PRACTICE OBSERVED

Practice Research

Problem drinking among drunk drivers

TAYSIDE SAFE DRIVING PROJECT

In 1976 the Blennerhassett committee recommended that individuals at high risk among convicted drivers should be identified.[1] The Department of Transport may soon define high risk offenders as drivers who are convicted of drinking and driving, with concentrations of alcohol over 43·6 mmol/l (200 mg/100 ml) in the blood on two occasions within 10 years. The driver would then be investigated by the medical advisers of the Department of Transport for evidence of dependence on alcohol or drink problems. Information from the general practitioner and objective biochemical indicators might be important in making an assessment of a driver's potential or actual alcohol related problems in addition to those associated with driving.[2]

Although there have been several studies of presenting symptoms of alcoholism in general practice,[3 4] the validity of the information is in doubt.[5] It is apparent that most drunk drivers are men in their teens or their twenties and a proportion are unlikely to have consulted their general practitioner.[6] The problem is further complicated by patients not being registered, by some patients denying an alcohol problem, and perhaps by general practitioners' lack of awareness of problems related to drink.

The enzyme γ-glutamyltranspeptidase is generally accepted as a reasonably sensitive indicator of excessive alcohol consumption[4–7] and has been used in three studies of drivers.[8–10] The activity of the enzyme measured at the time of arrest may be a simple way of identifying many individuals who are at high risk of being alcohol dependent.

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This study compares concentrations of alcohol in the blood and γ-glutamyltranspeptidase activity with information from a questionnaire sent to the driver's general practitioner.

Subjects and methods

Motorists who were arrested for drinking and driving in Tayside Region were invited to participate in the study: 96% of 521 drivers agreed to participate. Of the 521 drivers studied, 499 were men and 22 women. Their mean age was 32·5 years, range 17 to 70.

At the time of arrest 5 ml of blood was taken and divided into three samples; one was given to the driver, the second was analysed for blood alcohol concentration by the public analyst, and the third was used to measure the serum activity of γ-glutamyltranspeptidase using a centrifugal fast analyser (37 °C). An examination to detect drugs or diseases known to raise serum γ-glutamyltranspeptidase activity was carried out but none was detected.

A two page structured questionnaire, based on that devised by Wilkins[3] was sent to the general practitioner of drivers who lived within Tayside. Ten per cent of the drivers were not registered with a general practitioner. Questions were asked about diagnosis and whether there were social difficulties attributable to alcohol, medical and psychiatric disorders associated with alcohol, or classic symptoms of alcoholic disorder, and how patients were managed. General practitioners did not know whether the questionnaire related to someone who had been prosecuted for a driving offence, to someone who was subsequently judged to be below the legal limit for blood alcohol concentrations (17·6 mmol/l; 80 mg/100 ml), or to a subject concerned in additional studies.

Returned questionnaires were given an alcohol rating score from 1 to 3. 1 = Alcohol problems stated to be present by general practitioner. 2 = Two or more covert indicators of problem drinking in the medical record—for example, excessive short term national insurance certification, frequent attendance at casualty departments, dyspepsia, marital problems, etc. 3 = "Clean" medical record—fewer than two covert indicators or illness/injury unassociated with alcohol.

A subgroup of 128 subjects, chosen for geographic proximity, gave a second blood sample five to nine months after arrest and γ-glutamyltranspeptidase activity was measured again. This subgroup represented 38% of those drivers residing in the district and available to take part

TABLE II—*Sensitivity and specificity of blood alcohol concentrations and γ-glutamyltranspeptidase activity in detected problem drinkers*

	Percentage with overt problems (alcohol rating 1)		Percentage with overt and covert problems (alcohol ratings 1 and 2)	
	Blood alcohol concentrations	γ-glutamyl-transpeptidase activity	Blood alcohol concentrations	γ-glutamyl-transpeptidase activity
Problem drinkers who were correctly predicted by an abnormal result	13	41	17	28
Non-problem drinkers who were correctly predicted by a normal result	87	84	81	86
Problem drinkers who had an abnormal result	18	27	34	55
Non-problem drinkers who had a normal result	82	91	63	67

Discussion

Serum γ-glutamyltranspeptidase activity is generally considered to be a reasonably sensitive indicator of problem drinking. Thus our results indicate that most "high risk" offenders have blood alcohol concentrations in the range 17·6–43·2 mmol/l (80–199 mg/100 ml); however, problem drinkers may also be found among drivers with alcohol concentrations below the legal limit.

Scientific evidence given to the Department of Transport suggested a blood alcohol concentration of 33 mmol/l (150 mg/100 ml) as the criterion of "high risk" individuals, but for logistic reasons the department recommended 43·6 mmol/l (200 mg/100 ml) found on two occasions in 10 years. From our results it seems that any attempt to identify high risk individuals based on blood alcohol concentrations would be an arbitrary choice, likely to miss a large proportion of "high risk" offenders.

Serum γ-glutamyltranspeptidase activity has an additional advantage over blood alcohol concentrations. When measured more than five months after arrest it indicates whether or not the driver is controlling his drinking. Although it seems that conviction results in a restoration of normal enzyme activity, this occurs in a very few drivers—in less than 10% of our subjects. It is far commoner to find continuing abnormal activity or increasing abnormality, indicating that conviction has not moderated the driver's alcohol consumption. When there is sustained abnormal or rising enzyme activity, but no other known causes of disturbed liver function it seems unwise to restore a driver's licence.

A quarter of convicted drivers in this study had raised serum γ-glutamyltranspeptidase activity. Given the reported sensitivity, specificity, and predictive value of the test,[11] a third of drivers in the study may well be problem drinkers. In the only other comparable study of drunk drivers, conducted in Finland, 15% had increased enzyme activity.[9] In a study of 54 drivers with clean driving licences only 16% had increased enzyme activity.[12] Community studies in the United Kingdom have shown prevalences of 14·9% and 16% of increased enzyme activity, but differences in age and sex make a comparison with our study difficult.[4 13]

It is generally acknowledged that drunk drivers are a major threat to the public health.[14] Our results, if representative of drivers outside Tayside, indicate that the time has come when the Road Traffic Act should include procedures to detect and rehabilitate "high risk" offenders, preferably before they reach the Department of Transport's proposed criterion. Many high risk individuals may be readily detected by measuring γ-glutamyltranspeptidase activity, by psychological tests,[14 15] and by examining criminal records.[16] A high proportion of drivers identified as problem drinkers by biochemical markers are also known to their general practitioners. In a different social context[16] it has been suggested that general practitioners overlook social and psychological problems related to alcohol abuse and recognise only a narrow band of medical problems.[6] In this study the contrary was noted: a multifactorial perspective largely accounted for discrepancies between biochemical results and information from general practitioners. General practitioners' records may therefore be particularly useful in assessing problems arising from social, occupational, and psychological causes that are not detectable by biochemical tests.

Nearly half the drivers studied were aged under 30, and 86% under 45. The youthfulness of these offenders is cause for concern. On the other hand, they may be more responsive to preventive measures, including low cost alcohol re-education programmes, such as exist in some parts of the United Kingdom and the United States. Early results are encouraging.[17]

With regard to assessment and treatment programmes, comments by general practitioners concerning the important question of confidentiality require consideration. Within the closed structure of our study assurances were given that information would remain totally confidential, but it is possible that some general practitioners did not return the questionnaire on problem patients. Since there is no independent authority for data protection it seems unlikely that general practitioners would be prepared to disclose such information to a government department. Perhaps assessment of potential problem drinkers, if required by legislation, should be conducted by police surgeons, who would be bound by professional ethics.

Conclusions

Serum γ-glutamyltranspeptidase activity was measured in 521 drivers at the time of arrest for driving under the influence of alcohol. Samples were also obtained five to nine months later from 128 drivers. Information about previous medical history was sought from general practitioners by means of a questionnaire for 174 drivers.

A quarter of the drivers who were subsequently convicted had abnormal γ-glutamyltranspeptidase activity at the time of arrest. Although there was a significant correlation between the activity of the enzyme and the concentration of alcohol in the blood, γ-glutamyltranspeptidase activity indicates that the blood alcohol concentration is a poor guide to alcohol related problems among drunk drivers (other than those associated with driving under the influence) and that a third of convicted drunk drivers may be problem drinkers. Serial estimations of enzyme activity indicated the dynamics of the problem.

General practitioners reported that 13% of the drivers had an alcohol problem, and a further 24% of drivers had covert indicators of problem drinking in their medical records. The predictive value, sensitivity, and specificity of blood alcohol concentration and γ-glutamyltranspeptidase activity were given and the inadequacies of criterion measures of alcohol related problems in drunk drivers discussed.

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References

1 Departmental Committee, Department of the Environment. *Drinking and driving*. London: HMSO, 1976.
2 Committee Stage of Transport Bill. *Hansard* 26 March, 1981.
3 Wilkins R. *The hidden alcoholic in general practice*. London: Paul Eleck Scientific Books, 1974.
4 Buchan IC, Buckley EG, Deacon GLA, *et al*. Problem drinkers and their problems. *J R Coll Gen Pract* 1981;**31**:151-3.
5 Hore BD. Alcoholism in the UK—current problems and solutions. *British Journal of Alcoholism* 1982;**17**:98-101.
6 Whitehead TP, Clark CA, Whitfield AGW. Biochemical and haematological markers of alcohol intake. *Lancet* 1978;**i**:978-81.
7 Rosalki SP, Rau D. Serum gamma glutamyltranspeptidase activity in alcoholism. *Clin Chim Acta* 1972;**39**:41-7.

in the second phase of the study. There were no statistically significant differences between the subgroup and the overall population of drunk drivers.

Results

Of all the drivers arrested, and cooperating in the first phase of the study, 24% had raised γ-glutamyltranspeptidase activity (fig 1).

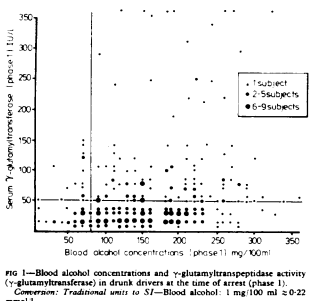

FIG 1—Blood alcohol concentrations and γ-glutamyltranspeptidase activity (γ-glutamyltransferase) in drunk drivers at the time of arrest (phase 1). *Conversion: Traditional units to SI*—Blood alcohol: 1 mg/100 ml ≈ 0·22 mmol/l.

Drivers with abnormal enzyme activity had blood alcohol concentrations throughout the entire range, including concentrations that were under the legal limit for driving. The correlation between blood alcohol concentrations and enzyme activity at the time of arrest was highly significant, although the degree of association was only moderate ($r = 0{\cdot}22$, $p < 0{\cdot}0001$).

A comparison of serum γ-glutamyltranspeptidase activity at the time of arrest with that five to nine months later, in those who cooperated in the follow up study, showed a significant association ($r = 0{\cdot}88$, $p < 0{\cdot}0001$) (fig 2). In three subjects enzyme activity was high at arrest but was in the reference range five to nine months later. In five subjects enzyme activity was in the reference range at the time of arrest but was raised five to nine months later. In 23 subjects (18%) serum enzyme activity was high at the time of arrest and continued to be high at follow up.

Of the subjects recalled for follow up with blood alcohol concentrations over 17·6 mmol/l (80 mg/100 ml), 25 (22%) had raised γ-glutamyltranspeptidase activity at the time of arrest, and of those, 88% were unchanged at follow up (fig 3). Thirteen (45%) of the recalled subjects with blood alcohol concentrations over 43·6 mmol/l (200 mg/100 ml)—the suggested index of problem drinking—had raised enzyme activity at the time of arrest, and 10 of these had raised activity at follow up.

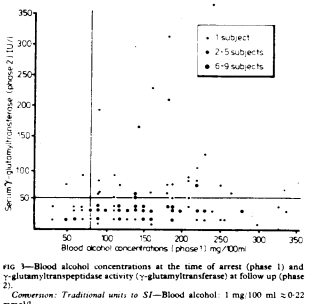

FIG 3—Blood alcohol concentrations at the time of arrest (phase 1) and γ-glutamyltranspeptidase activity (γ-glutamyltransferase) at follow up (phase 2). *Conversion: Traditional units to SI*—Blood alcohol: 1 mg/100 ml ≈ 0·22 mmol/l.

General practitioners completed and returned 93% of the questionnaires distributed, providing information on 174 drivers. Twenty two drivers (13%) had an alcohol rating of 1—that is, general practitioners were aware of the patient's alcohol problem. A further 42 drivers (24%) had two or more covert indicators of problem drinking in their medical records. There was a significant relation between alcohol rating and γ-glutamyltranspeptidase activity but not between blood alcohol concentrations and alcohol rating (table I). Table II gives information on the sensitivity and specificity of γ-glutamyltranspeptidase activity and blood alcohol concentrations using alcohol rating as the criterion.

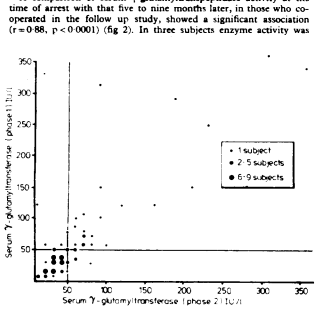

FIG 2—Serum activity of γ-glutamyltranspeptidase (γ-glutamyltransferase) in drunk drivers at the time of arrest (phase 1) and at follow up (phase 2)

TABLE I—*Number of drivers with an alcohol problem rating of 1, 2, or 3 against blood concentrations of alcohol and against γ-glutamyltranspeptidase activity at time of arrest*

	Alcohol problem rating			
	1	2	3	Total
	No (%)	No (%)	No (%)	No (%)
Blood alcohol concentrations (mg/100 ml)*				
50	4 (18)	10 (24)	26 (24)	40 (23)
51–150	7 (32)	16 (38)	41 (37)	64 (37)
151–200	7 (32)	9 (21)	22 (20)	38 (22)
>200	4 (18)	7 (17)	21 (19)	32 (18)
Total	22 (13)	42 (24)	110 (63)	174 (100)
γ-glutamyltranspeptidase activity (IU/l)*				
>50	13 (59)	33 (79)	95 (86)	141 (81)
≤50	9 (41)	9 (21)	15 (14)	33 (19)
Total	22 (13)	42 (24)	110 (63)	174 (100)

*$\chi^2 = 1{\cdot}70$, df = 6, p = 0·9.
†$\chi^2 = 9{\cdot}09$, df = 2, p = 0·025.
Conversion: Traditional units to SI—Blood alcohol: 1 mg/100 ml ≈ 0·22 mmol/l.

8 Christenson H, Trell E, Fex G, *et al*. Serum gamma glutamyltransferase, statistical analysis in a middle-aged male population and evaluation of alcohol habits in individuals with elevated levels. *Preventive Medicine* 1980;**9**:108-19.
9 Pikkarainen J, Pentilla A. Screening of arrested drunk drivers for alcoholism. In: *Proceedings of 8th International Conference on Alcohol, Drugs and Traffic Safety*. Stockholm: Almqvist and Wiksell, 1980.
10 Geisselbrecht W, Kruger D, Vinkel M. The use of gamma glutamyltransferase in identifying motorists with alcohol problems in driving licensing tests. *Blut Alkohol* 1978;**15**:370-5.
11 Dunbar JA, Hagart J, Martin B, *et al*. Drivers, binge drinking, and gamma glutamyltranspeptidase. *Br Med J* 1982;**285**:1083.
12 Department of Transport. *Consultative document on drinking and driving*. London: HMSO, 1979.
13 Baxter S, Fink W, Leader AR, *et al*. Laboratory tests for excessive alcohol consumption evaluated in general practice. *British Journal on Alcohol and Alcoholism* 1982;**15**:164-9.
14 Saunders WM, Kershaw PW. Screening tests for alcoholism—findings from a community study. *British Journal of Addiction* 1980;**75**:37-41.
15 Hagart J, Dunbar JA, Devgun MS, *et al*. The detection of problem drinkers in a population of drivers suspected of driving offences. *Bulletin of the British Psychological Society* 1983;**36**:A7.
16 Perrine MW. The Vermont driver profile: a psychometric approach to early identification of high risk drinking drivers. In: *Proceedings of 7th International Conference on Alcohol, Drugs and Traffic Safety*, Canberra, 1979.
17 Selzer ML. Alcoholics and social drinkers: characteristics and differentiation. In: *Proceedings of the 6th International Conference on Alcohol, Drugs and Traffic Safety*, Toronto, 1976.
18 Selzer ML. The Michigan alcohol screening test: the quest for a new diagnostic instrument. *Am J Psychiatry* 1971;**127**:1653-8.
19 van Oijen D. The problem drinker—who is he? In: *Proceedings of 8th International Conference on Alcohol, Drugs and Traffic Safety*. Stockholm: Almqvist and Wiksell, 1980.
20 Clayton AB, McCarthy PE, Breen JM. *The male drinking driver: characteristics of the offender and his offence*. Supplementary Report 600. Transport Road Research Laboratory, 1980.
21 Davis P. The pattern of problems. In: Plant M, ed. *Drinking problems and drinking*. London: Junction Books, 1982.
22 Robertson IH, Heather N. An alcohol education course for young offenders. *British Journal on Alcohol and Alcoholism* 1982;**17**:32-8.

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Diary of Urban Marks: 1880-1949

During the latter fortnight of the month in casualty, Dicky Bird came to me and asked if I would like to go to Swansea as a locum for Leonard Isaac who, at the moment, was house surgeon there. It appeared that Isaac was going into practice in Swansea and required a locum to fill the gap. He intimated that he would do his best to get the locum the post of house surgeon. I did not accept the offer of the locum tenent but wrote to Isaac, whom I knew well since he was in hospital with me but 12 months my senior. As a result of this letter and the reply thereto, I applied for the post of house surgeon and was invited to appear before the board of management. I borrowed the necessary fare from Dicky Bird and left London overnight arriving in Swansea at 7 30 am. Never shall I forget my first impressions of Swansea. It was a cold bleak December morning and dawn was beginning to break as we reached Landore. All the works in that district were in full swing. The smoke and glare of the furnaces made the place look like Hell itself. But beggars cannot be choosers and although I had half made up my mind that I could never live in such an atmosphere I proceeded. I had donned a frock coat which was not in the best of condition, considering that I had had it since my mother's death. It was inclined to be on the green side. My top hat was not new by any means, being as old as the frock coat. An umbrella and kid gloves completed my outfit. As I came out of the station so equipped I must have looked like Guy Fawkes to the casual passer by. I had to meet the hospital people at midday and I could not walk about in such a rig, obviously. I ought to have gone to see Isaac but the idea did not strike me at the time. Instead, I walked down High Street and seeing the Royal Hotel I walked in and engaged a room. I divested myself of my clothing and had breakfast sent into me. After a rest and a bath, I once more disguised myself and set out for the hospital. On arrival, the secretary Mr Hughes informed me that I was one of three on the shortlist but the other two had wired to say that they could not come. Consequently I was the only candidate and my frock coat and top hat so paralysed the committee that they unanimously elected me to the vacant post. I commenced my duties on 1 January 1906.

The post was that of junior house surgeon. I had to do all the casualty work, give anaesthetics when required (which was often since Dr Edwards, the honorary anaesthetist, came but rarely), prepare the men for operation, and only go into the wards when the senior house surgeon allowed me there. My salary was £50 per annum but I had board and lodging and laundry free and was allowed two bottles of beer daily. The senior man was called Groves. At the time of my arrival he was very pious. He went to religious meetings almost daily and although he knew I could not go with him unless Miss Price, our house physician, elected to stay on duty, he constantly pestered me to meet his pastor. I never did so and Groves pursued his religious activities up to a point. I have to add that he was a staunch teetotaller and suffered from ozoena, a disease of the nose which causes fetid pus to issue therefrom. I always kept a good distance from him but how he fared with his spiritual adviser I never knew. No doubt he became "manured" to the condition.

I soon came to know people through invitations being sent to the hospital residents to dances and public functions. I was only allowed off duty by the grace of Groves, but even he recognised that he could not keep me in for ever. At one of these dances I became very friendly with Amy Parker, who was a delightful dancer. I took her home one night and was invited in. I met her parents and her brother Fred. Thus began a very intimate association with the Parkers which lasted until the Great War. I will have more to say about the Parkers later.

Fred and I became very friendly. He was of my own age and mostly of my temperament. One night we persuaded Groves to come out with us. We went into the town and called in several hotels. We told Groves that cherry brandy was teetotal and he believed us. By the time we arrived back he had had at least six. In our common room there was an incandescent light on a long glass funnel protecting it. The glass had cracked and the top part was askew to the lower. Groves was sitting opposite to this light and suddenly remarked on the aspect of the glass. We told him that the glass was perfectly correct and that he must be drunk. He argued about this but eventually became convinced that he was not sober and went to bed. Fred and I laughed loud and long. After this fall from grace, Groves changed altogether. He took up dancing and went out every day to play golf. He had a little cupboard made and kept whisky in it. He lost all his religious interest and never went to chapel again.

ON THE USE OF WHISKERS IN FELINE AND OTHER ANIMALS By S D Broughton MRCS "It may not, perhaps, be generally known that, as far as they have been traced, the whiskers which form the upper lip in tygers, panthers, leopards, cats, seals, &c. are very copiously supplied with nerves; and altogether in a manner which precludes the possibility of our considering them as merely ornamental appendages. So large and particular a distribution of an exquisitely sensible nerve, it is reasonable to suppose, must be for the purpose of some sensible function. To ascertain this, I put it to the test of experiment, in the following manner: I placed walls of books upon the floor, so as to resemble the streets of a town opening into each other; and, having closed the eyes of a kitten completely, I set it down to find its way through the lanes of books. It continued to move on wherever a free communication presented itself, holding its head cautiously down close to the floor, and very adroitly avoiding contact with the sides of the walls, the corners of which it also turned without approaching closer than just sufficient to touch the tips of the whiskers slightly, when it always drew back instantaneously. At length it found its way out freely; and I then cut off the whole of the whiskers close to the face, and again set it down, to observe whether this would produce any alteration in its manner. The kitten now showed evident signs of having lost its only remaining means of guiding itself. It struck its head repeatedly against all the corners, and tumbled over steps placed in its way, instead of avoiding all these as before the removal of the whiskers. Not the slightest sensation of pain appeared to attend the cutting of the bristles; and I should therefore suppose that their substance is insensible, and that it carries on the impression it receives by vibration, their sensation being propagated through the nerves inserted in the bulbs of the bristles." Art: VIII. *London Medical and Physical Journal* 1823;**49**:397.