

An Overview of Posterior Fossa Associated Pathologies and Segmentation

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Abstract : Segmentation tools continue to advance, evolving from manual methods to automated contouring technologies utilizing convolutional neural networks. These techniques have evaluated ventricular and hemorrhagic volumes in the past but may be applied in novel ways to assess posterior fossa-associated pathologies such as Chiari malformations. Herein, we summarize literature pertaining to segmentation in the context of this and other posterior fossa-based diseases such as trigeminal neuralgia, hemifacial spasm, and posterior fossa syndrome. A literature search for volumetric analysis of the posterior fossa identified 27 papers where semi-automated, automated, manual segmentation, linear measurement-based formulas, and the Cavalieri estimator were utilized. These studies produced superior data than older methods utilizing formulas for rough volumetric estimations. The most commonly used segmentation technique was semi-automated segmentation (12 studies). Manual segmentation was the second most common technique (7 studies). Automated segmentation techniques (4 studies) and the Cavalieri estimator (3 studies), a point-counting method that uses a grid of points to estimate the volume of a region, were the next most commonly used techniques. The least commonly utilized segmentation technique was linear measurement-based formulas (1 study). Semi-automated segmentation produced accurate, reproducible results. However, it is apparent that there does not exist a single semi-automated software, open source or otherwise, that has been widely applied to the posterior fossa. Fully-automated segmentation via such open source software as FSL and Freesurfer produced highly accurate posterior fossa segmentations. Various forms of segmentation have been used to assess posterior fossa pathologies and each has its advantages and disadvantages. According to our results, semi-automated segmentation is the predominant method. However, atlas-based automated segmentation is an extremely promising method that produces accurate results. Future evolution of segmentation technologies will undoubtedly yield superior results, which may be applied to posterior fossa related pathologies. Medical professionals will save time and effort analyzing large sets of data due to these advances.

Keywords : chiari, posterior fossa, segmentation, volumetric

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