

Effect of ascorbic acid supplementation on skin wound healing

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Abstract:

Ascorbic acid is essential for proper synthesis of collagen fiber and intercellular ground substance of connective tissue.

Objective of this study was to determine the effect of ascorbic acid supplementation 550mg once daily for 10 days in the treatment of wound skin incision about 2cm in length and 4mm in depth.

Thirteen albino rabbit were used in this study (eight rabbits represent experimental group while five represent as a control group).

The result of general histological observation revealed rapid and active healing process through complete epithelization of the surface of incision site and collagenous fibrous tissue formation in the incision wound of animals with ascorbic acid administration while in control group incomplete epithelization and incomplete healing of connective tissue of skin wound.

It was concluded that the administration of ascorbic acid might be sufficient to promote wound healing.

Key words:

Ascorbic acid, Wound healing.

Introduction:

The healing of a skin wound is identical with the healing of a similar wound in other part of the body and thus may be classified as either primary healing or secondary healing.

The nature of the healing process depends upon whether the edges of the wound can be brought into apposition, after suturing, or whether the lesion must fill in gradually with granulation tissue^(1,2,3) when there is a close apposition of the edges of the wound, surface epithelium proliferates rapidly across the line of incision and re-establishes the integrity of the surface connective tissue cells undergo transformation into fibroblasts which in

turn undergo mitotic division and the new fibroblasts begin to migrate into and across the line of incision, these cell from thin delicate collagen fibrils which intertwine and coalesce in a general direction parallel to the surface of the wound. At this time a network of young capillaries and capillary loops is formed.

The delicate connective tissue fibrils coalesce into denser bundles so small linear scar which may be depressed below the surface^(4,5).

Ascorbic acid was found to be essential for the proper synthesis and regulation of collagen fiber and intercellular ground substance of connective tissue. Daily requirements for adult rang between 30 to 60 mg⁽⁶⁾.

Deficiency of ascorbic acid may effect wound healing through the interference

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with production of mucopolysaccharides, which make up cement substance⁽⁷⁾.

Microscopically it is recognized that fibroblastic proliferation in a wound of a scorbutic animal continues longer than in control animal, this is interpreted to mean that there is prolonged need for formation of connective tissue and this is borne out by the fact that scorbutic animals exhibit a decreased tensile strength of the healing wounds⁽⁸⁾.

General factor affecting wound healing are location of wound, physical factors (sever trauma is a deterrent to rapid wound healing, local temperature in the area of wound and the effect of x-ray radiation), circulatory factors, nutritional factors, age of patient, Infection and hormonal factors.

Material and methods:

Thirteen albino rabbit age (6-8) months, weight (800-1000)gm were used in this study.

Wound incision of 2cm in length and 4mm in depth had been done in skin back of the rabbit after shaving.

Eight rabbit were given ascorbic acid 550mg once daily (it is the available dose in the market used as a supplement) after wound incision for 10 days, they represent experimental group, while five of rabbits weren't given and they represent as the control group.

All animals were kept free in animal house at the same room temperature and feed a standard diet.

Both experimental and control groups have no ascorbic acid deficiency but a supplementary dose were given to show the effect of ascorbic acid on skin wound healing.

Specimens from skin wound site were excised after ten days, postoperative fixed 10% buffered

formalin and stain with haemotaxilin and eosin stain (H&E) for microscopical evaluation of healing rate using light microscope.

Results:

General histological observation revealed that the incision wound of animals with ascorbic acid a administration showed more rapid and active healing process as compared to control group.

Experimental group show complete epithelization of the surface of incision site (fig 1, 2, 3), moreover collagnous fibrous tissue formation was obviously seen (fig4).

In control group a wound healing shows incomplete epithelization of skin incomplete healing of connective tissue underneath it fig (5, 6, 7, 8).

Discussio:

Ascorbic acid supplementation has been suggested as a possible factor to induce collagen synthesis and other intercellular supporting structure, and to promote wound healing^(9, 10).

It participate in the production of intercellular material of other tissue such as cement substance of vascular endothelium and attachment of striated muscle cells to tendon together with its oxidation product.

Ascorbic acid diffecincy (scurvy) is seldom nowadays. Scurvy can be defined as a nutritional disorder caused by prolonged inadequacy of the supply of ascorbic acid treatment with ascorbic acid resulted in a significant reduction of delay in wound healing by curlier wound closure through the increase of wound contraction, collagen deposition, fibroblast and vascular densities⁽¹⁰⁾.



Figure (1): Complete wound healing of 10 day postoperatively skin incision in rabbit with ascorbic acid administration (x40)



Figure (3): High magnification of fig (1) show epithelization of wound site (H&E x20).

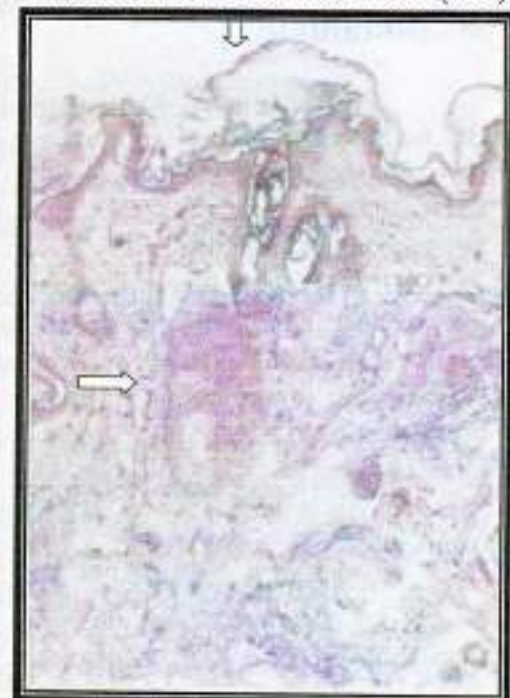


Figure (2): High magnification of fig (1) H&E (x100).



Figure (4): View illustrated the connective (CT) tissue epithelium (Ep.) of skin, showing interdigitation of collagen fiber (cf). After 10 days. Post operatively wound healing in rabbit with ascorbic administration (H&FX100)



Figure (5): In complete wound healing of 10 day posoperative skin incision in rabbit (control group) H&E (X40).



Figure (7): High power view of epithelium layer showing incomplete healing Control group) H&E (X200)

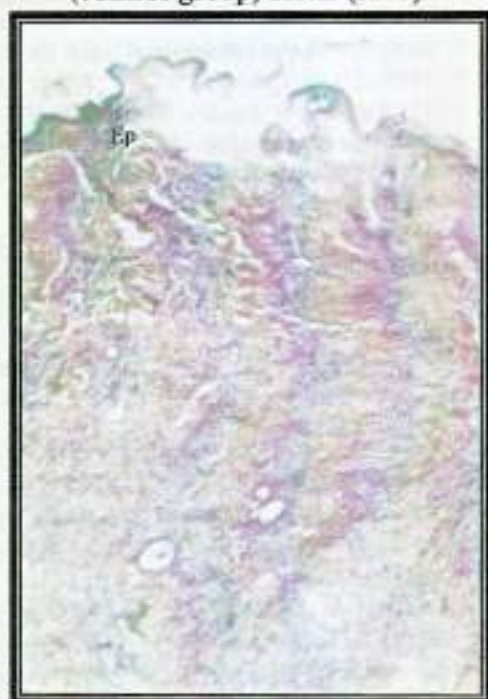


Figure (6): High magnification of incomplete epithelium of skin wound incision after 10 days posoperatively (Control Group) H&E (X100)



Figure (8): Incomplete healing of connective tissue epithelium of skin wound healing after 10 days of incision (Control Group) H&E (X200)

Suppression of collagen formation become evident in experimental studies of wound healing such as this which had been done by Agrawal⁽¹¹⁾ reported that surgical incision showed no evidence of organization for some days until administration of ascorbic acid was given.

The result of present study revealed faster healing mechanism of skin incision wound following ascorbic acid administration.

As seen in the result, ascorbic acid has main effect on the connective tissue through the increase in the synthesis of collagen fiber, fibroblast formation and increase in the vascular, in addition, it induces the epithelization of the surface of incision site.

The preliminary result of this study comes in agreement with the findings obtained by other researchers utilizing ascorbic acid^(12, 13, 14, 15).

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