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دراسة تجريبية عن التفاعلات النسيجية للأسمنت العظمى

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تم اجراء بحث تجريبى على الكلاب لدراسة تفاعلات العظم بعد حقن الاسمنت العظمى فى ثقوب حفرت فى الوجه الجانبى للفك السفلى.

ولقد وجد انه تم التئام العظم المحيط بالاسمنت العظمى بطريقة جيدة وبدون وجود أى تنكرر فى العظام.

ولوحظ وجود طبقة ليفية رقيقة تفصل العظم عن المادة المحقونة.

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TISSUE RECTION TO BONE CEMENT: AN EXPERIMENTAL STUDY

(With 3 Figures)

By

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SUMMARY

An experimental work was perfermed in dogs to study the reaction of bone to implanted acrylic cement in the holes pored in the lateral surface of the mendible.

Response of bone tissue adjacent to the acrylic cement was good and repair occured with no evidence of bone necrosis. A thin layer of fibrous connective tissue was present between the acrylic material and the adjacent bone.

INTRODUCTION

The use of self-setting acrylic cement in bone surgery is relatively limited. It can be used as a tooth implant HODOSH et al.,1964) and in fixation of mandibular fractures (KANGUR et al., 1976). There have been very little histopathological studies in human beings. Animal studies are conflicting, in the early published work little or no fibrous tissue was found betqeen the cement surface and bone or soft tissues (WAERHAUG and ZANDER, 1956, while recently the intervention of layers of thick fibrous tissue has been reported (SHKLAR et al., 1966 and CHARNEL, 1970). Other workers pointed out to the occurrence of malignant transformation resulting from tissue contact with polymethyl methacrylate (OPPENHEIMER et al., 1958 and STINSON, 1966).

The present study was carried out to investigate tissue bone reaction against an acrylic cement in dogs.

MATERIAL and METHODS

The study was conducted on 9 apparently health mongrel dogs aging 1-4 years and of 8-19 Kg body weight.

The animals were anaesthetized with i.v. thiopental sodium, ten minutes after i.m. tranquillization with Cobmelen (Bayer) in a dose of 0.05 ml/Kg body weight. The extraoral approach was used during the surgical intervention. Periosteum was then reflected from the site of the last molar to a point just posterior to the canine tooth. Three holes were drilled into the lateral surface of the body of the mandible. These retentive holes were approximately 0.5 cm in diameter. The depth extended just into the cancellous bone. Saline irrigation was used during the operation.

In a sterile container 10 gm of orthopaedic bone cement* polymer (polymethyl methacrylate) were mixed with 5 ml of the corresponding liquid monomer (methyl methacrylate). The retentive area was maintained in a dry condition. The bone cement was inserted into two holes an a doughy state and compressed, while the third one temained as a control. The excess of the soft bone cement had been trimmed. The surgical area was flushed with aline and the periosteum was closed with 3/0 chromic sutures. The skin was then sutured as usual.

Three dogs were killed at 2, 4, and 6 weeks after operation. The bone segments were carefully removed and fixed in 10% neutral buffered formaline. The specimens were decalcified and stained with haematoxylin and eosin.

RESULTS

All dogs did not show any change in appetite and maintained their post-operative weights.

Microscopical examination of the bone specimens revealed no haemorrhage, blood vessels were intact, no evidence of acute inflammatory reactions and the borders of bone holes which adher to bone cement appeared more or less regular. The later was mainly due to formation of a narrow band of highly vascular connective tissue

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between bone surface and the implanted cement (Fig. 1). Small bone fragments and specules occuring in the area undergo resorption (Fig. 2). Active osteoclasts were observed both around these bone remnants and adjoining the serrated edges of the bony holes. At many sites, the surface of the later was covered by a single layer of osteoblasts probably originating from the blood vessels. Narrow rim of newly deposited bone matrix was was occasionally observed (Fig. 3).

In one sample, the neighbouring cancellous bone revealed areas consisted of connective tissue associated with some giant cells and early fibrillar bone formation. Periosteocystic osteolysis was observed in the lacunae of adjacent bone.

DISCUSSION

In the present study, microscopical examination revealed that the implanted bone cement could remain in the healthy bone tissue without any signs of rejection. Clinically, no inflmmatory signs were observed around the implanted cement. Histologically, the reaction induced by it was mild and that bone healing of injured area of bone proceeded to an advanced stage at the end of experimental duration.

These results are in agreement with many investigators who found that the inclusion of acrylic cement in tissues was associated with the formation of thin fibrous connective tissue band filling all the defect produced by the surfical bur (CASTELLI et al., 1971 and YAMAN et at., 1973) and with no features of bone or formation of fibrocartilage (SHKLAR et al, 1966 and KANGUR et al., 1976). However, YAMAN et al. (1973) observed an irregular layer of a necrosed bone adjacent to the acrylic material.

In the present experiment, fibrillar bone formation and perioosteocystic osteoosis were found in the adjacent bone area of one case. These changes may occur probably under thermal effect produced during polymerization of the cement at the moment of injection.

OPPENHEIMER et al. (1958), HUEPER (1959) and STINSON (1966) have warned of carcinogenetic potential of acrylic resin since they were able to induce the formation of fibrosarcomas after a relatively short period of time when the resin was implanted subcutaneously in small laboratory animas.

No evidence whatever of dysplastic epithelium was observed in our experiment. This is in agreement with SHKLAR et al. (1966) who stated that there has not been the slightest histologic indication of premalignant lesions, and certainly there has been no occurrence of malignant transformation resulting from tissue contact with the polymethyl methacrylate.

REFERENCES

Castelli, W.A., Nasjleti, C.E., Huelke, D.F. and Diaz-Perez, R. (1971): Revascularization of the periodontium after tooth grafting in monkeys. J. Dent. Res., 50: 414-421.

Charnley, J. (1970): Acrylic cement in orthopaedic surgery. Williams and Wilkins Company, Baltimore.

Hodosh, M., Montagna, W., Povar, M. and Shklar, G. (1964): Implants of acrylic tooth in human beings and experimental animals: clinical and microscopic studies. Oral Surg., 18: 569-579.

Hueper, W.C. (1959): Carcenogenetic studies on water soluble and insoluble macromolecules. Arch. Path., 67: 587-617.

Kangur, T.T., Tolman, D.E. and Jowsey, J. (1976): The use of methylmethacrylate in the fixation of mandibular fracture in dogs; Experimental results. Oral Surg., 41: 578-587.

Oppenheimer, B.S., Oppenheimer, E.T., Stout, A.P., Willhite, M. & Danishefsky, I. (1958): The latent period in carcinogenesis by plastics in rats and its relation to the presarcomatous stage. Cancer, 11: 204-213.

Shklar, G., Hodsh, M. and Povar, M. (1966): Thissue reactions to the plastic tooth implant: current status of animal investigation. Oral Surg., 22: 349-357.

Stinson, N.E. (1966): The tissue reaction induced in rats and ginea pigs by polymethylacrylate (Acrylic) and stainless steel. Br. J. Exp. Pathol., 45: 21-29.

Yaman, P., Castelli, W.A., Nasjleti, C.E. and Diaz-perez, R. (1973): Self-setting acrylic as an immobilizing agent in mandibular fractures: A histologic study. Oral Surg., 36: 459-466.

Waerhaug, J. & zander, H.A. (1956): Implantation of acrylic roots in tooth sockets. Oral Surg., Oral Med. and Oral Path., 9: 46-54.

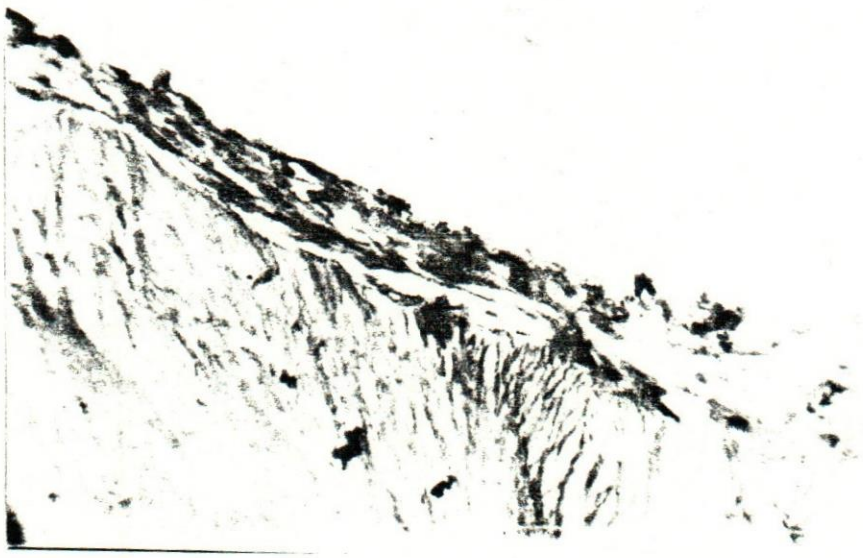

Fig. (1): Regular surface of implanted hole with a narrow band of vascular connective tissue (10 X 10).

Fig. (2): Bone resorption at the surface of operated hole. An osteoclast lying against bone surface (10 X 10)

Fig. (3): Affected area in the neighbourhood of operated hole showing depolymerization of bone matrix and fibrillar bone formation. (10 X 10).