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Burn in Animals

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كلية الطب البيطري

الحروق في الحيوانات

بحث مقدم إلى

كلية الطب البيطري / جامعة القادسية وهي جزء من متطلبات نيل درجة الباكالوريوس في علوم الطب و الجراحة البيطرية

من قبل

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1441هـ **2021 م**

بِسْمِ اللَّهِ الرَّحْمَٰنِ الرَّحِيمِ

(فتعالى الله الملك الحق ولا تعجل بالقرآن من قبل أن يقضي أليك وحيه وقل رب زدني علما)

صدق الله العلي العظيم

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Certificate of supervisor

I certify that **Ali Salman Abd-Alhasan Abd-Ali** and

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Summary

This review aimed to highlight on burn in animals, causes, degree of burn and the way of treatment.

Burn is a type of injury to the skin. It’s a damage of body tissues caused by the action of high temperature or by electrical effects, exposure to radiation or by Chemical agents like alkalis, acids, salts of heavy metals. The researches confirm that there are several degree of burn depending on the concentration and period of exposure to heat agent, and the best way to heal depending on this degree. At the time of the burn, it is essential to stop the contact to high temperature as soon as possible with topical care of partial thickness burnings, silver dressings play a significant role and can be employed as an effective antimicrobial in the treatment.

The conclusions of this study, the rare amount of knowledge emphasizes the necessity for study to identify acute and chronic pain of burn. Burns weaken, endanger life and are difficult to evaluate and control. Recent developments in evaluation and management have been made since the previous publication of an extensive investigation of the treatments of patients with severe burns that can affect research and clinical practice..

Introduction

Burn is a type of injury to the skin. It's a damage of body tissues caused by the action of high temperature or by electrical effects, exposure to radiation or by Chemical agents like alkalis, acids, salts of heavy metals. The sudden formation of widespread burns causes the release of a large number of toxins and Elements into blood. (Efimova1 et.al, 2019) skin is the largest organ in the body and may extinguish it due to burns. Burns responsible for many patho physiological deviations, resulting in a severe form of trauma such as increasing of infection and mortality rates and also sustained hospitalization (Ashburn, 1995;Summer et.al, 2007). Burns may cause systemic problem that affects a different group of organs, this is relative to the large surface area affected. (Horton, 2004).

The pathogenic reflexes of burns are crucial. Extreme thermal stimulation, acting on the receptor system of the skin and other tissues, causes invasion of pain impulses to the central nervous system. It should be noted that the flow of pain does not stop with the elimination of the effect of high temperature on the tissues, but is maintained because of pressure on the swollen of inflammatory tissues on the peripheral nerves. Burn is not only restricted tissue damage but also a serious general illness that affects the body and may include Eye burns, inhalation injuries, and burns of the respiratory tract. The severity of a burn is determined by the size of the area and the depth of tissue damage. The larger the area and the greater the tissue damage, the higher the risk of a burn (Danilevskaya et.al, 2018; Maltseva, 2004).

Thus, there will be an intense and coordinated inflammatory process for a long time, By hormones, hypermetabolism, acute phase proteins, and cytokines linked to multiple organ failure, massive catabolism, delayed wound healing, and death (Jeschke et.al, 2011). Moreover, burn patients were also associated with

disruption in activities of daily living after physical rehabilitation, anxiety, sleep disturbances, depression, and social avoidance. (Rumsey, 2003).

The aim of the study:

1- Performing the main causes of burn in animals.
2- To highlight on the degree of burn and the differentiation between them.
3- Investigate that there are special way used treated and management the burn.

Literature Review

2.1.Pathophysiology of burns

The sudden formation of extensive burns causes the release of a high number of toxins and components of damage cells into blood. The blood levels of prostaglandins, serotonin, histamine, sodium, potassium and proteolysis enzymes increase. This leads to increased permeability of blood vessels. Plasma comes out of the vascular bed, accumulates in the tissues, as a result, the exchange of circulating blood is decrease. In reaction, the body produces hormones into blood that cause vasoconstriction like noradrenaline, catecholamine's, and adrenaline. The mechanism of blood circulation concentration starts. Peripheral parts of the body, and then the internal organs suffering from a absence of blood, which leads to the development of hypovolemic shock. Along with this, there is a thickening of blood and disorders of water-salt metabolism. All of the above leads to failure of various organs, as well as the toxic effect of tissue breakdown products on the internal organs. (Danilevskaya et.al, 2018; Maltseva, 2004).

In the first 1-3 days of burn, the number of red blood cells increases to 10-15 million per mm3, white blood cells up to 20-30 thousand, the hemoglobin. Metabolic disorders dehydration, acidosis, low chloride content in the blood and a disorder of oxidative processes. Thickening of blood with extensive burns is explained by a significant loss of the liquid part of blood (plasma) and enhanced regeneration of red blood cells, resulting from irritation of the bone marrow protein breakdown products; and 1-2 weeks after the burn, anemia develops, which is associated with the intoxcation of the body and a large loss of protein through the burnt surface (Danilevskaya et.al, 2018; Maltseva, 2004).

A balance of the numerous parameters that influence wound healing to limit the duration of stay (and the related treatment expense), the danger of infection, the time to close the wound and the total time to functional restoration are the different clinical

difficulties for thermal acute injuries. Burn wounds have progressed in clinical and preclinical studies over several decades. In terms of patient care significant progress has been made in the area of injury monitoring, the development of new grafts and coverage alternatives, inflammatory management, nutritional optimization and testing of innovative pharmacological procedures., patient survival has improved along with a concomitant decrease in the length of stay(Matthew *etal* ,2015). A serious burn damage leads to a hyper metabolic and hyperflammatory reaction that is far deeper and longer than previously seen. Given the huge adverse effects related with the hypermetabolic and hyperinflammatory reactions, the necessity for seriously brulated individuals has now been established for a much longer time.(Jeschke *etal*, 2011).

2.2. Causes of burns

2.2.1. Chemical burns

happen as a consequence of the action on the tissue of strong acids, alkalis, salts of heavy metals, coagulation necrosis of skin, mucous membranes, and essential tissues occur. A thick fabric shell, that rapidly forms on the place of effect of such chemicals, prevents further penetration of them to the tissue depth. Alkali and other similar chemical compounds, dissolving proteins and saponifying fats cause tissue necrosis. As a consequence, this type of burns are deep; necrotic tissue at the site of the burn turns into a soft scab usually white. When healing chemical, especially alkaline, burns, usually formed powerful deep scars. Chemical burns are slow, without a florid inflammatory reaction.

The degree of damage depends on its concentration and period of exposure . The Effect of acids on the surface of the skin causes superficial lesions. A burn crust, which avoids penetration of acids into the skin. Skin is deeply penetrated due to the influence of caustic alkali on the surface.

Figure 1. Oral burn and ulceration in a feline patient after ingestion of a caustic substance - the specific substance that was ingested is unknown.

2.2.2. A thermal burn

is caused by the action of high temperature in fires, ignition of the fuels , as well as from the impact on the tissue of boiling water and hot steam. The area of the burn is comparatively large, the depth is mainly of the 2nd degree. The primary treatment of the burn signifies the complexity of the residues removal and can subsequently contaminated by infection (danilevskaya *et.al*, 2018; Maltseva, 2004).

In case of Boiling water , The area of the burn is comparatively small but relatively deep, mainly that of 2-3 degrees, while When the body exposed to steam, a skin-deep tissue lesion and affection of the upper respiratory tract happen in most cases. When the body expose to Hot items, a clear border of the object remains in the place of exposure. These burns are deep and are characterized by the second or fourth degree of damage. Additional injuries may happen when the object are removed.

The degree of skin damage during thermal exposure depends on many factors, the temperature , the duration of exposure and thermal conductivity. (Pulniashenko *et.al*, 2006; Stepanov, and Yermolaev 2016).

The most sensitive to burn are sheep and cattle, less - horses and pigs. Young animals tolerate burns worse than adult animals. The reaction to the burn is much stronger, and the course of the disease is more severe in those who have suffered from disease, had injuries with significant loss of blood or are in the last stage of pregnancy

Burns in the head, groin, genitals, udders, and limbs are the most dangerous and severe. So, in case of head burns and inhalation of hot air, suffocation happens due to oedema of the mucous membrane of the larynx and trachea or then complications happen in the form of purulent necrotic inflammation of the trachea, bronchi or bronchopneumonia. Lesions in the groin and genitals are accompanied by shock, a disorder of urination, and in the udder – deep cracks, suppuration, mastitis, general blood infection (sepsis) (Horton, 2004) .The burnt areas of the limbs are contaminated, suppressed, in the subsequent development of contraction, the impossibility of extension in the joints ,partial or complete loss of function. Extensive and deep burns of chest are complicated by purulent inflammation of the pleura and lungs.

Figure 2. Dry thermal burn to cat hind limb.

2.2.3.Electrical burns

occur in contact with a conductive material. Trauma is associated with technical electric current or lightning coming through a body. The electric current bass through the tissues with high electrical conductivity through the blood, cerebrospinal fluid, muscles, to a lesser extent -through the skin, bones or adipose tissue. There is always a current mark (point of entry and exit) in case of electric shock on the body. Burns of this type are characterized by a small area of the lesion, but they are deep. Burns due to radiation exposure can be caused by ionizing, ultraviolet, infrared. Ionizing radiation causes damage not only to the skin but also to adjacent organs and tissues. Burns in

such case are characterized by a shallow form of the lesion but their treatment is difficult due to the destructive effects of radiation on the underlying organs and tissues. Vascular fragility and bleeding increase but ability to regenerate decrease. Ultraviolet skin lesions mainly happen in summer period. Burns, in this case, are shallow, but characterized by a large area of damage. When exposed to ultraviolet light, surface burns of the first or second degree often occur. Infrared radiation can cause damage to the eyes, mainly the retina and cornea, as well as the skin. (Pulniashenko *et.al*, 2006; Stepanov, and Yermolaev 2016)

2.3.Degree of burns

The severity of the burn, the prognosis, and the therapeutic measures depend not only on the depth, but also on the area of the burn surfaces. When calculating the area of burns, the "rule of nine" is used : the neck and head make up 9% of the whole body Surface - outward appearance; Chest - 9%; Abdomen - 9%; The posterior surface of the trunk - 18%; Single upper limb - 9%; One thigh - 9%; One leg with a foot - 9%; External genitalia and perineum - 1%.

There was four degrees of burns: 1- redness of the skin, 2- blistering, 3- skin necrosis Skin thickness, 4 - charred tissue. (Pulniashenko *et.al*, 2006; Stepanov, and Yermolaev 2016).

2.3.1. A first-degree burn:

the affected area of burn is red or pink , slightly shrinkage, sensitive to external irritations; slight swelling (swelling) of skin; in case of thermal burns, not completely burnt hair is visible; pain is expressed slightly.

2.3.2. A second-degree burn:

The skin is compact,; touching with fingers is painful; spilled swelling of the skin and subcutaneous tissue. The greatest progress is reached in 24-48 h after the heat injury. Extensive edema falls on the breastbone, lower part of the chest, abdomen, and limbs. Serous exudate in the form of yellowish-pink droplets sweats out on the borders

of the burn, which, drying up, form loose coatings; on the tender areas of the skin, bubbles with pinkish transparent content and necrosis of the surface layers of the skin. The skin in these places has a wet, contaminated surface. The hurt animal worries, falls to the ground, rubs with a damaged surface on objects. These characteristics are especially strong in dogs and horses. Injuries may be simply produced and ready to reproduce in our new second-level model of thermal burns. Similarities exist in clinical and pathological features with human second-degree burns. Therefore the animal model reported in this study may be used to evaluate the utilization of therapeutic drugs in the cure of deep grade burns..(Pereira *etal* 2012)

2.3.3-Third degree burn:

it is characterized by necrosis of skin and deep-lying tissues. Skin is compact, firm; unresponsive to pain stimuli Pressing your finger in the burn area is painful. After few minutes after the burn, subcutaneous tissue in the area of the lesion and in the circumference swells, and the swelling falls on the underlying parts of the body by 3-4 day. Dead skin areas begin to discard, cracks appear on the 7th-15th day from which serious, large scars are formed. Long-term exposure to concentrated acids leads to the formation of a dense crust – scab of dead tissue. Concentrated alkalis melt tissues often to the bone and, unlike acids, cause very deep burn lesions. General changes in third-degree burns are more significant than in second-degree burns. The stage of excitation of burn shock can last for 3-6 hours. The animal lies down, jumps to feet, makes finical movements, and staggers. The animal has increased sweating, muscles are trembling, it has frequent urination, defecation. Dogs and pigs are aggressive at this time. They have increased body temperature, increased heart rate, and breathing, blood pressure briefly increases. Then the stage of oppression comes: all reflexes are weakened, the animal refuses to eat, it is thirsty, movements are uncoordinated, blood pressure is decreased. The oppression develops in sheep and cattle in the fastest way. After 6-12 hours after the burn organism is getting intoxicated with products of protein decomposition, the

activity of all systems and organs are impaired. These signs may occur with extensive burns of the second and third degree.

2.3.4-Fourth degree burn:

occur from prolonged exposure to high temperature and leads to the charring of a body part or organ. The skin and deep-lying tissues are crumpled, dry, completely insensitive to external stimuli crust. Deep cracks are formed in some places, from which bloody fat-like liquid often flows. Significant in width and depth burns, starting from the 4-8 day, can be complicated by general blood infection and intoxication due to the growth of pyogenic infection. Periods of raised temperature replacement with periods of normal temperature , cardiac activity is weakened, there are deep metabolic disorders of all kinds. This condition often ends with the death of the hurt animal. The size of the burning surface is not difficult to identify, but to determine the depth of the lesion, particularly with burns II and III degree, is possible only on the 5-8-th day, when there will be a definition of the necrotic tissue and start of their rejection. Therefore, when determining the degree of burn in the first hours, the following indicators are taking into account. (Pulniashenko et.al, 2006; Stepanov, and Yermolaev 2016).

2.4. Managment and control

Burns weaken, endanger life and are difficult to evaluate and control. Recent developments in evaluation and management have been made since the previous publication of an extensive examination of the treatments of patients with severe burns that can affect research and clinical practice

Based on the fact that the treatment of burns needs a lot of time and a lot of work of veterinary workers, as well as certain material costs, which with widespread burns do not always pay off, Treating animals with more extensive and deep burns is not economically feasible. Such animals should, if possible, be slaughtered. In determining

the severity of damages and deciding the treatment of the animal it is necessary to consider the localization of the burn. Treatment of burns is one of the most difficult problems in veterinary surgery. .(Thomas,e*tal* 2019)

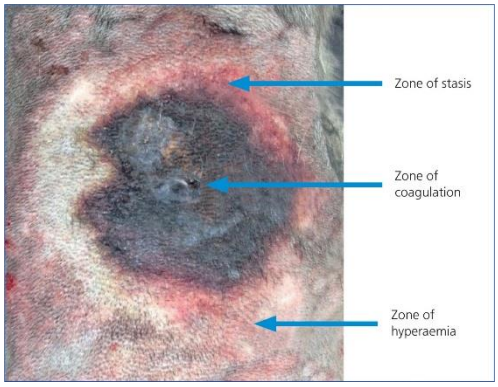

Figure 7. Jackson wound model. This is a burn to the withers of a canine patient where the three distinct zones described by this model can be seen.

2.5. Primary treatment

primary treatment of the burnt surface depends on what process of treatment is chosen. Open or closed and mixed methods of treatment. In veterinary, the most common was an open method of treatment in combination with the use of tanning, fixing and coagulating materials. When processing (lubrication) with these solutions, the burnt surface is covered with a solid crust, which prevents the loss of plasma and protects the damaged tissues from infection. With a closed method of treating burns, bandages with antiseptic agents . In recent years, in the treatment of burns includes covering fibrin and plastic layers that protect injured tissues from the effect of the external environment and infection. The prevention and control of microflora in case of burns should be started as soon as possible. A common antiseptic therapy should be

applied with this purpose in conjunction with the local application of the above-mentioned means.(Efimova1, 2019).

Figure 8. Wet thermal burn day 1 presentation part clip. Figure 9. Wet thermal burn full extent post clip.

2.6. The basic principles of burns subsequent treatment are as follows:

1) Treatment of infected burn is like to that of infected wounds. by using same methods as in the treatment of wounds .

2) treatment of burns methods of epidermisation , The transplantation of free flaps is the only technique for saving the life of an animal .

3) high protein loss through the wound surface and the development of post-burn anaemia, so a blood transfusion, apply the blood plasma hydro lysate and other substitutes are very important to treatment of this situation

2.7.Treatment

At the time of the burn, it is essential to stop the contact to high temperature as soon as possible. The burnt surface is carefully cleaned, and washed with water. To reduce pain and limit irritation, use cold or lotions with alcohol, cologne, 1-3% solution of potassium permanganate. As for chemical burns, the surface washed by a large

amount of water for 30 minutes, burn by acidic agent are nullified with 1-2% alkaline solutions like soap, soda or dusting with chalk. In case of a burn with alkalis, the burned place is poured with 1-2% solution of acetic or citric acid. The burn caused by quicklime is treated by milk. Burns with phosphorus, where the chemical effect is shared with thermal, are profusely washed with water and lotion of 5% copper sulfate . Good results in burns of any localization are required with intravenous administration of local analgesic, Neuroleptic drugs (Maltseva, 2004).

In subsequent days novocaine anesthesia can be combined with sleeping pills (sodium bromide 0,02-0,05 g per 1 kg of animal weight 2 times a day). Polyglucin (1.5-2 l for large animals and 100-500 ml for small animals), etc is injected intravenously as antishock fluids. It is advisable to treat animals only with burns of the first and partly second degree, but not with burns of the third and fourth degree, affecting 5-10% of the body area. Such animals are used on meat in the first 1-2 days after burn and only on medical conclusion. In the modern world people in their home conditions often manage a wide variety of pets, whose main function is animal therapy. But often animals are not adapted to the conditions offered by a man. Animals are exposed to various hazards, including being exposed to burns.(Maltseva, 2004; Danilevskaya *et.al*, 2016). Nonexclusive dressings used to reduction of bacterial contamination, enhance the healing of skin and minimize pain caused by air movement over the skin or direct contact to the burnt or grafted region (Broussard and Powers,2013).

In the topical care of partial thickness burnings, silver dressings play a significant role and can be employed as an effective antimicrobial in the treatment of (but not preventive) skin infections in burning wounds. In terms of infection control, LO S, time necessary for healing, pain and surgical interventions, among silver containers, nanocrystalline silver, silver impregnated and silver-impergnized hydro fibre each seems preferable to SSD (Duran, *et.al,* 2016; Nherera, *et.al*.2017)

Antibiotic products In addition to the operating, antibiotics and other antimicrobial agents such as silver should only be used to treat infections..(Wibbenmeyer,*etal* 2006) Because of the danger of sepsis development, established infection is necessary to diagnose. In patients with burns, sepsis has been identified as a major cause of death. (Bang,*etal* 2002)

References

Ashburn MA. (1995)Burn pain: The management of procedure-related pain. *The Journal of Burn Care & Rehabilitation.;16(3):365-371*

Bang RL, Sharma PN, Sanyal SC, Najjadah IA.(2002) Septicaemia after burn injury: a comparative study. *Burns;28:746–751*.

Broussard KC, Powers JG.(2013) Wound dressings: selecting the most appropriate type. *Am J Clin Dermatol;14:449–459.*

Danilevskaya N V, Deltsov A A and Parasyuk L P (2016) Fundamentals of pharmaceutical technology. *Part 2. Industrial production. Manual - Moscow, p. 124.*

Danilevskaya N V, Deltsov A A, Tuhvatova R F, Bessarabova E V and Parasyuk L P (2018) Workshop on General and Private Pharmacology, *Moscow, p.94.*

Duran N, Duran M, de Jesus MB, Seabra AB, Favaro WJ, Nakazato, G.(2016). Silver nanoparticles: a new view on mechanistic aspects on antimicrobial activity. *Nanomedicine;12:789–799*

Efimova1, O I Dimitrieva, A I Nesterova, O P Aldyakov, A V Obukhova, A V and Ivanova T N (2019) Methods for the effective treatment of animal burns. *5th International Conference on Agricultural and Biological Sciences* .

Horton JW. (2004); Left ventricular contractile dysfunction as a complication of thermal injury. *Shock. 22(6):495-507.*

Jeschke MG, Gauglitz GG, Kulp GA. (2011) Long-term persistance of the pathophysiologic response to severe burn injury. *journal.pone.;6(7):*e21245.

Maltseva B M (2004) The use of wound coatings in burns [experiments on white rats] *Veterinary Abstract J - Moscow, p. 485* .

Matthew P. Rowan, Leopoldo C. Cancio, Eric A. Elster, David M. Burmeister, Lloyd F. Rose, Shanmugasundaram Natesan, Rodney K. Chan, Robert J. Christy & Kevin K. Chung. (2015)Burn wound healing and treatment: Review and advancements. *Critical Care. 19:243. DOI: 10.1186/s13054-015-0961-22) (PDF) Animal Models of Burn Wound Management.*

Nherera L, Trueman P, Roberts C, Berg L. (2017) Silver delivery approaches in the management of partial thickness burns: a systematic review and indirect treatment comparison. *Wound Repair Regen;25:707–721* .

Pereira DST, Lima-Ribeiro MH, Pontes-Filho NT. (2012) Development of animal model for studying deep second-degree thermal burns. *Journal of Biomedicine & Biotechnology10.1155/2012/46084 (2) (PDF) Animal Models of Burn Wound Management.*

Pulniashenko P R, Kozjy R S and Fedorov V N (2006) Infusion therapy animals *Veterin. Sci. Kuban, 2 pp. 5-9.*

Rumsey N, Clarke A, White P. (2003);Exploring the psychosocial concerns of outpatients with disfiguring conditions. *Journal of Wound Care. 12:247-252.*

Stepanov A A and Yermolaev V A (2016) Modern methods of treatment of burns in veterinary medicine *The International student's scientific bulletin. No. 4-3*

Summer GJ, Puntillo KA, Miaskowski C, Green PG, Levine JD. (2007)Burn injury pain: The continuing challenge. *The Journal of Pain.;8(7):533-548.*

Thomas C L, Ruilong Z, Albert K, Aruna W, John Vandervord, Meilang Xue, and Christopher John Jackson .(2019) A Critical Update of the Assessment and Acute Management of Patients with Severe Burns. *Advances in Wound Care 1; 8(12): 607–633.*

Wibbenmeyer L, Danks R, Faucher L.(2006) . Prospective analysis of nosocomial infection rates, antibiotic use, and patterns of resistance in a burn population. *J Burn Care Res;27:152–160* .

الخلاصة

هذه الدراسه هدفت الى تسليط الضوء على الحروق في الحيوانات، اسبابها، درجه الحروق وطرق علاجها.

الحرق هو جرح يحدث بالجلد، وهو تلف بانسجة الجسم يحدث بسبب فعل الحراره العالية او بواسطه العوامل الكهربائية ، التعرض للاشعاع او بواسطة العوامل الكيميائية مثل القاعدة ، الحوامض ، املاح المعادن الثقيلة . اكد الباحثين على انه هنالك عده درجات لشدة الحرق تعتمد على تركيز الحراره ومده التعرض لها ، وان افضل الطرق لعلاج الجروح يعتمد على درجة الحرق . في وقت حدوث الحرق من الضروري ايقاف التعرض للحرارة بقدر الامكان مع استخدام العلاج الموضعي، استعمال ضماده مركبات الفضه يلعب دور اساسي وكذلك استخدام مضادات الجرثوميه لمنع التلوث.

المستنتج من هذة الدراسة بان هنالك معرفه محدودة توكد على دراسة خصائص الالام الحاده والمزمنه للحروق. الحروق وتعرض الحياة للخطر ويصعب تقييمها والسيطرة عليها. ان التطورات الأخيرة في التقييم والإدارة حول علاجات المرضى الذين يعانون من حروق شديدة يمكن أن تؤثر على البحث والممارسة السريرية.

List of Contents