



Tissue response to implanted dental material in rabbits

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Abstract

Aim of the study: is to assess the tissue compatibility of implanted dental material.

Material and methods: fourteen albino rabbits were used for subcutaneous implant for 14 days of different dental metallic material includes titanium, cobalt chrome and nickel chrome.

Result: titanium and cobalt chrome show fibrous capsule formation while nickel chrome shows necrotic tissue filled the area of the implant.

Conclusion: to minimize biologic risk, dentists should select dental materials that have the low tissue toxicity, allergy and sensitivity, with proper manufacturing and quality control of metals.

Key words: Tissue compatibility, implanted dental material.

Introduction

Dental materials are widely used in application that place them into contact with the oral epithelium, connective tissue or bone for many years^(1,2) some of them are metallic alloy form and their corrosion resistance affect their tissue compatibility^(3,4,5,6) or they may release ions into the body fluids which are harmful to tissues. Other metal alloy used in crown and bridge restorations may demonstrate a sensitivity and allergic reaction^(7, 8).

The diagnosis of a tissue response reaction is usually more difficult to establish in the mouth than on the skin⁽⁹⁾, therefore to assess the tissue compatibility of dental material; we prefer to implant them subcutaneously in rat or rabbit or in buccal pouch of the hamster.

The present study was designed to evaluate the histological feature of tissue response to dental materials implanted subcutaneously in rabbits.

Materials and methods

A-Animals:-

Fourteen male albino rabbits (6 months old) were used in this study. The animals were fed a standard laboratory diet and water.

B-Implant Procedure:-

All animals were fully anesthetized with ketamine hydrochloride using thigh muscle in dose 100 mg/kg. they were shaved on the dorsal side mid line and 1 cm incision through skin were made at the side midline with scalpel⁽¹⁰⁾ a pocket was prepared with blunt instrument into the subcutaneous

tissues of each dorsal quadrant (figure, 1) three kinds of round specimen (5 mm in diameter and 3 mm in thickness) of titanium, cobalt chrome and nickel chrom. They were implanted one each in pocket in each quadrant and the incision was closed with sutures. In the fourth quadrant an incision, pocket preparation and closure with suture was done without introducing of any specimen in it and it represented the control one.

C-Histological preparation:-

Animals were killed at 14 days after implantation .A tissue specimen containing the implants (figure,2) was excised and fixed in 10% neutral buffered formalin for 48 hours. The implants were carefully removed and tissue specimen were dehydrated by a serial concentration of alcohol, embedded in paraffin, sectioned and stained with hematoxylin and eosin stains. Then examined under light microscope.

Result

At 14 days a fibrous connective tissue finds to fill the pocket area of control (figure, 3).

Figure (4) shows a capsule formation composed of fibrous connective tissue was visible around the titanium implant.

Figure (5) shows fibrous encapsulation was developed around the cobalt chromium implant.

Figure (6) shows necrotic tissue filled the space of nickel chrome implant.

Discussion

The implantation method of this study illustrate a technical problem encountered with the subcutaneous implants which show tendency to disrupt the fibrous membrane during

implant extraction, therefore, ideally histological processing should be performed without implant removed but it can not be done with the conventional microtome⁽¹⁰⁾.

Several factors are considered with metallic dental implants such as corrosion, fatigue, toxicity which interfere with healing process⁽¹¹⁾. Titanium and cobalt chromium showed good tissue compatibility as they show to be most corrosion resistant and best tolerated by tissue. They are also reported to possess low toxicity⁽⁹⁾.

Nickel chrome implants shows a necrotic tissue which may be related to nickel ion that was released from implant and cause cellular damage. Many studies^(12, 13) observed cellular damage in dental and related that damage to the metallic ion which must be at sufficient concentrations to cause cellular necrosis.

Proper manufacturing and quality control of metals would minimize the potential problems of metals which were shown to be tissue compatible⁽¹⁴⁾.

Conclusion

The present study show good toleration of implants by tissue except nickel chrome. We suggest proper manufacturing and quality control of metals to increase and exhibited favorable tissue compatibility.

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Figure (1) The view illustrate incision of skin for sub cutnecons implantation

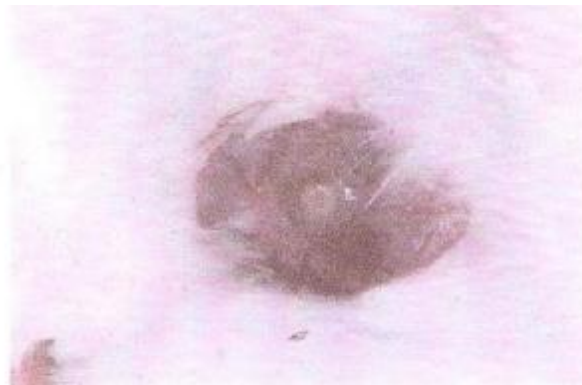


Figure (2) Subcutaneous implant coveredb fibrous tissue after 2 weeks duration

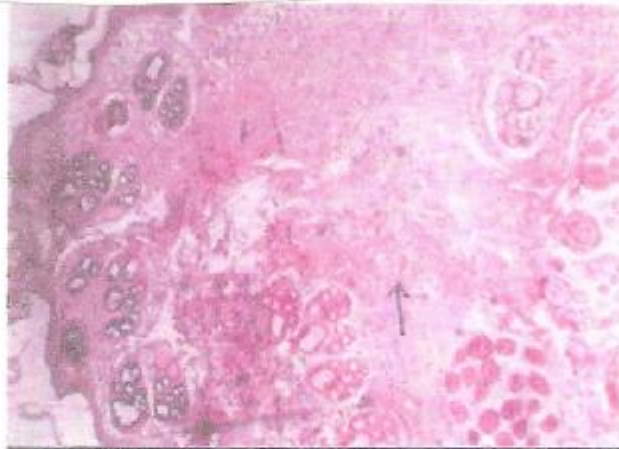


Figure (3) The view shows of subcutaneous pocket without implantation (control) after 2 weeks duration .
fibrous connective tissue filled the pocket (arrow).
(H and E X 100)

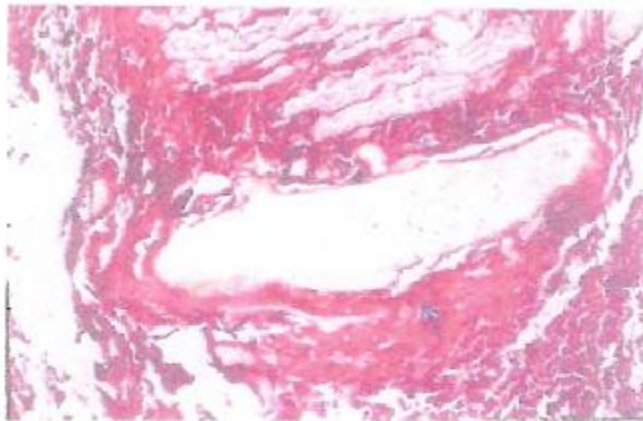


Figure (4) Fibrous capsule formation (arrow) around the titanium implant after 2 weeks duration .(H and E X 100)

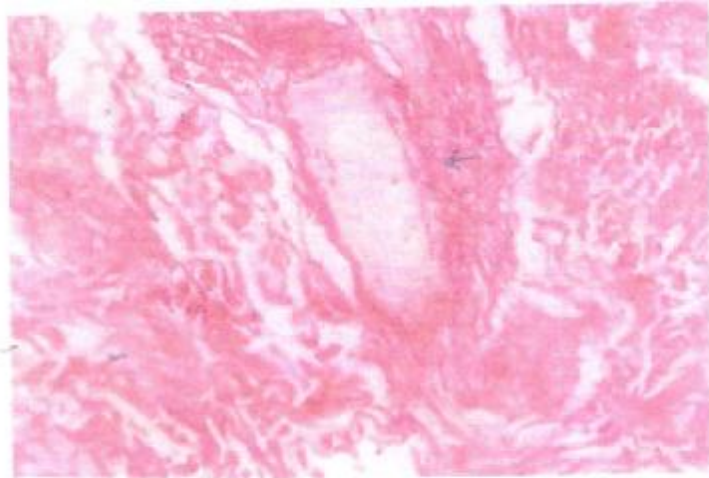
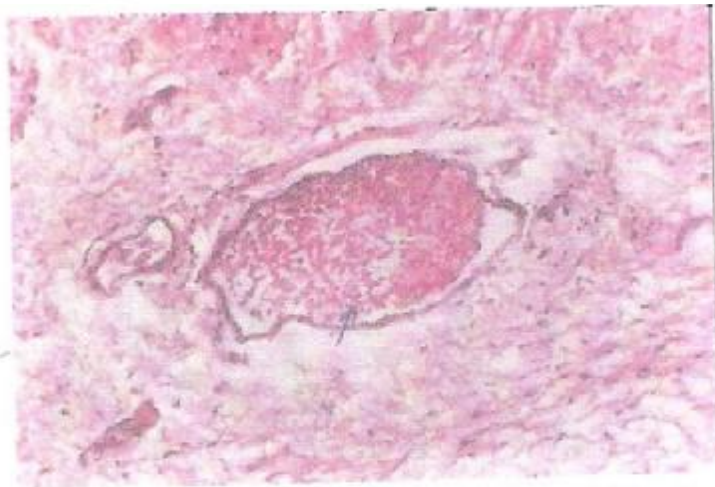


Figure (5) Fibrous capsule formation (arrow) around the chrom cobalt implant after 2 weeks duration. (H and E X 100)



Figuer (6) Necrotic tissue (arrow) filled the space nickel chrom implant after 2 weeks duration. (H and E X 100)