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Case Report and Review of the Literature

Ganglioneuroma and Its Very Rare Localisation: A Case Report and Review of the Literature

Jan Hemza*

Department of Neurosurgery, Saint Ann Faculty Hospital, Czech Republic

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ABSTRACT

Ganglioneuroma is a very rare benign tumor growing from the vegetative, autonomic nervous system. It grows from the central or peripheral part. We describe cervical ganglioneuroma in a 38-year-old man growing in the C7/Th1 foramen area on the right before the fibers enter the ganglion stellatum. It is a non-dumbbell shaped tumor growing between ganglion stellatum and ganglion cervicale. Treatment is resection with total tumor excess. Complete surgical resection is a very effective therapy. The relapse of the tumor is not described in literature studies. Similar type of this case has been described only once in literature and reviewed from anglophone literature, which is selected with the exclusion of neurofibromatosis and with localization in the neck area [1].

Introduction

Ganglioneuroma is a very rare benign tumor growing from the vegetative, autonomic nervous system [2, 3]. It grows from the central or peripheral part. The most common localization is in the area of the posterior mediastinum, retroperitoneum, and from the adrenal glands; more rarely, it is located in the cervical area [3, 4]. From the literature, 1-5% of patients with a tumor in the neck area are presented [3, 5]. More often, it is localized in the neck area by growth from the peripheral part of the autonomous system and from areas exiting the truncus sympathicus, ganglia of the peripheral system, more at the distance of rami communicantes grisei than from preganglion's fibers – rami communicantes albi. In the cervical region, 34 cases were reported, of which 19 were in adults, 10 men and 9 women. In the area of foramen type, dumbbell shaped tumor found only in 2 cases and in the area of the upper cervical spine, only one case was found in the root area 8 [1].

Case Presentation

We describe cervical ganglioneuroma in a 38-year-old man growing in the C7/Th1 foramen area on the right before the fibers enter the ganglion stellatum. It is a non-dumbbell shaped tumor growing between ganglion stellatum and ganglion cervicale. The patient observed about 4 years of algoparesthesia on the ulnar side of the forearm, the pinky edge of the hand and the 4th and 5th fingers of the right hand. These were gradually worsening the problem. MRI performed with contrast substance, where expansion in the foramen intervertebrale C7/Th1 on the right, i.e. root C8, was detected (Figure 1). Furthermore, electrophysiological examination without signs of acute or distinct chronic lesion in the distribution of C7-Th1 roots on the right. The basic diagnosis was neurinoma or neurofibroma. The patient's medical history was unobserved only after arthroscopy of both knees. In 2008, the patient was randomly examined for a foreign body of the right eye, which was removed instantly, a wider pupil to the right, which the patient did not notice. The examination of eyesight shows following findings: right eye under the upper eyelid of the foreign body, which was removed, cornea intact, intraocularly calm, papillae round, bounded, in niveau, with physiological excretion, retina without bearing changes, left eye anterior segment intact, papilla intact, with physiological excrement, pupil: pronounced anisocoria to the right wider, on the right eye the ocular reacts only very roundly to the light, noticeable on the slit lamp rather than with the naked eye, a pronounced reaction to convergence, on the right eye difficult to read, apparently a lack of accommodation. The conclusion of an anisocoria of unclear etiology from the eye point of

**Correspondence to: Jan Hemza, M.D., Ph.D. (Biomech.), Ph.D. (NSc.), M.P.A., DWFNS, Department of Neurosurgery, Saint Ann Faculty Hospital, Pekarska 53, 56591 Brno, Czech Republic; Tel: 00420724221190; E-mail: jan.hemza@fnusa.cz*

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view is most likely pulpitonia of the right eye. These were examined neurologically without pathological findings, except for the one on the right. Gradually, the disability was adjusted. In 2015, the findings were already in the norm. Genetic testing ruled out neurofibromatosis.

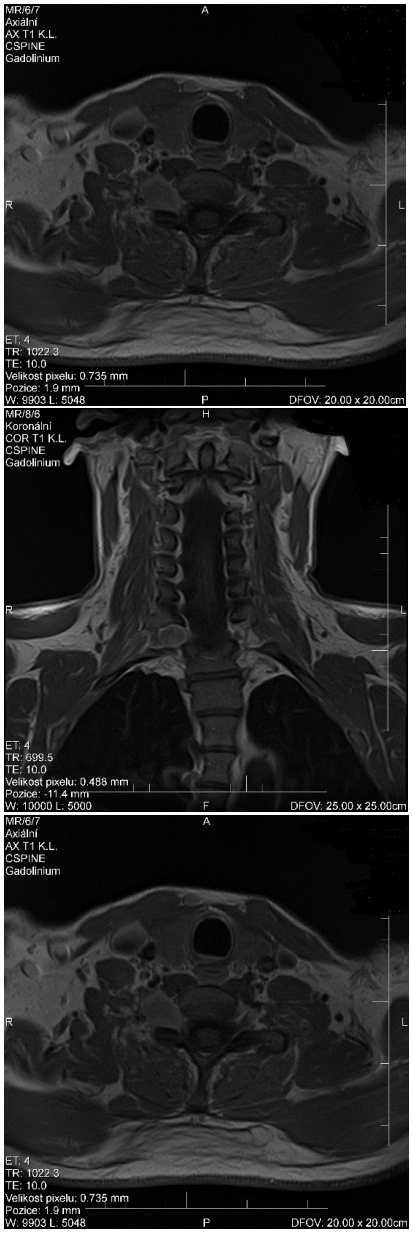

Figure 1: Preoperative MRI, 2015y.

Surgery was indicated as a definitive solution and to determine the histological classification of the tumor. The operation was performed by anterolateral approach through the lateral corridor from the carotid-jugular bundle with the release of ventro-medial-lying ganglion stellatum transforaminally. In the foramen, we evaporate our own tumor from the nerve root, which we preserve and dorso-medially preserve even our own root ganglion on the back portion of the root. After resection, the histological finding shows connective pseudocapsule bound tumor infiltration consisting of structures of a differentiated Schwannian stroma (S100+, GFAP-, EMA focally weakly positive) and mature voluminous graduated ganglia cells (synaptophysin+, NSE+, NeuN+/-), bearing granular rusty brown pigment in the cytoplasm. Satellite cells are found on the periphery of some ganglia cells. Stromata structures are graduated with bland morphology and without conclusive mitotic activity. Proliferation activity as measured by the Ki67 index below 1%.

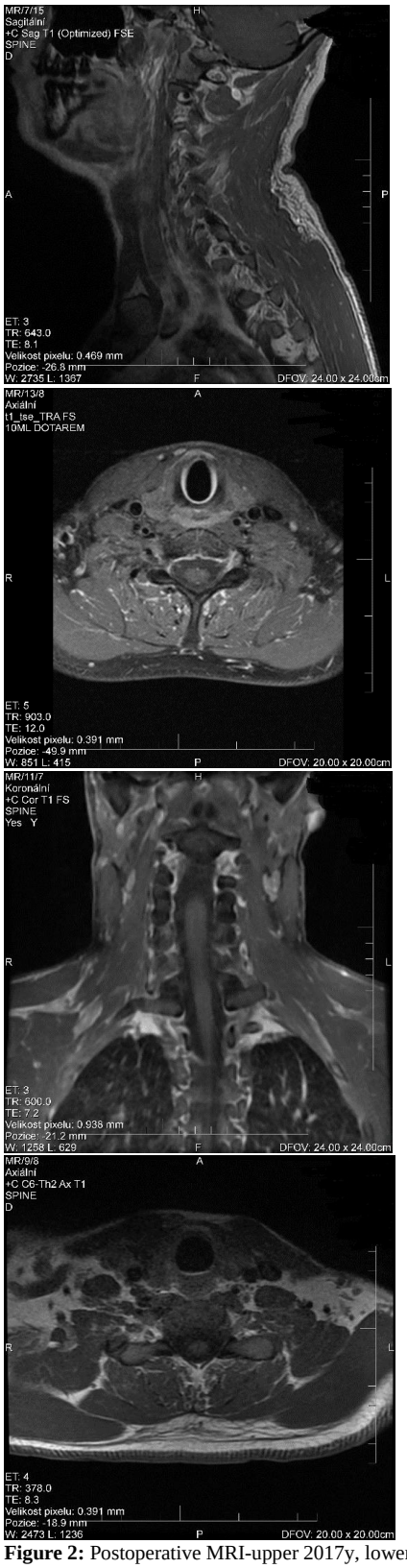

Figure 2: Postoperative MRI-upper 2017y, lower 2019y.

In conclusion compatibility is found with dg. ganglioneuroma, graduated; v.s. from the structures of cervical sympathetic ganglia - necessary clinical-pathological correlation. MKN: D361 MKN-O: M-9490/0. After resection, a slight disorder of the sensuality in the area of the pinky edge of the right hand, which over time regressed. A pupil is found without any pathological findings. The patient was monitored by regular MRI examination about 2021 with negative MRI findings (Figures 2 & 3).

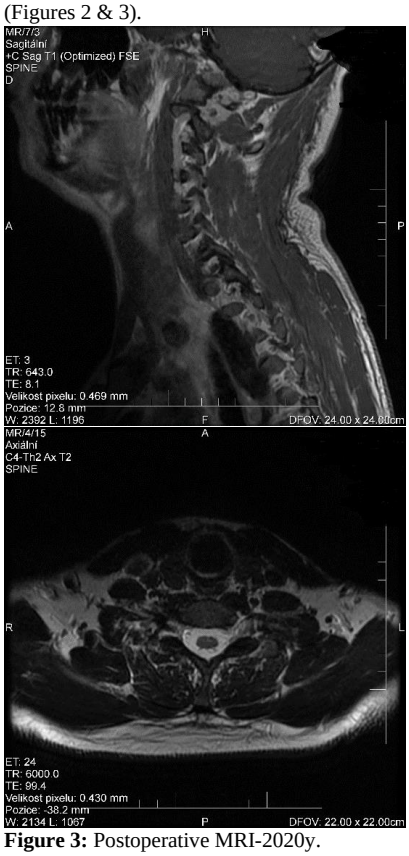

Figure 3: Postoperative MRI-2020y.

Discussion

Ganglioneuroma is a slow-growing, well-differentiated tumor in the autonomic nervous system and is often asymptomatic. Clinically manifested by local symptoms from obstruction, some patients may have diarrhea, hypertension, virilization, and myasthenia gravis [3, 6]. Ganglioneuroma has a typical location in the thoracic cavity (60-80%, posterior mediastinum), abdominal cavity (10-15%, retroperitoneum, adrenal glands, pelvic area, sacral and coccyx sympathetic ganglia, and Zuckerkandl organ) and cervical region (1-5%) [3, 7, 8]. Other minor localizations are the middle ear, parapharynx, skin, orbit, and gastrointestinal tract [3, 9-11]. The case of the primary brain tumor is associated with arterial malformation, Fallot's tetralogy. Fallot's tetralogy is associated with other syndromes such as Di George syndrome and velocardiofacial syndrome [3]. Ganglioneuromas are fully differentiated neuronal tumors that do not contain immature elements and potentially occur anywhere along with the peripheral autonomic ganglion sites. On imaging, usually, they present as well-defined solid masses and can be quite large at presentation. Generally, they are hypoattenuating to muscle on CT and have a heterogeneous intermediate signal on both T1 and T2-weighted MRI sequences. Contrast enhancement ranges from none to heterogeneous enhancement. Calcification may be present in less than a quarter of cases. Ganglioneuromas tend to occur in the pediatric population and are often asymptomatic. At the time of diagnosis, 60% of patients are under the age of 20 years. The median age at diagnosis is 7 years, and there is a slight female predominance. Ganglioneuromas are usually asymptomatic and often discovered incidentally as they are slow-growing and usually endocrinologically inactive.

Like neuroblastomas (Link 1) and ganglioneuroblastomas, ganglioneuromas are derived from the primordial neural crest cells that form the sympathetic nervous system. Pathologically, they are composed of ganglion cells, Schwann cells and fibrous tissue. They do not contain neuroblasts, intermediate cells, or mitotic figures and necrosis is not a feature. Intradural extramedullary ganglioneuromas have been reported but are extremely rare. Ganglioneuromas may occur de novo or may arise from maturing neuroblastomas and ganglioneuroblastomas [12]. Exclusion criteria for literature studies are:

i. Neurofibromatosis
ii. Irrelevant to our localization, localization only in the neck area
iii. Duplicated data

34 cases were found in 26 articles [1, 13-38]. Clinical data are summarised in (Table 1). All tumors were reported without metabolic activity. The proportion of adults and children is 56%: 44%. In adults, the proportion of men and women is 52%: 48%. Postoperative complications were most commonly Horner's syndrome in 8 cases; one patient had only median left-sided ptosis of the eyelid and one child of myosis. In one case, there was postoperative vocal cord paresis. In one case, tetraparesis persisted, and in one hemiparesis. One case was similar to our ganglioneuroma case in the C8 root area with the same postoperative finding of transient sensitivity [1]. Imageology is an important helper in preoperative planning. The MRI informs us about the size, localization, composition of the mass and relations to the surrounding structures. On the MRI, it is a well-bounded, predominantly oval mass and in the case of an hourglass-type mass, the shape is of an hourglass. In the case of localization in the foramen, a CT is found to reduce bone structure and enlarge the form. On MRI, there are high-intensity tumors in T2W1 and is enhanced after administration of the contrast agent.

Table 1: Clinical-pathological findings of cervical ganglioneuromas in the literature.

Case	Age/Gender	Size, cm	Side and localisation	Complication	Follow-up, mo
Strang (1962) [13]	63/F	3.0x1.0-2.0	Posterior root C2-C4	Some improvement of weakness	NED (4)
Ugarriza (2001) [14]	53/M	NA	C1-2 level bilat.	Tetraparesis, respiratory problems	NED (6)
Friedlander (2002) [15]	28/M	4.0x2.0x4.3	Carotid space/left	NA	NA
Leonardis (2003) [16]	50/M	10.0x6.8x4.0	Adjacent to the thyroid gland./left	A mild left palpebral ptosis	NA
Cannady (2005) [17]	6/F	4.0x3.3x8.3	Carotid space/right	None	NED (12)

	7	NA	Carotid space /right	None	NA
Radulovi (2005) [18]	39/M	NA	C4-5 dumbbell shape/ left	Tetraparesis	NA
Uchida (2007) [1]	38/M	NA	C8 solitary/NA	None	NA
Zhang (2008) [19]	6/M	4.0x3.0	Upper neck/left	None	NED
	62/F	8.0x4.0	Upper neck/left	None	NED
	57/F	8.0x7.0	Neck/ right	None	NED
	9/M	4.0x2.0	Neck/bilateral	None	NED
	53/F	4.0x4.0	Upper neck /right	None	NED
Bisakhiya (2008) [20]	22/M	2.0x2.5x3.0	Carotid space/left	Horner´s syndrome	NA
De Bernardi (2008) [21]	2/M	NA	Carotid space/left	Horner´s syndrome	NED (130)
Pucci (2009) [22]	25/F	4.7x2.2x3.0	Carotid space/right	Horner´s syndrome	NA
Cavanaugh (2010) [23]	41/M	NA	Carotid space/left	Horner´s syndrome	NA
Kolte (2011) [24]	8/F	5.0x4.0x3.0	Neck/left	NA	NA
Mahajan (2011) [25]	7/M	7.0x5.5x5.0	Upper neck/left	NA	NA
Ma (2012) [26]	4/F	10.0x6.4x5.7	Prevertebral region/right	Myosis in the right eye	NED (18)
		4.1x2.6x5.0	Paravertebral region/right		
González-Aguado (2012) [27]	41/F	NA	Neck/right	Horner´s syndrome	NA
Ramani (2013) [28]	5/F	5.0x4.5x3.0	Below angle of mandible/left	None	NA
Bhadarge (2014) [29]	11/F	10.0x5.5x4.0	Sternocleidomastoid muscle region/left	None	NA
Jabbour (2015) [30]	53/M	3.2x2.5x2.2	Submandibular/left	None	NED (10)
Spinelli (2015) [31]	26/F	NA	Neck	None	NED (96)
	37/F	NA	Neck	None	NED (84)
Dutta (2016) [32]	1.5/M	3.0x2.0	Upper neck/left	NA	NA
Dalmia (2016) [33]	25/M	5.0x3.0	Carotid space/left	Left vocal cord palsy	NA
Fialova (2016) [34]	26/F	4.6x2.4x1.4	Adjacent to the thyroid gland./left	Horner´s syndrome	NA
Paraskevopoulos (2017) [35]	17/F	4.0x2.5x1.0	Carotid space/left	None	NA
Kiflu (2017) [36]	7/F	5.0x7.0x3.0	Paravertebral space/left	Horner´s syndrome	NA
Misagh (2017) [37]	23/M	NA	C1-2 dumbbell shape/ left	Hemiparesis	NA
Helal (2018) [38]	10/F	15.0x6.0x5.0	Sternocleidomastoid muscle region /left	None	NED (12)
Xu (2019) [3]	12/M	4.6x1.7x1.6	Carotid space/left	Horner´s syndrome	NED (8)
Can (2019) [39]	32/F	NA	Parapharyngeal space/left	Horner´s syndrome	NED (6)
Our (2021)	38/M	2.5x1.2x1.3	C8 solitary/right	None	NED (144)

F: Female; M: Male; NA: Not Application; NED: No Evidence of Disease.

Macroscopic tumor is often a well-bounded tumor. In our case, in microscopic surgery, it was possible to distinguish ganglion stellatum medially from the tumor, and then ganglion root C8, which was oppressed dorsally and, in the media, and grew probably from preganglion's fibers rami comunicantes albi. Microscopic tumor is composed of intersecting bundle of spindle cells, loose myxoid stroma, and dysplastic ganglion cells. The most common characteristic feature is the presence of mature ganglion cells with positive for S-100 protein in most cases. The treatment is resection with total tumor excess. Complete surgical resection is a very effective therapy. The relapse of the tumor is not described in literature studies.

Conclusion

The treatment is resection with total tumor excess. The best surgical technique is microscopic technique. Complete surgical resection is a very effective therapy. The relapse of the tumor is not described in literature studies.

Conflicts of Interest

None.

Ethical Approval

Not applicable.

Consent

The patient gave informed consent before being included in this report.

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