Introduction: Following injury, inflammatory response occurs and the cells below the dermis begin to increase collagen production, then, the epithelial tissue is regenerated. Royal jelly (RJ) has anti-inflammatory activity hence, the aim of this study was to examine the effect of RJ on the induction of sterile skin incision in Balb/C mice.

Methods: In an experimental study 60 female Balb/C mice (8 weeks old) were anaesthetized with ether and a longitudinal para vertebral full thickness incision of 10 mm long was made. The animals were divided into six equal groups. Group 1 was considered as negative control. Group 2 (positive control) was treated topically with Nitrofurazon ointment, group 3 with RJ (200 mg/kg) every day, group 4 with RJ (200 mg/kg) every two days, group 5 with RJ (300 mg/kg) every day and group 6 with RJ (300 mg/kg) every two days. The wound length was measured with vernier capilar every two days up to full healing occurred and compared in different groups.

Results: There was significant difference between groups 1 or 2 and other groups (p<0.05). RJ promoted wound healing activity significantly in group 3, 5 compared to negative and positive control groups. There was no significant difference between the uses of 200 mg/kg and 300 mg/kg RJ (p>0.05).

Conclusion: The results of this study indicate that daily application of RJ possesses betters wound healing effects than Nitrofurazon and every two days usage of RJ.

Implication for health policy/practice/research/medical education: Royal jelly has beneficial effect on burn healing with better wound healing effects when is used daily compared to every two days usage.


Introduction
Skin is the body's most extensive organ and is considered as a main physical barrier between a creature and its surrounding. Human's skin protects his body against numerous harmful agents (1).

The wounds of skin are categorized into two groups, acute and chronic. Surgical wounds could be healed through different ways (2). The primary healing occurs when the tissue is incised with no infection and clean, non-infectious edges of scalpel only destroy the center of basement membrane integrity and kill a small number of epithelial and connective tissue cells. In these wounds, cut edges are close to each other and healing is complication-free. The wounds with delayed healing, has a lower tensile strength initially, but the consistency and strength become similar to normally healed wounds' ultimately (1,2).

The stages of wound healing comprise of hemostasis and inflammation, proliferation, differentiation and reformation. Hemostasis occurs before initiation of wound inflammation. Macrophages cause regulation of cell proliferation, matrix formation, and angiogenesis through releasing of mediators such as transforming growth factor beta, vascular endothelial growth factor, insulin-like growth factor, epithelial growth factor, and lactate. In addition, macrophages contribute greatly to regulating angiogenesis as well as matrix deposition and...
Royal jelly contains, 1. Royal jelly is a milky 4.6. Royal jelly has estrogenic properties and 3. Royal jelly exerts anti-
properties have been demonstrated in 2. Royal jelly seems to be an alternative drug for wound healing. Thanks to therapeutic effects and low side effects, royal jelly seems to be an alternative drug for wound healing. Therefore, the purpose of this study was to investigate the effect of royal jelly on sterile skin cut repair in Balb/C mice.

Materials and Methods
In an experimental study 60 female Balb/C mice with 8-week old were selected and randomly assigned to 6 groups of 10 each. The animals were maintained in natural living conditions with water, food and light available. The study protocol complied with international regulations for use of laboratory animals and was approved by Shahrekord University of Medical Sciences Ethics Committee. The mice were anesthetized by ether. After shaving the hairs and disinfecting the skin with alcohol, a 10 mm long full skin-thickness incision was performed on the back of animals with a scalpel no. 20. First group (negative control), only saline was applied on the skin cut daily. Royal jelly was mixed with saline and the concentration was adjusted to acquired doses in 100 µL of the solution. And test groups were treated as follows: Second group (positive control) treated with 2.0% nitrofurazone ointment. Third group received 200 mg/kg royal jelly daily, and forth group received 200 mg/kg royal jelly every other day. Fifth group 300 mg/kg royal jelly was applied daily, and sixth group, 300 mg/kg royal jelly was used every other day.

To assess wound recovery, all mice were physically examined every other day and parameters including the rate of wound shrinking, changes in wound length, and duration of recovery were used (14).

To measure the length of wounds, Vernier caliper with 0.01-mm precision was used. The wounds were examined for 17 days. On the day 17, all mice wounds recovered completely. The collected data were analyzed by SPSS using Kruskal-Wallis test.

Results
The wound length was measured each day. On the 3rd and 4th days of examination, there was a significant difference in wound length among different groups of study (p<0.05). But, no significant difference was seen on other days. As illustrated in Figure 1, on days 3 and 4 of examination significant difference was observed between negative controls and the group receiving royal jelly daily (p<0.05). Therefore, daily application of royal jelly at any dose used in this study had a considerable effect on wound healing compared with negative control. In addition, there was a significant difference between mean score of positive controls and that of the groups receiving royal jelly every other day on the days 3 and 4 (p<0.05); this shows that daily application of royal jelly caused a better recovery of the wounds compared to nitrofurazone ointment.

The results also indicated that on the day 3 of examination there was a significant difference in mean score between the two group receiving royal jelly at 200 mg/kg daily and every other day (p<0.05). Daily use of same dose of royal jelly, had a better effect on wound recovery compared to every other-day. As illustrated in Figure, on the day 3, a significant difference was noted between the two group receiving royal jelly at 300 mg/kg daily and every other day (p<0.05).

In addition, on the days 3 and 4 the mean score of the group receiving royal jelly at 300 mg/kg daily was significantly different from that of the group receiving royal jelly at 200 mg/kg every other day. This could be due to frequent use of royal jelly at higher doses. However, no significant difference was seen between doses of 200 and 300 mg/kg.

Discussion
In this study we investigated the effect of royal jelly...
Effects of royal jelly on skin repair

The present study results are in consistent with Fuji et al’s, and showed a decrease in duration of wounds recovery due to royal jelly application. The discrepancy was the method of royal jelly administration. Taniguchia et al indicated that oral administration of royal jelly prevented the progression of dermatitis-like skin lesions in NC/Nga mice (19). Similarly to our results royal jelly administration prevented the progression of skin lesions.

In view of above findings, royal jelly as a natural product could be effective on wound restoration in mice, which indicates that this substance could be a good candidate for human wounds, as well. However, further human studies are needed to offer royal jelly as a main alternative to effective drugs used for wound restoration. Therefore, similar complementary works should be conducted on human to make use of royal jelly as an alternative possible.

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Authors’ contributions

All the authors wrote the manuscript equally.

Conflict of interests

The authors declared no competing interests.

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