ORAL PRESENTATIONS

Eagle jugular syndrome: A morphometric computed study on styloid process orientation

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Background

Cerebral venous drainage impairment is related to a wide spectrum of pathologies, both acute or chronic. Among the most intriguing and less explained there are those caused by a long-lasting compression on internal jugular vein (IJV), mono or bilaterally. Recently, a jugular variant of the Eagle syndrome has been described,[1,2] in which an elongated styloid process, coming from the mastoid tip down through the neck, compresses the IJV (more frequently J3) in its passage on the C1 anterior arch. Interestingly, those patients often complaint of typical symptoms of intracranial hypertension, such as headache (not frequent in classic Eagle syndrome), tinnitus, dizziness. They also seem to have an increased risk of perimesencephalic hemorrhages. Conceptually, it is not the styloid process length in itself to determine the compression, but rather its spatial orientation. We could therefore expect to find patients suffering from Eagle jugular syndrome who present normal or short styloid process, but in close proximity to C1. To test this hypothesis, we are developing a novel software to analyze 3-D spatial orientation of styloid process in patient with a previously diagnosed Eagle jugular syndrome compared to healthy controls.

Methods

We collected cervical computed tomography angiography (CTA) images from 8 patients with EJS confirmed by venous angiography at our institution, and a control group of 7 random patients, homogenous for sex and age. A blind operator created with a dedicated pre-existing software[3], an editable 3-D model (.stl file) of the 3 main region of interest (ROI), namely: right styloid, left styloid, C1 anterior arch. Starting from this dataset, our software, written using the open-source package management system Anaconda[4] ver. 2-2.4.0, compares all the possible couples of points between each styloid process and the C1 arch, detecting the minimum and maximum distance. Then, it provides the mean spatial orientation of the process respect the CT-axis: x-axis (from left to right), y-axis (from occiput to nose) and z-axis (cranio-caudal).

Results

By now we included 15 patients (8 cases, 7 controls), homogeneous for sex and age. Preliminary data (Table 1), although not statistically significant yet, seems to indicate that Eagle jugular patients effectively have a more vertical styloid process, meaning an angle between styloid and y-axis greater than controls, rather than a longer one.

Conclusions

Our preliminary results could confirm that spatial orientation is more important in Eagle jugular patients than styloid process length. This study is currently ongoing and we planned to enroll at least 20 subjects for

Table 1. Preliminary data results.

Variables	Overall sample (n=15)	Eagle syndrome (n=8)	No Eagle syndrome (n=7)	p-value *
Right styloid-C1 process (mm):				
- Minimum distance, mean (SD)	7.32 (2.89)	7.36 (3.39)	7.28 (2.47)	0.9
- Maximum distance, mean (SD)	87.0 (6.47)	87.8 (7.31)	86.1 (5.78)	0.6
- Average distance, mean (SD)	45.8 (2.75)	45.4 (2.25)	46.2 (3.37)	0.6
Right-left styloid processes:				
- Minimum distance, mean (SD)	63.5 (12.8)	66.6 (4.94)	59.8 (18.1)	0.3
- Maximum distance, mean (SD)	89.6 (7.07)	90.6 (8.45)	88.4 (5.48)	0.6
- Average distance, mean (SD)	77.6 (3.93)	78.2 (3.16)	76.9 (4.83)	0.5
Left styloid -C1 process:				
- Minimum distance, mean (SD)	8.74 (3.06)	8.70 (3.64)	8.79 (2.59)	0.9
- Maximum distance, mean (SD)	86.9 (6.89)	87.2 (9.06)	86.6 (3.78)	0.9
- Average distance, mean (SD)	44.6 (2.90)	45.0 (2.76)	44.2 (3.20)	0.6
Right styloid-angle:				
- x-axis, mean (SD)	100.9 (11.6)	99.9 (14.8)	102.0 (7.37)	0.7
- y-axis, mean (SD)	72.6 (16.9)	78.3 (20.8)	66.1 (8.15)	0.2
- z-axis, mean (SD)	27.9 (9.02)	28.0 (8.31)	27.7 (10.4)	0.9
Left styloid-angle:				
- x-axis, mean (SD)	79.2 (12.3)	82.3 (15.4)	75.6 (6.70)	0.3
- y-axis, mean (SD)	75.3 (18.6)	83.7 (21.2)	65.7 (8.97)	0.06
- z-axis, mean (SD)	27.4 (8.96)	25.7 (8.42)	29.4 (9.79)	0.4

* Kruskal-Wallis test; SD, standard deviation.

each arm. At the same time, we are collecting data from patients with carotic variant of Eagle syndrome, to better characterize morphometric structure of styloid in various subset of this pathology.

References

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