



Editorial



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Evaluation of Cervicomedullary Compression Around the Craniovertebral Junction: Commentary on "Measurement of Deformity at the Craniovertebral Junction: Correlation of Triangular Area and Myelopathy"

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The craniovertebral junction (CVJ) is the region around the skull base and the upper cervical spine (atlas and axis), along with its neurovascular components, including the brain stem, spinal cord, vertebral artery, and venous plexus.¹⁻⁶ The stability of CVJ is dependent on a robust ligamentous complex and the shape of the bony structures, which are also responsible for much of the axial rotation (C1-2 joint) and flexion-extension movements (C0-1 and C1-2 joint).^{7,8} CVJ pathologies are usually rare and can result in progressive deformity, myelopathy, severe neck pain, and functional disability, such as difficulty swallowing.^{3,9-12} The most common causes are rheumatoid arthritis, trauma, neoplasm, infection, and congenital bony malformation. These CVJ pathologies may alter the quality of life because of the neck pain, disabling headache, dysphagia, and myelopathy.^{12,13}

In most cases, standard radiographs, computed tomography, and magnetic resonance imaging typically conduct the proper diagnosis of CVJ pathology. However, no one-single method has been recommended to properly diagnose CVJ pathology due to the overlying structures on lateral plain radiographs. Ambiguous landmarks lead to low reliability or consistency for confirming basilar invagination (BI).¹⁴⁻¹⁶ Accordingly, we must establish a more reliable and consistent method for diagnosing CVJ pathologies.

Many methods for diagnosing BI and CVJ pathology may imply that choosing just one method in clinical circumstances is complicated. These measurements can show variable results due to multiple reasons. First, anatomical landmarks may be ambiguous, thus leading the interpreter to measure different results. Second, measurement errors can be made by the interpreter himself or on the radiographs. The lack of confidence in anatomic landmarks can cause unreliable results, and it is hard to obtain absolute true-lateral radiographs in every patient.

Variations in measurement may lead to a different type of treatment. Therefore, we need to determine how reliable and reproducible these measurements are.¹⁶

In this article,¹⁷ the novel measurement method of the cord compression around CVJ is well described, and the measurement of triangular area (TA) could indicate the severity of cervicomedullary compression.

Cervical TA is a 2-dimensional volumetric measurement of ventral cord compressive lesion. It is possible to evaluate the exact degree of cervicomedullary compression in patients with CVJ deformity compared to the existing 1-dimensional measurement methods.

Moreover, the change of TA could reflect the effect of surgery, such as the improvement of CVJ alignment, cord decompression, and the resorption of retro-odontoid soft tissue mass.

However, there are several limitations of cervical TA evaluation. First, most CVJ pathologies often accompany mechanical instability, and this instability often causes or exacerbates neurological symptoms, but cervical TA measurement does not reflect the dynamic cord compression.

And cervical TA does not show the cord compressive lesions caused by posterior pathologies. And finally, cervical TA cannot reflect the indirect decompression effect of the C1–2 joint distraction technique.

As introduced by Goel, a C1–2 joint distraction technique has been gaining popularity recently as a possible treatment modality for selected CVJ pathologies, especially for BI.^{13,18–20} C1–2 joint distraction reduces BI and decompresses indirectly by down-migrating the C2 dens and stretching the retro-odontoid pannus in patients with BI and the retro-odontoid pannus.^{13,19,20} This technique has several advantages over conventional transoral surgery, the most important of which are indirect reduction and fixation are possible posteriorly for the compressive pathology around the cervicomedullary junction.

However, confirming the indirect cord decompression effect by the cervical TA method could be difficult after C1–2 joint distraction surgery because the length between the clivus and the lower C2 endplate increases even though the degree of anterior spinal cord compression decreases after vertical distraction surgery of C1–2 facet joint.

Despite these disadvantages, this cervical TA measurement method can evaluate the degree of ventral compression more accurately in 2 dimensions, which could be helpful for the pre- and postoperative evaluation of many CVJ pathologies. Of course, it will be necessary to evaluate and confirm the efficacy of this new measurement method for the various types of CVJ disease.

Conflict of Interest: The author has nothing to disclose.

REFERENCES

- Hong JT, Lee SW, Son BC, et al. Analysis of anatomical variations of bone and vascular structures around the posterior atlantal arch using three-dimensional computed tomography angiography. *J Neurosurg Spine* 2008;8:230-6.
- Hong JT, Lee SW, Son BC, et al. Hypoglossal nerve palsy after posterior screw placement on the C-1 lateral mass. Case report. *J Neurosurg Spine* 2006;5:83-5.
- Kim IS, Hong JT, Jang WY, et al. Surgical treatment of os odontoideum. *J Clin Neurosci* 2011;18:481-4.
- Hong JT, Kim IS, Kim JY, et al. Risk factor analysis and decision-making of surgical strategy for V3 segment anomaly: significance of preoperative CT angiography for posterior C1 instrumentation. *Spine J* 2016;16:1055-61.
- Lee HJ, Choi DY, Shin MH, et al. Anatomical feasibility for safe occipital condyle screw fixation. *Eur Spine J* 2016;25:1674-82.
- Lee CH, Hong JT, Kang DH, et al. Epidemiology of iatrogenic vertebral artery injury in cervical spine surgery: 21 multicenter studies. *World Neurosurg* 2019;126:e1050-4.
- Takigawa T, Simon P, Espinoza Orias AA, et al. Biomechanical comparison of occiput-C1-C2 fixation techniques: C0-C1 transarticular screw and direct occiput condyle screw. *Spine (Phila Pa 1976)* 2012;37:E696-701.
- Hong JT, Takigawa T, Udayakumar R, et al. Biomechanical effect of the C2 laminar decortication on the stability of C2 intralaminar screw construct and biomechanical comparison of C2 intralaminar screw and C2 pars screw. *Neurosurgery* 2011;69(1 Suppl Operative):ons1-6; discussion ons6-7.
- Lee JJ, Hong JT, Kim IS, et al. Significance of multimodal intraoperative monitoring during surgery in patients with craniovertebral junction pathology. *World Neurosurg* 2018;118:e887-94.
- Kim CH, Hong JT, Chung CK, et al. Intraoperative electrophysiological monitoring during posterior craniocervical distraction and realignment for congenital craniocervical anomaly. *Eur Spine J* 2015;24:671-8.
- Kim JY, Hong JT, Oh JS, et al. Influence of neck postural changes on cervical spine motion and angle during swallowing. *Medicine (Baltimore)* 2017;96:e8566.
- Hong JT, Oh JS, Lee DH, et al. Association between the severity of dysphagia and various parameters of the cervical spine; videofluoroscopic analysis in neutral and retraction position of the normal volunteers. *Spine (Phila Pa 1976)* 2020;45:103-8.

13. Hong JT, Kim IS, Lee HJ, et al. Evaluation and surgical planning for craniovertebral junction deformity. *Neurospine* 2020;17:554-67.
14. Park JH, Hong JT, Lee JB, et al. Clinical analysis of radiologic measurements in patients with basilar invagination. *World Neurosurg* 2019;131:e108-15.
15. Park JH, Kim JT, Kim IS, et al. Are plain radiographic measurements still consistent with a diagnosis of basilar invagination in the era of cross-sectional images? *Medicine (Baltimore)* 2022;101:e30552.
16. Lee HJ, Hong JT, Kim IS, et al. Analysis of measurement accuracy for craniovertebral junction pathology: most reliable method for cephalometric analysis. *J Korean Neurosurg Soc* 2013;54:275-9.
17. Chang CC, Wu JC, Ko CC, et al. Measurement of deformity at the craniovertebral junction: correlation of triangular area and myelopathy. *Neurospine* 2022;19:889-95.
18. Goel A, Sharma P. Craniovertebral realignment for basilar invagination and atlantoaxial dislocation secondary to rheumatoid arthritis. *Neurol India* 2004;52:338-41.
19. Goel A. Progressive basilar invagination after transoral odontoidectomy: treatment by atlantoaxial facet distraction and craniovertebral realignment. *Spine (Phila Pa 1976)* 2005;30:E551-5.
20. Kim IS, Hong JT, Sung JH, et al. Vertical reduction using atlantoaxial facet spacer in basilar invagination with atlantoaxial instability. *J Korean Neurosurg Soc* 2011;50:528-31.



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