Histopathological evaluation of skin wound in rabbits treated by systemic dexamethasone.

Muhammad A. Kashmoola B.D.S, M.Sc., Ph.D. (1)

ABSTRACT

Background: Healing of all damaged tissues including skin wounds has an identical pattern and depends on numerous intrinsic and extrinsic factors; one of these factors is cortisone hormone. The present study was designed to show the effect of dexamethasone on skin wound healing.

Materials and methods: Twelve rabbits were used, experimental group (7 rabbits) were given 4 mg dexamethasone ten days prior to skin incision and control group (5 rabbits) had skin incision without medicament application. Biopsies were taken from two groups for histopathological evaluation.

Results: There was a delay healing in the experimental group in comparison to control group.

Conclusion: Prolonged use of dexamethasone or misuse of this drug impaired wound healing.

Key words: Dexamethasone, skin wound. (J Bagh Coll Dentistry 2007; 19(1)58-61)

INTRODUCTION

Wound healing is the response of tissue to injury that results in scar formation. Tissue regeneration would be more ideal response to destruction (1).

Tissue damage may be caused by (2):

1- Traumatic excision
2- Physical, chemical and microbial agents.
3- Ischemia.
4- Body response to external agent. Can itself engender necrosis

The healing process has two ways (3)

1- Contraction as a mechanical reduction in the size of the defect occurring in the first week.
2- Replacement of lost tissue which is brought about by migration of cells as well as division of adjacent cells to provide extra tissue to fill the gap.

Healing of skin wounds result by either (4)

1- Primary intention: The wound rapidly filled with clot and shortly afterward the epithelium migrates in to the wound to close it. Granulation tissue then proceeds.
2- Secondary intention: The wound show extensive tissue loss and failure to approximate the wound edges. The main bulk of tissue which performs is granulation tissue, this type of healing sometimes known as healing by granulation.

Factors affecting the healing of skin wounds include (5)

A- Local factors:
1. Blood supply
2. Immobilization
3. Local temperature
4. Drying
5. Exposure to radiation

B- General factors:
1. Age of patient
2. Nutrition
3. Infection
4. Hormones include:
   a- Insulin hormone
   b- Adrenocorticotropic hormone and cortisone.

Dexamethasone is corticosteroid drug can be used postoperatively to decrease pain, nausea and vomiting (6). Many studies used 20-80 mg dexamethasone intraoperatively and they found a significant decrease in postoperative pain score and wound infection (7, 8). Studies demonstrated that topical dexamethasone enhance healing more than systemic administration of this drug (9).

Dexamethasone is also used in dental treatment. Sae et al (10) treated replanted tooth in dog by topical dexamethasone and others systemically treated by administrated dexamethasone intramuscularly 2 days prior to, one on the day and every other day after implantation. A significant result was found in topical use of dexamethasone that enhances healing more than systemic use.

The present study was designed to determine if long receiving or misuse of dexamethasone would impair healing and/or increase incidence of postoperative skin wound complication.

MATERIALS AND METHODS

Twelve albino rabbits, age mean 6.5 months, weighed 900-1100 grams are used in this study. Seven rabbits represented the experimental group while other five rabbits represented control group.

Experimental group: the rabbits received intramuscularly dexamethasone 4 mg injection once daily for one month. Then skin incision 4mm in depth and 2 cm in length was done in shaved rabbit back. Biopsy of operated skin after 10 days of incision was studied under light microscopy for histopathological evaluation.
Control group: The five rabbits were subjected to skin incision 4 mm in depth and 2 cm in length at their shaved back. Microscopical evaluation for histopathological feature of wound healing was done after 10 days duration to the excised skin biopsy (figure 1-3).

RESULTS
Histopathological features of control group showed proper wound healing include epithelial growth migration that brought the wound edges to be close. Granulation tissue underneath the epithelium showed to fill the incision gap represented by collagen fibers and fibroblast cells scattered through it (figure 4, 5).
Histopathological findings of experimental group showed failure of epithelial wound edges to close and to be approximately in contact with absence of rete ridges.
The main bulk tissue filled the incision gap is thick granulation tissue. Inflammatory cell with congested blood vessels can be detected (figure 6-8).

DISCUSSION
The results of this study illustrates of delayed healing of skin wound after systemic administration of dexamethasone. Histopathological findings showed the effect of this drug on epithelia as failure of epithelial cells to migrate and to bring the edges together in comparison to control group. While granulation tissue was thicker with presence of inflammatory cell which is of chronic type with congested blood vessels represented an infectious state which tends to be a complication state of wound healing.
Takahashi et al induced gastric ulcer by using of systemic dexamethasone. They hypothesized that dexamethasone may inhibit hepatocyte growth factors expression which facilitate the restitution of gastric mucosal epithelial cells.\(^{(11)}\)
The results coincide with Gras et al \(^{(12)}\) findings who found delayed and impaired reepithelialization of wound healing in human treated with dexamethasone. They demonstrated that dexamethasone is a potent transcriptional inhibitor promoter activity that antagonizes transforming growth factor, beta (which affects reepithelialization).
In the present study dexamethasone affected the epithelial migration rather than its proliferation.
Figure 4: Skin wound healing, complete epithelization (control) x 40

Figure 5: High power view showing complete epithelization (control) x 200

Figure 6: Impaired skin wound healing, open edges (experimental) x 100

Figure 7: High power view showing lack of epithelial rete ridges, underneath it the Granulation tissue (experimental) x 200
REFERENCES


Figure 8: Congested blood vessels with presences of inflammatory cells (experimental) x 400