REVIEW OF 110 CASES OF CANCER OF ORAL CAVITY IN PAPUA AND NEW GUINEA

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It is believed that tumours of the oral cavity have a high incidence among the native population of the Territory of Papua and New Guinea. This state of affairs is similar to that in other countries where the habit of chewing betel nut is practised. The Port Moresby General Hospital is the only hospital in the Territory of Papua and New Guinea which has facilities for radiotherapy, and all patients requiring such treatment are sent there. Patients also come to Port Moresby from West New Guinea and the British Solomon Islands Protectorate.

In the 110 patients treated in the radiotherapy department the tumours occurred in the upper and lower lips, the tongue, the floor of the mouth, the buccal mucosa, the upper and lower gingiva, and the hard palate (Table I).

TABLE I.—*Tumours of Oral Cavity*

Location	Male	Female	Total	
			No.	%
Upper and lower lips ..	2	1	3	2.7
Tongue ..	27	3	30	27.3
Floor of mouth ..	2	—	2	1.8
Upper and lower gingiva ..	1	—	1	0.9
Hard palate ..	2	—	2	1.8
Buccal mucosa ..	50	22	72	65.5
Total ..	84	26	110	100.0

At the present stage of development of the Territory most cases of oral cancer are far advanced when first seen. Less than half of the buccal cancers were restricted to the buccal mucosa. In 25 patients there was further extension of the buccal tumour towards the corner of the mouth, invading mainly the lower lip. In nine patients the upper gingiva and the palate, and in four patients the lower gingiva and the floor of the mouth, were invaded in continuity.

The patients were indigenous Papuans and New Guineans. The Papuans came from the south and south-east coasts of the mainland and from the D'Entrecasteaux and Trobriand Islands. The New Guineans came from the Central Highlands and the north coast of the mainland and from New Britain, New Ireland, Bougainville, and Manus Islands. All patients except one (a male) were village natives without close contact with European communities. Their usual occupations included gardening, fishing, and hunting—their economic status differed in no way from that of the average rural native in the Territory.

The sex ratio among our patients was 3.2 males to 1 female. This ratio is similar to that of some of the countries where betel nut is chewed, but it differs from the ratios in the Philippines, Malaya, Ceylon, and Java, where women suffer from oral cancer as much as or even more than men. In Thailand (Vellios *et al.*, 1953) there is an even distribution between male and female patients. Social arrangements and tribal customs amongst our people may ensure that many more males than females are willing to present themselves to mission or Government hospitals. This may be affecting the sex ratio in the series.

The age-distribution curve shows a peak at 40 years, which is similar to that of Indian patients, in whom the peak age was 42.5 years and of the Malayan patients who are middle-aged rather than elderly. Three of our patients with advanced oral cancers were under 20 years of age (Table II).

TABLE II.—*Sex and Age* Distribution*

Age:	10-19	20-29	30-39	40-49	50-59	60-69	Total
Male ..	2	8	24	28	20	2	84
Female ..	1	2	8	8	6	1	26
Total { No.	3	10	32	36	26	3	110
{ %	2.7	9.1	29.1	32.8	23.6	2.7	100.0

* Estimated only.

Incidence

The incidence of tumour of the oral cavity shows great variation in different racial groups. In European communities malignant tumours of the oral cavity account for only 5% of the total number of cancers. Within this 5% the most frequent site is the lower lip. The tongue ranks second in frequency. The buccal mucosa provides only one-third or a quarter of the number of cancers found in the tongue. The floor of the mouth accounts for about 15% of the total. The lower gingiva is more often the site of cancer than the upper gingiva. The hard palate is the most frequent site of mucous and salivary gland tumour, but squamous-cell carcinoma occurs rarely in this site (Ackerman and Regato, 1954).

In India (Khanolkar, 1950) 35.9% of all cancers were found in the oral cavity. In Bangkok (Mendelson and Ellis, 1924) 47.1% of all cancers were also localized to the buccal cavity. It is known to be a common form of primary cancer in the Philippines, Ceylon, Malaya, and Indonesia (Table III). However, when one

TABLE III.—*Percentage of Malignant Tumours of the Oral Cavity in Different Population Groups, Compared with the Total Number of Cancer Cases*

European communities (Ackerman and Regato, 1954) ..	5%
India (Khanolkar, 1950) ..	35.9%
Bombay (Paymaster, 1957) ..	13%
Madras (Shanta and Krishnamurthy, 1959) ..	26.4%
Thailand (Vellios <i>et al.</i> , 1953) ..	11.1%
Bangkok (Mendelson and Ellis, 1924) ..	47.1%
Indonesia (Kouwenaar, 1951) ..	11.9%

analyses the data from India it becomes evident that there is a remarkable geographical variation in the location of oral tumours. In Travancore and Madras the buccal mucosa accounts for 71% of all oral tumours. In Bombay, on the other hand, tumours of the tongue (and especially those of the base of the tongue) occur four times more often than buccal tumours. In Andhra the oral surface of the palate is the most frequent site of cancer, in Assam the hypopharynx, and in Bihar the lip. This anatomical variation is partly explained by the variations in chewing habits and ways of smoking.

In Malaya (Marsden, 1958) the incidence of oral tumours is high among Indians, rare in Malays, and unknown in the Chinese communities. The explanation

offered is that only the Indians include tobacco in the quid.

Such geographical or racial variations are not demonstrable among our patients. Among patients reaching Port Moresby Hospital there have been no significant numerical differences observed between Papuans and New Guineans or between different parts of the country.

Cancer of the buccal mucosa is a cancer of special interest to us, and therefore most of what follows is concerned with this cancer.

Aetiology

With regard to aetiology the habit of chewing betel nut must be considered. All the patients except two (one male and one female) were inveterate chewers and had been since early childhood. However, at the time of their admission the great majority of patients had been forced to give up the habit owing to trismus and inability to masticate. In the process of chewing various substances are added to the nut. The use of lime made from shells was generally practised by all patients. Shell lime is alleged to be more irritant than stone lime. This lime is obtained mainly from river shells. The following ingredients were used by the patients with the betel nut and lime. The fruit, leaf, root, or stem of pepper (*Piper betle*) (Motu names*: popo, popo vaga, popo rauna, popo ramuna, popo gabana; Pidgin names*: daga, pikinini daga, lip daga, rob daga, bun daga). Ginger (*Zingiber officinale*) (Motu name: agi; Pidgin name: kawawa). Shell of young coconut (*Cocos nucifera*) (Motu name: niu; Pidgin name: kokonas). Bread fruit (*Artocarpus incisa*) (Motu name: unu; Pidgin name: kabiak).

The Motu name for lime is ahu and the Pidgin name is kambang. The betel nut is called buatau in Motu and buai in Pidgin.

Styles of chewing and the quantities consumed daily showed considerable variation in our patients, depending on age, sex, social status, occupation, etc.

Other factors noted which may have importance in aetiology are poor hygiene of the oral cavity with dental sepsis and perhaps a vitamin-deficient diet.

Tobacco.—The majority of our patients of both sexes were smokers. Mainly they used locally grown tobacco or imported twist tobacco rolled in newspaper or in tobacco leaves. European-type cigarettes were available to one of our male patients. Two patients smoked coarse tobacco in European pipes. The habits of "reverse" smoking and chewing of tobacco were unknown to our patients. Shanta and Krishnamurthi (1959), in a review of 347 oral cancers, assert that carcinoma of the buccal mucosa occurs in 85% of those who chew tobacco with betel nut and only 8.7% of those with cancer chew betel nut or lime alone. None of our patients chewed tobacco with betel nut. Coexistence with yaws and with syphilis has not been established.

Leucoplakia.—This was seen frequently in irregular whitish patches associated mainly with the relatively early and less extensive lesions. Only one of our male patients suffered from bilateral tumours involving the buccal mucosa extensively and with clear evidence of bicentric origin; however, there was no evidence of pre-existing multifocal leucoplakia (Martin and Pflueger, 1935).

*Motu is the trade language used along the south coast of Papua predominantly. Pidgin is the lingua franca of New Guinea mainland and islands.

Pathology

Examination invariably showed squamous-cell carcinoma in our studies. The grading from well-differentiated through moderately well differentiated to highly anaplastic types gives a ratio of 4:2:1. This is in accordance with the findings of Willis (1953), who reported that tumours of the buccal cavity are of cornifying epidermoid type and anaplastic growth is rare. (Pathologists: Dr. A. V. G. Price, Port Moresby; Dr. V. Swanson, Port Moresby; Dr. B. R. V. Forbes, Sydney; Professor ten Seldam, Perth.)

Metastases.—On histological grounds it is difficult to state the number of cases in this series with regional metastatic involvement. With few exceptions our patients present for the first time in advanced stages. Palliative measures alone are justified. Block dissection without the control of the primary lesion is not indicated; consequently in many of our cases the causes of regional lymphadenopathy are established clinically, and no clear distinction between inflammatory and metastatic involvement of glands is possible. In those cases where there was a good chance of cure and where radiotherapy of the primary tumour was followed by block dissection of cervical lymph nodes, twice as many glands were histopathologically negative than showed metastatic involvement. Distant metastases were not detected in any of our cases.

Course and Treatment

There is little to be added to the well-known clinical evolution. The duration of symptoms given by the patients is invariably unreliable. Commonly there are no events which can be used as time-marks of the recent past. The history of the illness varies from "two to three weeks" to "three to four months."

At presentation most patients are beyond curative treatment. Pain is not a frequent symptom even in these advanced cases. As a rule there is much secondary infection leading to induration and oedema of surrounding tissues. Destruction of mandible and hard palate is not infrequent. In our study 18 cases showed bone invasion radiologically, mainly of the mandible. The general condition of the patient is affected substantially by the secondary infection and by the trismus which causes inability to masticate.

Diagnosis was not difficult in our cases. Leucoplakia may provide a minor problem. This is usually found in isolated or confluent patches of raised whitish mucus membrane. Microscopical examination of such lesions is essential to exclude evidence of neoplastic changes.

The majority of patients were treated by external application of conventional deep x-ray therapy. One patient has undergone interstitial radon application. Two have received supervoltage radiotherapy. Eleven patients were treated by a combination of external irradiation and surgery: four received radiotherapy after the surgical excision, and seven were irradiated prior to the operation. The treatment of metastatic lymph nodes was by block dissection.

Follow-up

Evaluation of therapeutic results offers difficulties of a kind and degree not present in other countries. Owing to our unique environmental factors it is not yet possible to present remote results of therapy with a clear

assessment of all relevant facts which might lead to the formulation of relative or absolute survival rates. Furthermore, our knowledge of such things as average life expectancy and life expectancy of untreated patients with particular forms of cancer is so incomplete that such elegant studies are impossible at this time.

It is hoped that efforts to operate a minimal follow-up system will enable us to complete this study along these lines.

Summary

A review of 110 cases of oral cancer treated at the radiotherapy department of the Port Moresby General Hospital was made. The incidence of oral cancer in patients reaching hospital in Papua and New Guinea is higher than is found in European communities, but the overall incidence may be lower than that in countries of South-east Asia, for instance, where tobacco is chewed with betel nut.

The age and sex incidence of the condition in our patients differs from those found in European communities, but there is a similarity with figures from the countries of South-east Asia.

The relatively high incidence of oral cancer compared with other cancers is thought to be due partly to easy detectability of the cancer in an accessible site. Properly conducted clinical studies might throw light on environ-

mental and racial factors in the development of oral tumours.

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INFECTION WITH EATON'S PRIMARY ATYPICAL PNEUMONIA AGENT IN ENGLAND

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Studies during the last ten years have done much to reinforce the conclusions of Eaton and his colleagues (Eaton *et al.*, 1944; Eaton and van Herick, 1947; Eaton, 1950) that an organism isolated from a patient with pneumonia in California in 1944 is a cause of various forms of respiratory illness ranging in severity from febrile bronchitis to that form of primary atypical pneumonia in which a proportion of patients develop agglutinins for *Streptococcus MG* or cold agglutinins against human erythrocytes (Liu *et al.*, 1956, 1959; Cook *et al.*, 1960; Chanock *et al.*, 1961a, 1961b; Clyde *et al.*, 1961; Evans and Brobst, 1961).

Eaton and Liu (1957) expressed no final opinion about the nature of their organism, but in recent years it has frequently been referred to as a virus. However, a reconsideration of its properties—namely, its size, sensitivity to broad-spectrum antibiotics and an organic gold compound, the type of pneumonia produced in the hamster lung, and the presence in infected chick-embryo lungs or tissue cultures of coccobacillary bodies stained by an intensified Giemsa method—led to the view that the organism is not a virus but is related to the pleuropneumonia-like (*Mycoplasma*) group of organisms (Marmion and Goodburn, 1961; Clyde, 1961; Goodburn and Marmion, 1962a, 1962b). Substantiation of this view has been provided recently by Chanock *et al.* (1962a), when they cultured on agar a pleuropneumonia-

like organism from one of the standard strains of Eaton's agent which had been maintained in eggs and tissue culture and showed that the colonies reacted specifically by immunofluorescence with convalescent-phase, but not with acute-phase, sera from cases of atypical pneumonia or with antisera against various other pleuropneumonia organisms, including some from chickens and contaminated tissue cultures.

The purpose of this paper is to show that infection with Eaton's agent occurs in Britain by describing the clinical and serological findings in some representative sporadic cases and in those of a small institutional outbreak. In passing, evidence is also provided which supports the claim (Chanock *et al.*, 1962b) that the organisms propagated in chick embryos and in cell-free media (P.P.L.O. agar) are antigenically related.

Materials and Methods

Specimens of sera were taken from those submitted for routine virus diagnostic tests. They were selected either because of a history suggesting atypical or "virus" pneumonia or because of a positive cold haemagglutinin or *Streptococcus MG* agglutinin reaction in the absence of serological evidence of infection with myxoviruses, psittacosis, Q fever, or adenoviruses. In addition, there were sera from seven cases of infection of the lower respiratory tract in a boy's boarding-school. A description of this school, consisting of about 370 boys

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