

Prophylactic effect for the sesame oil and camphor oil on the infected burn skin of mice

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Abstract

The effect of sesame oil and camphor oil on experimental burn mice infected with common pathogen *Pseudomonas aeruginosa* was studied . Sesame oil and camphor oil which prepared in Vaseline gel at two concentration (2.5% , 5%) and, and Gentamycin cream 3% were used .The macroscopic changing on the skin were demonstrated, the result shown that treated animal with oils were improved while the animal treated with Gentamycin cream showed no healing for the skin . The histological study of infected skin showed severe necrosis and neutrophil infiltration in the epidermis and dermis and the inflammatory reaction extended to hypodermis is reflected by fibrin deposition and neutrophil infiltration also granulation tissue started in to the subcutaneous tissue ,The oils were effect on treated skin after one week and complete the healing after 3week from the beginning of treatment and there was no response for the animal treated with Gentamycin cream till end of treatment duration . Combination of sesame oil 2.5%and Gentamycin cream in equal percent used in treatment the infected burn skin and compare with Moist exposed burn ointment (MEBO) the influence was more effective than using oil or cream alone the animals were healing through 2 weeks after using the combination oil and Gentamycin , and MEBO ointment. There was no histo-pathological lesions for skin of animal healing from the burn area of it covered with thick layer of epithelial cell and replaced with thin layer of epithelial cell .

Introduction

Burns are widespread in the developed world, and expensive burn dressings are not universally available. Most burn patients suffer from a partial thickness burn that can be treated conservatively [1]. Patients who suffer severe burns are at higher risk for local and systemic infections, in recent years emerging resistant pathogens have forced burns care providers worldwide to search for alternative forms of treatment [2]. Though burns have traditionally been considered as special types of wounds does not differ in any way from healing of any other type of wound [3,4]. *Pseudomonas aeruginosa* can cause variety of skin infections, both localized and diffuse. The common predisposing factors are breakdown of the integument which may result from burns, *Pseudomonas aeruginosa* is notorious for its resistance to antibiotics, therefore, a particularly dangerous and dead pathogen. The bacterium is naturally resistant to many antibiotics due to the permeability barrier afforded by its Gram-negative outer membrane. Also, its tendency to colonize surfaces in a biofilm form makes the cells impervious to therapeutic concentrations antibiotics , only a few antibiotics are effective against *Pseudomonas aeruginosa*, including fluoroquinolones, gentamycin and imipenem [5] Burn wound infection is problematic because it delays healing, encourages scarring and may result in bacteremia, sepsis or multiple-organ dysfunction syndrome whereby organs from several systems are unable to maintain homeostasis on their own, requiring immediate medical attention , *Pseudomonas aeruginosa* is the most prevalent infective agent. particularly difficult to treat because it posses a large number of virulence factors and antimicrobial resistance genes[6].The sesame oil derived from seeds of *Sesamum indicum* L (Pedaliaceae) and sesame oil which are used traditionally in the folklore the treatment of various

kinds of wounds [7]. herbaceous annual belonging to the Pedaliaceae family. The main constituents of sesame oil include fatty acids, lignans, and antioxidants, such as α -tocopherol. The fatty acids in sesame oil include palmitic acid (16:0; 7.0%–12.0%), palmitoleic acid (16:1; less than 0.5%), stearic acid (18:0; 3.5%–6.0%), oleic acid (18:1; 35.0%–50.0%), linoleic acid (18:2; 35%–50%), linolenic acid (18:3; less than 1.0%), and eicosenoic acid (20:1; less than 1.0%). it is one of the oldest oilseeds known to man and is considered to have not only nutritional value ,but also medicinal properties.[8, 9], it is employed in ancient Chinese medicine to increase energy and prevent aging[10]. Camphor oil can be used in the treatment of nervous depression, acne, inflammation, arthritis, muscular aches and pains, sprains, rheumatism, bronchitis, coughs, colds, fever, flu and infectious diseases [11,12] Camphor is readily absorbed through the skin and produces a feeling of cooling similar to that of menthol, and acts as slight local anesthetic and antimicrobial substance. There are anti-itch gels and cooling gels with camphor as the active ingredient. Camphor is an active ingredient (along with menthol) in vapor-steam products, such as Vicks VapoRub. Although touted as a cough suppressant, it has no effects on respiratory tract function. A recent publication in Pediatrics suggests the topical application of VapoRub may improve symptoms of colds and sleep quality when compared to a control [13] Camphor essential oil is extracted from the *Cinnamomum camphora* (also known as *Laurus camphora*) of the Lauraceae family[11,12]. The risk of infection in burnt patients is high and at the antibiotic resistance of bacteria isolated from these patient has increased. The aim of the present research was to detection the herbal treatment to help in treated the infection of burnt patients and to detect prophylactic effect of Sesame Oil and Camphor Oil against clinical isolates of *P. aeruginosa* obtained from burns patients in vivo and well the potentials of

their effect in combination with two selected ointment use as protocol treatment of skin burn.

Material and methods

We obtain the oils from local market (Emad traditional mark) for this purpose.

Vaseline gel as control.

The animal experiment .

Eighteen adult white mice weighting between 20-25 gm were used, the animals were caged individually after wounding for treatment till completion of wound healing. The animals were burn wound shaven back by metal hot contact put the metal hot on the animal back for 30 seconds , The burned area injected subcutaneously by 0.1ml of *Pseudomonas aeruginosa* growth over night [14] and wait until the infection symptoms appear and dissect one animal to study the histological lesion. Begin the treatment with animals until wound healing (the treatment was continued till the day of scab falling) of each group then studied the histological changing of skin for each group of animals [7].

Results

Macroscopic experiments

After infected burn the animals symptoms of infection showed (swelling, redness of skin) figure(a) Begin the local treatment , after 1week of using local

Group 7: MEBO ointment [15].

Group 8: Gentamycin cream.

Preparation the local application .

So, sesame oil 2.5%,5% and camphor oil 2.5%,5% in vasline gel as basement were used and use only application treatments showed, group (9 ,7) give good response to healing or improved of infected burn skin figur(b) around infected burn area, but group 2 and group 8 no improved of infected burn area and another groups give intermediate healing of infected burn skin table (1) , after 2 weeks of using local application treatment. Group (9,7) appear completely healing markers of skin , group(2,8) stay end of treatment period no appear healing markers or no improved infected burn skin figur (c) ,other groups appear healing markers of skin (after 3weeks end of treated) figure(d,e).

Groups of animals experiment.

Two animals for each group were used .

Group 1: animal has no burn and infection

Group 2: control animal that treated with Vaseline gel only

Group 3: sesame oil 2.5%.

Group 4: sesame oil 5%.

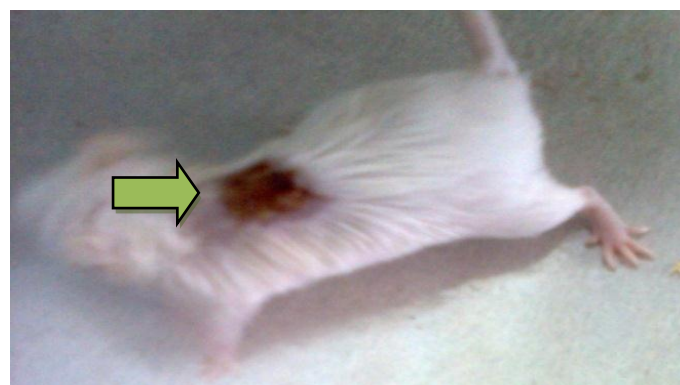
Group 5: camphor oil 2.5%.

Group 6: camphor oil 5%.

Group 9: Gentamycin cream 3% + sesame oil 2.5%.



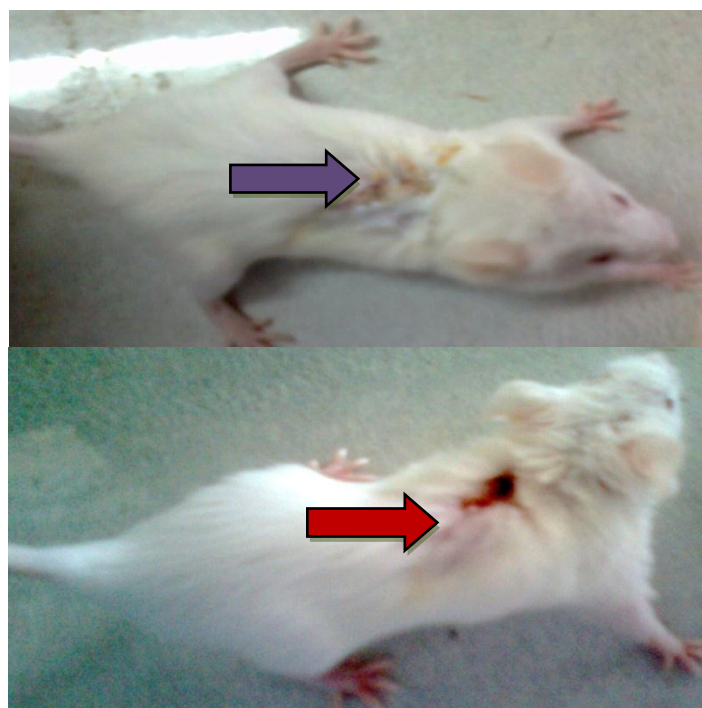
Figure (a) The burn and infection animal before treatment





Fig(b) This section show the area response for treatment (→)



Fig (c) This section show no any response for treatment



Fig(d) This section after 2 weeks of treatment appear completely healing () and this section appear intermediate healing before end period of treatment ().

Microscopic examination.

The result of histological changing in the animal burn and infected skin with *P.aeruginosa* characterized by severe necrosis and neutrophil infiltration in the epidermis and dermis of skin and the inflammatory reaction extend to hypodermis layer which showed fibrin deposition and neutrophil infiltration also granulation tissue start in the subcutaneous tissue fig(2,3).

In the end of treatment period dissect the animal and study the histological change in the groups (2,8) there was granulation tissue consisting from blood vessel and fibroblast replacement the necrotic area and cover by a regular thickness of epidermis there was no

improved of skin fig(7,8) and the histological changes of healing skin ,the layer of skin was similar to the normal skin fig(1) and the tissue come back to normal skin gradually fig(9,10). The animal that treated with sesame oil 2.5% , 5% after 3 weeks showed neutrophil and mononuclear cell infiltration in the dermis area and thick epithelial layer cover the burn area which complete healing fig(4,5) also healing the animal treated with camphor oil 5% after 3 weeks showed fibrin deposition, necrosis and neutrophil filtration in the dermis layer fig(6),the healing animals were the skin was improved which cover the burn area with thick layer of epithelial cell and replacement of thin layer of epithelial layer.

Table (1) show groups animals and the duration of treated with local application

| Animal groups | Days of treatment 21days | Type of healing |
|---------------|-----------------------------|------------------------------|
| 2 , 8 | 21 st days | No healing animals |
| 3 , 4, 5, 6 | 14 th day | Intermediate healing animals |
| 7 , 9 | 7 th day | |
| 7,9 | 14 th day | Complete healing animals |
| 3,4,5,6 | 21 st day | |

Discussion

The results of oils used and MEBO ointment which used in vivo (table 1) came in agreement with was mentioned by [7, 15, and 16]. Wound healing process was accompanied by the reduction of necrosis, ulcer size, inflammatory cells, and also by an increase of fibroblasts, vessels, and, re-epithelialization. Among inflammatory cells, there were few neutrophils, surrounding the ulcer, and few mononucleotide cells, the animal treated with combination sesame oil 2.5% and Gentamycin cream, and animal treated with MEBO were showed accelerated epithelial repair in the burn skin infected which was agreement with Jurjus et. al. [17]. The normal healing response begins at the moment that the tissue is injured[4]. The

effect of sesame seed and oil the constituent of the seeds on experimentally induced wounds in rats which is very potent antioxidant activity, sesame oil and other constituent like sesaminol, sesaminolinol, and sesamol reduce lipid oxidation in liver and kidney [7]. Camphor oil give good result in healing in this study, which is used in treatment of human facial demodicidosis with freshly prepared camphor oil with or without glycerol dilutions gave complete cure with concentrations of 100%, 75%, and 50%. Incomplete cure but marked drop in infestation density was achieved with diluted camphor oil at concentrations of 25-20%. Camphor oil application proved to be safe with no side effects[18].

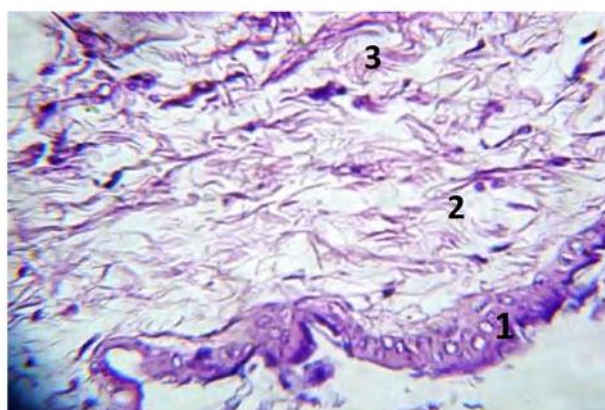


Fig. (1) Histological section in normal skin of mice H & E 40X, (1) epidermis, (2) dermis, (3) hypodermis.

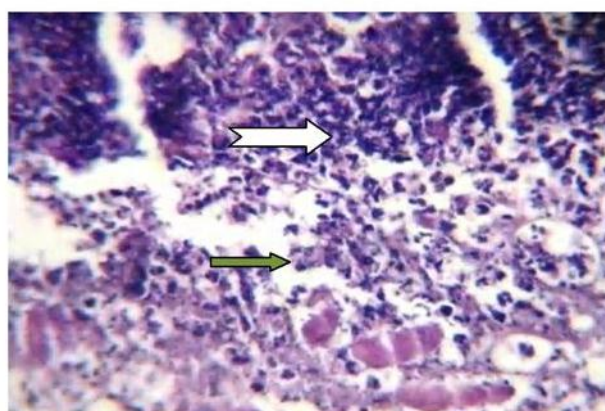


Fig. (2) Histological section in the burned skin and infected animal with *Pseudomonas aeruginosa* shows necrosis of the epidermis and dermis layer (\Rightarrow) & neutrophil infiltration (\Rightarrow) H&E40X.

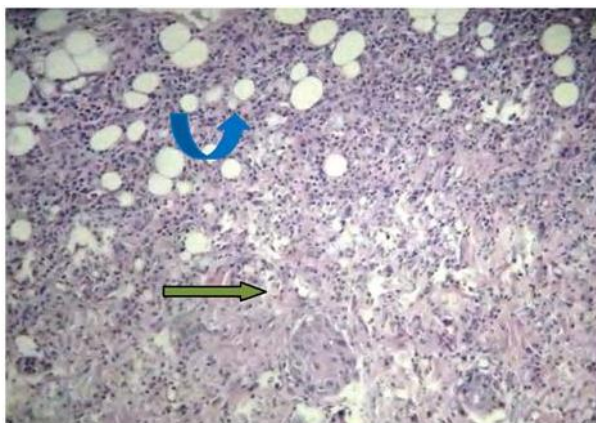


Fig.(3) Histological section in the burned skin and infected animal with *Pseudomonas aeruginosa* shows severe neutrophil infiltration in adipose tissue (↪) and fibrous connective tissue proliferation (→) H&E 10X.

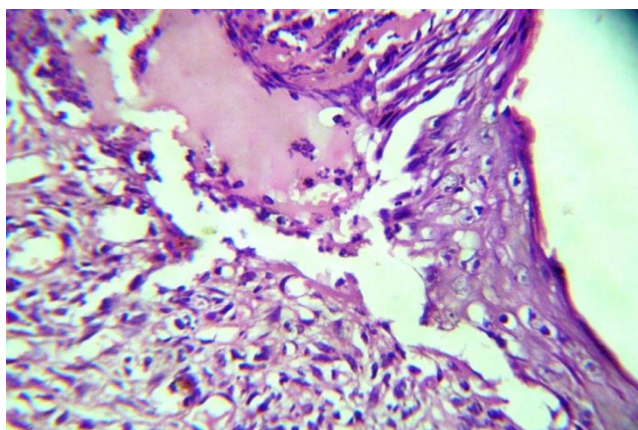


Fig. (4) Histological section in the skin of burn and infected animal with *Pseudomonas aeruginosa* treated with sesame oil 2.5% after 2 weeks shows stages of healing skin H&E40X.

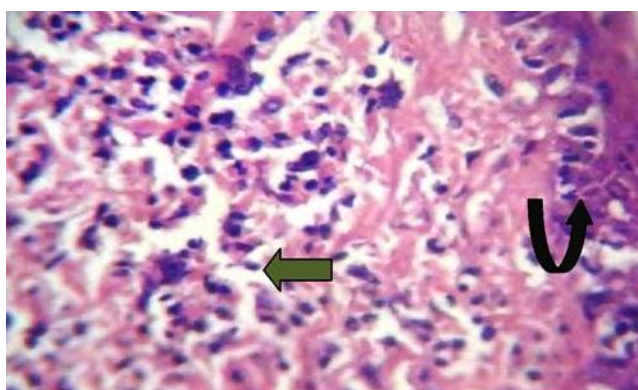
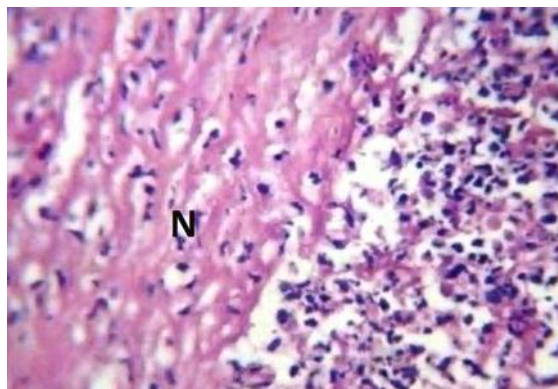


Fig (5) histological section in the burned skin and infected animal with *Pseudomonas aeruginosa* post treated with sesame oil 5% after 2 weeks shows neutrophil & mononuclear cell infiltration in the dermis area (↪) and thick epithelial layer cover the burn area (↪) H&E40X.



Fig(6) Histological section in the skin of burn and infected animal with *Pseudomonas aeruginosa* treated with camphor oil 5% show fibrin deposition , (N)necrosis and neutrophil infiltration in the dermis layer H&E 40X.

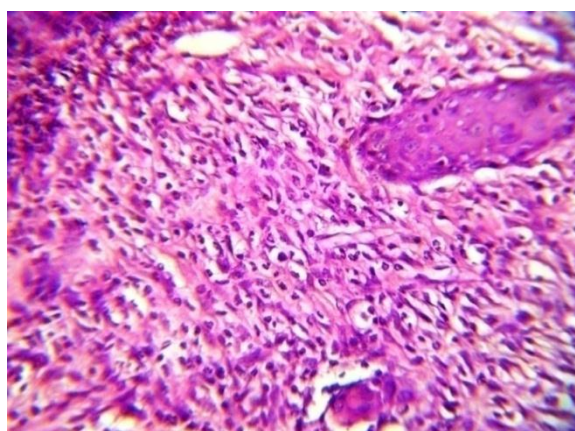
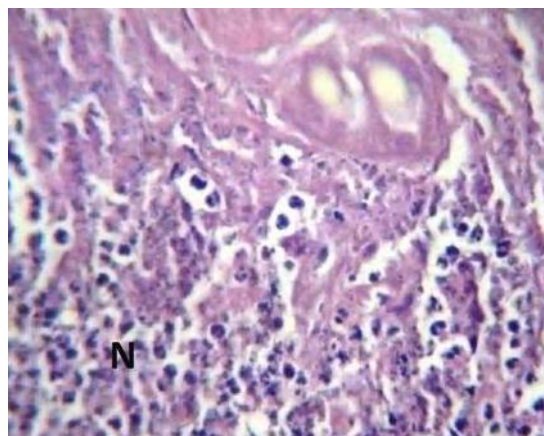


Fig. (7) Histological section in the skin of burn and infected animal with *Pseudomonas aeruginosa* treated with Vaseline gel only no improved in the epidermis H & E 40X.



Fig(8) Histological section in the skin of burn and infected animal with *Pseudomonas aeruginosa* treated with gentamycin cream shows (N) necrosis with neutrophil infiltration in the dermis & epidermis layer H&E 40X.

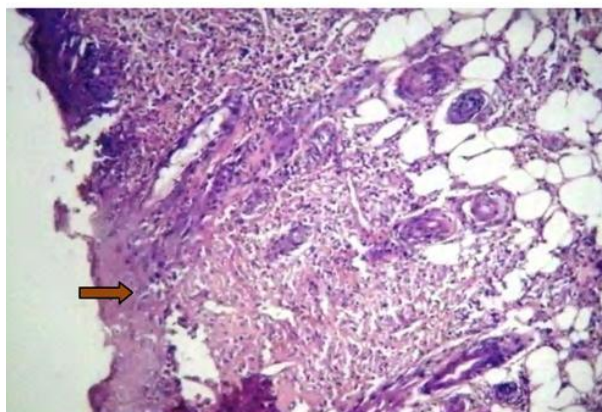

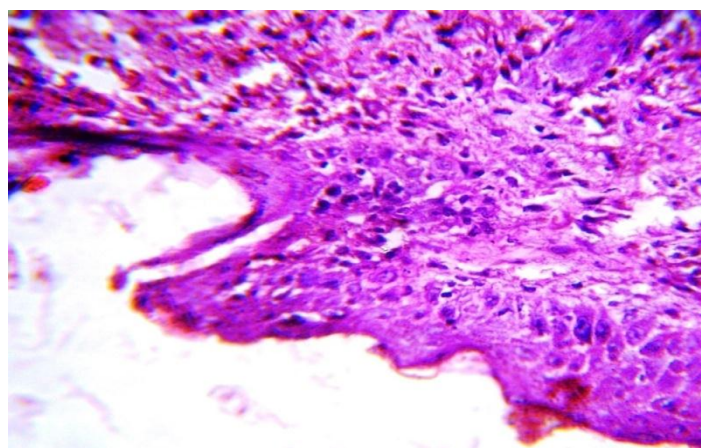


Fig. (9) histological section in the skin of burn and infected animal with *Pseudomonas aeruginosa* treated with MEBO ointment shows necrosis of epidermis with inflammatory cell infiltration in the dermis

() H&E 10X.



Fig(10) Histological section in the skin of burn and infected animal with *Pseudomonas aeruginosa* treated with Gentamycin cream 3% + sesame oil 2.5% after 2weeks shows improved and healing of mice skin H&E40X.

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التأثير الوقائي لزيت السمسم وزيت الكافور في الحروق المخمجة في جلد الفئران

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الملخص

درس تأثير زيت السمسم وزيت الكافور على حروق مختبرية في الفئران تم اصابتها بالبكتريا الاكثر شيوعا *Pseudomonas aeruginosa* . حضر زيت السمسم وزيت الكافور بتركيزين هما (2.5% و 5%) وحضرت التراكيز باستخدام الفازلين جل واستخدم Gentamycin cream بتركيز 3%. لوحظت التغيرات الظاهرية على الجلد فأظهرت النتائج ان الجلد المعالج بالزيوت اظهر تحسن اما استخدام الفازلين جل ومرهم الجنتاميسين فلم يظهر اي شفاء للجلد المحروق . فحصت التغيرات النسيجية للجلد المحروق بعد ظهور علامات الاصابة عليه لوحظ حدوث تنخر وارتشاح في الخلايا اللمفية في طبقة الادمة والبشرة وحدوث التهاب وارتشاح في الخلايا امتد الى الطبقة تحت البشرة وتكون نسيج حبيبي في نسيج تحت الجلد . ظهر تأثير الزيوت على الجلد المعالج استجابة بعد الاسبوع الاول من العلاج واكتمال الشفاء بعد نهاية الاسبوع الثالث من العلاج وعدم استجابة الحيوانات المعالجة بمرهم الجنتاميسين بعد انتهاء فترة العلاج . تم عمل مزيج من زيت السمسم بتركيز 2.5% مع Gentamycin cream بنسب متساوية واستخدمت في علاج الجلد المحروق المصاب بالبكتريا ومقارنتها مع مرهم Moist (MEBO) exposed burn ointment اذ كان التأثير اكثر فعالية من استخدام Gentamycin او sesame oil كلا على حدا. شفيت الحيوانات بعد اسبوعين من استخدام خليط زيت السمسم ومرهم الجنتاميسين ومرهم MEBO . كانت التغيرات النسيجية بعد انتهاء مدة العلاج بالنسبة للحيوانات التي استجابت للعلاج عودة الجلد الى وضعه الطبيعي اذ عودة طبقات الجلد بصورة تدريجية حيث غطيت منطقة الحرق بطبقة سميكة من الخلايا الظهارية ثم استبدلت بطبقة رقيقة الخلايا الظهارية.