MALE ALCOHOLISM — BIOCHEMICAL DIAGNOSIS
AND EFFECT OF ABSTINENCE

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SUMMARY

Eighty three patients with alcoholism were evaluated on several biochemical parameters against seventy-five healthy controls. Linear discriminant analysis of three laboratory tests (GGT, GOT and GPT) yielded accurate diagnosis among 63% of the total sample. Sensitivity of these tests was 47% and specificity 80%. Repeat analysis of these three tests among 50 alcoholics following thirty days of abstinence showed significant decline of values. Preliminary observations suggest improvement of liver function following cessation of drinking habit.

It has been fairly well established that biochemical and haematological values are abnormal among alcohol dependent individuals. Transaminases glutamic oxaloacetic (GOT) & glutamic pyruvic (GPT); gamma-glutamyl transpeptidase (GGT) and mean corpuscular volume (MCV) have been found raised often (Kontinen, Hartel & Loughia, 1970, Whitehead, Clarke and Whitefield, 1978, Ryback et al 1982). Various laboratory tests have also been looked into to arrive at a biochemical diagnosis of alcoholism (Whitehead et al 1978). Rosalki & Rau (1972) reported that GGT was elevated among 75% of alcoholics, 31% and 19% of alcoholics and elevated among GOT and GPT respectively. Eckardt et al (1981) and Chan, Welte & Whitney (1987) reported that multivariate analysis have improved the diagnosis and 89%-98% of people with alcoholism and 92%-95% of non-alcoholics were correctly diagnosed. Further, it has also been found that abstinence from alcohol result in improvement of health status including reversal of biochemical and haematological values. In the event of consistent findings on reversal of biochemical values following cessation of drinking, these tests could be used to monitor patients' progress and post-treatment alcohol consumption. We present here our attempt at biochemical diagnosis of alcoholism and changes in biochemical parameters following short term abstinence.

Material and Methods

All the patients with alcoholism included in this study satisfied RDC (Spitzer

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et al 1978) criteria and were inpatients in the hospital for 4-6 weeks. They were included with informed consent. During this period they underwent detoxification. Withdrawal symptoms were managed by tab. diazepam 20-40 mg p.o. per day along with Inj. thiamine 100 mg i.m. for 10 days and oral vitamin supplements. Blood for biochemical tests were collected in an overnight fasting condition within 24-48 hours of admission (N = 83). The second sample (N = 50) was collected after one month of hospital stay while they were strictly abstinent. Blood was also drawn from physically healthy psychiatric patients (non user of alcohol) undergoing treatment in the unit (N = 52) and from 23 normal healthy volunteers. Exclusion criteria for the control population (N = 75) were:
a) recent h/o myocardial infarction;
b) clinical evidence of jaundice, hepatomegaly and portal hypertension;
c) dehydration and obvious malnourishment;
d) recent use of phenothiazines, antidiabetic, anti-tubercular, antibiotic and antiepileptic drugs for more than two weeks.

The experimental group was not dependent on any other intoxicants or using drugs as applicable to the control population (exclusion criteria-d). Serum specimens were analysed for the following tests: GOT, GPT, alkaline phosphatase, and bilirubin (Wooten, 1964), GGT (Persijn & Van Der Slik, 1976), total protein (Doumas et al 1981), albumin (Sonnerwirth and Jarett, 1980), electrolytes by flame photometry, phosphorus (Varley, 1969), and Calcium (Gindler and King, 1972). In addition blood sugar and cholesterol (Varley, 1969) were also estimated.

**Results**

Mean age of patients with alcoholism was 40 ± 8.1 years as against 31.1 ± 12.6 years of the controls. Average consumption of alcohol per day over the last month (O.F. index) was 183.1 ± 100.8G of ethanol. The patients were in the study after 9.7 ± 7.9 years of heavy drinking. Biochemical analysis revealed that mean values of GGT, GOT and GPT were significantly higher among the alcoholics as against the controls. Values of total cholesterol though significantly elevated among the alcoholics were within laboratory normal range. Other values (Total protein, albumin, bilirubin, alkaline phosphatase, sugar, sodium, potassium, calcium and phosphorus) were not different in the two groups and were within normal range.

As GOT, GPT and GGT were elevated among the alcoholics, biochemical diagnosis was attempted through these three tests. GGT was elevated (above lab. normal range) among 47% of alcoholics and 3% of controls, GOT was elevated among 60% of alcoholics and 40% of controls and GPT was high among 35% of alcoholics and 16% of controls. In other words, these tests independently (based on their raw values) were better in identifying controls rather than the patients. Discriminate

| Table 1 | Discriminant Analysis as per 3 Lab. Values |
|---------|-----------------------------------------|
|         | GGT, GOT & GPT                          |
|         | Correct  | Wrong | Total |
| Alcoholics | 39 (47%) | 44  | 83   |
| Controls  | 60 (80%) | 15  | 75   |
* Mean D Score–Alcoholics : 4.05
* Mean D Score–Controls : 2.26
  Average : 3.16
* Mahalanobis D^2 = 1.79, P = 24.12 P< .001 3,154
Sensitivity (True cases) = 47%
Specificity (True Noncases) = 80%
+Ve Predictive value = 63%
### Table 2
Laboratory values of male alcoholics at intake and 30 days of abstinence (N=50)

|                         | Normal lab values | 1st sample (admission) Mean & SD | 2nd sample (after 30 days of abstinence) | Significance (t) |
|-------------------------|-------------------|----------------------------------|------------------------------------------|------------------|
| Total Protein (g/dl)    | 6.8 - 7.8         | 6.8 ± 0.7                        | 6.9 ± 0.5                                | NS               |
| Albumin (g/dl)          | 3.8 - 5           | 4.1 ± 0.5                        | 4.0 ± 0.5                                | NS               |
| * Bilirubin (mg/dl)     | 0.2 - 1           | 0.8 ± 0.4                        | 0.7 ± 0.2                                | P < .05          |
| Alkaline Phosphatase    | 3 - 13            | 11 ± 5                           | 11.1 ± 4.3                               | NS               |
| * GOT (IU/L)            | 3 - 19            | 29.5 ± 18.6                      | 17.7 ± 9.4                               | P < .001         |
| * GPT (IU/L)            | 3 - 17            | 20.3 ± 18.8                      | 12.2 ± 9.4                               | P < .01          |
| * GGT (U/L)             | 8 - 37            | 73.4 ± 87.1                      | 28.2 ± 24.7                              | P < .001         |
| Total Cholesterol (mg/dl)| 120 - 230        | 186 ± 32.4                       | 185.2 ± 28.9                             | NS               |
| Blood Sugar (mg/dl)     | 60 - 100          | 83 ± 45.2                        | 87 ± 68.4                                | NS               |
| * Sodium (MEq/l)        | 137 - 148         | 136.9 ± 4.2                      | 135 ± 4.5                                | P < .05          |
| Potassium (MEq/l)       | 3.0 - 5           | 4.5 ± 0.8                        | 4.5 ± 0.9                                | NS               |
| * Phosphorus (mg/dl)    | 2 - 4             | 3.2 ± 0.8                        | 3.8 ± 0.9                                | P < .01          |
| Calcium (mg/dl)         | 9 - 11            | 9.1 ± 1.4                        | 9.2 ± 1.2                                | NS               |

* Significantly different.

Paired 't' test was applied.

Analysis of these values from the two groups yielded the following scores: GGT.012, GOT.033 and GPT.011. Mean D scores for the two groups and the average score are shown in Table 1. Using the midpoint (D score), 47% of patients and 80% of controls were correctly classified. Positive predictive value was 63% and 37% were misclassified.

Values of biochemical tests after one month's abstinence showed that (Table 2), GOT, GPT, and GGT which were elevated at admission showed significant decline. Serum bilirubin and sodium declined significantly and phosphorus raised (2nd sample). The above values were however within normal range on both the occasion. Other tests did not show any change.

### Discussion

It was seen that our effort to arrive at a biochemical diagnosis of alcoholism had limited success. Among the various tests GGT, GOT and GPT were significantly elevated among the alcoholics. A linear discriminate analysis correctly classified 63% of the total population by using midpoint as the cut off score. It appeared that in our sample these tests together were more specific (false +ve 20%) than sensitive (true +ve 47%). Twenty per cent of controls were misclassified. Only 3% of them had elevated GGT, though 35-40% had elevated GOT or GPT. This was possibly because of our selection of control population. It was not possible to recruit large number of healthy volunteers and hence we had to resort to include patients with psychiatric illness. Adequate care was however taken to exclude factors likely to influence L.F.T.

Sensitivity and specificity of GGT among alcoholics were reported to be 72% and 96% respectively. (Cottin et al 1979). In contrast raw values of GGT and MCV enabled correct classification of 36% of alcoholics (Eckardt et al 1981). However quadratic discriminant analysis by the same
authors resulted in correct classification of 100% of non alcoholics, without overt liver disease, and 98% of alcoholics with mild liver disease. Logistic regression analysis of GGT and MCV predicted correct group identify (alcoholics vs non alcoholics) at 77% accuracy (Ryback et al 1982). Our findings are similar to the above finding. It is possible that other kinds of multivariate analysis would have improved our accuracy of diagnosis.

Further, it is seen that values of GGT, GOT and GPT declines significantly following one month of abstinence. Most obvious change is reflected in values of GGT which is more specifically altered in hepatobiliary damage. Decline of these values would thereby suggest improvement of liver function. Reduction in biochemical values (L.F.T.) and MCV following abstinence have been reported earlier (Eckardt et al 1983, 84). Electrolyte imbalance too improves following abstinence (Kaysen & Noth, 1984).

In our experimental group (alcoholics) screen protein and albumin were normal. On a Sub Sample (N=33) mean Hb was 13.5 ± 1.7 gm% and mean weight was 57 ± 9.2 kgs. In other words, malnutrition was not obvious. Hence hospital diet and vitamin supplements would not explain the reversibility. Abstinence from drinking is the likely cause for such a change. It is seen that there is a wide variation of biochemical values (SD on occasions are large). Hence it is too early to suggest that anyone of these tests in isolation, can be used to monitor patients’ progress. In this regard GGT however appear promising.

To conclude, evaluation or multiple bio-chemical parameters and their inter-relationship is more likely to detect alcoholism and recovery following cessation of drinking.

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