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Letter to the Editor

Anatomical features of the GV20 acupoint

GV20 is an important acupoint in the government vessel (GV) meridian that is widely used to treat neurological and psychiatric disorders in Oriental Medicine.[1–3]

To elucidate the anatomical features of GV20, three cadavers, donated to Chungnam National University College of Medicine for education and research, were dissected. The study was approved by the Institutional Review Board.

The location of GV20 was determined using a general method.[4] Red latex was injected into the cadaver common carotid artery to observe the arteries distributed in the scalp. The occipital arteries were distributed around GV20. The parietal foramen was found only one around GV20 (Fig. 1A). To observe the typical structure of the skull related to GV20, we observed the skull with all overlying structures removed. Two parietal foramina on either side of the sagittal suture were found at the posterior part of GV20. A distinct depression in the skull was observed at GV20 (Fig. 1B).

The nerves distributed in the scalp were observed in the dense connective tissue layer of the scalp in one cadaver. The greater occipital nerves, branches of cervical nerve II, were distributed around GV20. In this case, no parietal foramen was observed around GV20 (Fig. 1C).

We have three proposals based on our observations. First, the parietal foramina through which the parietal emissary veins connect to the superior sagittal sinus were located near GV20. The greater occipital nerves, branches of cervical nerve II, were distributed around GV20. The occipital veins may also be distributed around GV20 because most of the arteries of the head are accompanied by veins.[5] Although the branches of the superficial temporal vessels and supra-orbital nerves were expected to be distributed around GV20,[5] we could not find them because they are very thin structures. However, our findings regarding the nerves and vessels around GV20 suggest why GV20 is an important acupoint.

Second, GV20 was located in a depression similar to other acupoints. This is consistent with Langevin's connective tissue the-

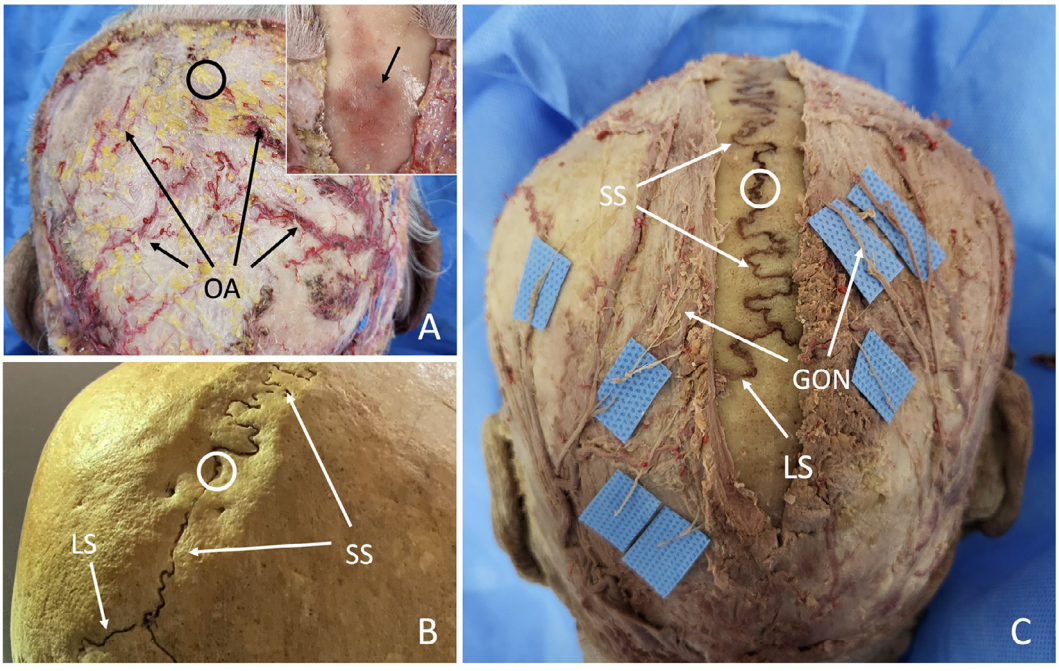

Fig. 1. (A) Artery distribution in the scalp after injection of red latex into the common carotid artery. Upper right rectangle, magnified photo after vertical incision of the circle portion. (B) The aspect of the skull around GV20 with all overlying structures removed. (C) The nerve distribution in the dense connective tissues around GV, and the feature of the skull after vertical incision around GV20. Circle, GV20; arrow in the upper right rectangle of (A), parietal foramen; OA, occipital artery; SS, sagittal suture; LS, lambdoid suture; GON, greater occipital nerve.

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ory.[6,7] The depression contains a relatively large amount of connective tissue, along with mast cells, fibroblasts, and nerve endings, so that GV20 acupuncture may be effective because of the greater propagation of molecular signaling through the connective tissue planes.[8]

Third, the presence or absence of a parietal foramen is highly variable among humans.[9] In the three cadavers, we observed parietal foramens on both sides (Fig. 1B), on one side (Fig. 1A), and no parietal foramen (Fig. 1C). The intracranial effect via the parietal emissary vein may differ among humans due to this variation. In addition to variation of the parietal foramen, complete closure of the sagittal suture may also reduce the intracranial effect via the nerves passing the suture (Fig. 1A).[10,11]

In summary, the GV20 acupoint involves the parietal foramina and the parietal emissary veins near the sagittal suture. The greater occipital nerves and occipital vessels are distributed around GV20. This reflects the name given to GV20, which is '100 Convergences' in English.

Conflict of interest

The authors declare no conflict of interest.

CRediT authorship contribution statement

Sang Hyun Kim: Methodology. **Ji-Yeun Park:** Conceptualization, Writing – review & editing. **Young Ho Lee:** Conceptualization, Writing – original draft, Writing – review & editing, Project administration, Funding acquisition.

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Ethical statement

This study was approved by the Institutional Review Board of Chungnam National University (202106-BR-090-01).

Data availability

The data will be made available upon reasonable request.

Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.imr.2022.100919.

References

1. Byeon HS, Moon SK, Park SU, Jung WS, Park JM, Ko CN, et al. Effects of GV20 acupuncture on cerebral blood flow velocity of middle cerebral artery and anterior cerebral artery territories, and CO_2 reactivity during hypocapnia in normal subjects. *J Altern Complement Med*. 2011;17(3):219–224.
2. Yang Y, Deng P, Si Y, Xu H, Zhang J, Sun H. Acupuncture at GV20 and ST36 improves the recovery of behavioral activity in rats subjected to cerebral ischemia/reperfusion injury. *Front Behav Neurosci*. 2022;16:909512.
3. Li S, Zhang Z, Jiao Y, Jin G, Wu Y, Xu F, et al. An assessor-blinded, randomized comparative trial of transcutaneous auricular vagus nerve stimulation (taVNS) combined with cranial electroacupuncture vs. citalopram for depression with chronic pain. *Front Psychiatry*. 2022;13:902450.
4. Korean Medicine Convergence Research Information Center. Governor Vessel. KMCRIC Website. www.kmcric.com/database/acupoint/GV. Accessed October 15, 2014.
5. Moore KL, Dalley AF, Agur AM. *Moore Clinically Oriented Anatomy*. 8th ed. Philadelphia: Wolters Kluwer Health Inc; 2020.
6. Langevin HM, Yandow JA. Relationship of acupuncture points and meridians to connective tissue planes. *Anat Rec*. 2002;269(6):257–265.
7. Langevin HM, Churchill DL, Wu J, Wu J, Badger GJ, Yandow JA, et al. Evidence of connective tissue involvement in acupuncture. *FASEB J*. 2002;16(8):872–874.
8. Li NC, Li MY, Chen B, Guo Y. A new perspective of acupuncture: the interaction among three networks leads to neutralization. *Evid Based Complement Alternat Med*. 2019:2326867 2019.
9. de Souza Ferreira MR, Galvão APO, de Queiroz Lima P, de Queiroz Lima AMB, Magalhães CP, Valença MM. The parietal foramen anatomy: studies using dry skulls, cadaver and in vivo MRI. *Surg Radiol Anat*. 2021;43(7):1159–1168.
10. Tower RJ, Li Z, Cheng YH, Wang XW, Rajbhandari L, Zhang Q, et al. Spatial transcriptomics reveals a role for sensory nerves in preserving cranial suture patency through modulation of BMP/TGF-β signaling. *Proc Natl Acad Sci U S A*. 2021;118(42):e2103087118.
11. Kosaras B, Jakubowski M, Kainz V, Burstein R. Sensory innervation of the calvarial bones of the mouse. *J Comp Neurol*. 2009;515(3):331–348.

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