrinological test, mIU/mL					
LH	0.1	11.3	10.9	9.4	8.8
FSH	5.0	16.7	23.4	26.7	28.5

Free-T3 = free triiodothyronine, Free-T4 = free thyroxine, FSH = follicle-stimulating hormone, GH = growth hormone, LH = luteinizing hormone, TSH = thyroid-stimulating hormone.

Levels of luteinizing hormone (LH), follicle-stimulating hormone, growth hormone, prolactin, thyroid-stimulating hormone, free-triiodothyronine, and free-thyroxine were within normal ranges.



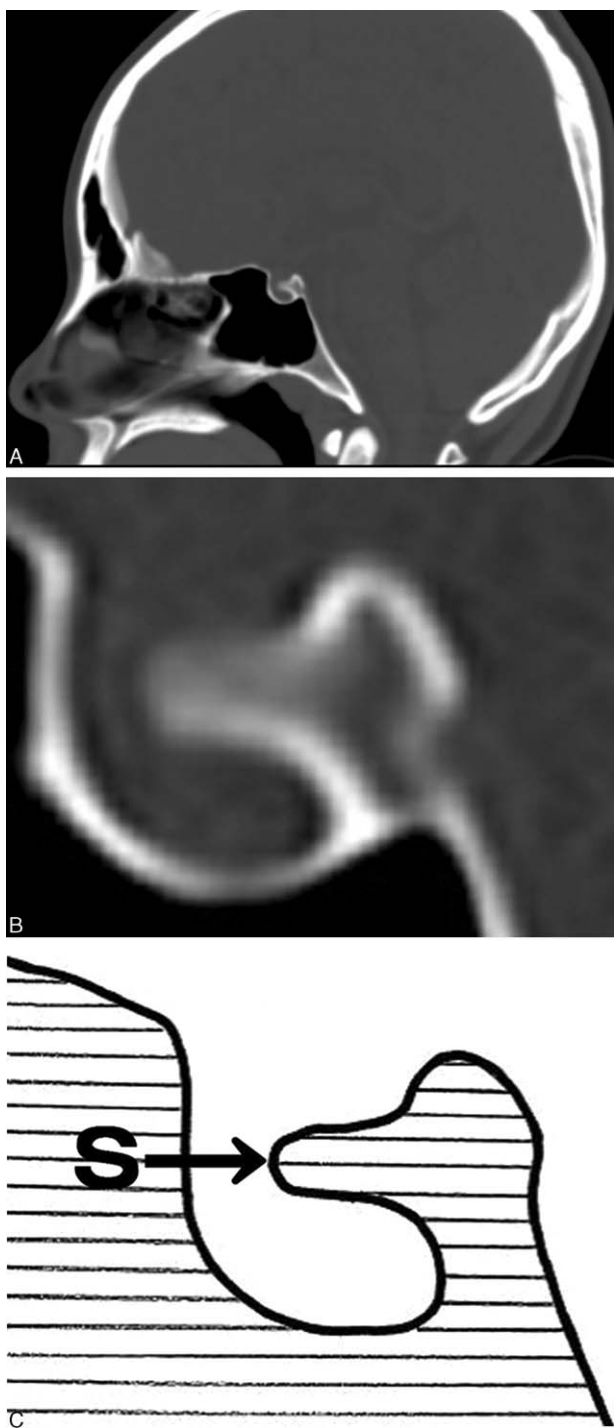
**Figure 1.** (A) Sagittal T1-weighted MRI in an 8-year-old girl with sellar spine; (B) magnification of the sella tunica; and (C) schematic presentation of the MRI findings. T1-weighted MRI was performed on a 1.5-T unit (Phillips Medical Systems, Achieva, the Netherlands) using the following parameters: repetition time = 500 ms, echo time = 18 ms, slice thickness = 3.0 mm, interslice gap = 0.3 mm. The anteriorly facing bony spine arises from the dorsum sellae. The structure has high-signal intensity, similar to the signal intensities of the dorsum and clivus, suggesting the presence of yellow bone marrow. The posterior lobe of the pituitary gland is deformed by the lesion. a = anterior lobe of the pituitary gland, p = posterior lobe of the pituitary gland, s = sellar spine.



**Figure 2.** (A) Sagittal reconstruction of a CT scan at age 9 years; (B) magnification of the sella tunica; and (C) schematic presentation of the CT findings. CT of the pituitary fossa shows a 3.8-mm bony spur arising from the dorsum sellae projecting anteriorly. s = sellar spine.

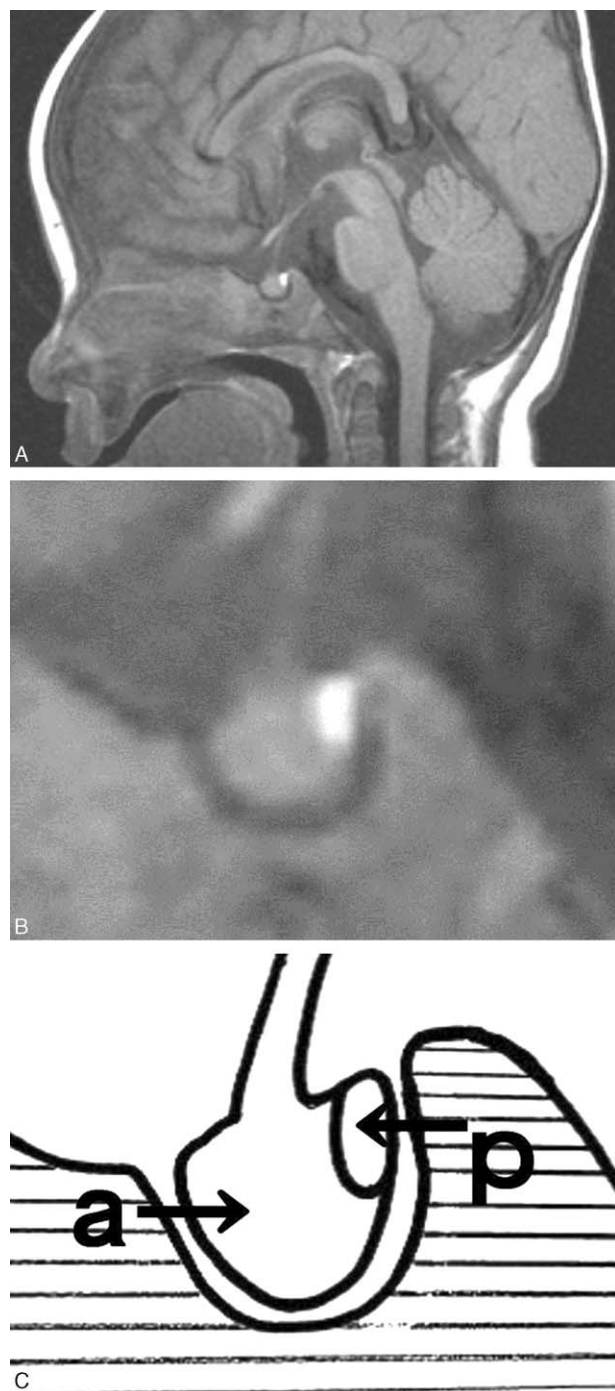
An LH-releasing hormone loading test confirmed early puberty onset (Table 1).

T1-weighted sagittal MRI at 1.5-T showed a high-intensity structure protruding anteriorly from the central portion of the dorsum sellae. The posterior lobe of the pituitary gland was displaced anteriorly by this structure (Fig. 1). Its intensity was identical to that of the bone marrow in the clivus. CT performed when the patient was 9 years old showed a 3.8-mm bony spur protruding anteriorly from the central portion of the dorsum



**Figure 3.** (A) Sagittal reconstruction of a CT scan at age 12 years; (B) magnification of the sella tunica; and (C) schematic presentation of the CT findings. The pituitary fossa has a 4.7-mm bony spur that appeared slightly enlarged compared with the previous examination. s=sellar spine.

sellae (Fig. 2). The location and shape of this structure were indicative of a sellar spine. A repeat investigation when the patient was 12 years old showed that the lesion had slightly enlarged and was 4.7 mm long (Fig. 3). Notably, an MRI that had been performed following a febrile convulsion when the patient was 4 months old had not revealed the sellar spine, and the



**Figure 4.** (A) Sagittal T1-weighted MRI at 4 months of age; (B) magnification of the sella tunica; and (C) schematic presentation of the MRI findings. T1-weighted MRI was performed taken on a 1.5-T unit (SIEMENS and FUJITSU LTD, GBS2 and HOPE/DrABLE2) using the following parameters: repetition time=510ms, echo time=15 ms, slice thickness=4 mm, interslice gap=0.8 mm. The sellar spine was not detected, and the posterior lobe of the pituitary gland was not deformed. a=anterior lobe of the pituitary gland, p=posterior lobe of the pituitary gland.

posterior lobe of the pituitary gland had appeared to be of normal shape then (Fig. 4). Except for the finding of sellar spine, all other encephalons including the hypothalamus and hippocampus were unremarkable on all MRI and CT investigations.

**Table 2**  
**Patient characteristics.**

Age, y	Sex	Chief complaint	Pre-image	Size, modality	Post-image	References
23	M	None	NA	4 mm autopsy	NA	Lang et al <sup>[1]</sup>
4, 30, 50		None	NA	2–5 mm, autopsy/radiograph	NA	Dietmann et al <sup>[2]</sup>
24	F	Irregular menses	NA	5 mm, CT	NA	LaMasters et al <sup>[3]</sup>
12	F	Headache	NA	4 mm, CT/radiograph	NA	Dietmann et al <sup>[4]</sup>
19, 21	F	None	NA	None, MRI/radiograph	NA	Fujisawa et al <sup>[5]</sup>
13	F	Headache	NA	None, CT/MRI	NA	Ambrosetto et al <sup>[6]</sup>
21	F	Galactorrhea	NA	None	NA	Eguchi et al <sup>[7]</sup>
		Oligomenorrhea		CT/MRI		
39	M	Pituitary deficiency	NA	9 mm, CT/MRI/radiograph	NA	Abs et al <sup>[8]</sup>
15	M	Excessive height	NA	4 mm, CT/MRI	NA	Matsumoto et al <sup>[9]</sup>
53	M	Headache	NA	None, MRI/CT	NA	Carpenzano et al <sup>[10]</sup>
16	F	Recurrent syncope	NA	4 mm, CT	NA	Johnston et al <sup>[11]</sup>
8	F	Precocious puberty	Not detected	3.8 mm, MRI/CT	4.7 mm, CT	Present case

CT=computed tomography, MRI=magnetic resonance imaging, NA=not available, Pre-image=images before sellar spine detection, Post-image=images after sellar spine detection. Dietmann et al<sup>[2]</sup> reported 3 cases and Fujisawa et al<sup>[5]</sup> reported 2 cases.

This case report was approved by the ethics committee of our institution (Ethics committee of Saitama Children's Medical Center), and informed consent was waived.

### 3. Discussion

Sellar spine was first described by Lang in 1977.<sup>[1]</sup> Some of the previous case reports<sup>[1–11]</sup> are shown in Table 2, which shows that mean patient age is  $23.3 \pm 12.3$  years, with a range of 12 to 53 years. This excludes one report for which the ages of patients were unavailable.<sup>[2]</sup> The table describes 4 male and 7 female patients (excluding case report<sup>[2]</sup> as the sex is not mentioned). The mean length of the sellar spine is  $5.0 \pm 1.8$  mm (range, 4–9 mm) (excluding case reports<sup>[2,3,7,9]</sup> because exact sellar spine lengths were not mentioned). Previous reports include various ages and chief complaints, as well as more women than men. The present case had typical characteristics of female and sellar spine length.

The etiology of sellar spine is unclear. The case of a 4-year-old boy<sup>[2]</sup> and the MRI findings of sellar spine<sup>[3]</sup> strongly support the theory of an ossified notochordal remnant.<sup>[3]</sup> According to these hypotheses, a sellar spine should be detected due to deformity in the posterior lobe of the pituitary gland at birth. However, although the sellar spine could not be detected at 4 months of age in the present case, the lesion size was measured as 3.3, 3.8, and 4.7 mm on imaging performed at ages 8, 9, and 12 years, respectively. There may be a tendency of linear growth. In this case, the length at 4 months of age would have been approximately 0.6 mm, which is too small to detect on 1.5-T MRI and would not cause posterior pituitary lobe deformation. Although the etiology of sellar spine is unclear, the lesion may resemble an osteochondroma during postnatal growth and exhibit a high signal intensity of yellow bone marrow on T1-weighted MRI.<sup>[12]</sup> Nevertheless, the timing of enlargement and ossification onset remains unclear. Although a 9-mm sellar spine has been detected in a 39-year-old patient,<sup>[6]</sup> the ideal duration of follow-up or when the lesion's growth stops is unclear.

The sellar spine is almost an incidental radiological finding; however, previous cases are reported to be associated with chief complaints such as hypopituitarism<sup>[6]</sup> or galactorrhea/oligomenorrhea.<sup>[9]</sup> Pituitary gland enlargement typically begins at the onset of puberty. In infancy and childhood, the pituitary gland is small relative to the sella tunica, and the sellar spine may be too small to deform the gland. This may be the reason for a paucity of case reports of sellar spine with hypopituitarism in infancy or

childhood. Did the precocious puberty occur in the patient, which led to enlargement of the pituitary, and subsequent pressure effects that led to the detection of the sellar spine.

A sellar spine should be differentiated from other intrasellar calcified lesions. Calcifications have been reported in association with craniopharyngioma, pituitary calculus, chondroma, chordoma, and traumatic damage. A recent report stated that similar spurs can develop after severe fracture of the skull base,<sup>[13]</sup> but our patient had not experienced any traumatic episodes. Patient age and radiological findings can readily distinguish these tumor-like lesions from a sellar spine.

In conclusion, we speculate that the sellar spine may be too small to detect early in development and would grow postnatally. In this case, the sellar spine and precocious puberty were potentially associated due to deformation of the growing pituitary gland.

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