THE BACTERIOLOGICAL CONTROL OF ENDODONTIC TREATMENT

II[1]. *The Significance of two Consecutive Negative Cultures*

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Introduction

Several authors (e.g. Appleton[2], Buchbinder[3], Morse and Yates[4], Ostrander[5]) state that the root canal should not be filled until two consecutive cultures have been negative. This statement is founded on the fact that after one negative culture has been obtained the next culture occasionally is positive and on the theoretical consideration that a negative culture from an infected canal will be a fairly regular occurrence.

The fact is, of course, beyond doubt. Appleton[2] cites 156 cases, treated by students, which yielded a positive culture after a negative one in 26%. Grossman[6] noted the same phenomenon in only 8% of 26 cases treated by himself.

The difference between these percentages gives rise to the question, whether technical errors in taking cultures or in applying a temporary filling may not be the main cause of the phenomenon, as positive cultures from these sources will obviously occur more frequently with unexperienced operators.

If this line of reasoning is sound the number of false negative cultures from an infected canal might be much smaller than is often suggested. In that case a second negative culture would not materially increase the probability of the canal being sterile. The question is of great practical importance, as the number of sessions in a treatment could be reduced if it could be proved that one negative culture is sufficient evidence of sterility.

To decide the issue we investigated the frequency of the cases in which a positive culture occurred after previous culture(s) had been negative.

Materials and methods

The number of cases was 385, i.e. 180 cases with vital pulps and 205 cases with necrotic pulps. The treatment was mainly done by students, 45 of the necrotic cases were treated by the author. Cultures were taken as described previously [1].

Initial cultures were taken by entering an absorbent point into the canal and leaving it in contact with its contents for three minutes. In subsequent cultures from the same case the point was left in contact with the periapical tissue during the same period. Furthermore special care was always taken that the point carried filings of dentin, which had been dislodged previously with a Hedström file.

Brain heart infusion broth (Difco) in 5 ml lots in plugged tubes was used as a culture medium. The tubes were incubated for 48 h., subcultured on blood-agarplates and studied as Gram stained smears.

Cultures were taken in various stages of treatment:

a. at the start of the treatment (initial cultures, I-cultures)
b. immediately after mechanical preparation (P-cultures)
c. after every application of therapeutic agents (medicaments) (M_1, M_2, M_3 cultures)
d. as soon as a negative M culture was obtained a last culture was taken immediately before the root canal was filled (control culture, C culture)

Before taking M cultures, the drugs were removed from the canal by rinsing the canal with two ml of sterile saline. The period between each session was one week. At the end of each session the canal entrance was sealed with a sterile cotton pellet covered with a zinc oxide-eugenol cement and gutta percha.

The above procedure implies that canals yielding negative cultures initially or at preparation were not filled until after at least one drug treatment. In each case at least four cultures were thus available.

In this way we were able to study 1) the number of cases in which a positive culture occurred after one or two previous cultures had been negative; 2) the frequency of this phenomenon at the various stages of treatment.

Results

The results of cultures taken by students are given in fig. 1, A to E inclusive. The data for vital and necrotic pulps are given separately.

In A and B the four available cultures were grouped in series of two (I and P, P and M, M and C) whereas in C and D the four cultures are grouped in two series of three (IP and M, PM and C.) The first column of fig. 1, A, for instance, gives the number of cases in which a negative initial culture was followed by a negative P culture (92 times — —) or by a positive P culture (11 times — +). Between these two figures the percentages of these occurrences are plotted. The percentage — + is shaded. The next two columns give the same data for P—M_1 cultures and the M—C cultures respectively.

These data show that the number of unexpected positive cultures i.e. the combination (— +) is equal for vital (A) and necrotic pulps (B). The same holds for the sequence (— — +), see graphs C and D.

Furthermore the phenomenon of a positive culture after a negative one is equally frequent at the different stages of the treatment (columns a, b and c in graph A and B and columns d and e in graphs C and D).

In graph 1, E the separate data of A and B are added and the same is done with the data of C and D. These results show conclusively that the probability that the next culture is positive is the same whether one or whether two negative cultures had been obtained previously.

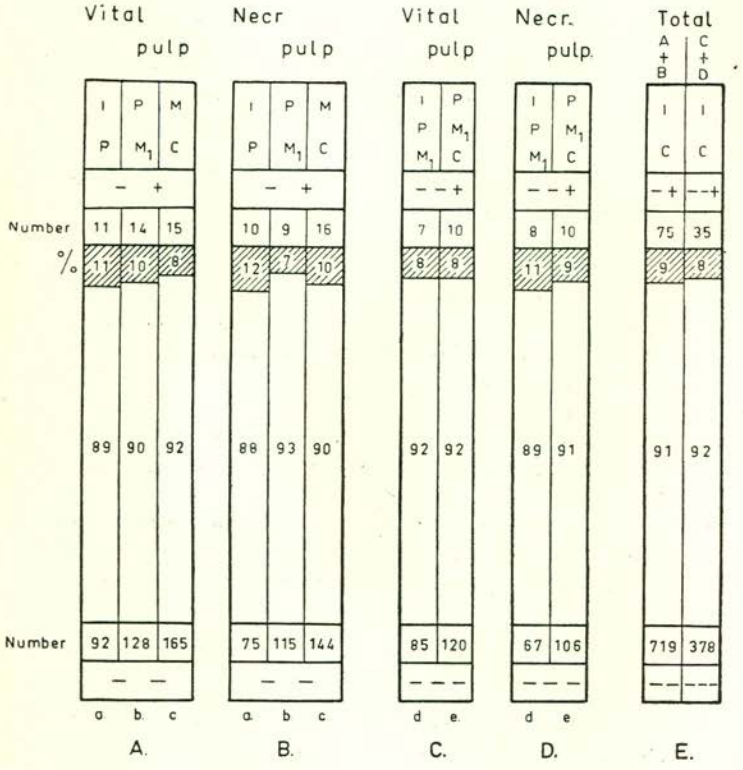

Fig. 1. For explanation, see the text

Fig. 2 gives the results for the cases treated by the author. Again the frequency of the sequence (—+) or (——+) is equal for all stages of the treatment and again the probability of a positive culture is equal whether one or two negative cultures had been obtained before.

However on comparing 2, C with 1, E it becomes evident that the percentage of positive cultures is much less for a more experienced operator (3 and 2%) than for students (8 and 9%).

Discussion

In accordance with the literature (A p p l e t o n[2]) it was found that the number of positive cultures is lower when the cultures are taken by a more experienced operator. This means that at least part of the (unexpected) positive cultures is due to technical errors and chance contamination.

Two consecutive negative cultures do not permit to expect a higher probability of the canal being sterile than one negative culture.

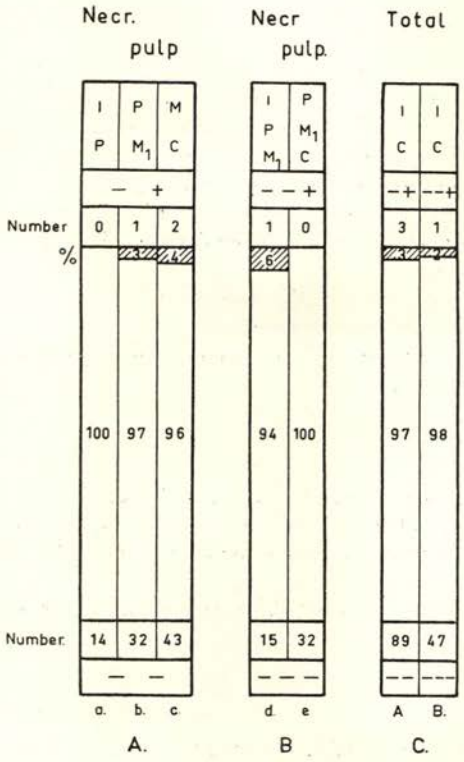

Fig. 2. For explanation, see the text

The fact that the combination — + is not more frequent in the initial stages of the treatment shows that negative initial cultures — mostly obtained from pulp tissue — are equally reliable as the cultures taken as a later stage which contain periapical secretions and particles of dentin.

A negative initial culture thus shows that the canal is — at least bacteriologically — ready for immediate filling and has only to be prepared mechanically to be ready for filling in the clinical sense.

The use of bacteriological cultures in endodontics is often recommended because it has been shown that canals which are clinically ready for filling may still yield positive cultures. Accordingly, cultures should be taken after the canal is clinically ready for filling. This approach is illogical and unduly increases the number of sessions. The above results seem to show that the problem should really be approached from the other end. By taking early and preferably initial cultures one will find in the majority of cases that the canal is bacteriologically ready for filling before or at the time this is clinically the case.

Summary

In 385 endodontic cases including 205 cases with necrotic pulps, bacteriological cultures were taken during all stages of treatment.

Cultures taken by an experienced operator are much less often positive than cultures taken by students, indicating that a large part of positive cultures is due to technical errors and contaminations by chance.

The probability that the next culture is positive is equal whether one or whether two negative cultures had been obtained previously. This is true for all stages of the treatment.

These data show that one negative culture is sufficient evidence as to the bacteriological situation in the root canal.

From a bacteriological point of view, canals which yield a negative initial culture are ready for filling.

Acknowledgements

I am greatly indebted to Prof. Dr. K. C. Winkler, Head of the Department of Bacteriology, Laboratory of Hygiene, Utrecht, for his advice and encouragement. Without his help, these experiments could not have been carried out.

My thanks are also due to Miss T. Noordanus for her most efficient technical assistance.

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