

A survey of 216 elderly men and women in general practice

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In a clinical survey of 216 elderly people on the lists of general practitioners in England, Scotland and Wales, there was a high incidence of epithelial and vascular lesion of the tongue, which have previously been shown to respond to treatment with the B group of vitamins and ascorbic acid. The incidence of lesions was related to sex, social class, smoking, peptic ulcer and frequently of consumption of vegetables and fruit, but was not related to 'living alone' or to age.

Brocklehurst *et al* (1968), Griffiths (1968) and Taylor (1968) described the results of a therapeutic trial (The Farnborough Trial) lasting for one year with 80 geriatric hospital patients, in which 40 patients received a daily tablet containing thiamine 15 mg, riboflavin 15 mg, nicotinamide 50 mg, pyridoxine 10 mg and ascorbic acid 200 mg, and the remaining 40 received dummy tablets. The untreated group showed some clinical evidence of deterioration and the treated group showed clinical and bio-chemical evidence of marked improvement. The clinical examinations in the Farnborough trial were all done by one of us (GFT). At the end of a year, Taylor was able to allot the survivors in the blind controlled trial into groups of 'treated' and 'untreated' with only one mistake. In their accounts of the Farnborough trial, the authors cited above

TABLE I
CHANGES IN CLINICAL ASSESSMENT (FARNBOROUGH TRIAL) THREE MONTHS AND SIX MONTHS
AFTER START OF TRIAL

<i>(a) Changes at 3 months</i>	<i>Improved</i>	<i>Unchanged</i>	<i>Deteriorated</i>	<i>Died</i>	<i>Total</i>
Treated	11	27	1	1	40
Untreated controls ..	1	25	9	3	38 (+2 patients not examined)
Total	12	52	10	4	78
	$\chi^2_3 = 15.80 \text{ P} < 0.005$				
<i>(b) Changes at 6 months</i>					
Treated	21	13	1	4	39 (+1 patient not examined)
Untreated controls ..	2	10	22	5	39 (+1 patient not examined)
Total	23	23	23	9	78
	$\chi^2_3 = 35.38 \text{ P} < 0.0005$				

did not notice that a highly significant difference between the treated and control groups had already been established at the first clinical follow-up at the third month, and the difference increased with each successive examination. The difference occurring at the third and sixth months of the trial taken from the published results given by Griffiths (1968), are shown in table I.

The controlled trial with hospital patients has now been followed by a clinical survey of 216 elderly people (103 men and 113 women) between the ages of 65 and 90 years on the lists of ten general practitioners. The clinical assessment was made by the same investigator (GFT) who used the same methods and recorded the same clinical signs of deficiency with similar photographic records of tongue, lips and skin as he made in the Farnborough trial.

The sample

The co-operation of the Royal College of General Practitioners was invited for the setting up of this study and the College records enabled us to select a number of general practitioners in both rural and industrial areas who maintained age and sex registers of men and women within their National Health Service lists. Ten practices were contacted and all agreed to take part in the survey (table II). From the list of each practitioner 20 names were selected at random in the practice office and these people were then visited by a clinician and assessed for the presence or absence of the signs described below.

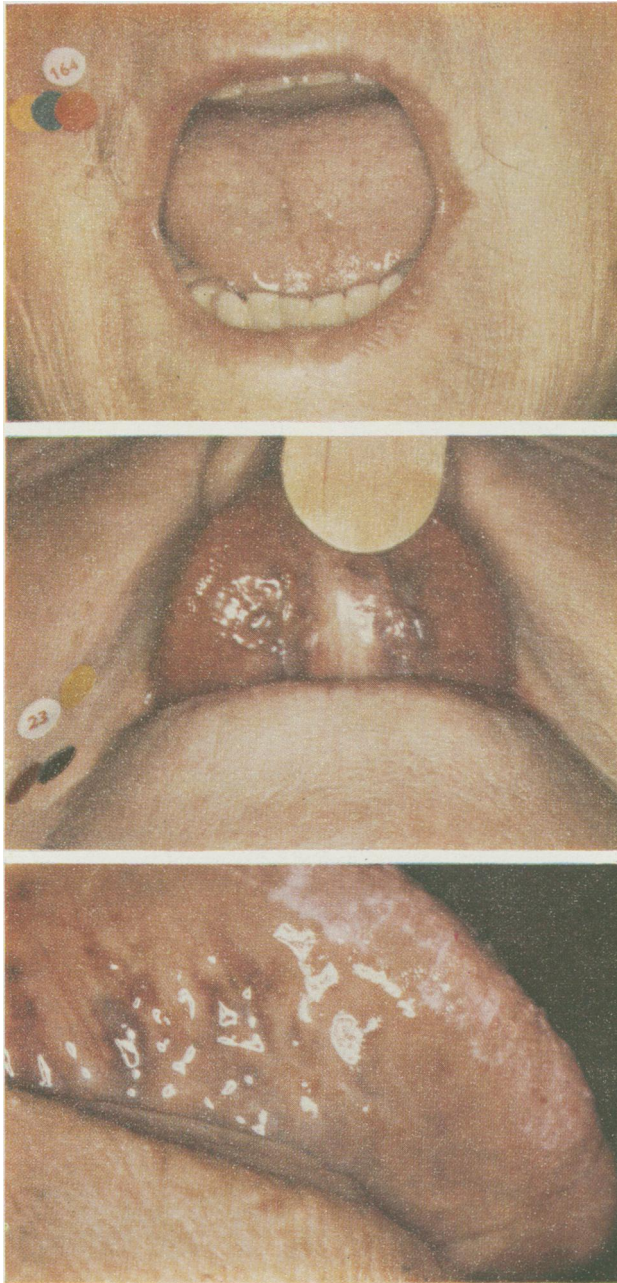
TABLE II

<i>Location of practice</i>	<i>Social class of majority of subjects in this survey (R.G.s classification)</i>	<i>Type of area</i>
Birmingham	IV	Industrial
Paignton, Devon ..	III	Retired seaside population
Holland Park, London ..	I, II	Affluent metropolitan
Stoke on Trent, Staffs ..	V	Industrial
Boston, Lincs	II, IV, V	Semi-industrial
Birmingham	III, IV, V	Industrial
Langholm, Dumfries ..	I to V	Small country town
Dundee, Angus ..	III, IV, V	Industrial
Middlesbrough, Yorks ..	III, IV, V	Industrial
Swansea, Glamorgan ..	III, IV, V	Industrial

Methods

A brief record of each subject was made on a specially prepared record card and photographs of the mouth and tongue (figures 1 to 3) were taken of every subject and, where necessary, of the skin. The most important single method in these studies has been the photographic record of changes in the tongue. The values of these can only be appreciated by direct examination of the pictures—printed reproductions are much less satisfactory.

Because of the time-factor, it was obviously not possible for all of the present authors to examine the subjects individually, but we had the opportunity of reviewing each patient after the reconnaissance was completed, from the photographs and records. It was thus possible to compare the photographs with the written records and assess the accuracy of the observations made by the clinician.



Figures 1 to 3

In this paper clinical signs are grouped into two categories—*epithelial lesions* and *vascular lesions*—and subjects have been assigned to one of four groups:

- (i) normal—m12:f34:t46
- (ii) those with epithelial lesions only—m16:f20:t36
- (iii) those with vascular lesions only—m21:f19:t40
- (iv) those with both vascular and epithelial lesions—m54:f40:t90

Normals are patients with no observed abnormality, with slight or indefinite changes or with an isolated record of one abnormality.

Epithelial lesions were *dorsal tongue signs*:—colour; colour of tip; filiform papillae—white, loss; fungiform papillae, colour, number, size; fissuring; geographical tongue. *Mucocutaneous signs*: angular stomatitis, cheilosis, blepharitis. *Dermal signs*: follicular keratosis and enlargement, curled subcuticular hairs in the skin of the arms, dyssebacia.

Vascular lesions refer to subjects with sublingual vascular defects—red or blue varicosities, vessels enlarged and red or with blurred edges, and apparent sublingual haemorrhages. Follicular and petechial haemorrhages in the skin of the arms and larger subcutaneous haemorrhages were recorded, but are considered separately from the sublingual vascular lesions in this paper.

The percentage incidence in all 216 subjects was: normal 21.3 per cent, epithelial 16.7 per cent, vascular 18.5 per cent, both 43.5 per cent. Those subjects showing both epithelial and vascular lesions tended to have more severe lesions than those with one group of signs only. Generally, therefore, in this paper the subjects have been classified in three groups, (i) normal, (ii and iii) single group lesions, (iv) double group lesions, indicating degrees of severity; but in comparisons referring to the intake of vitamin C the incidence of epithelial (ii) and (iv), and vascular (iii) and (iv) lesions have been considered separately.

In addition to the clinical assessment, the following information was obtained:

Age and sex

Occupation before retirement: classification into the Registrar General's social classes I–V

Chronic diseases (if any) for which patient was being treated by general practitioner

Smoking habits: whether or not patient smoked. No record was made of the amount or type of smoking

Frequency of consumption of fruit and vegetables

Cooking time of vegetables

Social factors: living alone, housebound, etc.

Results

Sex. Table III shows the incidence of the clinical signs in men and women.

Men were more affected than women, the difference is highly significant ($P < 0.01$) and occurs mostly between those who are normal and those worst affected. There is little difference between men and women affected with one group of signs only.

TABLE III
SEX INCIDENCE OF LESIONS

	Men	Women	Total
Normal	12	34	46
Epithelial	16	20	36
Vascular	21	19	40
Both	54	40	94
Total	103	113	216
	$\chi^2_3 = 12.70 P < .01$		

Social class. Table IV shows the incidence of signs in different social classes. There was a progressive deterioration from Class I and II, through Classes III and IV, to Class V, and the differences were highly significant ($P < 0.0005$).

TABLE IV
SOCIAL CLASS OF PATIENTS, AND NUMBERS WITH LESIONS

	<i>I+II</i>	<i>III</i>	<i>IV</i>	<i>V</i>	<i>Total</i>
(i) Normal	11	16	11	8	46
(ii) and (iii) Subjects with one group of lesions	8	27	30	11	94
(iv) Subjects with both groups of lesions	3	23	38	30	94
Total	22	66	79	49	216

$\chi^2_6 = 24.26 \quad P < .0005$

TABLE V
SMOKING AND INCIDENCE OF LESIONS

	<i>Without lesions</i>	<i>With lesions</i>	<i>Total</i>
Non-smokers ..	38	101	139
Smokers	8	69	77
Total	46	170	216

$\chi^2_1 = 7.5 \quad P < 0.005$

Smoking. The predominance of defects in males was associated with a higher incidence of smoking in men and a relationship between smoking and incidence of clinical signs. The difference in experience of smokers and non-smokers shown between normals and all those showing clinical signs in table V is highly significant ($P < 0.005$).

Sixty men and 17 women stated that they were smokers. The incidences of smoking in men (58 per cent) and women (15 per cent) were about 10 per cent less than the percentages of smokers among men (71 per cent) and women (24 per cent) over 60 years old given by Todd (1962). Perhaps only those for whom smoking formed a considerable item in the weekly budget stated that they were smokers. The incidence of lesions in 43 men (84 per cent) and 96 women (68 per cent) who were non-smokers, were not significantly different ($P > 0.05$); nor were those between 60 smoking men (92 per cent) and 17 smoking women (83 per cent) ($P > 0.10$). The sex difference in incidence was associated with sex differences in smoking habits.

Chronic illness. Ninety-eight patients were being treated by their general practitioners for some form of chronic illness. Of these only two groups of illnesses, 39 patients with chronic diseases of the chest and 17 with gastro-intestinal diseases, affected sufficient numbers to show any significant trends. The relationship of chronic disease to deficiency signs is shown in table VI.

The differences in incidence are highly significant for all diseases ($P < 0.001$) and for gastro-enteritic complaints ($P < 0.005$) but are not statistically significant for chest diseases ($P > 0.10$). Gastro-intestinal diseases were mostly peptic ulcers and sequelae of gastrectomy; there were 14 patients with chronic peptic ulcer, including four with partial gastrectomy; one with hemicolectomy and cholecystectomy; one with colitis (15 years' duration) and one with hiatus hernia.

Fruit, vegetables and cooking. Each subject was asked how often fresh fruit or green vegetables were included in the diet, and the patient or household cook was asked

the time taken to cook vegetables. These are shown in table VII as daily consumption, consumption twice a week and consumption once a week or less. Cooking vegetables for more than 30 minutes was classified as overcooking.

TABLE VI
TREATMENT FOR CHRONIC ILLNESS BY GENERAL PRACTITIONER AND INCIDENCE OF LESIONS

	(a) All chronic illness			(b) Gastro intestinal diseases			(c) Chronic chest diseases		
	Under treatment	Not under treatment	Total	Under treatment	Not under treatment	Total	Under treatment	Not under treatment	Total
(i) Normal	10	36	46	0	46	46	4	42	46
(ii) and (iii) One group: epithelial or vascular ..	35	41	76	3	73	76	15	61	76
(iv) Both groups of lesions ..	53	41	94	14	80	94	20	74	94
Total	98	118	216	17	199	216	39	177	216
	$\chi^2_2=15.10 P<0.001$			$\chi^2_2=11.94 P<0.005$			$\chi^2_2+3.54$ $0.10 < P < 0.20$		

TABLE VII
CONSUMPTION OF VEGETABLES AND FRUIT AND INCIDENCE OF LESIONS

Fruit and vegetable consumption	(a) Vascular lesions			(b) Epithelial lesions		
	Present	Absent	Total	Present	Absent	Total
(i) Daily	59 (—25)	52 (— 9)	111 (—34)	65 (—26)	46 (— 8)	111 (—34)
(ii) Two or three times weekly	33 (—13)	17 (— 5)	50 (—18)	31 (—12)	19 (— 6)	50 (—18)
(iii) Once weekly or less	42 (+38)	13 (+14)	55 (+52)	34 (+38)	21 (+14)	55 (+52)
Total ..	134	82	216	130	86	216

Numbers in parentheses are those who overcooked vegetables
 $\chi^2_2=8.85 P<0.025$ (not corrected for overcooking) $\chi^2_2=0.25 P>0.80$ (uncorrected for overcooking)
 $=17.86 P<0.0005$ (corrected for overcooking) $=5.19 0.05 < P < 0.10$ (corrected for overcooking)

There is a statistically significant ($P<0.025$) negative relationship between signs of vascular lesions and the frequency of consumption of fruit and vegetables but no relationship between consumption of these foods and the epithelial signs.

If, however, of those who took green vegetables twice weekly or more, subjects who overcooked vegetables are considered, it is shown in table VII that their experience is the same as that of subjects who took these foods once weekly or less. Correcting for overcooking by classifying all of these, with those who had a low consumption of vegetables, as shown in table VII, the difference in vascular defects in the three groups is more highly significant ($P<0.0005$) but there is still no significant association between consumption and overcooking of these foods and epithelial signs ($P<0.05$).

Twenty-five subjects used soda for cooking vegetables. This also might have been related to the occurrence of vascular signs. It was only realized towards the end of the survey, in the last two practices that were visited, that soda was commonly used in

cooking vegetables. In Middlesbrough it was used by seven subjects and in the last place visited—Swansea—where everyone was asked, 18 out of 20 subjects used soda.

Milk. One hundred and fifty-one subjects were asked about milk consumption and of these 69 took one pint and 80 took half-a-pint daily, and two took no milk. No relationship could be observed between these records of milk consumption and clinical signs.

Follicular, petechial and other skin haemorrhages

Nineteen subjects had subcutaneous petechias, follicular and other skin haemorrhages; of these 17 (89.5 per cent) had sublingual vascular lesions, as compared to 59.5 per cent of the remaining 197. The difference is highly significant ($<P0.01$); there was, therefore, a relationship between sublingual lesions and subcutaneous haemorrhages.

Myoedema

Myoedema, classified as no reaction, under 6 seconds' duration and 6 seconds and over, showed no relationship with epithelial or vascular lesions.

Age

There was no relationship between age and the occurrence of either epithelial or vascular lesions; the incidences were evenly distributed over 10-year age-groups.

Living alone

Six men and 36 women lived alone. Of the 36 women, 23 had lesions, an incidence of 64 per cent; this was lower than the incidence of 73 per cent in women not living alone but the difference is not significant. Five of the six men living alone had lesions, approximately the same incidence as the 88 per cent seen in all men. It is generally supposed that old people living alone are at a disadvantage compared with other old people and are more liable to suffer from deficiencies. The results of this survey do not support this; there was no significant difference between the two groups.

Discussion

The tongue and oral mucous membrane are easily examined in ordinary clinical examination and often show the first clinical signs of metabolic and nutritional disorders. They are the most actively metabolizing tissues easily accessible to clinical inspection without recourse to endoscopy or surgical investigation. Though the changes are not specific, they have generally been associated with nutritional deficiencies and particularly deficiencies of the B group of vitamins. As a guide to the assessment of nutritional status, Jelliffe (1966), following the recommendations of the WHO Expert Committee (WHO, 1963), lists angular stomatitis, atrophic papillae, scarlet and magenta tongue as Group 1 signs that are of value in nutritional assessment, while hypertrophied hyperaemic papillae, fissures and geographical tongue are Group 2 signs that need further investigation but in whose causation chronic malnutrition may play some part.

Taylor (1968) has suggested that sublingual vascular lesions may be associated with a deficiency of vitamin C and in a study of 93 elderly people, Andrews and Brook (1966) showed an association between sublingual petechiae and a low leucocyte level of ascorbic acid. In his classical *Treatise on Scurvy*, James Lind cited Hermann Boerhaave (*Aphorismus 1148 de scorbuto* 1708) and Joan (*Ecthii de scorbuto* 1541) who both gave 'varicose veins under the tongue' as a symptom of scurvy (Lind 1753). Andrews, Letcher and Brook (1969) described the histology in post-mortem specimens of tongues

of affected old people as 'consistent with that of dilated capillaries or of venules but the size of the walls suggested that the vessels were more likely to be venules'. The vessels had a very thin wall of connective tissue with no muscular or elastic elements. Because there was no clinical response, shown by improvement in old aneurysmal dilations, to therapy with vitamin C, nor any sign of haemorrhage, they, and also Berry and Darke (1968), considered that these lesions were not scorbutic. But the histological changes they describe are precisely those which many authors have described in scurvy in guinea pigs, thinning of the walls of arteries and veins, disappearance of collagen and dilation of capillaries and veins so great as to give an erroneous impression of actual haemorrhage (Hojer 1924). Lee (1961) described dilation of venules on the venous side of the capillary bed, with capillary and venular stasis in the mesentery of scorbutic guinea pigs. These changes occurred without haemorrhage, but with an increased liability to haemorrhage following slight trauma. Similar lesions have been seen in the conjunctiva in experimental scurvy in man by Hood and Hodges (1969).

The definition, grading and comparison of clinical signs, such as these, subject as they are to personal variations between patients and to subjective variations by observers, is a well recognized difficulty. There is an infinite gradation from normality to conditions which are grossly abnormal. Any division between 'normal' and 'abnormal' must be arbitrary, and standards of 'normality' and 'abnormality' will vary between different observers. The assessment in this study has been made mainly from photographic records and slight or single defects have been counted as normal. We have all examined the photographs and are agreed on a particular standard of assessment, using the original 35 mm photographic transparencies from the Farnborough trial as standards for comparison. The acute lesions described in this survey in general practice—sublingual venous suffusion and dilation, and glossitis—were seen to improve following vitamin supplementation in the Farnborough trial, but chronic changes—varicoceles, severe fissuring of the tongue or complete papillary atrophy—are irreversible.

The incidence and severity of lesions in this survey were related to social class, sex, smoking and chronic illness, particularly gastro-intestinal disease and peptic ulcer. The vascular signs were related to the infrequent consumption of vegetables and fruit and to the over-cooking of vegetables. This association suggests that there were deficiencies of ascorbic acid. Brook and Grimshaw (1968) and Pelletier (1968) both describe reduced levels of ascorbic acid in smokers and cite many authors who have observed these differences in relation to age, sex and smoking.

None of the four patients who had partial gastrectomies or the other ten patients with peptic ulcer—mostly of many years' duration—could recollect any advice that they might have received to protect themselves from deficiency by suitable diet or supplements. In fact, none of the 216 patients was receiving any prescribed supplements, though six were taking vitamins independently at their own expense.

Many factors enter into the aetiology; for example, signs suggestive of possible fungus infection were seen in many of the tongues, and the significance of this finding is being further investigated. But we believe, from the experience of the original therapeutic trial, that some degree of vitamin deficiency in these old people must play an important part.

Acknowledgement

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PROGNOSTICS

Upon my first Visit I was bold to tell them who had not let fall all Hopes of his Recovery, that in my sad Opinion he was not like to behold a Grashopper, much less to pluck another Fig; and in no long time after seem'd to discover that odd mortal Symptom in him not mention'd by *Hippocrates*, that is, to lose his own Face, and look like some of his near Relations; for he maintain'd not his proper Countenance, but look'd like his Uncle, the Lines of whose Face lay deep and invisible in his healthful Visage before: For as from our beginning we run through Variety of Looks, before we come to consistent and setled Faces; so before our End, by sick and languishing alterations, we put on new Visages: and in our Retreat to Earth, may fall upon such Looks which from Community of seminal Originals were before latent in us.

He was fruitlessly put in hope of advantage by change of Air, and imbibing the pure Aerial Nitre of these Parts; and therefore being so far spent, he quickly found *Sardinia* in *Tivoli*, and the most healthful Air of little effect, where Death had set her broad Arrow; for he lived not unto the middle of *May*, and confirmed the Observation of *Hippocrates* of that mortal time of the Year when the Leaves of the Fig-tree resemble a Daw's Claw. He is happily seated who lives in Places whose Air, Earth and Water, promote not the Infirmities of his weaker Parts, or is early removed into Regions that correct them. He that is tabidly inclin'd, were unwise to pass his Days in *Portugal*: Cholical Persons will find little Comfort in *Austria* or *Vienna*: He that is weak-legg'd must not be in Love with *Rome*, nor an infirm Head with *Venice* or *Paris*. Death hath not only particular Stars in Heaven, but malevolent Places on Earth, which single out our Infirmities, and strike at our weaker Parts; in which Concern, passager and migrant Birds have the great Advantages; who are naturally constituted for distant Habitations, whom no Seas nor Places limit, but in their appointed Seasons will visit us from *Greenland* and Mount *Atlas*, and as some think, even from the *Antipodes*.

SIR THOMAS BROWNE. The works of Sir Thomas Browne, Volume III. 1907. Edinburgh. John Grant. P. 370.