Perspective
Volume 8:6, 2022

Oral Health Case Reports

ISSN: 2471-8726 Open Access

Gastrodin's Mechanism and Prospects in Osteoporosis, Osteogenesis and Osseointegration

Fenglan Li*

Department of Prosthodontics, Shanxi Medical University, Taiyuan 030000, China

Introduction

Gastrodin, an ingredient in traditional Chinese medicine, is widely used to treat vascular and neurological diseases. However, a growing number of studies have demonstrated that gastrodin has anti-osteoporosis effects, and its mechanisms of action include antioxidant, anti-inflammatory, and anti-apoptotic effects. Furthermore, gastrodin has a number of distinct advantages in promoting bone healing in tissue engineering, including inducing high hydrophilicity in the material surface, anti-inflammatory activity, and pro-vascular regeneration. As a result, this paper summarised the current research on the effects and mechanisms of gastrodin on osteoporosis and bone regeneration. We propose here that the use of gastrodin in the surface loading of oral implants may greatly promote osseointegration and increase implant success rates.Furthermore, we speculated on the potential mechanisms of gastrodin against osteoporosis by affecting actin filament polymerization, the renin-angiotensin system, and ferroptosis, and proposed that combining gastrodin with Mg^{2+}, angiotensin type 2 receptor blockers, or artemisinin could significantly inhibit osteoporosis. The goal of this review is to serve as a resource for future research and application of gastrodin in the treatment of osteoporosis and implant osseointegration [1].

Description

Osteoporosis is a systemic bone disease characterised by decreased bone mass, bone tissue microarchitecture damage, increased bone fragility, and fracture susceptibility. Each year, the International Osteoporosis Foundation reports more than 8.9 million fractures caused by OP. An epidemiological survey in China found that the prevalence of OP was 19.2% in people over the age of 50 and up to 32.0% in those over the age of 65. OP is associated with lower levels of sex hormones, systemic inflammation, oxidative stress, glycosylation, calcium absorption, and physical activity. Currently, the majority of OP patients are treated with bisphosphonates, calcitonin, and selective oestrogen receptor modulators; however, these medications primarily prevent further bone loss without having any significant effect on osteogenesis promotion and have a number of side effects [2].

Multi-site action, multi-targeted action, high safety, large dosing space, less toxic side effects, and systemic conditioning are all advantages of Chinese herbal medicines. Gastrodin, epimedium, curcumin, and other herbal active ingredients have received attention, and numerous studies have demonstrated their antioxidant, anti-inflammatory, and osteogenic properties. In comparison to other herbal components like epimedium and curcumin, gastrodin has a relatively simple chemical structure with polyhydroxy functional groups that are more conducive to chemical polymerization. Its pharmacokinetic properties and broad biodistribution allow for long-term drug delivery. Furthermore, its properties of increasing the hydrophilicity of the material surface and pro-vascular regeneration are advantageous for bone healing in the vicinity of biomaterials [3].

However, there is currently no summary of gastrodin's effects and mechanisms of action on bone, bone regeneration, and osseointegration. The effects of gastrodin on OP, tissue engineering, and implant osseointegration are discussed, as well as the possible mechanisms and hypotheses regarding the active use of gastrodin in the surface loading of oral implants. We also looked at the pharmacokinetics, toxicity, and physicochemical properties of gastrodin. Furthermore, we hypothesised gastrodin's potential mechanisms on actin filament polymerization, the renin-angiotensin system, and anti-ferroptosis in bone metabolism, and proposed that combinations of gastrodin with Mg2+, angiotensin type 2 receptor blockers, or artemisinin may have greater anti-osteoporosis potential.

OP affects roughly one-third of postmenopausal women over the age of 50. The prevalence of osteoporotic fractures rises as the population ages. A growing body of evidence suggests that systemic diseases like diabetes and rheumatic inflammatory diseases are strongly linked to the development of OP. Furthermore, glucocorticoids are known to cause iatrogenic osteoporosis. In patients with osteoporotic edentulism,bone metabolism disorders and bone resorption occur more frequently than bone production. OP causes increased bone fragility and a higher risk of fracture. Furthermore, the patients have a loss of bone density in the alveolar bone and are at a higher risk of tooth loss. With the advancement of oral implant technology, the demand for implants among people prone to tooth loss has risen dramatically.

Bone is a metabolically active tissue in which osteoblasts and osteoclasts are constantly repairing and remodelling. Any factor that reduces osteoblast activity or increases osteoclast activity can upset the bone metabolic balance, resulting in increased bone resorption by osteoclasts and decreased osteogenesis by osteoblasts, i.e., OP. Increased reactive oxygen species levels influence many cellular processes and are linked to the development of ageing and age-related diseases. Significant evidence suggests that ROS can promote osteoclast differentiation and activity, thereby increasing bone resorption. They can also induce apoptosis and decrease osteoblast activity, resulting in decreased osteogenesis by osteoclasts. Numerous studies have shown that oxidative stress, caused by excessive ROS production, and inadequate antioxidant defence mechanisms are major causes of OP [4,5].

Conclusion

Gastrodin has been shown to have anti-osteoporosis properties. Its mechanisms of action include antioxidant activity, anti-inflammatory activity, anti-osteoblast apoptosis, and osteoclast differentiation inhibition. Furthermore, given the many unique advantages of gastrodin in promoting bone healing in tissue engineering, such as inducing high hydrophilicity in the material surface, anti-inflammatory effect, and pro-vascular regeneration, we believe that using gastrodin in the surface loading of oral implants has a high potential for effectively promoting implant osseointegration. This assumption could serve as motivation to improve the success rate of patient implants in clinical practise. However, there has been little research on gastrodin as an auxiliary drug for osseointegration of oral implants. The research on

***Address for Correspondence:** Fenglan Li, Department of Prosthodontics, Shanxi Medical University, Taiyuan 030000, China, E-mail: lifenglan@gmail.com*

Received: 02 November, 2022, Manuscript No. OHCR-23-86876; **Editor Assigned:** 05 November, 2022, PreQC No. P-86876; **Reviewed:** 16 November, 2022, QC No.Q-86876; **Revised:** 22 November, 2022, Manuscript No.R-86876; **Published:** 28 November, 2022, DOI: 10.37421/2471-8726.2022.8.69

gastrodin involved in local sustained-release systems on the surface of oral implants, in particular, is completely lacking.

References

1. Sözen, Tümay, Lale Özışık and Nursel Çalık Başaran. "An overview and management of osteoporosis." *Eur J Rheumatol* 4 (2017): 46.
2. Noh, Ji-Yoon, Young Yang and Haiyoung Jung. "Molecular mechanisms and emerging therapeutics for osteoporosis." *Int J Mol Sci* 21 (2020): 7623.
3. Chen, Songfeng, Hang Liang, Yanhui Ji and Hongwei Kou, et al. "Curcumin modulates the crosstalk between macrophages and bone mesenchymal stem cells to ameliorate osteogenesis." *Front Cell Dev Biol* 9 (2021): 634650.
4. Jiao, Hongli, E. Xiao and Dana T. Graves. "Diabetes and its effect on bone and fracture healing." *Curr Osteoporos Rep* 13 (2015): 327-335.
5. Li, Limei, Qing Li, Li Gui and Yi Deng, et al. "Sequential gastrodin release PU/n-HA composite scaffolds reprogram macrophages for improved osteogenesis and angiogenesis." *Bioact Mater* 19 (2023): 24-37.

How to cite this article: Li, Fenglan. "Gastrodin's Mechanism and Prospects in Osteoporosis, Osteogenesis and Osseointegration." *Oral Heath Case Rep* 8 (2022): 69.