



The Effect of Age and Sex on Volume and Fractional Anisotropy Values of the Trigeminal Nerve in Healthy Young Adults

Eduardo Rocha Arruda¹, Carlos Ernesto Garrido Salmon^{2,3}, Hohana Gabriela Konell⁴, Antonio Carlos dos Santos³

¹Faculdade de Medicina de Ribeirão Preto, Universidade de São Paulo – FMRP-USP

²Departamento de Física, Faculdade de Filosofia Ciências e Letras de Ribeirão Preto, Universidade de São Paulo – FFCLRP-USP

³Departamento de Imagens Médicas, Hematologia e Oncologia Clínica, Faculdade de Medicina de Ribeirão Preto, Universidade de São Paulo – FMRP-USP

⁴Centro de Ciências da Imagem e Física, Departamento de Imagens Médicas, Hematologia e Oncologia Clínica, Faculdade de Medicina de Ribeirão Preto, Universidade de São Paulo – FMRP-USP

Introduction

Some chronic orofacial pain diseases have a well-defined etiology, such as classic trigeminal nerve (TN) neuralgia. However, in idiopathic neuralgia, symptoms suggest problems directly in the TN. Studies that evaluate the volume in different regions of interest (ROIs) of the TN in healthy young adults (HYA) contribute to defining a standard of normality, being scarce in the current literature. Additionally, Diffusion Tensor Imaging (DTI) allows white matter integrity to be assessed using diffusion metrics such as fractional anisotropy (FA).

Objective

To evaluate the absolute volume (AV), determine the relationship AV/total brain size (RV), in different ROIs of the TN in HYA. Check the effect of AV, RV, age and sex on FA values in a General Linear Model (GLM).

Method

Structural and diffusion MRI data from 300 HYA, 150 men and 150 women (22 to 35 years old), were obtained from the Human Connectome Project (HCP) database, separated into 3 groups considering age and sex. T1w images were used for bilateral marking of the ROIs: total NT, root entry zone, middle portion of the cistern and Merckel's cave. Marking of ROIs, maps and calculation of FA, VA of ROIs and brain size were done using MRTrix3 software. The results were analyzed using the Kurskal-Wallis test ($p < 0.05$) and correlations using GLM.

Results

The effects of sex on AV (male > female) disappear considering RV in relation to total brain size, except for the total volume of the right NT where the effect of larger AV persists in men, regardless of age. In relation to age: in the right Cistern we have an increase and reduction in AV and RV; in Root we have bilateral reduction of AV and RV; in the cave on the right we increase AV and RV. The GLM showed that the variation in FA values is explained by the effect of AV and sex, with the effect of sex being stronger for the model.

Conclusion

AV and FA values are more affected by sex. There is spatial heterogeneity in relation to the evolution of volume with age, affecting more the right side.