Type of Alcoholic Beverage and Cancer of the Upper Respiratory and Digestive Tract

ANNETTE LECLERC,* JACQUES BRUGÈRE,† DANIÈLE LUCE,* DOMINIQUE POINT† and PASCAL GUENEL*

*Unité 88 de l'INSERM, 91 Bd de l'Hôpital, 75013 Paris, and †Service ORL, Institut Curie, Paris, France

Abstract— The study concerns a series of 2443 French men with cancer of the upper respiratory and digestive tract (tongue, buccal cavity, oropharynx, hypopharynx, larynx supraglottis, larynx glottis and epilarynx).

Each patient was examined in the Head and Neck Department of the Institut Curie in Paris. For each of them, data on the consumption of tobacco and alcohol was obtained with specification of the type of alcoholic beverage: wine, beer, cider, aniseed spirit or 'pastis', fortified wines, and whisky.

The relationship between the type of alcohol consumed, and the precise location of cancer, was studied using a case-control approach, controlling for the total amount of alcohol consumed. Among mouth cancer cases, a higher proportion of wine consumers was observed. For the 'larynx supraglottis' location, more drinkers of aniseed spirit were found than expected. Among glottic cancer cases, more than expected usually drank whisky or fortified wine.

Those results suggest that different alcoholic beverages may not produce the same effect. This could be in accordance with the fact that the discrepancy between France and other countries in the incidence of upper respiratory and digestive tract is greater for some locations (mouth or pharynx) than for others.

INTRODUCTION

APART from tobacco, alcohol is the main risk factor for cancer of the larynx, pharynx and mouth [1–9]. However, the effect of different types of alcoholic beverages has not been completely studied. In most of the studies, the alcoholic beverages were beer and whisky, and the size of the series did not allow for comparison of their effects. Since the exact mechanism of alcohol-related carcinogenesis is unknown, different types of alcoholic beverages might play different roles; for example, drinkers of strong alcoholic beverages could present a higher risk, as is suspected for cancer of the oesophagus [10–12].

We studied the relationship between the type of alcohol consumed, and the precise location of cancer, in 2443 French men with squamous cell carcinoma of the upper respiratory or digestive tract. Each location was compared to all the others, adjusting for the total amount of alcohol consumed.

Seven beverages were studied, including the most popular drinks in France, which are wine, beer, and aniseed spirits.

MATERIALS

The study group was selected from a register of 3465 male and female patients treated in the Head and Neck Department of the Institut Curie in Paris between 1975 and 1982. This institute is a hospital specializing in cancer treatment.

From this group, 2443 male patients were selected as indicated in Table 1. Patients with unknown primaries, second primaries, non-squamous carcinomas, and rare locations (including paranasal cavities and nasopharynx) were excluded. Lip cancer cases were also excluded.
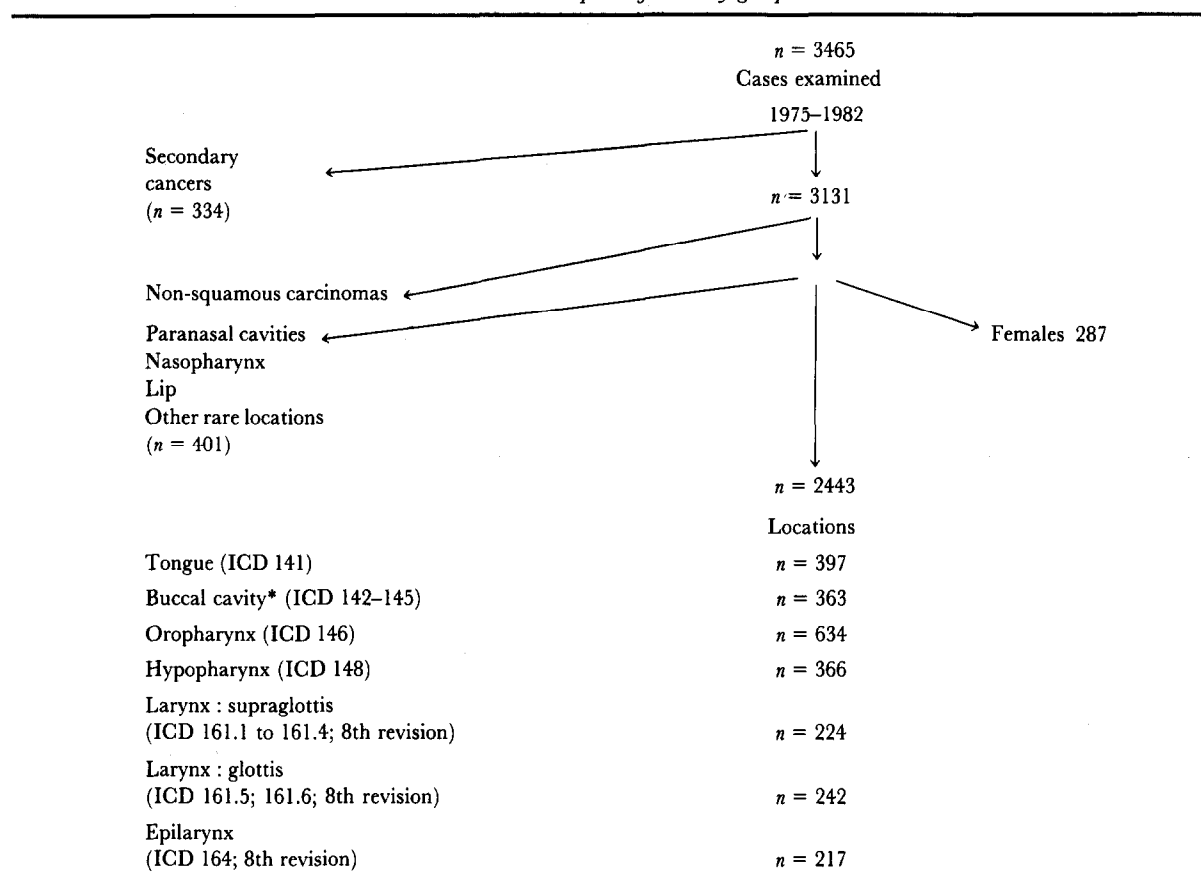
METHOD

Each patient was examined by 1 of the 3 doctors in the Department. During the consultation the following data were systematically recorded: sex; age; location of the cancer according to the International Classification of Diseases, (WHO Code— 8th revision) [13]; histology; precancerous lesions.

Tobacco: smoking habits; age at which patients began smoking; mean daily consumption in grams per day; total life-long consumption.

Alcohol: type of beverages consumed (7 beverages, consumed or not); mean daily total consumption in g of pure alcohol.

Table 1. *Description of the study group*

	$n = 3465$	
	Cases examined	
	1975–1982	
Secondary cancers ($n = 334$)	$n = 3131$	
Non-squamous carcinomas		
Paranasal cavities		Females 287
Nasopharynx		
Lip		
Other rare locations ($n = 401$)		
	$n = 2443$	
	Locations	
Tongue (ICD 141)	$n = 397$	
Buccal cavity* (ICD 142–145)	$n = 363$	
Oropharynx (ICD 146)	$n = 634$	
Hypopharynx (ICD 148)	$n = 366$	
Larynx : supraglottis (ICD 161.1 to 161.4; 8th revision)	$n = 224$	
Larynx : glottis (ICD 161.5; 161.6; 8th revision)	$n = 242$	
Epilarynx (ICD 164; 8th revision)	$n = 217$	

*Including one case of salivary gland (ICD 142).

Weight: usual weight; weight on the day of first presentation.

Occupational data: occupational history; socio-professional group; past occupational exposures.

The unit of alcohol used in this study was the daily consumption in g of pure alcohol. This quantity was based on the declaration of the patient, given in volume of beverage. The individual intake was expressed in g pure alcohol, calculated using classical reference values [10]; for example, 1 l. of wine = 80 g of pure alcohol. There was no information on prior drinking habits.

The 7 alcoholic beverages studied were wine, beer, cider, aniseed spirit or 'pastis', fortified wines, whisky, and 'other spirits' (rum, cognac, apple brandy, etc). Aniseed spirit, whisky, and most of 'other spirits' are strong alcoholic distilled beverages. Fortified wines are only a little stronger than wine; cider and beer can be considered as light alcoholic beverages.

Seven cancer sites were compared. In the first part of the analysis, global comparisons were performed with analysis of variance or chi-square tests. In the last part, concerning the type of alcoholic beverage, a case-control type of analysis was used. For one particular site, cases having this site of cancer were compared to all other patients, taken as a control group.

For each specific cancer site, the number of drinkers of each beverage was compared to an expected number, using a Mantel-Haenszel test [14] The comparison was restricted to patients drinking at least 1 alcoholic beverage.

The results cannot be interpreted as in a classical case control study: all cancer sites are strongly related to alcohol and tobacco consumption. If a negative association happens in this series, such as a deficit of drinkers of 1 beverage for 1 site, it does not mean that this beverage has a protective effect; it suggests that it does not produce the same effect for this site as for the other ones.

We considered that it was important to control for the total alcohol consumption, because it was related both to cancer location [15], and to the consumption of some of the beverages.

Cancer sites were compared according to age, socio-economic status, and tobacco consumption (Table 2).

There was a significant difference in the mean age, and in the percentage of blue collar workers, according to cancer site. The mean daily tobacco consumption did not differ.

Table 2. Age, tobacco and socio-economic status by location

	Age	Tobacco	Socio-economic status
	Mean and confidence limits of the mean (95%)	Daily consumption (g) mean and confidence limits of the mean	Percentage of blue collar workers
Tongue	55.5 ± 1.0	26.3 ± 1.30	57
Buccal cavity	55.4 ± 1.4	26.5 ± 1.35	63
Oropharynx	56.4 ± 0.8	27.2 ± 1.10	67
Hypopharynx	57.0 ± 0.9	28.2 ± 1.35	68
Larynx supraglottis	57.8 ± 1.3	28.2 ± 1.65	64
Larynx glottis	59.5 ± 1.4	25.4 ± 1.81	46
Epilarynx	56.3 ± 1.3	27.9 ± 1.78	70
Comparison between locations	‡	N.S.	‡

NS: not significant.
$*P < 0.05$.
$\dagger P < 0.01$.
$\ddagger P < 0.001$.

As a consequence, we did not control for tobacco in the comparisons between one particular site and the other locations.

Since age and socio-economic status could have a confounding effect, we performed the same tests controlling for 2 factors: alcohol consumption, and age (two classes), and alcohol consumption and socio-economic status (blue collar or not).

We took 3 classes of alcohol consumption, according to the daily intake of pure alcohol: less than 50 g; 50–169 g; 170 g and more.

The choice of those limits was made according to the distribution of alcohol consumption. This distribution had peaks at 40 g, 80 g, 180 g: very few cases were met near the limits we chose.

The first group comprises moderate drinkers (½ l. wine a day, or less); very heavy drinkers form the third group; they drink more than the equivalent of 2 l. wine a day; drinking so much alcohol is not unusual among those patients, but is rare among the French male population [16, 17].

For age, we used the mean age in the group (57 years) as a limit between the 2 classes.

For socio-economic status, a patient was considered as a blue collar worker if one of his past occupations was a manual occupation.

RESULTS

Total daily intake of alcohol and type of alcoholic beverage

Wine was consumed by almost all the patients (92%), aniseed spirit and beer were also widely consumed (41% and 34% of consumers). Fewer patients were consumers of fortified wine, whisky, cider or other spirits.

Most patients were heavy drinkers, and consumed several alcoholic beverages. The most frequent associations were: wine + aniseed spirit

($n = 391$); wine + aniseed spirit + beer ($n = 319$); wine + beer ($n = 240$).

The comparisons between sites according to alcohol consumption are given in Table 3. The number of daily consumers of each beverage is also given.

Cancer sites significantly differed according to the percentage of abstainers, and the average alcohol consumption of drinkers. The locations for which the percentage of non-drinkers was highest were also those for which the alcohol consumption was the lowest. This was especially noticeable for the glottis.

The percentage of drinkers of some of the beverages (beer, aniseed liquor, whisky) also differed between sites. The percentage of drinkers of beer, among those who drink at least 1 beverage, was the highest among epilarynx patients (43%) and the lowest among glottic patients (26%). The same pattern was observed for aniseed spirit (47% for epilarynx, 26% for glottis). The highest percentage (11%) of drinkers of whisky was found among glottic patients. A part of these differences could be due to the effect of the total alcohol consumption, and to socio-economic differences between patients of different locations.

For all alcohol consumption variables in Table 3, the subsite which differed the most was the glottic larynx.

Type of alcoholic beverage

Each cancer site was compared to all other sites, concerning the number of patients who daily drink each alcoholic beverage, associated or not with one or several other alcoholic beverages.

The observed number was compared to an expected number, using a Mantel–Haenszel test, and controlling for total alcohol consumption, plus

Table 3. *Alcohol consumption by location*

| | Non-drinkers | Drinkers | Daily consumption (g) of pure alcohol, mean and confidence limits of the mean (95%) | Number of daily consumers | | | | | | |
	n	n		Wine	Beer	Cider	Aniseed liquor	Fortified wine	Whisky	Other
Tongue	14	383	179 ± 10.9	377	127	14	177	32	21	56
Buccal cavity	9	354	169 ± 9.4	338	121	11	139	43	16	38
Oropharynx	15	619	175.8 ± 8	592	234	20	271	51	30	72
Hypopharynx	7	359	179.7 ± 8.8	341	138	7	160	36	12	53
Larynx supraglottis	11	213	157.2 ± 13.9	204	77	6	97	23	16	19
Larynx glottis	31	211	121.9 ± 11.5	197	55	3	55	29	24	22
Epilarynx	6	211	187.9 ± 12.2	203	90	5	99	23	11	24
Comparison between locations	‡		‡	N.S.	†	N.S.	‡	N.S.	*	N.S.

N.S. Not significant.
*$P < 0.05$.
†$P < 0.01$.
‡$P < 0.001$.

Table 4. *Observed and expected number of drinkers (tongue, buccal cavity, oropharynx)*

| | Tongue | | | | Buccal cavity | | | | Oropharynx | | | |
	O	E[1]	E[2]	E[3]	O	E[1]	E[2]	E[3]	O	E[1]	E[2]	E[3]
Wine	377	368†	365*	366*	377	339	337	337	592	594	590	590
Beer	127	140	141	140	121	129	131	126	234	225	225	224
Cider	14	11	11	11	11	10	10	10	20	17	17	17
Aniseed liquor	177	166	166	166	139	153	154	154	271	267	268	267
Fortified wine	32	39	39	40	43	36	36	36	51	63	62	62
Whisky	21	22	22	24	16	20	20	20	30	35	34	32
Other	56	48	48	50	38	44	44	45	72	76	76	75

O = Observed number.
[1]Expected number, controlling for the total amount of alcohol.
[2]Controlling for the amount of alcohol, and age.
[3]Controlling for the amount of alcohol, and socio-economic status.
*$P < 0.05$.
†$P < 0.01$.
‡$P < 0.001$.

age or socio-economic status. Abstainers were excluded from the analysis.

The results are given in Tables 4 and 5.

Tongue

For the tongue, there was a greater proportion of drinkers of wine than expected. Almost all cases of tongue cancer (abstainers excluded) drank wine. Only 6 did not drink wine, vs. 15 expected.

This association remained when controlling for age, or for socio-economic status.

Buccal cavity and oropharynx

For these 2 locations, no special association with 1 beverage was observed.

Hypopharynx

The proportion of drinkers of whisky was smaller than expected. This was also observed when controlling for age. When controlling for socio-economic status, the association became borderline for significance ($P = 0.052$).

Larynx supraglottis

For this location, the proportion of drinkers of aniseed liquor was higher than expected. The association remained when controlling for age or socio-economic status.

Larynx glottis

Patients with glottic cancer were less often than

Table 5. Observed and expected number of drinkers (hypopharynx, larynx)

	Hypopharynx				Larynx supraglottis				Larynx glottis				Epilarynx			
	O	E^1	E^2	E^3	O	E^1	E^2	E^3	O	E^1	E^2	E^3	O	E^1	E^2	E^3
Wine	342	346	346	347	204	203	205	206	197	199	204	202	203	203	205	205
Beer	138	135	135	136	77	72	71	72	55	60	59	60	90	81	80	81
Cider	7	10	10	10	6	6	6	6	3	5	5	6	5	6	6	6
Aniseed liquor	160	162	162	162	97	84*	84*	84*	55	68*	68*	67*	99	97	96	97
Fortified wine	36	38	38	37	23	21	21	21	29	18†	18†	19†	23	22	23	22
Whisky	12	21*	21*	19§	16	11	11	11	24	10‡	10‡	12‡	11	12	12	11
Other	53	46	46	46	19	23	23	22	22	18	18	19	24	28	28	27

O = Observed number.
[1]Expected number, controlling for the total amount of alcohol.
[2]Controlling for the amount of alcohol, and age.
[3]Controlling for the amount of alcohol, and socio-economic status.
*$P < 0.05$.
†$P < 0.01$.
‡$P < 0.001$.
§$P = 0.052$.

expected drinkers of aniseed liquor, and more often drinkers of fortified wine, or whisky. The associations remained when controlling for age, or for socio-economic status.

It is worthwhile noting the differences between the glottis and the supraglottis locations; the effect of aniseed liquor was clearly restricted to the supraglottis, and no significant association was observed between fortified wine or whisky, and the supraglottis.

Epilarynx

For this location, no significant association was observed.

DISCUSSION

Some of the results could have occurred by chance. Among all multiple comparisons between sites, the difference between the glottis and other sites is the most reliable result. The fact that alcohol consumption is lower in glottis cases than in other sites was found in this series, in accordance with results from Wynder [2] and Schwartz [18]. This suggests that the mechanism of alcohol-related carcinogenesis could differ from one site to another. If this was the case, different types of alcoholic beverage also could play different roles.

The results can only partly be compared with results on oesophagus cancer, which showed a special effect of cider and apple brandy [10].

Apple-based alcoholic beverages are consumed in Normandy and Brittany, where they are produced. In the rest of France, these beverages are not widely consumed [19, 20]. In our series, there were few cider drinkers, and they exhibited no special features.

Moreover, as the study was restricted to cases, it is not possible to compare the alcoholic beverages in terms of relative risk for one location or another.

The higher proportion of whisky drinkers among glottic cancer patients could be due to the fact that more popular French drinks, such as wine or aniseed liquor, are more harmful for cancer sites such as mouth or pharynx.

The fact that the proportion of whisky drinkers is smaller than expected, among hypopharynx cases, could also be coherent with the fact that some other beverages (wine, aniseed liquor) have stronger carcinogenic effects on the hypopharynx.

This hypothesis might be supported by the fact that the discrepancy between France and other European countries in the incidence of cancer, is much wider for the mouth or pharynx than for the larynx; the higher incidence is always observed for France, except in laryngeal cancer, where France is comparable with Italy or Spain [21].

A specific carcinogenic effect of whisky on the glottis is less probable, since it should have consequences in countries where whisky is more widely consumed, which is not the case: in countries like England or the United States, the incidence of glottic cancer is not very high.

It would be useful to know more about the effect of table wine, or aniseed liquor, since both of them contain several additional substances as well as ethanol. Nevertheless, any epidemiologic study in France is limited by the fact that, although heavy drinkers are rather numerous, they almost always drink several beverages, including wine.

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