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**A rare case of malignant nonfunctional retroperitoneal paraganglioma with C3
spinous process metastasis**

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A 39-year-old man was admitted to our department with a 5-month history of a stiff
neck and pain in the cervical spine. The physical examination demonstrated mild

tenderness and percussion pain on the back of the neck, normal sensation and strength of limbs, decreased sensation in the right shoulder, intact range of motion of the cervical spine, and no Hoffmann's sign. Lateral plain radiography and 3D-CT of the cervical spine showed destruction of the C3 spinous process, vertebral plate, and left lateral mass (Fig. 1A, B). Contrast-enhanced T1-weighted MRI showed an elliptical occupying lesion with high signal intensity at the C3 and C4 appendix region (Fig. 1C). CT angiography of the cervical arteries showed intact carotid and vertebral arteries that had no signs of tumor invasion (Fig. 1D). Blood pressure was normal. The patient underwent debridement, decompression, bone graft fusion, and fixation (Fig. 1E). His blood pressure had no obvious fluctuations intraoperatively. Postoperatively, the cervical pain and the decreased sensation in the right shoulder were obviously relieved. Histopathological examination showed that the tumor was a paraganglioma. Three months later, a retroperitoneal 10×7×5 cm phyma was found accidentally during abdominal CT evaluation. Postoperative pathology verified that the retroperitoneal tumor was paraganglioma. Six months later, he again complained of a stiff neck. Coronal plane 3D-CT showed increasing destruction of C3 and a left lateral mass. The left C3 pedicle and partial vertebral body were also invaded (Fig. 1F). It was suggested that the patient undergo radiotherapy.

We thought that the cervical appendix tumor was the origin of the retroperitoneal paraganglioma. Paragangliomas are usually defined as tumors arising from an extra-adrenal paraganglion [1]. They are mostly benign and are accompanied by catecholamine hypersecretion [2]. To our knowledge, however, malignant nonfunctional retroperitoneal paraganglioma with C3 spinous process metastasis is rare.

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2 **References**

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9 **Figure legends**

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11 Fig.1 Lateral plain radiography of cervical spine showed the extensive destruction of
12 C3 appendix (white arrow). **(A)** CT imaging scan showed the destruction of C3
13 spinous process, vertebral plate, and left lateral mass and an elliptical soft tissue
14 shadow intruding into the vertebral canal instead of the C3 spinous process (white
15 arrow). **(B)** Contrast-enhanced T1-weighted sequence MRI showed the lesion with
16 high signal intruded into the cervical spinal canal, and the spinal cord was pushed to
17 the right. **(C)** CT angiography of cervical arteries showed intact arteria carotid and
18 vertebral artery. **(D)** Postoperative radiography of cervical spine showed C2-5 were
19 fixed. **(E)** Coronal plane of 3D-CT 6 months after surgery showed increasing
20 destruction of C3 left lateral mass. The left C3 pedicle and partial vertebral body were
21 also invaded. **(F)**

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