A CADAVERIC STUDY OF ANATOMICAL VARIATION OF SPHENOPARIETAL SINUS & SUPERFICIAL SYLVIAN DRAINING VEINS IN SABAH POPULATION

By

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List of abbreviations

QEH- Queen Elizabeth Hospital

SPS- Sphenoparietal sinus

CS- Carvenous sinus

LS- Coronal suture

CS- Central Sulcus

CV- Cortical vein

PV- Petrosal vein

MCV--Middle cerebral vein

SV- Slyvian vein

Abstrak

Latar belakang: Istilah "sinus sphenoparietal" dicipta oleh Gilbert Breschet dalam atlas sistem vena pada awal abad kesembilan belas (Breschet, 1829). Sejak itu, banyak literatur telah mendapat minat untuk mengetahui sinus dan saliran. Saliran urat sylvian dangkal adalah konsisten dalam banyak kesusasteraan namun kontroversi wujud. Salah satu langkah utama dalam pendekatan transsylvian dan subtemporal ialah mengenal pasti sinus ini dan merapatkan urat daripada urat Sylvian dangkal (SSV) untuk mewujudkan koridor pembedahan yang luas.Oleh itu, kajian ini bertujuan untuk menggambarkan anatomi mikrosurgikal dan variasi sinus dan vena penyaliran sylvian.

Kaedah :30 mayat telah didiseksi di Jabatan Forensik Hospital Queen Elizabeth antara Oktober 2020 hingga Oktober 2021, dianalisis secara anatomi dan dikaji melalui lembaran pengumpulan data. Semua data dianalisis menggunakan “Statistical Package for the Social Science” (SPSS) versi 22.0

Keputusan :Mayat yang dikaji adalah 76% Lelaki (n=23) dan 7% perempuan (n=7). Purata umur mayat ialah 52.5 tahun. Semua mayat (100%) mempunyai sinus sphenoparietal di kedua-dua belah dan semuanya mengalir ke sinus carvenous ipsilateral. Bilangan ssv(urat sylvi dangkal) Saliran berbeza dari 0 urat sehingga 4 urat pada kedua-dua hemisfera. 40% mayat (n=12) mempunyai 3 SSV Vena penyaliran di hemishere kiri dan 36.7% (n=11) mempunyai 2 dan 3 penyaliran vena di sebelah kanan hemisfera. Hanya 3.3% (n=1) mayat tidak mempunyai penyaliran vena di kedua-dua belah. Tiada perbezaan antara kerumitan vena antara kedua-dua belah hemisfera dengan menggunakan McNemar test (p=0.332). Lelaki adalah didapati mempunyai lebih vena yang rumit berbanding dengan perumpuan di hemisfera kiri dengan menggunakan Fisher exact test (p=0.024). Berdasarkan data kadaver, kami telah merumuskan klasifikasi baru pada saliran SSV SPS berdasarkan bilangan penyaliran(bridging) urat.Jenis A (4 penyaliran urat) Jenis B(3 penyaliran urat) Jenis C (2 penyaliran urat) Jenis D (1 penyaliran Urat) Jenis E (0 urat mengering)

Kesimpulan : Kami telah menyatukan hipotesis kami tentang kehadiran SPS dan varians dalam bilangan urat penyaliran kepada SPS Klasifikasi baharu ini bertujuan untuk menyediakan tatanama mikosurgi baharu untuk kegunaan masa hadapan dalam neuroanatomi dan pembedahan saraf.

Abstract

Background : The term "sphenoparietal sinus" was coined by Gilbert Breschet in an atlas of the venous system in the early nineteenth century (Breschet, 1829). Since then, many literatures have gained interest in knowing the sinus and the drainage. Drainage of superficial sylvian veins was consistent in many literatures however controversies exist. One of the key steps in the transsylvian and subtemporal approach is identifying this sinus and bridging veins from superficial sylvian vein (SSV) to create a wide surgical corridor. Hence, this study was aimed to delineate the microsurgical anatomy and variation of the sinus and sylvian draining veins.

Methods : 30 fresh cadavers were examined in Forensic Department Queen Elizabeth Hospital between October 2020 to October 2021, were anatomically analysed and studied through a data collection sheet. All data were analysed using Statistical Package for the Social Science (SPSS) version 22.0.

Results : The studied cadavers were 76% Male (n=23) and 23.3% female (n=7). The median age of cadavers is 52.5 years old with interquartile range of 14. All of Cadavers (100%, n=30) has Sphenoparietal sinus on both side and all draining to ipsilateral cavernous sinus. Number of superficial sylvian veins drainage (SSVD) varies from 0 veins up to 4 veins on both hemisphere. About 40% cadavers (n=12) has 3 SSV Vein draining on left hemisphere and 36.7% (n=11) has 2 and 3 draining veins on right side of hemisphere respectively. Only 3.3% of cadavers (n=1) has no draining veins on either side. Using McNemar test, there is no statistically significant difference of complexity between right and left hemisphere (p=0.332). It was noting to found that male group has more complex veins compare to female in the left hemisphere when compared with Fisher exact test (p=0.024). Based On cadaveric data, we have formulated new classification on SSV SPS drainage based on number of draining (bridging) veins. Type A (4 draining veins) Type B(3 draining veins) Type C (2 Draining veins) Type D (1 draining Vein) Type E (0 Draining veins)

Conclusion: We have consolidated our hypothesis on the presence of SPS and variance in numbers of draining veins to SPS these new classifications is aimed at to provide new microsurgical nomenclature for future use in neuroanatomy and neurosurgery.

Keywords: sphenoparietal sinus, superficial sylvian veins

Introduction

Venous anatomy is generally more variable than arterial anatomy. This is especially true for superficial cortical veins. The superficial middle cerebral vein (SMCV), also known as the superficial Sylvian vein, drains into the sphenoparietal sinus before emptying into the cavernous sinus (CS) (Matsushima *et al.*, 2014; Alexander *et al.*, 2021). The SMCV (also known as the sylvian vein or superficial sylvian vein) is the main component of the cerebral hemisphere's sphenoidal group of superficial bridging veins. The SMCV receives cortical venous drainage from the opercula and areas adjacent to the sylvian fissure as it runs along the course of the sylvian fissure. The SMCV's curvilinear path is ideal for confocal imaging of the cerebral hemisphere's lateral surface (Mortazavi *et al.*, 2013).

Gilbert Breschet coined the term "sphenoparietal sinus" in an atlas of the venous system in the early nineteenth century (Breschet, 1829). (Cruveilhier, 1867) later referred to Breschet's description of the sphenoparietal sinus as a "sinus found within the limits of the anterior and medial portions of the base of the skull, occupying a transversally oriented gutter that runs inward into the cavernous sinus." Several branches of the skull bones, the dura mater, and the diploic vein of the temporal bone enter this sinus [author's translation]." Breschet's drawings correspond to the sphenoid portion of the sphenoparietal sinus, which is located beneath the lesser sphenoid wing and is actively engaged in diploic and meningeal venous drainage. (When the idea that the superficial middle cerebral vein ended in the sphenoparietal sinus under the lesser sphenoid wing or that the superficial middle cerebral vein was at least partially equivalent to the sphenoparietal sinus was initiated, the vertebral detail grew increasingly convoluted and even somewhat ambiguous) (San Millán Ruíz *et al.*, 2004).

The sinus has been discovered beneath the lesser sphenoid wing, where it connects to the cavernous sinus medially. The sphenoparietal sinus joins the anterior branch of the middle meningeal vein, which runs from the foramen spinosum along the vascular groove in the floor of the middle cranial fossa, near the pterion (Takahashi *et al.*, 2007). Overall, the orbital, medial anterior temporal (uncal), and inferior frontal veins all contribute to the sinus.

In some cases, the superior ophthalmic vein communicates with the sphenoparietal sinus rather than the cavernous sinus (Nagata *et al.*, 2013).

The sphenoparietal sinus is a transversely oriented venous network within the dura mater situated immediately beneath the lesser sphenoid wing. Laterally, it connects to the branches of the middle meningeal vein, and medially, it terminates at the anterior aspect of the cavernous sinus. The sphenoparietal sinus receives venous drainage from the nearby skull base, specifically from the orbital roof diploic vein, the greater sphenoid wing diploic vein, and, on rare occasions, an orbital vein (San Millán Ruíz *et al.*, 2004; Takahashi *et al.*, 2007; Tubbs *et al.*, 2007). The anatomic relationship of the sphenoparietal sinus and the SMCV is debatable. San Millan studied the venous anatomy of this region in 15 nonfixed cadavers and discovered no link between the SMCV and the sphenoparietal sinus in any specimens(San Millán Ruíz *et al.*, 2004) . Similarly, Nagata discovered that the SMCV was not connected with the sphenoparietal sinus during contrast-enhanced 3D fast spoiled gradient-echo T1-weighted MR imaging in any of 24 patients(Nagata *et al.*, 2013). Other researchers, on the other hand, have discovered a high incidence of a link between the sphenoparietal sinus and the SMCV (Chung and Weon, 2005; Tubbs *et al.*, 2007; Matsushima *et al.*, 2014). When the sphenoparietal sinus receives a prominent frontobasal bridging vein, the sinus can be skeletonized and mobilised to allow elevation of the frontal lobe and preservation of the vein (Hasegawa *et al.*, 2013).

The brain's venous drainage can be divided into deep and superficial venous systems. The superficial system consists of cortical veins that run along the surfaces of the brain, which are drained venously from the cortex and from the subcortical white matter. Cortical venous veins connect to the bridging veins, which eventually lead to the venous dural sinuses (Ono *et al.*, 1984; Oka *et al.*, 1985; Curé *et al.*, 1994).

One of the key steps in the transsylvian approach is dissection of the superficial Sylvian vein (SSV) to create a wide surgical corridor without interfering with normal venous flow (Shimada *et al.*, 2020). The size and linkage of the sylvian vein vary frequently. Previous research mostly on sylvian veins has discovered outflow points using angiography, 3D computed tomography, and cadaver study. According to the gold standard for surgery in this area, "the arachnoid of the sylvian fissure should be opened on the frontal side of the veins, so that they will not cross the sylvian fissure when the frontal lobe is retracted." To complete the dissection, two or three fronto-orbital venous tributaries that cross the sylvian fissure and enter the middle cerebral vein must be sacrificed (Kazumata *et al.*, 2003a).

Breschet introduced in the early 19th century the phrase sine sphenoparietal sinus (sinus alae Parvae) as it was found within a uniformly oriented gutter, which flows in the cavernous sinus, inside this anterior and media segments of the base of the skull(Breschet, 1829). Several branches from the skull bones, the dura mater, and the diploic vein of the temporal bone enter this sinus (San Millán Ruíz *et al.*, 2004). Under the smaller sphenoid wing, which connects to the cavernous sinus medially, the sinus was identified. Close to the vascular groove in the ground of the middle cranial fossa, the spheno-parietal sinus connects with the front branch of the middle meningeal vein, the foramen round the vascular rock (Takahashi *et al.*, 2007; Nagata *et al.*, 2013). In general, the sine is also supported by orbital, medial anterior, temporal (uncal) and lower frontal veins. In some cases, the superior ophthalmic vein communicates with the sphenoparietal sinus rather than the cavernous sinus (Morris, 2007). The sinus is best visualised by removing the dura mater from the anterior part of the middle cranial fossa and viewing it from the front. (Tubbs *et al.*, 2007) examined 15 adult cadavers, all of which had both a left and right sphenoparietal sinus. The sinuses measured 2.5 and 3mm on average for the left and right sides, respectively.

One of the superficial cerebral veins is the superficial middle cerebral vein (SMCV), also known as the Sylvian vein. It usually runs cranially is along Sylvian fissure and drains numerous small tributaries from the opercular areas around the lateral sulcus. It drains into the sphenoparietal sinus or directly into the cavernous sinus after curving anteriorly around the tip of the temporal lobe. However, there is significant variation. It may have anastomotic spine connections to other dura mater venous sinuses, the superior sagittal sinus via the superior anastomotic vein, and the transverse sinus via the inferior anastomotic vein (Sumalatha *et al.*, 2019). The superficial middle cerebral vein (SMCV) usually runs downward and forward along the sylvian fissure before entering the sphenoparietal sinus or the cavernous sinus (Suzuki and Matsumoto, 2000).

The SMCV was not found to enter the sphenoparietal sinus; the sphenoparietal sinus and the SMCV appear to be separate entities. These venous structures can be evaluated using MRI or using SPGR sequence with fat suppression. Ikushima et al 4 reported that the SMCV entered the sphenoparietal sinus in 57.5 percent of patients diagnosed in an MRI study using 3-D contrast-enhanced magnetization-prepared rapid gradient-echo (MP-RAGE) (Takahashi *et al.*, 2007).

Hacker classified drainage of the SMCV to include the sphenoparietal sinus, sphenobasal vein, sphenopetrosal vein, or cortical veins. Suzuki reclassified SMCV drainage into seven patterns using 3D-CTV(Suzuki *et al.*, 2003) (Mortazavi *et al.*, 2013) .These reclassified forms are useful for understanding venous drainage in the context of surgery, as the preservation of these veins are thought to be necessary to avoid injury . The great anastomotic vein of Trolard connects the SMCV to the superior sagittal sinus, and the posterior anastomotic vein of Labbé connects it to the transverse sinus. Deep cerebral vein and SMCV in 53 per cent of cases are connected, which is a major collateral way that whenever a tumour occludes the proximal position of the SMCV. The SMCV drainage pattern influences the decision to use a microsurgical skull base approach with a middle cranial fossa dura incision (Nakajima *et al.*, 2017).

Frigeri explained that one of three sinuses, superior sagittal, transverse and sphenoparietal, drain directly from the central lobe(Frigeri *et al.*, 2015). The lower one-third of the lateral surface drains to the superficial sylvian veins, which then drain to the transverse sinus via the vein of Labbé or anteriorly to the sphenoparietal sinus via the superficial sylvian veins. In 50% of their specimens, the inferior one-third of the precentral gyrus drained to the sphenoparietal sinus, 40% to the transverse sinus, and 10% to the superior sagittal sinus. Finally, in the 35% of the specimens, the lower part of the postcentral drilled to the sphenoparietal sinus, in 45% the transverse senus, and in the final trolard vein the upper sagittal sinus.

Methods and Materials

Research Design

This a single centre cadavaeric dissection

Research location and duration

This is a 1 years prospective study conducted from 1 october 2020 to 1st october 2021 in Forensic Department, Hospital Queen Elizabeth Sabah. The study was approved by the Malaysian Medical Research and Ethics Committee (MREC) [NMRR ID: NMRR-19-4104-50949(IIR)]

Method of research

Fresh cadavers were recruited for post-mortem in the Forensic Department, QEH, Sabah and were subjected for anatomical study. The study was done from 1st October 2020 to 1st October 2021.

An electric hand drill craniotomy perforator and cutter, (Midas Rex Medtronic MIDAS REX Series Systems LEGEND EHS Electric High Speed drill 2012 manfactured in Canada) toothed forceps, non-toothed forceps, scissors, number 11 blade knife, curved mosquito artery forceps, straight mosquito artery forceps,(SMS Intruments and equipment manufactured in malaysia year 2008) and silk sutures(Silkam B braun manufactured year 2020) are obligated for this investigation. Digital camera 16 megapixels (Canon EOS 5D Mark IV 30MP sensor Dual Pixel CMOS AF) for photography.

About 30 fresh cadavers above age of 18 years old of both genders were subjected for autopsy examination in the Forensic Department, QEH, Sabah. The dissections were performed during routine medico-legal investigations. The skin incision was made through the scalp from behind one ear to the other over the vertex while standing at the top end of the table with the body supine and the head elevated on a supporting block. Technique for cranial and neck dissection is dine by forensic team using standard Knight forensic autopsy method published in 2012. Skin incisions begins about 1 cm behind one of the ear lobes and proceed to a coronal plane to a point 1 cm behind the other ear A sharp scalpel was used with a fresh blade. The initial incision took place when the scalpel was inserted into the skin down to the bone, and then the scalpel was turned over toward the periosteum with its back to continue with the incision superior to that point. The overlying hair were divided into pieces instead of cut. The skin was reflected front and back to expose the upper skull surface. The previous flap was removed by a strong retract from the scalp, while the scalpel swept gently toward the calvary, extending it just above the orbits.

The retro-flat, continuing to the occipital protuberance, was followed by a similar procedure. On either side the temporal muscles were retracted using a perforator electrical drill, burr various burr holes around the cranium and then an electric cutter to cut the skull around the periphery to produce several interconnection cuts. The temporal muscles on both sides were cut along the lines of the subsequent saw cuts prior to sifting. When using the cuts, it was important that the dura and leptomeninges should not be cut too deep, if possible, intact with the brain, and not attached to the skull. That was started on the mid-timer zone on one side and runs forward to the forehead, followed by an angle that ends just above and behind the reverse ear that intersects previously constructed burr holes**(image 3).**

To crack the inside of the skull table, the mallet, chisel, or skull key was used. With blunt dissection the inner surface of the skull's vault and the skull cap was carefully removed. It had been noted that this incision was a standard incision during autopsy, and that no changes were made to these standard routine procedures.

Blue saline dye injection was used for proper visualisation of the vein. The internal jugular veins were dissected cautiously in the neck and sampled. A saline solution (image**1**) had been completely scrubbed on the venous system. Sites of leakage and ligatures had been recognised(image **5**). A blue die combination was injected into each jugular vein until it was dilated with the angular vein**s** using technique from *Joe Alvernia et all 2010* **(image 2)**

. The dura on the right side, followed by a C-shaped left side was opened with a sharp scalpel with a base flat to the upper sagittal sinus that exposes the centre and lower temporal gyrus to the lobe tip of the time *Joe Alvernia et all 2010* **(image 4)** .The draining veins and sinus were slightly elevated and temporal pole exposed. Then, sphenoparietal sinus final drainage was identified**.(image 8)**

The sinus variation **(image 6)** and its draining veins were observed, and the discovery recorded**(image 7).** The other side of the cranium was dissected by using the similar method. The study participants then completed a test of the brain and other organs during the routine post-mortem test. Most importantly, to do this study, ensure the routine procedures of the forensic service were not hampered and the time required to finish the post-mortem examination was no longer affected

Data collection

Demographic and age were recorded in data form. 2 separate data is collected to avoid inter observed variability. A picture of anatomical structure is taken to be verified by An anatomist.

Statistical analysis

Analysis was conducted using statistical software, IBM SPSS version 22.0. Only descriptive analysis were used in this study. Continuous variables were presented in mean (standard deviation, SD) or median (interquartile range, IQR) depending on the normality of data. Categorical data was presented as frequency and percentage. Cohen's Kappa will be used to assess the inter-rater agreement if there is any discrepancies noted between two data given by 2 observers while data cleaning. We applied Fisher Exact Test, McNemar Test and Mann-Whitney U test accordingly in the analysis. The P level of less than 0.05 was considered statistically significant.

Results

A total of 30 cadaveric examinations were conducted on 30 bodies. Interrater variability for all the observed data were examined using Cronbach's alpha as well as Kappa's Cohen and obtained value of 1 for all observed data. Table 1 and figure 6 to 8 below summarizes the characteristics of all cadaver. Majority of cadaver were male (n=23, 76.7%), with median age of 52.5 years old (interquartile range of 14 years old). Races of all cadaver were noted to be Bumiputera Sabah where nearly half were reported as Bajau ethnics (n=13, 43.3%). Both right and left sphenoparietal sinus were found to be presented in all the cadavers (n=30, 100%) and all draining to ipsilateral carvenous sinus.

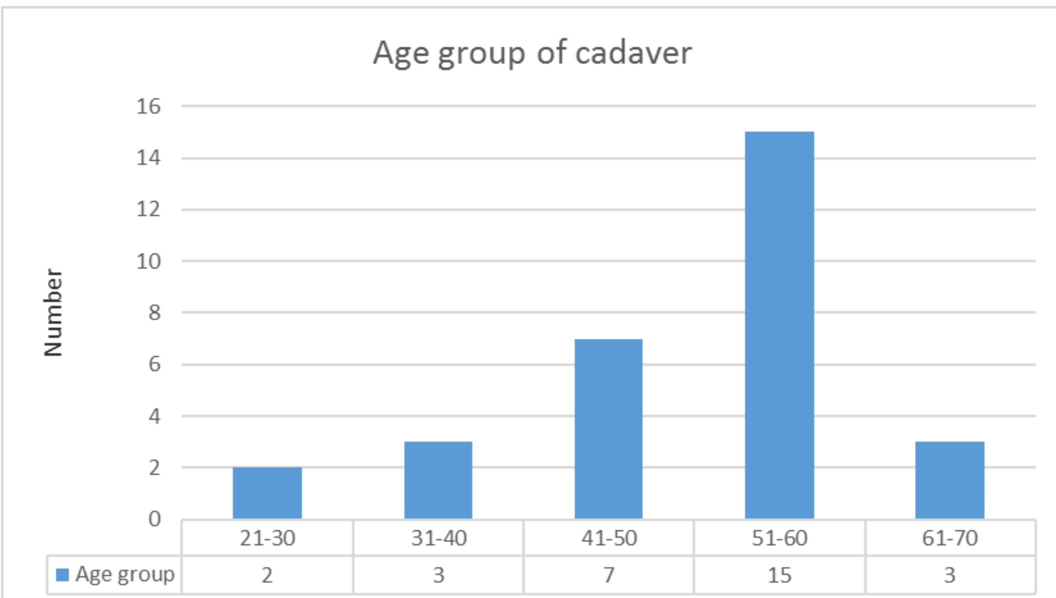


Figure 7: Distribution of age group of cadaver (n=30)

Table 1. Characteristics of cadaver (n=30)

Variables		**n,**	**(%)**	**Median,**	**(IQR)**
Age				52.5	14
Ethnicity	Sungai	5	16.7		
	Bajau	13	43.3		
	Dusun	5	16.7		
	Kadazan	6	20.0		
	Murut	1	3.3		
Gender	Male	23	76.7		
	Female	7	23.3		
Presence of Sphenoparietal Sinus (Right)	No	0	0.0		
	yes	30	100.0		
Presence of Sphenoparietal Sinus (Left)	No	0	0.0		
	yes	30	100.0		
Termination of Sphenoparietal Sinus (Right)	No	0	0.0		
	yes	30	100.0		
Termination of Sphenoparietal Sinus (Left)	No	0	0.0		
	yes	30	100.0		
Number of Superficial Sylvian Draining veins (right)	no	1	3.3		
	1	5	16.7		
	2	11	36.7		
	3	11	36.7		
	4	2	6.7		
Number of Superficial Sylvian Draining veins (left)	no	1	3.3	3.3	
	1	3	10.0	10.0	
	2	8	26.7	26.7	13
	3	12	40.0	40.0	11
	4	6	20.0	20.0	6

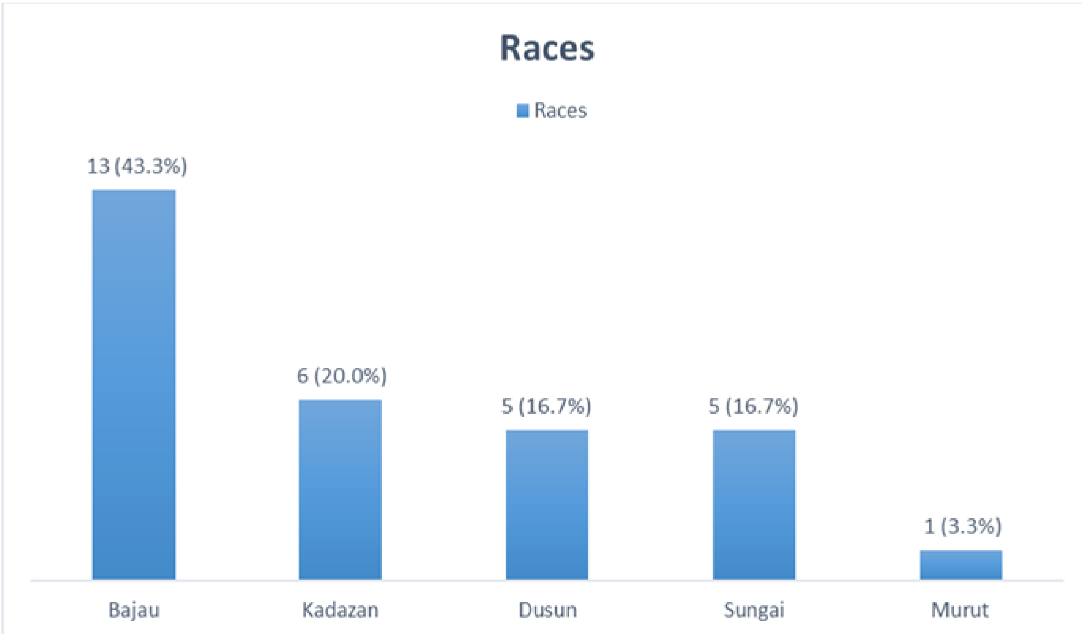


Figure 8: Race of cadaver (n=30)

The variations of superficial sylvian draining veins for right and left hemisphere were tabulated at the figure 9 below. For right hemisphere, equal number of cadavers (n=11, 36.7%) were identified to have 2 and 3 draining veins. On the other hand, it was noted that about 40% (n=12) of the cadavers have 3 draining veins. Only 1 cadaver (3.3%) was found to have no draining vein on right and left hemisphere respectively.

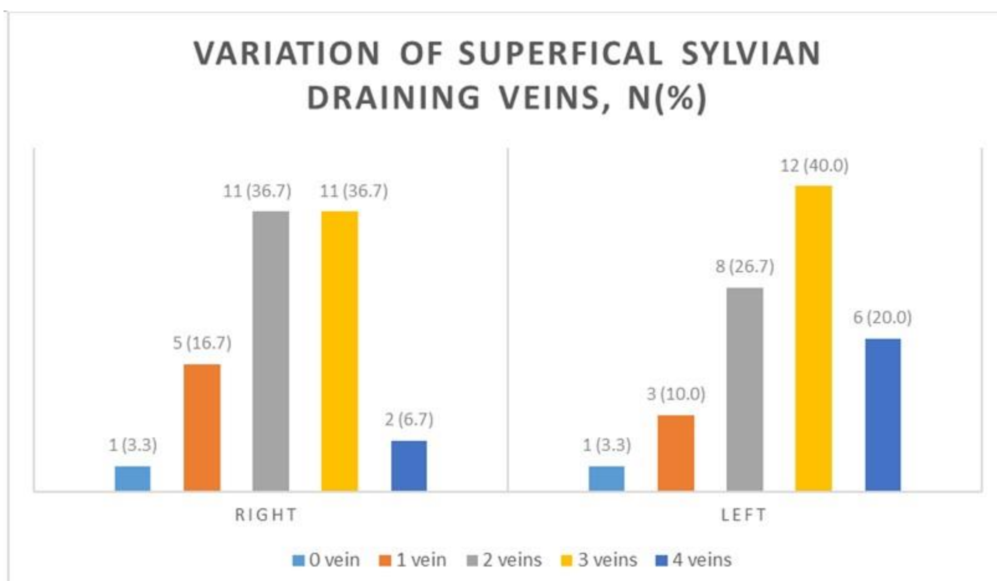


Figure 9: Variation of superficial sylvian draining veins (n=30)

Table 2: Comparison of complexity between right and left hemisphere (n =30)

	Left		
Right	Simple	Complex	p-value*
Simple	6	11	0.332
Complex	6	7	

**McNemar Test*

An exact McNemar's test determined that there was no statistically significant difference of complexity between right and left hemisphere (p = 0.332).

Table 3: Association between different variables and veins complexity for right hemisphere (n =30)

		Simple		Complex		
Variable		n	(%)	n	(%)	p-value
Gender	Male	13	76.5%	10	76.9%	0.977*
	Female	4	23.5%	3	23.1%	
Ethnicity	Sungai & Bajau	11	64.7%	7	53.8%	0.711*
	Others	6	35.3%	6	46.2%	
Age	Mean Rank	13.44	228.50	18.19	236.50	0.143^

**Fisher Exact Test* *^Mann-Whitney U Test*

For right hemisphere, a Fisher exact test was run shown, there was no significant association between gender and complexity of veins (p = 0.977). Also, there was no significant association between different ethnicity and complexity of veins (p = 0.711). A Mann-whitney U test revealed no significant association of age and complexity of veins (0.143)

Table 3: Association between different variables and veins complexity for left hemisphere (n =30)

Variable		Simple n	(%)	Complex n	(%)	p-value
Gender	Male	12	100.0%	11	61.1%	0.024*
	Female	0	0.0%	7	38.9%	
Ethnicity	Sungai & Bajau	6	50.0%	12	66.7%	0.458*
	Others	6	50.0%	6	33.3%	
Age	Mean Rank	14.42	173.00	16.22	292.00	0.582^

**Fisher Exact Test ^Mann-Whitney U Test*

For left hemisphere, a Fisher exact test shown, there was a significant association between gender and complexity of veins (p = 0.024). Complex veins are more with male group compared to female. However, there was no significant association between different ethnicity and complexity of veins (p = 0.458) and no significant association of age and complexity of veins (0.582)

On cadaveric data, we have formulated new classification on SSV SPS drainage based on number of draining(bridging) veins. Image9: Type A (4 draining veins), image 10 :Type B(3 draining veins) , image 11: Type C (2 Draining veins),image 12:Type D (1 draining Vein),image 13:Type E (0 Draining veins)

3.6 Discussion

The understanding of this anatomical architecture is the foundation of many surgical entry zone being formulated Kaan et al (2014). Considerable variation exists in the size, number, and exact location of the bridging veins of the skull base, and knowledge of this anatomic variation is clinically important, particularly from a neurosurgical perspective . In most cases, the surgeon can sacrifice the small veins and dural venous sinuses encountered during surgery without harming the patient Nakase et al (2005) . However, serious complications, including venous infarction, have occasionally resulted from seemingly minor injury to these interconnected veins Nakase et al (2005) .

These complications have prompted anatomic and surgical efforts to foster greater understanding and prevention of these events. Predicting the consequences of surgical ligation of the venous structures is challenging because there are no effective measures to guide the surgeon. Unlike with arteries, intraoperative occlusive testing is not feasible with veins, because the onset of venous infarction varies greatly among individuals. Nakase et al (2005) encountered symptomatic postoperative venous infarction in approximately 0.3% of cases. In their series, three patients had a severe type of venous complication from the sacrifice of due to Sphenopetrosal veins. Thus, preoperative assessment of these veins and their anastomoses is important because it allows the surgeon to optimize the surgical approach and anticipate sources of venous bleeding.

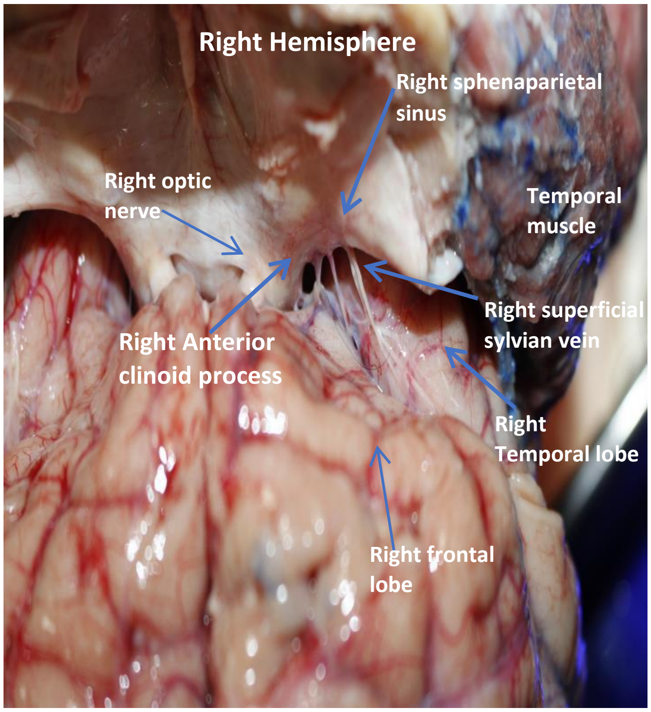
The SMCV (also known as the sylvian vein or superficial sylvian vein) is the main component of the cerebral hemisphere's sphenoidal group of superficial bridging veins. The SMCV receives cortical venous drainage from the opercula and areas adjacent to the sylvian fissure as it runs along the course of the sylvian fissure. The sphenoparietal sinus joins the anterior branch of the middle meningeal vein, which runs from the foramen spinosum along the vascular groove in the floor of the middle cranial fossa, near the pterion (Takahashi et al., 2007).

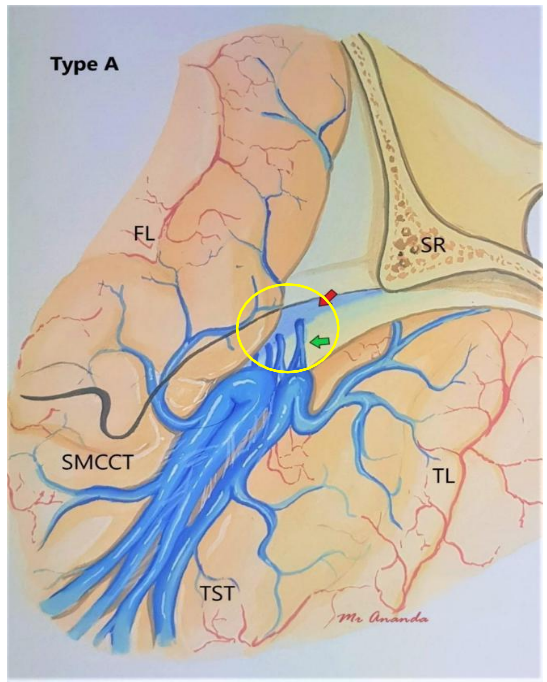
One of the key steps in the transsylvian approach is dissection of the superficial Sylvian vein (SSV) to create a wide surgical corridor without interfering with normal venous flow (Shimada et al., 2020). Previous research mostly on sylvian veins has discovered outflow points using angiography, 3D computed tomography, and cadaver study. The current study was conducted by dissecting the crainum of cadavers to determine the presence of the sphenoparietal sinus. The findings reported that sphenoparietal sinus present on both sides of hemisphere.

Our thirty cadaveric anatomical studies showed the presense of sphenoparietal sinus on left side of the hemisphere and on right side of the hemisphere. The findings reported has showed that the superficial sylvian draining veins varies among the Sabah population. According to findings, the cadavers among age of 50-60 years has high number of draining veins into ipsilateral SPS. From our data analysis, there is variation among numbers of draining veins that forms bridging veins and drains into ipsilateral SPS, however the variation is relatively consistent among all cadavers. All cadavers has SPS terminating into ipsilateral Carvenous sinus. The numbers of draining veins that we examined in cadavers ranges from 0 draining veins to 4 draining veins with variations between both hemispheres.

Majority of those examined dictated cadavers has 2 to 3 draining veins and both hemisphere which account for 36% of right hemisphere and 40% respectively. Hence based on these variation in numbers, we have proposed new nomenclature based on number SSV draining into SPS. The proposed classification is called *Superficial Sylvian Sphenoparietal draining(bridging veins)* based on numbers of draining veins.

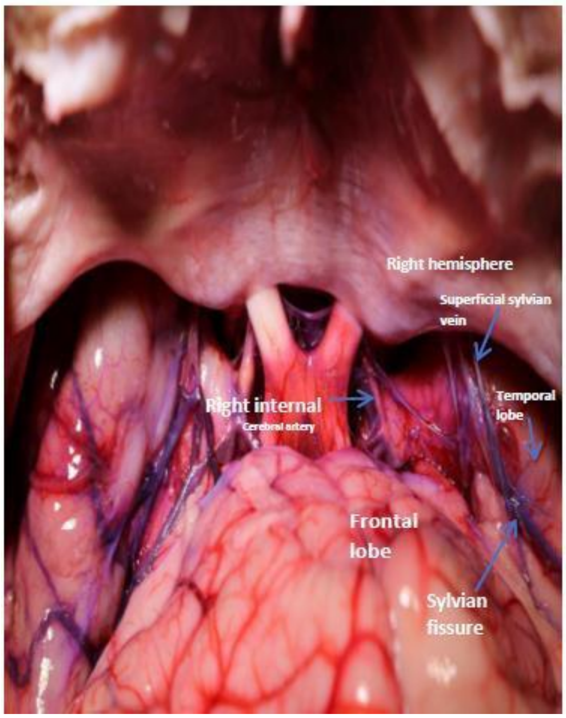
The first type has four draining veins noticed draining from ipsilateral ssv to ipsilateral sps, we have named it superficial sylvian bridging Type A

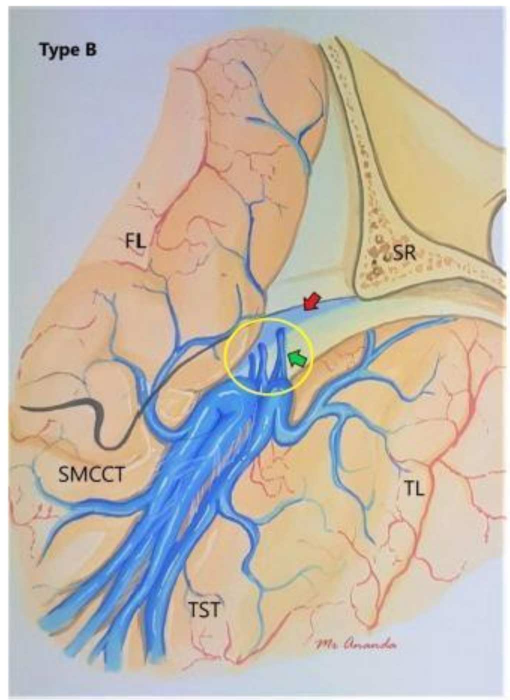




Red Arrow: Sphenoparietal sinus, **Green Arrow**: Four sphenoparietal bridging veins, **FL**: Frontal Lobe, **TL**: Temporal Lobe, **SR**: Sphenoid ridge, **SMCCT**: Superficial middle cerebral common trunk, **TST:** Temporal sylvian trunk.

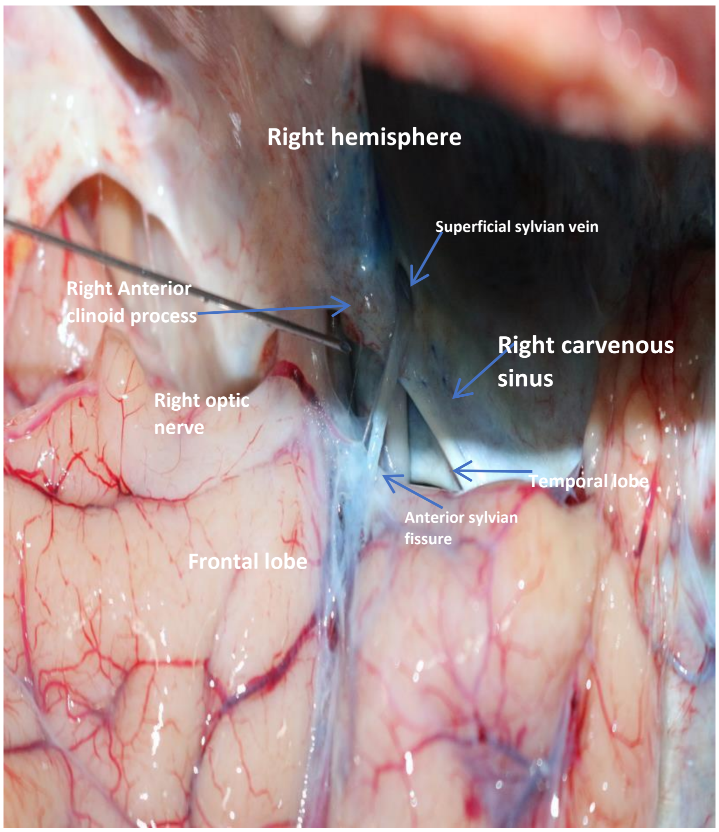
The second type has three draining veins noticed draining from ipsilateral ssv to ipsilateral sps, we have named it superficial sylvian bridging Type B

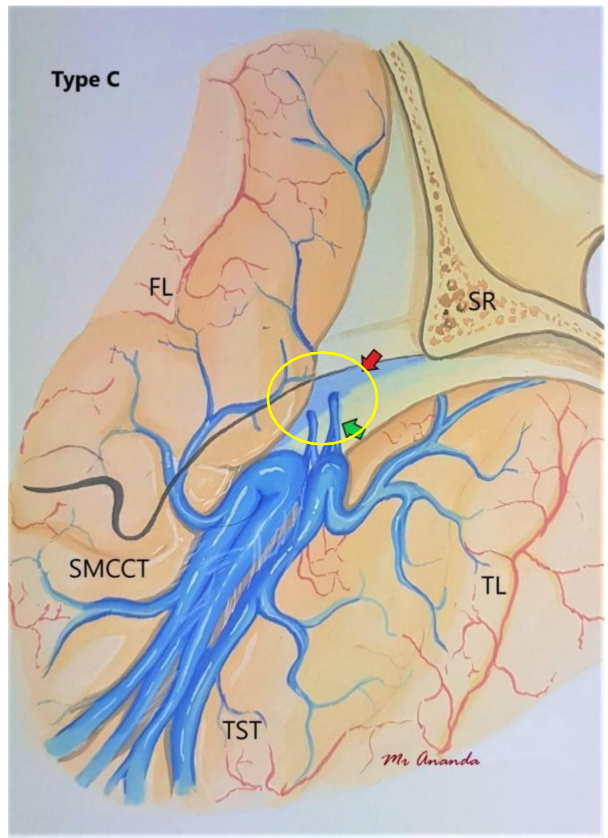




Red Arrow: Sphenoparietal sinus, **Green Arrow**: Four sphenoparietal bridging veins, **FL**: Frontal Lobe, **TL**: Temporal Lobe, **SR**: Sphenoid ridge, **SMCCT**: Superficial middle cerebral common trunk, **TST:** Temporal sylvian trunk.

The third type has double draining veins noticed draining from ipsilateral ssv to ipsilateral sps, we have named it superficial sylvian bridging Type C





Red Arrow: Sphenoparietal sinus, **Green Arrow**: Four sphenoparietal bridging veins, **FL**: Frontal Lobe, **TL**: Temporal Lobe, **SR**: Sphenoid ridge, **SMCCT**: Superficial middle cerebral common trunk, **TST:** Temporal sylvian trunk.