

THE EFFECT OF CORTICOSTEROID-ANTIBIOTIC DRESSING IN THE BEHAVIOUR OF THE PERIAPICAL TISSUE OF DOGS' TEETH AFTER OVERINSTRUMENTATION.

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ABSTRACT: *When an accidental overinstrumentation occurs, the apical environment can be completely modified and consequently becomes an adverse factor for the periapical healing process. Three corticosteroid-antibiotic dressings were studied comparatively with the aim of observing the behaviour of the periapical tissues of dogs teeth, 7 days after an intentional overinstrumentation. Less inflammatory reaction and a better healing process were observed with the employment of the dressings. The reaction of the periapical tissues were not the same for the 3 studied medicaments.*

KEY-WORDS: *Overinstrumentation; corticosteroid; antibiotic.*

The overinstrumentation is an accident relatively frequent during root canal treatment. When an instrument reaches the periodontal ligament it destroys the connective tissue in the cementary canal (pulp stump) and damages the ligament. Consequently debris, blood clot and inflammatory reaction may be present in the periapical tissue. Theoretically that apical environment is not ideal to receive the root canal filling material. Numerous experimental researchs on pulpotomy or on root canal treatment showed that calcium hydroxide has an adverse effect when in the presence of blood clot, debris, intense inflammatory reaction etc. These factors concur to a bad healing process, with apposition of irregular and partial hard tissue bridges and persistence of the inflammatory reaction (QUIGLEY, 1957; KALNINS and FRISBIE, 1960; SOUZA and HOLLAND, 1974; HOLLAND *et al.*, 1978a;

1979). However, if the apical environment is changed before the root canal filling, the results could be better. It was observed that a corticosteroid-antibiotic dressing, for 7 days after an overinstrumentation, improved the results of the treatment by calcium hydroxide. The filling without the use of the dressing and in the same section of the over instrumentation showed worse results (HOLLAND *et al.*, 1978b).

The purpose of this work is to study comparatively 3 corticosteroid-antibiotic formulations as dressing for 7 days after the root canal overinstrumentation of dogs teeth.

MATERIAL AND METHOD

Root canals from forty premolar teeth of 6 young mongrel dogs were used in this study.

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Under general anesthesia, and with rubber dam in place the chamber of each tooth was opened and the pulps were removed.

The canals were instrumented 2mm beyond the apices, as confirmed by radiograms, and the foramen perforated and enlarged up to the n.º 40 Kerr file. The canals were irrigated thoroughly with saline during and following instrumentation.

After irrigation, the canals were carefully dried with paper points and dressed with the following corticosteroid-antibiotic solutions: *Panotil* — nitrofurazone, polymyxin B sulfate, neomycin sulfate, fluorhydrocortisone, lidocaine hydrochloride (Zambon); *Otosynalar* — fluocinolone acetonide, polymyxin B sulfate, Neomycin sulfate, lidocaine hydrochloride, citric acid, propylene glycol (Syntex); *Otosporin* — polymyxin B sulfate, neomycin sulfate, hidrocortisone (Wellcome). Each corticosteroid-antibiotic solution dressed 20 canals, and 20 canals more without medication was taken as control. A sterile cotton pellet was placed over all the canal entrances, and the access cavities were filled with zinc oxide-eugenol cement.

Seven days later, the animals were killed by administration of excessive amounts of anesthetic. The pieces were fixed in 10 percent neutral buffered formalin solution and decalcified in formic acid-sodium citrate. The specimens were embedded in paraffin, serially sectioned to an average thickness of 6 micrometers and the sections stained with hematoxylin and eosin.

RESULTS

The obtained results are summarized in table I, but a brief description follows.

Control group

Eleven of the twenty studied roots presented a severe chronic inflammatory reaction in the periodontal ligament, nearest to

the area of overinstrumentation (fig. 1). In 7 specimens the inflammatory reaction was moderate and in 2 cases was mild. Only one specimen exhibited connective tissue invagination into the canal. All the other cases showed some cellular proliferation in the damaged area, and hemorrhage at the apical foramen. There were several areas of bone resorption. Cementum chips in the periodontal ligament were surrounded by macrophages and multinucleated cells.

Otosynalar

The periodontal ligament of seventeen specimens was infiltrated by a moderate chronic inflammatory reaction (fig. 2). In two specimens the inflammatory reaction was severe and in one it was mild. There was ingrowth of connective tissue into the canal of 4 specimens. Cementum chips were observed in the periodontal ligament, surrounded by macrophages or multinucleated cells. Bone resorption was less evident than the one of the control group.

Panotil

The inflammatory reaction in the periodontal ligament was mild in 3 cases, moderate in sixteen specimens and severe in only 1 specimen. The connective tissue invagination into the canal was more evident than in the other experimental groups, being observed in 8 cases. In 1 of these cases an abscess extended from the invaginated tissue to the periodontal ligament (fig.3). Other morphological observations were similar to the one related for the *Otosynalar* experimental group.

Otosporin

Fourteen of the twenty treated roots exhibited connective tissue invagination, but there was a more organized tissue than that observed in the other experimental groups (figs. 4 to 8). Numerous fibroblasts, blood vessels and a mild chronic inflammatory

reaction were observed in the apical third of the ingrown connective tissue. In the medium third there were numerous young fibroblasts and a more intense vascularization. In the coronary third there was hemorrhage and a moderate acute inflammatory reaction. A mild chronic inflammatory reaction was observed in the periodontal ligament of 10 specimens. In 9 others the inflammatory reaction was moderate and in the last one it was severe. Cementum chips were surrounded by macrophages or multinucleated cells and in few cases there was a hard tissue deposition. Bone tissue exhibited areas of deposition and resorption.

DISCUSSION

The inflammatory reaction in the periapical tissues of the dressed roots was less evident than the one observed in the control group. We also observed the fibroblastic and osteoblastic activity was not eradicated by the use of the corticosteroid. On the contrary, the fibroblastic proliferation was more evident in the treated group, especially in the one where Otopsporin was used. Similar results were observed by SMITH *et al.* (1976), in dogs teeth, using hydrocortisone alone. In this work we used corticosteroid associated with antibiotic. Considering that SMITH *et al.* (1976) found bacteria in all the apical tissues examined, we think it is important to associate an antimicrobial agent to the corticosteroid as a precautionary measure.

Among the 3 medications studied, the Otopsporin showed the best results. The inflammatory reaction was less intense and the healing process was evident. In most cases a well organized connective tissue was observed at the foramen and more or less 1mm into the root canal. Otopsporin has the more

simple formula of the 3 studied medications. It is possible that the irritant properties of some substances in the formula of the other two medications could be responsible for the worse results obtained. The same results were observed in dogs teeth without overinstrumentation (HOLLAND *et al.* 1980).

The apical environment of the Otopsporin experimental group was different from the one observed in the control group. In relation to root canal filling with calcium hydroxide one can admit the possibility of obtaining better results by filling the root canals after the dressing with Otopsporin than filling immediately after overinstrumentation. This is obvious because various experimental works demonstrated that in presence of debris, blood clots and severe inflammation, the results of treatment with calcium hydroxide are not so good (KALNINS and FRISBIE, 1960; QUIGLEY, 1957; HOLLAND *et al.* 1979). This hypothesis was confirmed in another work where calcium hydroxide was used as root canal filling material after overinstrumentation. The group with corticosteroid-antibiotic dressing for 7 days showed better results than the one where the root canal filling was done in the same section of the overinstrumentation (HOLLAND *et al.*, 1978b).

SUMMARY AND CONCLUSIONS

The root canals of forty premolars of dogs were overinstrumented and dressed with 3 corticosteroid-antibiotic medications. The histological analysis, realized 7 days after the treatment, showed less inflammatory reaction and a better healing process when the corticosteroid-antibiotic dressing was used than when it was not used. The reaction of the periapical tissues was not the same for the 3 medications studied.

HOLLAND, R., NERY, M. J. SOUZA, V., MELLO, W., BERNABÉ, P. F. E. & OTOBONI FILHO, J. A. Efeito do corticosteróide associado a antibiótico no comportamento dos tecidos periapicais de dentes de cães após sobreinstrumentação.

RESUMO: Quando ocorre uma sobreinstrumentação acidental, durante o preparo biomecânico do canal radicular, pode haver uma série de modificações nos tecidos dessa área, ao ponto de prejudicar o desenvolvimento do processo de reparo, principalmente quando do emprego do hidróxido de cálcio como material obturador. Com o objetivo de estudar o assunto, 80 raízes de dentes de cães foram intencionalmente sobreinstrumentadas. Sessenta delas receberam curativo de demora com 3 diferentes associações de corticosteróide-antibiótico. Vinte raízes não receberam curativo e foram tomadas como controle. Sete dias após o tratamento, procedeu-se à análise histológica dos resultados. Comparativamente ao grupo controle, o emprego do curativo de demora determinou menor inflamação e melhor reparação das áreas lesadas. Dentre os 3 medicamentos estudados, o denominado Otosporin evidenciou melhores resultados.

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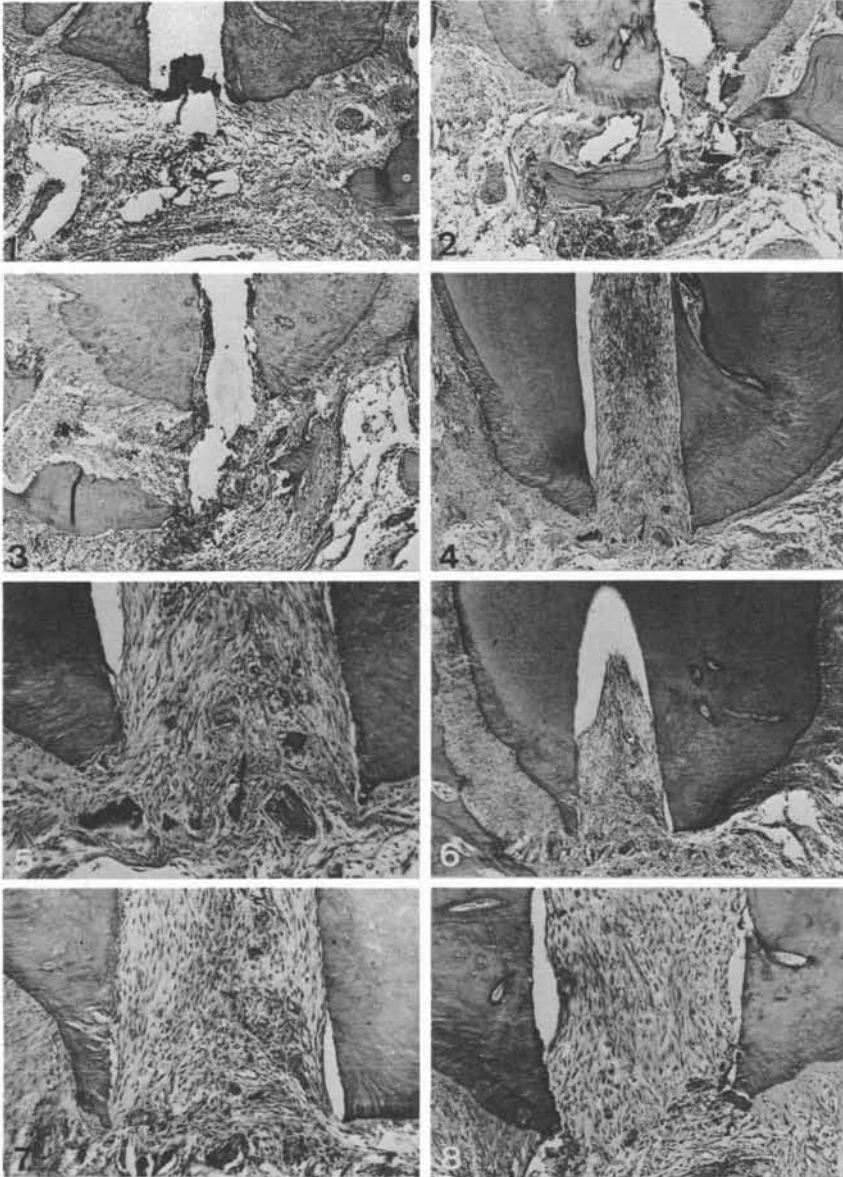
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TABLE I — Summary of the results observed 7 days after the treatment of 80 root canals.

Treatment	connective tissue invagination into the canal		periodontal ligament inflammatory reaction			n.º of samples
	Present	absent	mild	moderate	severe	
Control	1	19	2	7	11	20
Otosynalar	4	16	1	17	2	20
Panotil	8	12	3	16	1	20
Otosporin	14	6	10	9	1	20

CORTICOSTEROID-ANTIBIOTIC DRESSING AFTER OVERINSTRUMENTATION



- Fig. 1 — Control group. There is an intense chronic inflammatory reaction in the periodontal ligament. The connective tissue at the apical foramen is not organized. H.E. X 40.
- Fig. 2 — Otosynalar group. There is moderate chronic inflammatory reaction in the periodontal ligament and in the connective tissue nearest the apical foramen. The connective tissue at the apical foramen is not well organized. H.E. X 40.
- Fig. 3 — Panotil group. There is an ingrowth of connective tissue into the canal, but an abscess extends from the canal to the periodontal ligament. H.E. X 40.
- Fig. 4 — Otosporin group. There is an ingrowth of well organized connective tissue into the canal. H.E. X 40.
- Fig. 5 — Higher magnification of figure 4, showing the ingrown connective tissue and cementum chips at the apical foramen. H.E. X 100.
- Fig. 6 — Otosporin group. A well organized connective tissue ingrown into the root canal. H.E. X 40.
- Fig. 7 — Higher magnification of figure 6. At the apical foramen there are ingrowth of connective tissue and cementum chips surrounded by giant cells or macrophages. H.E. X 100.
- Fig. 8 — Otosporin group. The same morphological aspect of the anterior figure. H.E. X 100.