Ginkgo biloba: the precious qualities of a “fossil” tree

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Ginkgo biloba (Fig. 1) is the only species surviving of the genus *Ginkgo*, family Ginkgoaceae. It has over almost 200 million years history, and it is currently widely cultivated for its nut as well as for its leaves. *Ginkgo biloba* leaf extracts have been used for more than 5,000 years in traditional Chinese medicine for various purposes. The main active ingredients of *G. biloba* leaf can be divided into two major categories involving ginkgo flavonoid glycosides and terpene lactones. Ginkgo flavonoid glycosides include kaempferol, quercetin, and isorhamnetin, while terpenoids include bilobalide and ginkgolide. The standardized preparation of *G. biloba* extract is EGb 761 which contains 24% ginkgo flavonoid glycosides, 6% terpene lactones, and no more than five parts per million ginkgolic acids [1–3]. Studies on the biological activities and pharmacological effects of different *Ginkgo biloba* leaf extracts manifest their functions as an antioxidant, a neuroprotective agent, a free-radical scavenger, a membrane stabilizer, an inhibitor of platelet-activating factor (PAF), and an inhibitor of monoamine oxidase A and B [2, 4–7]. Therapeutically, *G. biloba* is widely used in the treatment of cerebrovascular disease, vascular dementia, early stage Alzheimer’s disease, intermittent claudication, tinnitus, macular degeneration, asthma, and hypoxia [8–13]. The function as an inhibitor of PAF is believed to be produced by ginkgolides, which can destroy platelet activation, aggregation, and decrease vascular permeability by reducing the production of proinflammatory effects. The other major components of ginkgo extract are the

Fig. 1 The cover shows a more than 400-year-old *Ginkgo* tree of the Yu garden in Shanghai

flavonoid glycosides, which make great effects to its functions as a free-radical scavenger and an antioxidant. However, the most considerable potential clinical problem with *G. biloba* leaf is also caused by its function as an inhibitor of PAF. Complications can arise from its direct and pharmacodynamic or pharmacokinetic effects. It can increase the risk of bleeding if it is used in combination with warfarin, garlic, red clover, and other herbal medications during the perioperative period [14]. *Ginkgo*

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should be discontinued before surgery, but the time period has not been determined conclusively. Accordingly, we should pay more attention to its clinical applications of safety, dosing, using in the perioperative period, and pharmacology [3].

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