



CADAVERIC STUDY ON TENTORIAL VENOUS SINUSES AND ITS VARIATIONS

Dr. Senthamarai Kannan

Ms.,M.ch., Assistant professor of Neurosurgery, thanjavur medical college, Thanjavur.

Dr.P.Muthuraman

Ms.,M.ch., Assistant professor of Neurosurgery, thanjavur medical college, Thanjavur.

ABSTRACT

Aim: To determine the frequency, the incidence, location, size and configuration and the drainage pattern of venous sinuses within the tentorium cerebella

Materials and Methods: This study of tentorial venous sinuses and its variations is a cadaveric study. 100 cadavers from the Forensic Medicine Department, Thanjavur Medical College were included in the study. When cadavers come for autopsy examination we used to conduct study. In this study, 100 human cadaveric brains of both male and female that underwent autopsy with in 10-48 hrs after death were studied.

Conclusion: In this cadaveric study the incidence of tentorial venous sinus is 89%. Middle one-third of tentorium cerebelli is the least vascular Portion. More sinuses present in left side of tentorium than the right side. These findings will be useful for procedures that require sectioning of the tentorium

KEYWORDS : .

AIM OF STUDY

The aim of study is

1. To determine the frequency and the incidence of venous sinuses within the tentorium cerebelli
2. To identify the location, size and configuration of the sinuses within the tentorium.
3. To know the drainage pattern of these sinuses.
4. To know which part of tentorium is least vascular.

MATERIALS

This study of tentorial venous sinuses and its variations is a cadaveric study.

100 cadavers from the Forensic Medicine Department, Thanjavur Medical College were included in the study.

All Non Trauma cadavers included in this study.

Exclusion

1. Head injuries
2. Murder
3. Intracranial pathology

Permission obtained from the professor of Forensic medicine department. After explaining the study purpose and after obtaining informed concerned in their regional from the relatives the cadavers were examined.

METHODS

When cadavers come for autopsy examination we used to conduct study.

In this study, 100 human cadaveric brains of both male and female that underwent autopsy with in 10-48 hrs after death were studied. As routine method of forensic cadaveric examination, the bicoronal scalp incision made. Skull vault was opened in circular manner. The frontal lobes were lifted after opening the duramater 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 size, location, configuration and pattern of venous drainage were noted. Subsequently, through tentorial incisura, the brain and cerebellum were removed and the tentorium was inspected again.

This was done 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, to confirm its presence, the tentorial sinus was opened and a probe was passed inside.

An imaginary line drawn horizontally at the junction of transverse

sinus and the superior petrosal sinus was used to divide the tentorium arbitrarily into anterior and posterior portions. And again the tentorium was arbitrarily divide into medial-third, middle-third, lateral one-third on relation to the transverse sinus.

RESULTS OF STUDY

Variations of tentorial venous sinuses in cadaver were examined in 100 autopsy. Tentorial Venous sinuses were present in 89(89%) cadavers and absent in 11 cadavers. There were 139 tentorial venous sinuses in 89 cadavers. Of these sinuses, 78(56.1%) occurred on left side, 61(43.9%) occurred on right side. More sinuses present in the left side.

Only one tentorial venous sinus was encountered in the anterior portion of tentorium cerebella. The sinuses were bilateral in 32 cadavers. The sinuses were unilateral in 57 cadavers.

The tentorial sinuses were classified into four groups, depending on their location, configuration, size, and pattern of drainage.

Group One(I) : Venous sinuses in medial-third of tentorium cerebella

Type a: sinuses draining into straight sinus

Type b: sinuses draining into torcular sinus

Type c: sinuses draining into medial-third of transverse sinus

Group Two(II) : Venous sinuses in middle-third of tentorium cerebella

Group Three(III): Venous sinuses in lateral one-third of tentorium cerebelli

Group Four(IV): Venous ring pattern

Group One(I) : Venous sinuses in medial-third of Tentorium cerebelli

Group one sinuses constituted 48%.2%(67 sinuses) of the total tentorial venous sinuses in this study. Among these sinuses 53.7%(36 sinuses) were on left side of the tentorium cerebelli and 46.3(31 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.

According to their draining veins they were separated into three subtypes. In Type a, the sinus courses transversely to drain into the straight sinus. In type b, the sinus courses poster medially to drain into the torcular sinus. In type c, the sinus drains into the medial-third of transverse sinus.

In this study, 21(31.3%) sinuses were type a, 39(58.12%) sinuses were type b, 07(11.4%) sinuses were type c, among the Group I sinuses. Of these 62 sinuses, 6 sinuses which were longer in size occupying a small

portion of medial part of middle-third of tentorium cerebelli along with its course in entire medial-third of tentorium cerebelli.

Most often group I sinuses were drained by the terminal portions of the cerebellar hemispheric or vermian veins.

Group Two(II) : Venous sinuses in middle- third of tentorium cerebelli

Group two sinuses constituted 6.5%(9 sinuses) of the total. Among these 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-third of the transverse sinus.

Group Three(III) : venous sinuses in lateral one-third of tentorium cerebelli

Group three sinuses constituted 40.3%(58 sinuses) of the 145 sinuses in this study. Among these sinuses 55.4%(31 sinuses) were on the left side and 44.6%(25 sinuses) were on the right-side. The tentorial sinuses of Group three were drained into lateral one-third of transverse sinus or to the junction of the transverse sinus and superior petrosal sinus.

Group Four(IV) : Venous ring pattern

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 one cadavers and unilateral in five cadavers. Among these seven sinuses(51% of total sinuses), three sinuses(43.1%) were on the right side of the tentorium cerebelli and four sinuses(57%) were on the left side of the tentorium cerebelli.

INCIDENCE OF TENTORIAL VENOUS SINUSES

Total no. of cadavers studied	Tentorium with venous sinuses	Tentorium with absent venous sinuses
100	89	11

INCIDENCE OF BILATERAL VENOUS SINUSES

Total no. of cadavers with tentorial venous sinuses	Bilateral venous sinuses	Unilateral venous sinuses
89	32(36%)	57(64%)

- P value<0.005

FREQUENCY OF VENOUS SINUSES BY LOCATION IN TENTORIUM

Medial-third of tentorium	Middle-third of tentorium	Lateral one third-of tentorium
67	9	56

- In medial third, more sinuses drained.
- In middle third, only 9 sinuses drained.

FREQUENCY OF TENTORIAL VENOUS SINUSES BY LOCATION IN PERCENTAGE

Medial-third of tentorium	Middle-third of tentorium	Lateral one-third of tentorium
50.8%	6.8%	42.4%

P value<0.005

FREQUENCY OF EACH GROUP OF VENOUS SINUSES

Classification	Left side	Right side	Total
Group 1	35	32	67
Group 2	08	01	09
Group 3	32	24	56
Group 4	03	04	07
Total	78	61	139

- In this study, 67 sinuses located in the medial on third,
- Only 9 sinuses located in the middle third

• P value<0.005

FREQUENCY OF EACH GROUP OF TENTORIAL VENOUS SINUSES BY PERCENTAGE

Classification	No. of venous sinuses	Percentage
Group 1	67	48.2%
Group 2	9	6.5%
Group 3	56	40.3%
Group 4	7	5%

- In Group I, 48.2% sinuses present.
- Group II only 6.5% sinus present.
- P value<0.005

FREQUENCY OF VENOUS SINUSES BY DRAINAGE PATTERN

Draining sinuses	Total no. of tentorial sinuses
Straight sinus	21
Torcular sinus	39
Medial-third of transverse sinus	07
Middle-third of transverse sinus	09
Lateral one-third of transverse sinus and its junction with superior petrosal sinus	56

(Venous ring pattern excluded)

- In medial third of tentorium most of the sinuses drain into torcular sinus.
- P value<0.001

FREQUENCY OF VENOUS SINUSES BY DRAINAGE PATTERN IN PERCENTAGE

Draining sinuses	Percentage
Straight sinus	15.9%
Torcular sinus	29.5%
Medial-third of transverse sinus	5.3%
Middle-third of transverse sinus	6.8%
Lateral one-third transverse sinus and its junction with superior petrosal sinus	42.4%

• P value<0.001

DISCUSSION

Traditionally, anatomists, clinicians and pathologists have devoted their attention to the major intracranial venous sinuses. Following in their footsteps, neurosurgeons have become knowledgeable regarding the course, size 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 neurosurgery, neuroanatomy and even in the literature..

Gibbs and Gibbs¹, in their study on the torcular and lateral sinuses, seem to have been the first to describe tentorial sinuses. They observed two sinuses in the tentorium which received blood from the superior cerebellar veins and emptied into the transverse sinus near the straight sinus. After their report, the tentorial sinuses were noted in studies of the dural sinuses near the torcular.

Browder et al. studied the presence of venous channels in the tentorium by injecting a vinylite-acetone mixture and then producing corrosion casts. They observed that venous channels are common in the tentorium

They also noted that, the least vascular part of the tentorium is its middle portion. In most instances They suggested that in addition to paleographic studies, the presence and the course of these venous channels could be established intraoperatively by jugular compression.

In his study of the anatomic variations of the venous sinuses in the region of the torcularherophili, Bisarja³⁹ noted the presence of venous sinuses within the tentoriumcerebelli

Variations of the tentorial sinus in cerebellar tentoria of 13 cadavers were examined under a surgical microscope by Matsushima et al¹ and classified the tentorial sinuses into four groups: Group one, in which the sinus receives venous blood from the cerebellum hemisphere; Group two, in which the sinus drains the cerebellum; Group three, in which the sinus originates from a vein bridging to the tentorial free edge. The tentorial sinuses of Groups one and two 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 two, which were usually large and drained into the duralsinuses near the torcular were separated into five Subtypes according to direction of termination and the draining veins.

The tentorial Sinuses of Group three and four were located near the tentorial free edge of the straight Sinus.

In their study, venous sinuses were present in all of the 13 tentoria studied; Group Two sinuses were the most frequent, with Group One being the next most frequent. Group One sinuses were Predominantly located in lateral onw-surgical approach 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-thirds.

Kopemaet al.⁴² studied the termination of Labbe's vein and observed that in 73% of the cases, Labbe's vein reaches the transverse Sinus through a tentoria sinus. Information about the termination of the inferior anastomotic vein of Labbe is of crucial importance in the subtemporal neurosurgical approach and its modifications. By dissecting the vein of Labbe out of its dural bed and shifting its fixation point, microsurgical access is facilitated considerably.

Duval et al. studied 23 cadavers using a retrograde venous injection of a mixture of Rhodopas and lead tetroxide and observed that the tentorial sinus was present in more than half of the cases and considered this sinus as a true sinus, principally draining the superior and inferior hemispheric veins of the cerebellum.

He also noted the tentorial sinus traversed the posterior portion of the tentorium cerebelli and opened into the lateral or straight sinus. Muthukumar et al.⁴⁴ studied cerebellar tentoria in 80 cadavers and reported that the tentoriumcerebelli was revealed to contain sinuses in 86% of the cadavers.

He classified the sinuses into the following three types:

Type one sinuses constituted 25% of the total and were most often located in the medial-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 torcularherophili, and the medial-third of the transverse sinus.

Type two 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 junction 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-third of the tentorium. Their size ranged from medium to small. Unlike Type one sinuses, no branching pattern was observed. These Sinuses tended to drain into the straight sinus, the torcularherophili, and the medial-third of the transverse sinus.

He considered, the medial-third of the tentorium was the most vascular part. No venous sinus was observed the venous ring pattern in three cadavers.

Jinet al⁴³ in his study of the normal variation of Sinuses draining into the straight sinus in 50 cadavers reported.

The incidence of tentorial venous sinuses in left side(55.9%)is more than the right side(44.1%).

In this study, 50.8% of tentorial venous sinuses are located in medial-third of tentorium cerebelli, 6.8% in middle-third of tentorium cerebelli,42.4% in lateral one third of tentorium cerebelli. But in the study of Muthukumar 69.3% of tentorial venous sinuses are located in

medial-third of tentorium cerebelli,8.6% in middle-third of tentorium cerebelli, 22.1% in lateral one-third of tentorium.

COMPARISON OF VENOUS SINUSES BY LOCATION

Studies	Medial-third of tentorium	Middle-third of tentorium	Lateral one-third of tentorium
Present study	50.8%	6.8%	42.4%
Muthukumar et al	69.3%	8.6%	22.1%

P value<0.005

Miabi et al in his study of lateral tentorial sinus with routine contrast enhanced MR images in 55 adult patients, repotted that it was detected in 104 of 110 lobes.

In this study The incidence of tentorial venous Sinuses in lateral one-third of tentoriumcerebelli is almost twice that of Muthukumar et al study.

In this study, Part of tentorium cerebelli found to be least vascular is middle-third of tentorium.

CONCLUSION

1. In this cadaveric study the incidence of tentorial venous sinus is 89%.
2. Depending on their size, configuration, location and pattern of drainage, the tentorial venous sinuses are classified into four groups
3. **Group One(I):** Venous sinuses draining in medial-third of tentorium cerebelli

Type a: sinuses draining into straight sinus

Type b: sinuses draining into torcular sinus

Type c: sinuses draining into medial-third of transverse sinus

Group Two (II): venous sinuses in middle-third of tentorium cerebelli

Group Three (III): venous sinuses in lateral one-third of tentorium cerebelli

Group Four (IV): venous ring pattern

45.0.8% of tentorial venous sinuses are located in medial-third of tentorium cerebelli, 6.8% in middle third of tentorium cerebelli.42.4% in lateral one-third of tentorium cerebelli. (venousring pattern is excluded)

5. Middle one-third of tentoriumcerebelli is the least vascular Portion.
6. More sinuses present in leftside of tentorium than the right side.
7. These findings will be useful for procedures that require sectioning of the tentorium.
8. These sinuses serve as important collateral channels when the straight sinus or torcularherophili is occluded by pathological processes.
9. They also play an important role in several vascular and congenital malformations of the brain.

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