Editorial

Unbiased Stereological Techniques

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This issue of *NeuroQuantology* is a special volume on the unbiased stereological techniques. Articles in this issue are designed to give a basic and comprehensive view about the latest methods of design-based stereology. Stereology is a branch of morphometry, which provide simple methods to estimate various parameters by a correct sampling design, without making biased assumptions about the shape and size of the object or the frequency of the interested particles, or cells. The results of stereological estimations can be considered as unbiased, *i.e.,* free from systematic error, from all practical angles. Papers included in the current issue give background information about some of the basic stereological methods, while the structure of papers are selected so that to put a view about the importance and practical implementation of some crucial points in the application general stereology. Papers are organized according to different subjects of modern stereological methods with a greater emphasis on neurostereology and we tried our best to make this issue as easy to read as possible.

Altunkaynak*et al.,* gives the basic knowledge about the general stereology, stereological terms and sampling strategies. Authors explain what the stereology is and discuss the methodological, mathematical and statistical aspects of stereology. They also give detailed information on the sampling procedures and calculation of coefficient of error, which are the crucial points on the application of stereological study designs.

In the second review, Kaplan *et al.,* present the disector counting technique, which allows us to counting particles in a 3D volume generated by two physical or optical consecutive sections, separated by a known distance. In addition, you can find a detailed information about the historical development of the method, variants, basic rules and various applications.

In the third review, Kaplan *et al.,*describes the fractionator counting technique, which is widely used for estimating the total quantity of particles in a tissue, or in a specified reference volume. You can also find the important practical points, general application rules and some examples of the fractionator technique generally used in particle counting studies.

Another study by von Bartheld discusses the meaning, significance and practical applications of "Z-axis" of thick section in stereology. It gives a broad perspective about the distribution of particles throughout the thickness of thick tissue sections, which are generally used in stereological studies. The paper ponders the prominent section artifacts that can affect the particle quantification including lost caps, homogeneous collapse and differential deformation occurred in the z-axis. At the last section of the paper, the author informs us about how to cope with the artifacts for reliable results with minimal bias.

The review written by Geuna and his colleagues gives a general overview of stereological techniques, related to the nerve studies. The paper gives the basic idea of sampling design, preparation protocols and assessable parameters of stereological studies

about peripheral and as well as optic nerves using two-dimensional disectors.

The paper written by Şahin and Elfaki is on the Cavalieri principle that is one of the main techniques to estimate the volume of object and its components. Using this technique, the volume of any object could be simply estimated from a set of slices through the object, provided that they are parallel, separated by a known distance. The sectioned surface areas of the sections are assessed and the multiplication of the total sectioned surface area with the mean of the section thickness provides an estimation of the volume of the examined object. In this paper, they have given simple information on the technique. They also discussed the factors affecting the volume estimations on radiological images. Some examples of applications and their solutions are also provided.

The paper by Ayas*et al.,* define some simple, economical and efficient approaches that were developed and successfully used in their research and laboratories. Their methods are based on the inspiration that the vertical movement of the stage during focusing through thick tissue sections can be tracked by a custom-made enlarged circular scale attached to any microscope. They also offer some inexpensive solutions about the cumbersome manual systematic random sampling steps during the application of stereological techniques under microscope.

Raimondo*et al.*, reviewed the literatures to explain and find effective strategies for the treatment of contusive spinal cord injury (SC) in the "*Stereology of Posttraumatic Spinal Cord Injury"*. They discuss in detail all aspect of experimental SC injury and treatment approaches for amelioration of SC injuries. Quantization of SC injury, it is a curricle matter for better understanding and made a good treatment for SC injury. They show nice examples of stereological techniques for quantization in this study.

In the first paper of Yigiter et al., they investigated brain development in rat fetuses, newborns and adults in their work. They found that adult neurogenesis may also occur in regions within the brain and that the postnatal neurogenesis capacity of neural precursors in the neocortex continues to increase under suitable conditions depending on age.

As Chintawar*et al.*, stated that estimation of cerebellar Purkinje cell number is not only an important parameter for the study of the development of the cerebellum but also for seeing the changes occurring in various experimental and physiological conditions. In this article, they briefly overview the stereological techniques that have been used so far for estimation of Purkinje cell number in different animal species. They gave some technical information on a simple method (the confocal physical disector) for Purkinje cell quantification on optical slices of confocal microscope. This method can be adopted without the need of any dedicated stereological workstation for Purkinje cell number analysis.

Yigiter*et al.*, investigate the age-related changes in female and male cerebral volumes using the stereological method. They found that a possible normal increase and then decrease in brain volume from age 0 to 60 years in healthy subjects. These differences in the brain sizes between the male and female subjects were attributed to the differences in total brain volume. It was suggested that a better understanding of this process may help to distinguish normal age-related alterations from neurodegenerative diseases.

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Guest Editors of the
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