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CATECHOLAMINE EXCRETION IN CHILDREN IN CONNECTION WITH VARIOUS TYPES OF DENTAL TREATMENT

by

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INTRODUCTION

Most patients react to the prospect of dental treatment with a feeling of anxiety and dislike. This applies particularly to children. It would therefore be of clinical interest to be able to determine the degree of psychological stress elicited in child patients in connection with various types of dental treatment. As there is a relationship between the degree of psychological stress and the excretion of catecholamines in the urine, an objective impression of emotional reactions might be obtained by measuring the excretion of these substance in the urine. A method of determining the catecholamine excretion in the urine has been reported by *von Euler* and *Lishajko* (1961).

The present study was accordingly designed to compare by this method the emotional reaction of children in connection with two essentially different types of dental treatment, namely orthodontic and surgical therapy. The former had been given to the patients in question over a fairly long period and they were aware that it did not involve pain, whereas in the case of the surgical therapy the patients knew that it consisted in a simple surgical operation viz. a tooth extraction.

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MATERIAL AND METHOD

The material consisted of 12 children (4 girls, 8 boys) aged 10—12 years, chosen at random from the children of this age group attending orthodontic therapy and requiring extraction of at least one tooth on orthodontic indications.

Urine samples were collected on 3 occasions namely on one control day and the 2 days the patient received orthodontic and oral surgical treatment. The procedure was as follows: the patient was told to empty the bladder completely on waking (between 5.30 and 7.30 a.m.). Urine samples were then taken immediately after the orthodontic or surgical treatment (at about 10.30). On the control day the sample was taken at the same time. The exact times that the bladder was emptied and the urine samples were taken were noted. The patient was informed a day in advance that the treatment in question would be carried out. The extractions were performed under local anaesthesia, using a vasoconstrictor-free solution (Carbocaine Dental®). The urine volume was measured and the pH was immediately adjusted to pH 3 with 1*N* hydrochloric acid and stored at -20°C until the analysis. The amounts of adrenaline and noradrenaline excreted were determined by the fluorimetric method of *von Euler* and *Lishajko* (1961).

As a check of the analytical method regular recovery tests were carried out. The recovery was within the usual range for the method — namely 70—80 per cent.

RESULTS

The results are surveyed in Table I. The values have not been corrected according to the recorded recovery. It is seen from Table I that there were differences in the mean adrenaline excretion on the control and the treatment days; the lowest value was recorded for the control samples and the

Table I.
Means and standard deviation for excretion of adrenaline and noradrenaline in the urine (ng/min) of childrens before dental treatment.

	Control		Orthodontic treatment		Extraction	
	\bar{x}	s	\bar{x}	s	\bar{x}	s
Adrenaline	3.48	2.06	5.45	2.40	8.39	3.44
Noradrenaline	16.55	9.83	21.12	10.29	20.03	6.50

highest after the surgical therapy. The t-test disclosed a significant difference in adrenaline excretion for the following comparisons: control—orthodontic therapy ($p < 0.01$), control—surgical therapy ($p < 0.001$) and orthodontic—surgical therapy ($p < 0.01$).

As regards the excretion of noradrenaline there were only minor differences between the means on the various occasions, and none of them was significant.

DISCUSSION

As mentioned above there is an established correlation between adrenaline excretion and the degree of psychological stress (e.g. *von Euler and Lundberg*, 1954; *Elmadjian et al.*, 1957; *von Euler et al.* 1959; *Frankenhaeuser et al.*, 1962; *Bloom et al.*, 1963). The significant increase in the excretion of adrenaline recorded in the present study in connection with different types of dental treatment, and especially oral surgery, suggests that on these occasions the patients were under stress. The absence of significant differences as regards the excretion of noradrenaline, however, was presumably due to the complex relationship between psychologic and physiologic factors that is considered to govern the excretion of noradrenaline (*Frankenhaeuser*, 1966), a relationship that can be affected by different factors. For instance *von Euler and Hellner* (1952) have shown that an increase in physical activity is accompanied by an increase in the excretion of noradrenaline.

It may appear somewhat surprising that children are under some stress prior to orthodontic treatment, to which they have been accustomed over a long period and which they are well aware will not cause pain. That this does not apply only to the Swedish series is evident from a study on Italian children (*Maj et al.*, 1967), where on the basis of various personality tests the authors concluded that children find orthodontic treatment stressing. That the young patient displays tension and apprehension in association with surgical therapy is more readily understood.

The implications of the results — for instance, to what extent the subjects were stressed and the significance thereof can not at present be decided, since the studies performed hitherto in this field appear to have been carried out only on adult patients and therefore there are no comparable values.

SUMMARY

A study of the excretion of catecholamines in the urine in connection with two essentially different types of dental treatment — orthodontic and surgical therapy (tooth-extraction) has been carried out on 12 children aged 10—12

years. The catecholamines were assayed by a fluorometric method. Significant differences in the adrenaline excretion were recorded in respect of the comparisons: control — orthodontic therapy, control — extraction therapy, and orthodontic — extraction therapy. The highest values were obtained prior to extraction therapy.

The results show that the patients were in a stage of some psychological stress in connection with both forms of treatment, especially prior to the extractions. As regards the excretion of noradrenaline, no significant differences were obtained, probably because of the more complex relationship between psychologic and physiologic factors, that is considered to govern the excretion of noradrenaline.

RÉSUMÉ

EXCRÉTION DE CATÉCHOLAMINES CHEZ LES ENFANTS À L'OCCASION DE DIFFÉRENTS TYPES DE TRAITEMENTS DENTAIRES

Une étude sur l'excrétion urinaire des catécholamines à l'occasion de deux types essentiellement différents de traitements dentaires — traitement orthodontique et traitement chirurgical (extraction dentaire) — a été effectuée sur 12 enfants âgés de 10 à 12 ans. Les catécholamines ont été dosées par une méthode fluorométrique. Des différences significatives en ce qui concerne l'excrétion de l'adrénaline ont été enregistrées lorsqu'on comparait: témoins-traitement orthodontique, témoins-traitement chirurgical, et traitement orthodontique-traitement chirurgical. Les valeurs les plus élevées ont été obtenues avant le traitement chirurgical.

Les résultats montrent que les patients subissent un certain degré de stress psychologique à l'occasion des deux formes de traitement, surtout avant les extractions. En ce qui concerne l'excrétion de la noradrénaline, aucune différence significative n'a été trouvée, probablement parce que le rapport entre les facteurs psychologiques et physiologiques, sous la dépendance duquel on considère que se trouve l'excrétion de la noradrénaline, serait plus complexe.

ZUSAMMENFASSUNG

AUSSCHEIDUNG VON KATECHOLAMINEN BEI KINDERN VOR ZAHNÄRZTLICHEN BEHANDLUNGEN

Eine Untersuchung über die Ausscheidung von Katecholaminen im Urin bei Kindern im Alter von 10 bis 12 Jahren vor verschiedenen zahnärztlichen Behandlungen ist durchgeführt. Die Behandlungen waren teils orthodonti-

scher und teils oralchirurgischer Natur (Zahnextraktionen). Die Katecholaminenausscheidung im Urin wurde nach einer fluorimetrischen Methode bestimmt. Signifikante Unterschiede in der Adrenalinausscheidung sind gefunden teils zwischen Proben an Kontrolltagen und an Behandlungstagen, teils zwischen Proben verschiedener Behandlungstagen. Die höchsten Werte ist vor Extraktionen erhielt. Die Resultate zeigten, dass sich die Patienten vor zahnärztlichen Behandlungen in einem gewissen Stresszustand befanden, besonders vor oralchirurgischen Eingriffen. Was die Noradrenalinausscheidung betrifft, sind keine signifikante Unterschiede gefunden. Diese scheint einem mehr komplexen Muster psychologisch-physiologischer Natur zu folgen.

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