Increased olfactory bulb volume due to treatment of chronic rhinosinusitis: neuroinflammation and adult neurogenesis

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Sir, in the recent paper by Gudziol et al. (2009), treatment of chronic rhinosinusitis lead to an increase of the olfactory bulb volume over a 3-month period, and they concluded that this was due to the restoration of olfactory function.

In this letter, we point out another factor that may affect olfactory bulb volume: neuroinflammation regulated neurogenesis.

The olfactory bulb volume is greatly affected by the sensory inputs, as the deprivation of olfactory activity decreases the size of the bulbs. One of the most important bases underlying the bulb volume change is the continuous neurogenesis in the central olfactory system: new neurons are generated in the subventricular zone and rostral migratory stream; then these new neurons migrate to the olfactory bulb, where they form interneurons and replace dead cells (Zhao et al., 2008). The loss of olfactory inputs decreases the survival of new neurons in the bulb and increases the cell apoptosis during migration.

Many environmental factors can regulate adult neurogenesis, such as exercise and inflammation. Inflammatory molecules (e.g. Interleukin-1, leukaemia inhibitory factor, interferon-a, interferon-y, transforming growth factor-a) can regulate the proliferation of neural stem cells, differentiation ability and they can direct the migration of new neurons and control their survival (Loseva et al., 2009). We believe that during the treatment of chronic rhinosinusitis, the inflammation was also brought down, which can lead to the upregulation of cell proliferation in the subventricular zone as well as the increased survival of new neurons in the bulb. Both of the two conditions could contribute to an increased olfactory bulb volume, and are consistent with the improved olfactory function. Additionally, the retinol that was applied to the olfactory mucosa directly may invade the brain through olfactory nerve and regulate the adult neurogenesis due to its strong neurogenic potential (Wang et al., 2005) in the olfactory bulb-subventricular zone system.

References


