professorial rank, and he should not be barred from private practice in the institution. This can easily be limited by the number of private beds at his disposal. The best men will get the best results, and they are entitled to their reward both in professional status and in income. However lavish may be the provision of armamentarium, in radiotherapy as in surgery it is "the man behind the gun" that counts.

Conclusion

It is twenty-three years since I had the honour of delivering a Hunterian Lecture in our College. That too was in wartime. On that occasion I told the story of the conquest of the hosts of death—of the taming of the typhoid group of organisms by protective inoculation. Many other diseases have been controlled and almost conquered in our time, and even during the last twenty years of peace. I have no doubt that cancer will be added to their number. The possibilities opened up by recent research increase our confidence in ultimate success.

But until many questions are answered and we are armed with full knowledge of the cause of this disease, and thus on the way to prevention, we have to face the task of giving the best treatment to relieve and, as I have shown, oft-times to cure. I hope I have said enough to show that in addition to proved and trusty means of treatment we have powerful new weapons with which to combat the disease; but they are powerful for evil as well as for good, and need skilled and experienced control. I have emphasized, therefore, that the training of more men and women to use these weapons should be undertaken without delay. It is obvious that in the future there must be closer co-operation between surgeons and radiologists if we are to do the best for our patients. Special tumour clinics should be arranged; teams should be carefully chosen and certain regions assigned to special surgeons. A competent team must include surgeon, radiologist, pathologist, and physicist. It is abundantly clear, therefore, that there is urgent need for far greater facilities and a large army of workers.

I have spoken of the sturdy heroic work which has been done in the past and of the successes which have been achieved, but in our College we are only too well aware of the gaps in our knowledge and of the colossal amount of research work still to be done.

"And here will I make an end, and if I have done well, and as is fitting the story, it is that which I desired"—not only because of the vital importance of the subject, but also because I wished to do honour to William Wood Bradshaw, by whose devoted widow this Lecture was founded. But whether I have done well or ill, I hope I shall be acquitted of ungraciousness if I observe that, greatly as I appreciate the honour done me, much of my Lecture goes to show that those who in the future may be disposed to make benefactions to our College will do a greater service to humanity and ensure a richer harvest from their gifts by providing endowments for research than by founding eponymous lectures to be delivered within its walls.

O. Witt Mitchell and O. D. Chapman (*New York State J. Med.*, 1940, **40**, 1308) record thirty-eight cases of *Staphylococcus aureus* septicaemia in patients aged from 3 to 65. Thirty-one were males and seven females. Twenty cases were examples of cellulitis, boils, or carbuncles, and eighteen of osteomyelitis, which with three exceptions were all in children. Half the patients with cellulitis, boils, or carbuncles had primary lesions on the neck or face. Of the osteomyelitis cases the tibia was the first bone to be involved in nine and the femur in six. Fifteen of the patients with primary lesions and seven of the patients with osteomyelitis died.

A SURVEY OF NUTRITION AND DENTAL CARIES IN 120 LONDON ELEMENTARY SCHOOL CHILDREN

BY

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A radiological investigation to study growth in school children was being carried out at University College by the late Prof. Woollard and the late Dr. Matthew Young which necessitated the six-monthly examination of 200 elementary school children between the ages of 5 and 8 years. It was hoped that this investigation would throw some light on the problem of nutrition.

In addition to the taking of radiographs the children were weighed and measured (without shoes), and various other clinical notes were made. It seemed of interest, to complete the picture, to have some information on the condition of the teeth, so a quick examination was made, and the findings form the subject of this survey. The period covered was one year, during which they were examined three times, although only the first and third inspections are considered here. As usually happens in this kind of investigation the numbers of children available dwindled considerably by the end of the year. Those examined appeared to be in fairly good physical condition on the whole and most of them had had extra milk at school.

When making the dental examination the buccal surfaces of the teeth were first tested with a probe for structural defects as shown by varying degrees of roughness, pits, etc., and graded into four categories. The grading was, so far as the personal factor allowed, similar to that used by M. Mellanby. Perfect smoothness of surface was graded as normal or category 0; and to categories 1, 2, and 3 were allotted teeth showing slight, marked, and severe roughness and pitting. It must be emphasized, to avoid misunderstanding, that the types of defects referred to here are those first recognized by M. Mellanby (1923, 1927, 1934) and included by her under the heading of "hypoplasia"; they are much more common, though less obvious, than the generally recognized gross type and present a different microscopical structure. In a dental survey J. D. King (1940) distinguished between the two kinds by calling them "M-hypoplasia" and "G-hypoplasia" respectively, and whereas it has been proved by many observers (Mellanby, King, Hughlings Davies, etc.) that the former type is to be found associated with dental caries, there is some doubt as to whether any association exists between dental caries and G-hypoplasia—in fact, King could find no association between these two conditions in the children examined by him in the Island of Lewis.

Having graded the structure of the teeth, the amount of caries was then noted. Owing to lack of time it was not possible to explore every tooth thoroughly with the probe; the teeth were also in some cases very dirty, so that very early caries must have been overlooked. The carious teeth were graded roughly into three categories, according to the size of the carious area: caries 1 included teeth with cavities up to about the size of a large pin's head; caries 2 included those with cavities larger than grade 1 but involving less than a third of any one surface; and caries 3 included all teeth with cavities involving more than a third of one surface. This method is admittedly rough and the grading arbitrary, but it serves to give an indication of the amount of spread of caries over a period of time, and when assessing the amount of caries per mouth is much more satisfactory than giving a mere percentage of teeth carious, which makes no allowance at all for the size of the carious cavities.

The dental examination was made by me and the observations were taken down at dictation by a second person. A complete survey was first made of the mouth for structural defects, then a second round of the teeth was made to assess

caries, by which time the figure assigned to any particular tooth for M-hypoplasia had been forgotten; the two sets of findings should therefore be quite independent.

Structural Defects (M-hypoplasia)

An average hypoplasia figure was first calculated for each type of tooth to see how the structure compared one type with another (see Table I); this figure is obtained by adding up the marks allotted to all the individual teeth and then dividing by the total number of teeth.

In Table I the types of teeth were arranged in ascending order of the average hypoplasia figures at age 5; the

TABLE I

	Age 5 (34 Children)		Age 6 (55 Children)		Age 7 (32 Children)	
	Total No. of Teeth	Average Hypoplasia* Figure	Total No. of Teeth	Average Hypoplasia Figure	Total No. of Teeth	Average Hypoplasia Figure
Lower :						
Lateral incisors	64	0.23	81	0.26	22	0.32
Central " "	59	0.27	30	0.53	14	0.29
Canines " "	68	0.37	110	0.35	58	0.16
Upper :						
Canines " "	67	0.42	108	0.75	61	0.49
Lateral incisors	64	0.66	89	1.09	40	0.63
Central " "	59	0.85	57	1.04	26	0.58
Lower :						
1st molars " "	53	1.02	65	0.89	38	0.82
2nd " "	56	1.55	62	1.47	35	1.26
Upper :						
1st molars " "	63	1.60	85	1.55	40	1.20
2nd " "	68	1.69	91	1.77	50	1.65

* The term "hypoplasia" is used to cover all degrees of surface structural defects, from very slight to severe, of the type known as "M-hypoplasia."

figures for ages 6 and 7 were subsequently added, and were found to be in much the same order. The teeth showing the best structure are the lower incisors and canines, and the worst are the molars—the upper incisors and canines being intermediate. The earliest-formed teeth are therefore those which have the best structure.

It was desired to ascertain whether in these children any association existed between the quality of the structure of the teeth and the amount of caries present in them. Each individual tooth was considered in relation to the two conditions, and the resulting figures for all the teeth were arranged in the form of fourfold tables for incisors and canines together and for molars. Values for χ^2 and P were then obtained. It will be seen from Table II that all the values for P except one are less than 0.01 (the exception being 0.05 for molars at age 7), showing that such distributions would occur by chance less than once in 100 times (or 5 times in 100 for age 7 molars). A value of 0.05 is usually taken as the level of significance, all values of 0.05 or less indicating a real difference between observed values and such as might occur by chance. It is evident, therefore, that an association did exist in these children between the quality of the structure and the amount of dental caries—the better the structure the less the caries.

TABLE II.—Association of Caries and Surface Structural Defects (M-hypoplasia) of Deciduous Teeth

	Age 5 (34 Children)			Age 6 (55 Children)			Age 7 (32 Children)		
	χ^2	n	P	χ^2	n	P	χ^2	n	P
Incisors and canines	27.141	1	<0.01	58.181	1	<0.01	6.750	1	<0.01
1st and 2nd molars	24.450	1	<0.01	32.982	1	<0.01	4.532	1	0.05

Dental Caries and Nutrition

As already stated the chief point of interest in planning the main investigation was nutrition, and as it was desired to correlate the amount of dental caries present with the nutrition, it was necessary to assign a numerical value to both in every individual.

The difficulty in devising a value for the dental condition is that a figure based only on the teeth present in the mouth at the time of examination is obviously not truly representative of the dental condition of a child who has had a considerable number of teeth extracted for caries. Consider, for example, a child of 5 with only its non-carious incisors and canines left, all molars being missing: unless some allowance is made for the molars which will almost certainly have been extracted for caries at this age, the caries figure for this child will be exactly the same as that for one having a complete set of non-carious teeth. To overcome this difficulty, when assessing the caries *per mouth* it was assumed that in these children (aged 5 to 7 years) all canines and molars missing had been carious in the third grade, and adjustments were accordingly made in the caries figures. Incisors lost might have been carious, but at these ages they might have been shed normally, so no allowance could be made for them. (The age 5 group was the least affected by this consideration, most of the teeth being actually present in the mouth—see Table I—and age 7 the most affected; therefore, age 5 group would give the most satisfactory data.) The carious marks allotted to deciduous teeth in each mouth were added together, then divided by the total number of teeth; this gives an average caries figure which can be correlated with any other condition as required. (Deciduous teeth which were present in the mouth at the first inspection but were shed or extracted during the course of the year were nevertheless included when calculating the final average caries figures in order that the increase in caries might be assessed in the same number of teeth over the whole period.) No account was taken of any permanent teeth.

The assessment of nutrition is a subject on which there is little agreement from any point of view. Standards of good and bad nutrition vary from one clinician to another, and sometimes even for the same clinician variations may be found in the standards used over a period of time. Many factors are involved and much depends on the order in which children are seen, well-nourished ones tending to make less fit ones examined subsequently seem even worse than they probably are, and vice versa. In an effort to produce some standard less influenced by the personal factor, many indices of nutrition have been devised based on various physical measurements. R. Huws Jones (1938) described investigations carried out to test the value of a number of these indices in relation to clinical assessments of nutrition in the same children. It was found that a simple index based on weight/height agreed as closely as any of the more complicated indices with the clinical assessments; moreover, it did not show a greater variation from the latter than that which occurred in the clinical diagnoses of the same children made by different physicians.

In order, then, to obtain a numerical value to represent (however roughly) the state of nutrition in these children it was decided to use the formula:

$$100 \text{ weight in kg.} / \text{height in cm.}$$

Average caries figures and nutrition indices were calculated for the first inspection and again at the end of one year, as well as the differences in each over the whole period. The correlation coefficients obtained are shown in Table III.

TABLE III

	Age 5 (34 Children)	Age 6 (55 Children)	Age 7 (32 Children)
A.C.F. at 1st insp. with 100Wt./Ht. at 1st insp.	0.127 ± 0.169	-0.075 ± 0.135	0.154 ± 0.175
Increase in A.C.F. with 100Wt./Ht. at 1st insp.	0.059 ± 0.173	-0.106 ± 0.135	-0.195 ± 0.173
Increase in A.C.F. with 100Wt./Ht. at last insp.	-0.233 ± 0.165	-0.138 ± 0.135	-0.196 ± 0.173
Increase in A.C.F. with increase in 100 Wt./Ht.	-0.483 ± 0.136	-0.261 ± 0.129	0.028 ± 0.179

At age 5 there is a fairly high negative correlation (−0.483) between the increase in the average caries figure

and the increase in the nutrition figure; that is to say, the *greater* the increase in the nutrition index (indicative of improvement in nutrition) the *less* the increase in caries. At age 6 the same relation exists: the correlation figure is rather low (-0.261), but it is significant statistically, being more than twice its standard error. At age 7 no correlation was found between the two conditions, but, as explained, this group is not so satisfactory because many of the deciduous teeth were already shed.

No association existed between the amount of caries found at the first inspection and the weight/height index at that time. Again, when the increase in the average caries figures was correlated with the weight/height index at the first inspection and at the last, no association could be found between them at any age. This was perhaps to be expected, as these indices only give an indication of nutrition at the time when taken and are not necessarily representative of past physical conditions which may have helped to produce defective and carious teeth, whereas the difference found to occur in the nutrition indices over a period shows what change, if any, is taking place in the child's physique during that time and whether its increase in weight is keeping pace with its growth in stature. It is interesting, however, to note that eight out of the twelve correlation coefficients calculated are negative, showing that the trend is frequently in the same direction—i.e., the better the nutrition the less the onset and spread of caries.

Conclusion

To sum up, it has been shown that, owing to the fact that the nutrition of an individual may vary from time to time, it is extremely difficult to relate it to any other condition at any given period; the complete picture from birth onwards is required. With the knowledge now in our possession, however, it is possible to fit together some of the pieces in the dental picture. It has been shown conclusively in animals that good dental structure can be produced by dietary methods (Mellanby, 1929), and in the investigations carried out in Birmingham by the Dental Disease Committee of the Medical Research Council (1936) there were indications (nursery school) that the same was true for children. Good structure, making the teeth more resistant to disease, is, then, the first line of defence. Post-eruptive influences, though less strong, appear to provide secondary protection, but it is not known how they are exerted. In Birmingham (where the average age of the children was higher than in this series) it was shown that vitamin additions to the diet *before eruption* of the teeth had a definitely beneficial effect in reducing the amount of decay which developed, and also that these dietary additions, even when given after *full eruption*, tended to delay the onset and spread of caries in the permanent teeth. In extension of these findings the present survey would appear to suggest that even in children who have not received any special dietary treatment an improvement in general nutrition, as gauged by the weight/height index, is found in conjunction with increased resistance of the deciduous teeth to dental disease.

Summary

120 elementary school children were examined over a period of one year for dental caries and surface structural defects of the teeth. It was found that:

(1) The lower incisors and canines showed the best surface structure and the molars the worst, the upper incisors and canines being intermediate; the structurally soundest teeth are therefore those of which the greatest part is formed *in utero* before dietary deficiencies are normally felt by the child.

(2) A definite association existed between the quality of the structure of the teeth and the amount of caries present: the better the structure the greater the resistance to dental disease.

(3) An improvement in physical condition as judged by an increase in the nutrition (weight/height) index at ages 5 and 6 was found to be fairly strongly associated with a smaller increase in dental caries.

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ANAESTHESIA FOR MAJOR DENTAL SURGERY

AN ALTERNATIVE TO THE ENDOTRACHEAL METHOD

BY

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Pernasal endotracheal inhalation anaesthesia is now firmly established as a method of choice for major dental and oral surgery. It has, however, long been felt that in spite of the obvious advantages attached to the method the liability to trauma of the mouth and pharynx would make a simpler but equally satisfactory alternative desirable for major dental surgery. The oral surgeon expects his patient to be "well" soon after the operation is over, because both he and the public, with a certain amount of justification, do not regard the removal of an impacted wisdom tooth or a cosmetic dental operation, in an otherwise healthy person, sufficient reason for a convalescence of several days or more to recover from the effects of the anaesthesia or from the operations of the anaesthetist.

To obtain the minimum of post-anaesthetic sequelae the anaesthetist must avoid the deeper planes of anaesthesia—the first plane of the third stage is all that is necessary for this work; trauma to the mouth and pharynx; lipid-soluble agents—nitrous-oxide-oxygen is still the most suitable one for the type of surgery involved.

Advantages and Disadvantages of Endotracheal Inhalation Anaesthesia

Before describing alternative methods the advantages and disadvantages of the endotracheal route will be briefly stated so that comparison may be made.

Advantages.—(1) A perfect airway is obtained which is not obstructed by altering the position of the head or by depression of the lower jaw. As a result the patient breathes quietly and without effort. (2) There is no danger of inspiration of blood, mucus, or operative debris, because the oral pharynx can be packed with gauze or an inflatable cuff round the tube can be used. (3) The mouth is left as a clear field for the surgeon to work in, with no anaesthetic apparatus to get in his way. (4) The anaesthetist is able to stand some distance away from the patient and still maintain efficient observation and control of the anaesthesia. (5) Post-operative vomiting is reduced, because if a lipid-soluble agent has been used direct impregnation of the saliva during maintenance is reduced. (6) Air is easily excluded, enabling nitrous-oxide-oxygen to be used exclusively and without pressure.