

## Case Report

# Spontaneous regression together with increased calcification of incidental meningioma

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## Abstract

**Background:** Regression of meningioma has been reported after hemorrhage or hormonal withdrawal. However, meningioma regression is rarely observed spontaneously.

**Case Description:** A right falx meningioma was incidentally diagnosed and was followed at every one-year by magnetic resonance imaging (MRI) for over 7 years. The tumor, with a maximum diameter of 4 cm, showed a slightly high density and was enhanced on computed tomography (CT), and a high intensity with a low-intensity core on T2 MRI, with significant edema. The meningioma gradually shrank together with a decrease of edema and increase of calcification. The initial volume, 25.5 cm<sup>3</sup>, regressed linearly to less than half, 9.9 cm<sup>3</sup>.

**Conclusion:** Here, we report a case of an incidentally diagnosed meningioma that regressed spontaneously. The pattern of the regression was similar to that following gamma knife radiosurgery.

**Key Words:** Calcification, incidental, meningioma, regression

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## INTRODUCTION

Regression of meningioma has been reported after hemorrhage or hormonal withdrawal.<sup>[2,4,15,17]</sup> However, meningioma regression is rarely observed spontaneously. Here, we report a case of an incidentally diagnosed meningioma that regressed spontaneously, together with an increase of calcification, based on 7 years of follow-up magnetic resonance imaging (MRI) and computed tomography (CT).

## CASE REPORT

A 66-year-old female patient with an incidentally

diagnosed meningioma was introduced to our hospital. A right falx meningioma with a maximum diameter of 4 cm showed a slightly high density and was enhanced on CT, and a high intensity with a low-intensity core on T2 MRI, with significant edema. There were no neurological deficits nor subjective complaints related to the tumor. She is a carrier of hepatitis C, infected by blood transfusion during surgery for uterine myoma when she was 30 years old. She was diagnosed with diabetes mellitus (DM) at the age of 64 (HbA1c: 7.4%), and treatment with insulin started 18 months before the diagnosis of meningioma. Blood sugar has been poorly controlled (last HbA1c: 8.5%). The meningioma was followed by MRI every year. The size of the tumor

gradually reduced with a decrease of edema and increase of calcification over 7 years. The length, depth, and width were measured by coronal and axial T2-weighted MRI. The initial volume (=length × depth × width × 0.5),<sup>[8]</sup> 25.5 cm<sup>3</sup> (3.8 × 4.2 × 3.2 cm), regressed linearly to less than half, 9.9 cm<sup>3</sup> (2.9 × 3.1 × 2.2 cm) [Figure 1].

## DISCUSSION

The natural history of meningiomas has been studied extensively.<sup>[5,9-12,19]</sup> The follow-up of a total of 381 patients with meningioma for an average of 59 months revealed that the growth rate was between 17.5% and 37%, and the rate of transition to becoming symptomatic was between 0% and 17.5%.<sup>[8]</sup> However, to date, there has been no report of meningioma regressing spontaneously. Tumor regression was clearly evident in the present patient when 7 years had passed.

CT and MRI of the present patient showed a trace of calcification at the beginning of follow-up, and the level of calcification increased gradually. It is well-known that meningiomas not associated with calcification on imaging are more likely to progress than calcified meningiomas.<sup>[5,9,11,12,19]</sup> Only the presence of calcification significantly discriminated between the no-growth and growth groups among the radiological characteristics.<sup>[5]</sup> Nakasu *et al.*<sup>[10]</sup> observed that the tumor growth pattern changed from exponential to linear and from linear to no growth with the progression of calcification. Yamamoto<sup>[18]</sup> reported significant increases in the CT density in 36 (43%) of 83 patients with meningioma 3-11 years after gamma knife radiosurgery (GKRS). In most patients, density increases occurred related to tumor shrinkage. The pattern of the shrinkage in

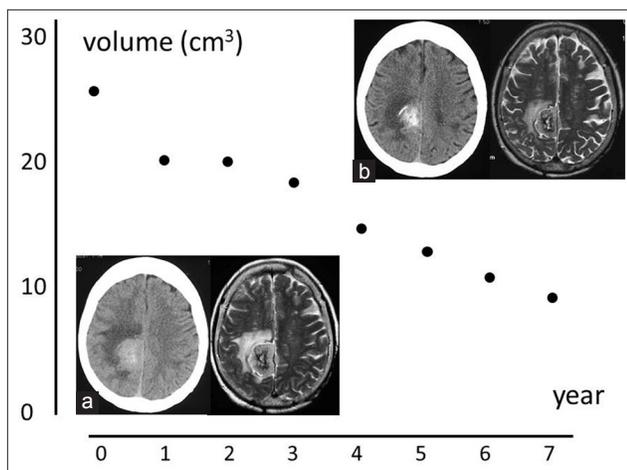
the present patient is similar to that following GKRS. The mechanism of calcification, however, remains poorly understood. There are a few studies about psammoma bodies, a distinctive pattern of calcification in meningioma. Psammoma bodies represent a process of dystrophic calcification, in which deposition occurs locally in nonviable or dying tissues with normal serum levels of calcium and in the absence of derangements in calcium metabolism.<sup>[1]</sup>

The etiology of peritumoral brain edema associated with meningiomas is multifactorial.<sup>[7]</sup> Factors that may influence the etiology of peritumoral edema include the tumor size, histological subtypes, vascularity, venous stasis, and brain invasion. Edema in the present patient may decrease with tumor size reduction.

It has been reported that almost all types of malignant tumors can regress spontaneously, although some histological types regress more frequently than others. The processes involved in the spontaneous regression are mainly related to the process of apoptosis and activity of the immune system, as well as to conditions in the tumor microenvironment. Such processes are occasionally linked more or less directly to oncogenic suppressors of DNA.<sup>[14]</sup> The mechanism of regression in benign tumors may not be the same as that of malignant tumors. Compared with meningioma, spontaneous reduction of nonfunctioning pituitary adenoma was observed more frequently, in 29%. Some of them were related to pituitary apoplexy.<sup>[3]</sup> Huang *et al.*<sup>[6]</sup> recently reported that 4% of sporadic vestibular schwannomas shrank spontaneously over a mean follow-up period of 9.5 years, and suggested the aging process as an etiological factor. To date, there have been no reports showing the relationship between the etiology of tumor regression and calcification.

Insulin treatment was started 18 months before and continued during the follow-up period. Insulin is a hormone that plays a key role in the regulation of blood glucose levels, and a number of roles and functions in metabolism and cell growth.<sup>[13]</sup> We could not rule out an association between tumor regression and insulin, although insulin has generally been reported to promote tumor progression.<sup>[13]</sup> A more probable cause of the regression may be uncontrolled DM. Medial arterial calcification is most commonly observed in the distal arteries of patients with DM and end-stage renal failure or at an advanced age. Recently, it was reported that glucose plays an important role in amplifying the osteogenesis induced by elastin peptides and transforming growth factor-beta 1.<sup>[16]</sup> The tumor regression in the present patient may be due to the calcification of tumor cells promoted by a high glucose level.

Follow-up periods of meningioma patient in the literature are mostly within 5 years.<sup>[5,9,10,12]</sup> The regression of meningioma may not be uncommon over a long period



**Figure 1:** The length, depth, and width were measured at every one-year follow-up MRI. The initial tumor volume, 25.5 cm<sup>3</sup> (3.8 × 4.2 × 3.2 cm), regressed linearly to less than half, 9.9 cm<sup>3</sup> (2.9 × 3.1 × 2.2 cm). The right falx meningioma with calcification and surrounding edema (a) reduced in size, with less edema, along with an increase of calcification on CT and MRI over 7 years (b)

of time, and it would be beneficial for the mechanisms and factors related to spontaneous regression to be clarified.

## CONCLUSION

Here, we report a case of an incidentally diagnosed meningioma that regressed spontaneously. The pattern of the regression was similar to that following GKRS.

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