

Abstract

Subject: Evaluation of wound healing effect of polyvinyl alcohol hydrogel loaded with silver nanoparticles modified with tannic acid to accelerate wound healing in Dawly-spague male rats

Introduction: Wounds, as an important treatment problem, are always of special interest in biomedical research. In the conducted studies, various wound dressings have been proposed to accelerate wound healing, each of which had its own advantages and disadvantages. Among the different wound dressings, hydrogels have attracted a lot of attention due to their suitable physicochemical and biological properties. On the other hand, the antibacterial property of many nanoparticles has been confirmed in the process of accelerating wound healing. In this study, taking advantage of the favorable biological properties of hydrogel and antibacterial nanoparticles, multi-branched polylysine/polyvinyl alcohol (PVA/PL) hydrogel wound dressing containing silver nanoparticles improved with tannic acid (AgTA NPs) was investigated and studied in an animal model. . . Antibacterial, anti-inflammatory and antioxidant effects of silver nanoparticles improved with tannic acid and polylysine are expected to accelerate the wound healing process. On the other hand, the therapeutic effects of Allantoin drug (Alla) as an anti-inflammatory drug model in the prepared hydrogel were investigated.

Materials and methods: In this study, the therapeutic effects of PVA/PL-based hydrogel wound dressing containing AgTA NPs and Alla drug to accelerate wound healing in male Dawly-Spague model rats were investigated. The animals were completely randomly divided into four groups of 6. After creating a wound, the wound site in the animals of each group was covered with Hydjoly wound dressing and Tegaderm film as wound dressing. Animals were treated with hydrogel, hydrogel containing AgTA NPs and hydrogel containing AgTA NPs and Alla drug during a period of 14 days. Animal survival was monitored during treatment. Likewise, on different days, the wound site was observed and photographed by a digital camera. Antibacterial effects, animal toxicity and wound area were investigated and studied in different groups.

Results: The results of this study showed that the prepared hydrogel has very good antibacterial properties for wound treatment. Likewise, wound monitoring in different groups showed that PVA/PL hydrogel containing AgTA NPs and Alla drug has a faster process in wound healing during the test period. The results of histology also showed that the hydrogel is not toxic on the important animal tissues such as liver, kidney and spleen, and the hydrogel had positive effects on healing the wound tissue.

Conclusion: The findings of this study showed that the prepared hydrogel, having antibacterial and anti-inflammatory properties, shortens the healing period of skin wounds, and by reducing the duration of scars, it is a suitable and desirable choice to help repair skin injuries.

Key words: Wound healing, Silver nanoparticles modified with tannic acid, Polyvinyl alcohol hydrogel, Branched polylysine, Allantoin