



Study of foramen vesalius in South Indian skulls

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Abstract

Foramen Vesalius is known to be an inconstant foramen, which appears in the anteriomedial side of the foramen oval. It is classified into the open type and closed type. The importance of this foramen lies in the fact that an infected thrombus from an extracranial source may reach cavernous sinus. We have conducted this study into 250 sides out of 125 skulls. The foramen Vesalius found in 90 sides out of the 250 sides, with in that 55 were right and 35 were left side. The incidence was 36%; out of that 22% was right and 14% left side. We have observed the incidence of bilateral and unilateral foramen Vesalius also, it was 24% that is 30 out of 125 skulls and unilateral was 16% that was 20 skulls out of 125 skulls. The knowledge of foramen Vesalius is important for neurosurgeons and anatomists.

Keywords: Foramen Vasalius, Sphenoidal foramen, Emissary vein

Introduction

Foramen Vesalius is a small, variable and an inconstant foramen located anteromedial to the foramen ovale and lateral to the foramen rotundum. This foramen is also known as emissary sphenoidal foramen. It opens below and lateral to scaphoid fossa¹. It transmits an emissary vein, "Vein of Vesalius", through which the cavernous venous sinus and pterygoid venous plexus communicate (Williams *et al.*, 1995). The sphenoidal emissary foramen varied in size among different individuals, and is not always present on both sides of the sphenoid bone. Numerous studies were conducted to assess the importance of the presence of the emissary vein in this foramen, promoting a better understanding of the morphology of this structure that has importance in the spread of infection from extracranial origin into the skull and also in neurosurgical techniques such as radiofrequency rhizotomy (Lang, 1883; Bergman *et al.*, 1995).

Materials and methods

For the present study, 125 dry adult human skulls of known sex (83 male and 42 female) constituted the material. The skulls belong to the Department of Anatomy, JJM Medical College, Davangere, Karnataka, India. Each was studied for the foramen vasalius on each side and recorded.

Results

The foramen Vesalius found in 90 sides out of the 250 sides, with in that 55 were right and 35 were left side. The incidence was 36%; out of that 22% was right and 14% left side. We have observed the incidence of unilateral and bilateral foramen Vesalius also, it was 24% that is 30 out of 125 skulls is bilateral and unilateral was 16% that was 20 skulls out of 125 skulls.

Discussion

Foramen vesalius is an inconstant foramen located between the foramen rotundum and foramen ovale. It is situated in the posterior part of greater wing of sphenoid at the transition zone between intracranial and extracranial structures. Foramen vesalius is an

inconstant foramen located between the foramen rotundum and foramen ovale. Foramen vesalius is an inconstant foramen located between the foramen rotundum and foramen ovale. It is situated in the posterior part of greater wing of sphenoid at the transition zone between intracranial and extracranial structures (Hast MH and Garrison, 2000).

The importance of this foramen lies in the fact that it gives passage to vein of vesalius, an emissary vein. Emissary veins are those, which link the intracranial venous sinuses with veins outside the cranial cavity. They pass through the potential space between galea aponeurotica and pericranium. They are of importance in that they are channels along which infected thrombus can reach the interior of cranial cavity from outside it. Since emissary vein passing through foramen vesalius connects pterygoid venous plexus with cavernous sinus, the infected thrombus may reach cavernous sinus. Surgical importance of foramen vesalius lies in the fact that during percutaneous trigeminal rhizotomy, needle insertion through the vesalius foramen the cavernous sinus puncture may occur (Decker Gag & du Plessis, 1986).

During development, most of the central skull base bones are preformed in cartilage and then ossify by the process of endochondral ossification with a small contribution from membranous bone. At 11 weeks 5 days the entire skull base is preformed in cartilage and then ossification of skull base progresses in an orderly pattern from posterior to anterior. Postsphenoid and presphenoid centres that appear at 14 weeks form the sphenoid bone and 17 weeks respectively with a contribution from orbitosphenoid and alisphenoid centres that appear at 16 weeks and 15 weeks respectively⁵. The greater wings are formed from alisphenoid centres. Moreover, it has been shown that the foramen of vesalius represents the site of fusion between the membrane bone and medial cartilaginous, alatemporalis (Nemzek *et al.*, 2000; James *et al.*, 1980).

Many studies have reported the incidence of the foramen of Vesalius and noted that this foramen may have variations. According to Lang (1883) and Bergman *et al.* (1995), the foramen found in 40% of cases, Williams *et al.* (1995) found foramen in 8.5% cases, Kodama *et al.* (2010) found in 21.75% cases, Wysocki *et al.* (2007) reported in 22% of cases, Gupta *et al.* (2005) found in 32.85% of cases, Wysocki *et al.*¹¹ found in 17% of cases, Ramalho *et al.* (2007) with analysis on 64 human skulls obtained incidence of 71.87% and Kalpan *et al.* (2007) who obtained 100% incidence but with only 10 skulls examined. Shinohara *et al.* (2010) found the foramen to 33.75% in 400 skulls.

The presence of foramen vasalius bilaterally was reported by Kodama *et al.* 2010 was 22%, Berge (2001) and Bergman *et al.* (1995) was 35%, Gupta *et al.* (2005) was 22%, Shinohara *et al.* was 12.5%. The presence of foramen vasalius unilaterally was reported by Ginsberg *et al.* (1994) was 80% of cases by CT scan of high resolution, Bergman *et al.* (1995) reported the presence of the foramen unilaterally in 13% of cases, according to study by Kodama *et al.* (1997) was 5.5%, Shinohara *et al.* (2010) found occurrence of unilateral foramen vasalius in 18.25% of cases.

Regarding incidence of foramen vesalius Lang *et al.* (1883) found the foramen in 49% of skulls on the right side and 36% on the left. Gupta *et al.* (2005) evaluated 70 sides of 35 adult human skulls with distinction of gender and the foramen of Vesalius was present in 23 sides (14 on the right and 9 on the left) with an incidence of 32.85% (20% right side and 12.85% on the left). Shinohara *et al.* (2010) found an incidence of 7.75% on the right side and 10.5% on the left. Shinohara *et al.* (2010) was the presence of a double foramen was observed in 7 of the 400 skulls examined.

Kodama *et al.* (1997) examined the adult skull of 321 men and 79 women, 69 (21.5%) of men skulls and 18 (22.8%) of women skulls had foramen vasalius. Consequently they reported that no remarkable differences were observed in the ratio of foramen vasalius

between men and women. Gupta et al. (2005) declared in their study including 35 dried skulls that the frequency of foramen vesalius was higher in women compared to men skulls.

Vesalius had described the presence of this foramen as a rare phenomenon, its importance should be considered, because it becomes a more complicated surgery on the skull because of its variations. The recognition of anatomical structures and their possible variations will help to distinguish between normal from potentially abnormal structures during the computed tomography and magnetic resonance imaging. We believe that our data will be enlightening not only for anatomical studies but also for clinical procedures also.

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