Original Research Article

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Drainage Pattern in Venous Sinuses within the Tentorium Cerebelli in 100 Cases of Autopsy

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Abstract

Introduction: Cerebral veins drain the blood into the dural sinuses, which are endothelium-lined channels without valves and enclosed in the leaves of the dura mater. The superior group comprises the superior and inferior sagittal sinus, and the straight, transverse, and sigmoid sinuses superficial veins drain into the superior sagittal and transverse sinuses, and the deep cerebral veins into the straight and transverse sinuses. The confluence of the sinuses (torcular Herophili) results from the junction of superior sagittal, straight, and transverse sinuses and is often asymmetrical. The inferior group drains the basal and medial parts of the undersurface of the brain, the orbits, and the sphenoparietal sinus and collects at the cavernous sinus. *Aim of the Study:* To assess the drainage pattern in venous sinuses within the tentorium cerebelli in 100 cases of the autopsy. *Materials and Methods:* In this study, 100 human cadaveric brains of both male and female that underwent autopsy within 12-48 hrs after death were studied in the year 2016-2018 in Department Of Neurosurgery, Government Mohan Kumaramangalam Medical College, Salem. Skullcap was opened in a circular manner. The frontal lobes were lifted after opening the dura mater and the anterior falx was cut. The brain stem was cut axially just above the level of tentorial incisura. *Results:* In this study, the group - 1: 22 (32%) sinuses were typed A, 40 (58%) sinuses were type B, 7 (10%) sinuses were type C, among the Group 1 sinuses. Of these 69 sinuses, 6 sinuses which were longer in size occupying a small portion of the medial part of middle one-third of tentorium cerebelli along with its course in entire medial one-third of tentorium cerebelli. Among these sinuses, two sinuses were on the right side and eight sinuses were on the left side. All of these sinuses were smaller in size. No branching pattern was observed in Group 2 sinuses. All of these sinuses were observed to drain into the middle one-third of the transverse sinus. The tentorial sinuses of Group 3 were drained into lateral one-third of transverse sinus or to the junction of the transverse sinus and superior petrosal sinus. Venous ring pattern was occupying the entire posterior portion of tentorium cerebelli. This venous ring was bilateral in two cadavers and unilateral in four cadavers. *Conclusion:* These sinuses serve as important collateral channels when the straight sinus or torcular herophili is occluded by pathological processes. They also play an important role in several vascular and congenital malformations of the brain.

Keywords: Tentorial Sinuses; Drainage Pattern; Sphenoparietal Sinus; Cavernous Sinus

Introduction

Traditionally, anatomists, pathologists, and clinicians have devoted their attention to the major intracranial venous sinuses. Following in their footsteps, neurosurgeons have become knowledgeable regarding the size, course, and tributaries of the major venous sinuses. Knowledge of the variations of the dural venous sinuses is important to distinguish normal variations from pathological processes.

However, until recently, venous sinuses in the tentorium cerebelli received scant attention in the text book of neuroanatomy, neurosurgery and even in the literature.

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Materials and Methods

In this study, 100 human cadaveric brains of both male and female that underwent autopsy within 12-48 hrs after death were studied in the

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year 2016-2018 in Department of Neurosurgery, Government Mohan Kumaramangalam Medical College, Salem.

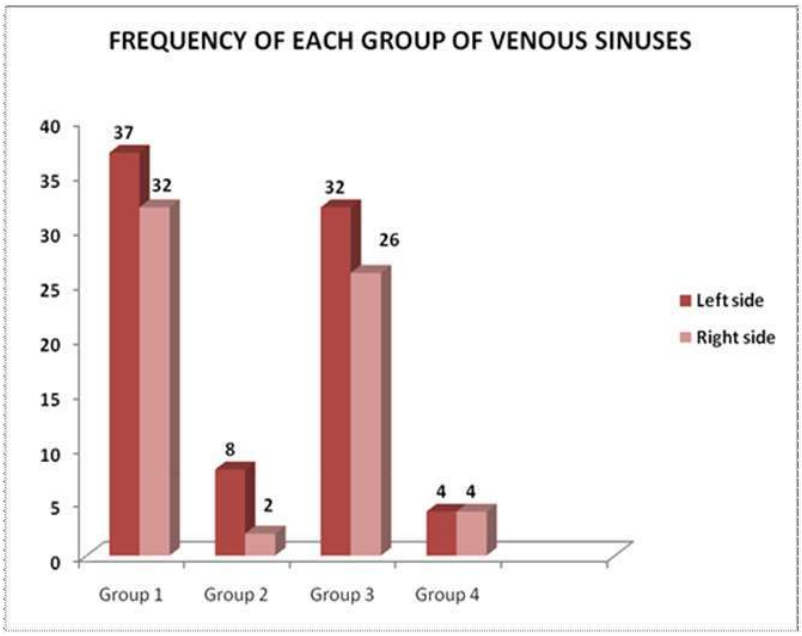
Exculsion criteria: 1. Head injury 2. Intracranial pathology 3. Accidental distortion during dissection Skullcap was opened in a circular manner. The frontal lobes were lifted after opening the dura mater and the anterior falx was cut. The brain stem was cut axially just above the level of tentorial incisura. The cerebral hemispheres were removed and the tentorium was inspected macroscopically for the presence of venous sinuses. The pattern of venous drainage was noted. Subsequently, the brain stem and cerebellum were removed through the tentorial incisura, and the tentorium was inspected again. This was performed to avoid confusing the veins on the surface of the cerebellum with venous sinuses, which was possible especially when the tentorium was thin. In addition, the tentorial sinus was opened, and a probe was passed inside to confirm its presence. An imaginary line drawn horizontally at the junction of the superior petrosal sinus and transverse sinus was used to divide the tentorium arbitrarily into anterior and posterior portions. And again the tentorium was arbitrarily divided into medial one-third, middle one-third, lateral one-third in relation to the transverse sinus.

Results

Group 1 sinuses constituted 47.6% (69 sinuses) of the total tentorial venous sinuses in this study. Among these sinuses, 53.6% (37 sinuses) were on the left side of the tentorium cerebelli and 46.4% (32 sinuses) were on the right side of the tentorium cerebelli. The tentorial sinuses of Group 1 were frequently present as a large sinus with occasional branching when compare with other groups. Group 2 sinuses constituted 6.9% (10 sinuses) of the total. Among these sinuses, two sinuses were on the right side and eight sinuses were on the left side. All of these sinuses were smaller in size. No branching pattern was observed in Group 2 sinuses.

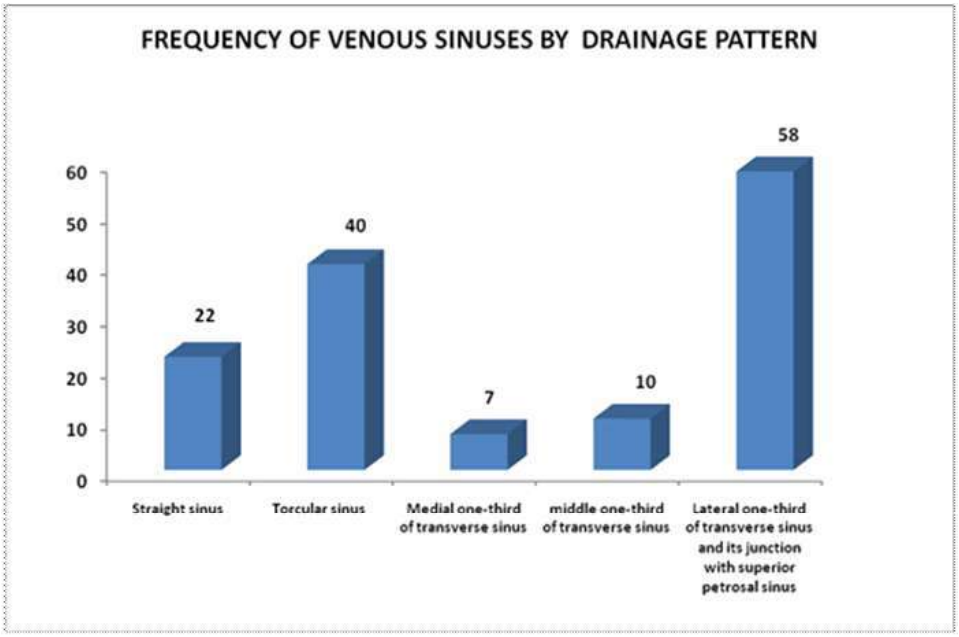
All of these sinuses were observed to drain into the middle one-third of the transverse sinus. Group3 sinuses constituted 40% (58 sinuses) of the 145 sinuses in this study. Among these sinuses, 55.2% (32 sinuses) were on the left side and 44.8% (26 sinuses) were on the right side. The tentorial sinuses of Group 3 were drained into lateral one-third of transverse sinus or to the junction of the transverse sinus and superior petrosal sinus. In six cadavers, there was a large tentorial venous sinus connecting the torcular sinus to the lateral one-third of transverse sinus or to the junction of transverse sinus and superior petrosal sinus, thereby forming a "venous ring". These venous ring was occupying the entire posterior portion of tentorium cerebelli. This venous ring was bilateral in two cadavers and unilateral in four cadavers. Among these 8 sinuses (5.5% of total sinuses), four sinuses (50%) were on the right side of the tentorium cerebelli and four sinuses (50%) were on the left side of the tentorium cerebelli.

The frequency of venous drainage was observed

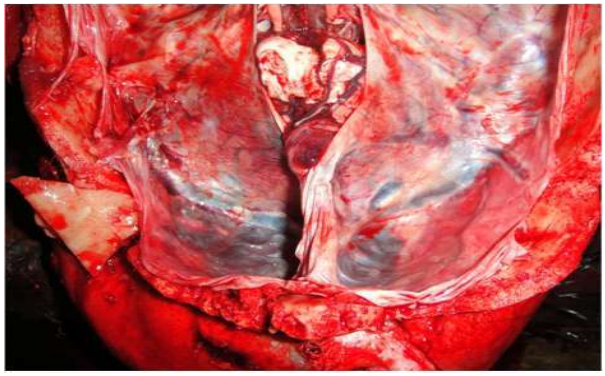


Graph 1: Frequency of Each Group of Venous Sinuses

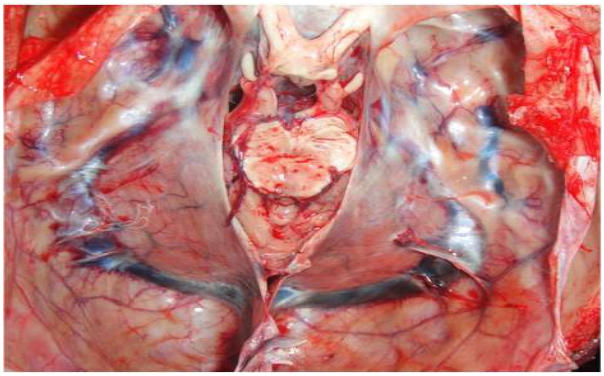
as 22 had straight sinus, 40 had torcular sinus, medial one third were transverse sinus, 10 had middle one-third of transverse sinus, 58 had lateral one-third of transverse sinus and its junction with superior petrosal sinus (Graph 2).



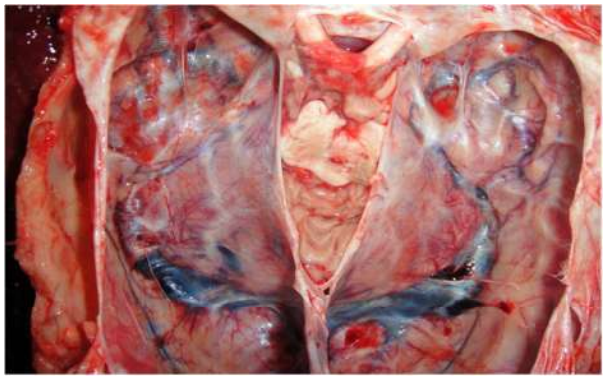
Graph 2: Frequencies Of Venous Sinuses By Drainage Pattern



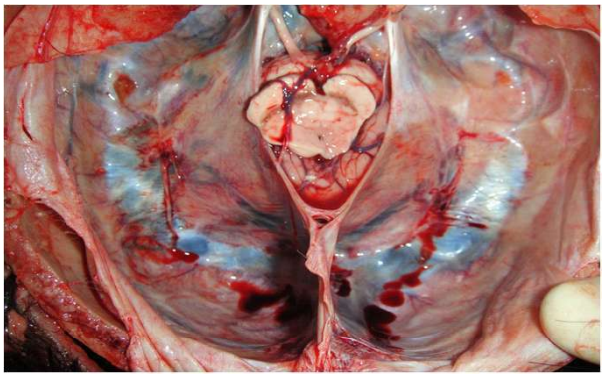
Group 1: Venous Sinuses In Medial One-Third Of Tentorium Cerebelli.Type C: Sinuses Draining Into Medial One-Third Of Transverse Sinus



Group 3: Venous Sinuses In Lateral One-Third Of Tentorium Cerebelli



Group 2: Venous Sinuses In Middle One-Third Of Tentorium Cerebelli



Group 4: Venous Ring Pattern

Discussion

Variations of the tentorial sinus in cerebellar tentoria of 13 cadavers were examined under a surgical microscope by Matsushima et al and classified the tentorial sinuses into four groups: Group I, in which the sinus receives venous blood from the cerebral hemisphere; Group II, in which the sinus drains the cerebellum; Group III, in which the sinus originates in the tentorium itself: and Group IV, in which the sinus originates from a vein bridging to the tentorial free edge. The tentorial sinuses of Groups I and II were frequently located in the posterior portion of the tentorium. The sinuses of Group I were short and most frequently present in the lateral portion of the tentorium. The tentorial sinuses of Group II, which were usually large and drained into the dural sinuses near the torcular, were separated into five subtypes according to the draining veins and direction of termination [9].

The tentorial sinuses of Groups III and IV were located near the tentorial free edge or the straight sinus.In their study, venous sinuses were present in all of the 13 tentoria studied; Group II sinuses were the most frequent, with Group I being the next most frequent. Group I sinuses were predominantly located in lateral one-third of tentorium cerebelli, but the Group II sinuses were less frequently located in the lateral one-third of the tentorium cerebelli than in the middle and medial one-third [10].

Sakaki T, Kakizaki et al.studied the termination of Labbé's vein and observed that in 73% of the cases, Labbé's vein reaches the transverse sinus through a tentorial sinus. Information about the termination of the inferior anastomotic vein of Labbé is of crucial importance in the subtemporal neurosurgical approach and its modifications. By dissecting the vein of Labbé out of its dural bed and shifting its fixation point, microsurgical access is facilitated considerably [11].

Sakata K et al. [1] studied cerebellar tentoria in 80 cadavers and reported that the tentorium cerebelli was revealed to contain sinuses in 86% of the cadavers. He classified the sinuses into the following three types: Type I sinuses constituted 25% of the total and were most often located in the medial one-third of the tentorium. They were larger than the other types, frequently occurring with a branching "stag-horn" configuration and a tendency to drain into the straight sinus, the torcular herophili, and the medial one-third of the transverse sinus [12].

Type II sinuses constituted 25% of the total and were most often located in the lateral one-third of the tentorium. They were smaller than the other types, and tended to drain into the duction of the transverse sinus and superior petrosal sinus and into the lateral one-third of the transverse sinus. Type III sinuses constituted 50% of the total and were located in the medial one-third of the tentorium. Their size ranged from small to medium. Unlike Type I sinuses, no branching pattern was observed. These sinuses tended to drain into the straight sinus, the torcular herophili, and the medial one-third of the transverse sinus [13].

Sekhar L Net.al considered, the medial one-third of the tentorium was the most vascular part. No venous sinus was observed in the anterior part of the tentorium in his study [14].

In this study, 50.4% of tentorial venous sinuses are located in medial one-third of tentorium cerebelli, 7.3% in middle one-third of tentorium cerebelli, 42.3% in lateral one-third of tentorium cerebelli. But in the study of Shoman NM 69.3% of tentorial venous sinuses are located in medial one-third of tentorium cerebelli, 8.6% in middle one-third of tentorium cerebelli, 22.1% in lateral one-third of tentorium [15].

Conclusion

50.4% of tentorial venous sinuses are located in medial one-third of tentorium cerebelli, 7.3% in the middle one-third of tentorium cerebelli, 42.3% in lateral one-third of tentorium cerebelli. (Venous ring pattern is excluded) Middle one-third of tentorium cerebelli is the least vascular portion. These findings will be useful for procedures that require sectioning of the tentorium. These sinuses serve as important collateral channels when the straight sinus or torcular herophili is occluded by pathological processes. They also play an important role in several vascular and congenital malformations of the brain.

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Conflict of Interest: None

Source of Support: Nil

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