

Morphometric evaluation of crista galli

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Abstract

Introduction and Objectives: Crista galli is a large triangular midline process arising from the surface of the cribriform plate anchoring the falx cerebri in the cranial cavity. Presenting with severe frontal headaches, sinusitis involving the pneumatized CG shows little response to drug therapy necessitating endoscopic surgical treatment. However, there is a paucity of literature on the same. Thus study aims to describe the anatomic characteristics and variations of the Crista galli as well as the factors which affect its pneumatization which, may guide clinical decision making and management. **Materials and Methodology:** Restrospective analysis of 500 Non contrast CT scans of the brian acquired on 16 slice GE light speed CT scanner between October 2014 and January 2015 was done .We observed height, position relative to the cribriform plate, degree of pneumatization, and cell of origin for the pneumatization in CG. We also analysed the relationship between several factors (age, sex, and position of CG) and pneumatization of CG. **Results and Conclusion:** Mean age of our study population was 46.9 yrs \pm 20.5 years. Study subjects were divided into two categories i.e. <18 yrs and > 18 years of age. Type 1 crista galli was the most common type in our study(58.7%) followed by type 2 and type 3 with frequencies of 38.1% and 3.2% respectively. 14.9% of type 1,22.5 % of type 2 and 25 % of type 3 were pneumatized. If pneumatized, most commonly it is an extension of right frontal (n=46) or left frontal sinuses. (n=43) **Keywords:** crista galli.

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INTRODUCTION

CT Scanning has over many decades revealed pneumatization of numerous facial bones which are well known to the radiologist and the rhinologist alike. The Crista Galli (CG) is an embryological derivative of the ethmoid bone which arises from the midline of the cribriform plate¹ Very few reports however exist in literature that recognized the pneumatization of this small midline structure. Its Pneumatization has been reported in literature with incidence ranging from 2.8% to 14.1%² Two theories are proposed for the process of its pneumatization depending on its cell of origin. Displacement of ethmoid air cells into the crista galli is one proposed theory, the other being extensive aeration

beyond the normal margin of the frontal sinus when the pneumatized crista galli is continuous with the same.³ The importance of recognizing the pneumatization lies in the fact that when inflammation or an infective process is present within the mucosal lining of a pneumatized crista galli,, antibiotic treatment rarely suffices. Thus reports like that of Socher *et al*³ showed that endoscopic sinus surgery was required to relieve the patients symptoms. The objective of this study was to investigate the anatomical dimensions and variations of the Crista Galli and the factors which affect its pneumatization.

MATERIALS AND METHODS

The study was a retrospective analysis of 501 Non contrast CT scans of the head and paranasal sinuses, with multiplanar reformations of patients from Father Muller Medical college, Mangalore, India. Independent assessment of all the Images were performed by three radiologists and difference of opinion was resolved by consenses. All CT scans were acquired on a 16 slice GE light speed CT scanner between October 2014 and January 2015. We observed height of crista Galli, position relative to the cribriform plate, degree of pneumatization, and cell of origin for the pneumatization in CG. We also analysed the association of demographic factors and the position of CG with pneumatization of the

same. The position of the Crista galli was evaluated according to Hajjioannou's method² and categorized into three grades according to the location related to the cribriform plate:

- Type I: base of the Crista galli is located at the level of the cribriform plate.
- Type II: less than 50% of the height of the Crista galli is located below the level of the cribriform plate.
- Type III: greater than 50% of the height of the Crista galli is located below the level of the cribriform plate.

Statistical Analysis

Statistical analysis of our data was performed using SPSS software (version 16; SPSS Inc, Chicago, Illinois). Variations in the rate of pneumatization of Crista galli with age, sex, and type of Crista galli were analyzed by using Chi square test. *P* values < 0.05 were considered statistically significant.

RESULTS

Mean age of our study population was 46.9 yrs \pm 20.5 years ranging from 1 year to 92 year. Study subjects were divided into two age categories i.e. <18 yrs and > 18 years of age. Male to female ratio in our study was 1.7:1. Mean height of crista Galli in our study was 15.1 \pm 2.9 mm and ranged from 7.5 to 26.9 mm. Type 1 crista galli was the most common type in our study (58.7%) followed by type 2 and type 3 with frequencies of 38.1% and 3.2% respectively. Type 1 CG was the most common type in both males and females. Only 18.16% of all CG were pneumatized with 14.9% of type 1, 22.5 % of type 2 and 25 % of type 3 showing evidence of pneumatization on CT. ANOVA test showed no significant difference in the pneumatization status with respect to the type of CG. In the under 18 age group category 3.3% were pneumatized (n=2/60) while in the over 18 age group category 19.73% were pneumatized thus proving a statistically significant difference in pneumatization with respect to age. (p<0.05) When pneumatized, the CG was most commonly an extension of the right frontal sinus (n=46) followed by the left frontal sinus (n=43). 2 cases showed communication with the right front ethmoid recess which is considered a part of the ethmoid sinus complex. 17.58 % of the pneumatized CG (n=16) were found to have mucosal thickening within, of which 81.25% showed extension from a surrounding paranasal sinus and 18.75 % did not.

DISCUSSION

The Crista galli is an embryologic derivation of the ethmoid bone. Being formed along with the anterior skull base and perpendicular plate of the ethmoid bone in the second fetal month.⁴ Little literature is

available on the anatomic variations and disease affecting the crista galli, however reports of midline nasal defects like dermoids originating through the pneumatized CG are reported.⁵ Due to communication with paranasal sinuses, chronic infection of its mucosal lining is known, successful treatment of which is only endoscopic sinus surgery.⁶ Mean height of Crista Galli was 15.1 \pm 2.9 mm in our study, slightly larger than that reported by Lee *et al*⁶ however smaller in comparison with study done by Kim *et al*⁴ Type 1 was the most common type of CG in this study, unlike Hajjioannou *et al*² and Kim *et al*⁴ who reported type 2 to be most common. This may point toward a racial variation of the CG. Our overall incidence of CG pneumatization was 18.16% which was lower than that reported by Mladina *et al*.⁷ Ossification of the cartilaginous Crista galli is reported to start at 2 months of postnatal life, with a steady increase till 14 months of age, followed by slow progression until 24 months of age when it is complete.⁴ This is why traditionally aeration of the Crista Galli was thought to arise from the ethmoid air cells. Our study showed that 81.25% of pneumatized CG were connected to the paranasal sinuses, most common of which were an extension of the left frontal sinus. (n=43). This is in agreement with Som *et al*¹ who also reported frontal sinus to be the most common air cell of origin. Our analysis showed a significant difference in the pneumatization of the CG in the less than 18 and over 18 year age group with very low incidence in the former. (3.3%). Thus we agree with Som *et al*¹ who stated that unlike earlier believed the pneumatization may not be connected to its bone of origin as the ethmoid is pneumatized at birth.

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