South African Medical Journal : Suid-Afrikaanse Tydskrif vir Geneeskunde

EDITORIAL : VAN DIE REDAKSIE

TRANSAMINASE ACTIVITY IN DISEASE STATES

Transamination may be defined as a 'chemical reaction in which an amino group is transferred from one molecule to another without the intermediate participation of ammonia.[1] Braunstein and Kritsman in 1937 laid the foundation for an understanding of the enzymatic mechanisms by which this process takes place, and they postulated the existence of two enzymes: glutamic and aspartic aminopherases. Later Cohen introduced the term transaminase, which is now preferred by European and American workers.

Enzymes catalysing different transamination reactions are widely distributed in animal tissues and in man. In decreasing order of concentration the distribution is: heart, liver, skeletal muscle and kidney.[2] This fact prompted Karmen, Wròblewski and LaDue[3] to determine if transaminase activity could be demonstrated in human serum and, if so, to study variations in activity of this enzyme in the blood of normal and diseased man. It has been shown that necrosis of cells rich in enzyme results in liberation of excess enzyme into the circulation. The two transaminases of present clinical interest are glutamic-oxalacetic and glutamic-pyruvic.

Serum glutamic-oxalacetic transaminase (SGOT) has been measured chromatographically, spectrophotometrically and colorimetrically. The colorimetric method is preferred to the spectrophotometric method since reagents are more easily obtained and the estimation more easily performed. Results obtained by the two methods appear to agree satisfactorily.[4] Colorimetrically, SGOT is expressed as units per ml. of serum. The mean activity of normal adult sera is $16{\cdot}4 \pm 8{\cdot}4$ units with a range of normal of 4-40 units. The mechanism for excretory and/or secretory handling of the enzyme is unknown, but the presence of the enzyme in small amounts in the urine and bile suggests that renal and biliary routes may contribute in this respect.[5]

Raised SGOT levels occur in myocardial infarction. The rise may begin as early as 3 hours after the onset and the enzyme returns to normal in 1-8 days, often by the end of the third day. The optimal time for observing the peak transaminase activity is 24 hours after the onset of pain. The SGOT may rise from 2 to 20 times the normal level, and the height of the enzymatic activity is roughly proportional to the size of the infarct. Failure to find the elevation after myocardial infarction can usually be attributed to failure to get early and serial enzyme determination. Levels above 200 units per ml. carry a bad prognosis.[6-8] No increase in SGOT has been recorded in angina pectoris, coronary insufficiency, heart failure or cardiac arrhythmias. SGOT levels are a valuable indication of infarction: (*a*) where there is an absence of Q waves on ECG, (*b*) where the ECG pattern is obscured by previous infarction, and (*c*) in patients with left bundle-branch block.[9]

High transaminase values have been recorded in acute myocarditis, acute pancreatitis, haemolytic crises, extensive crushing injuries, after surgery, and after administration of large doses of aspirin.[10] On the other hand, levels are normal in pericarditis, pulmonary infarction, rheumatic fever, rheumatoid arthritis and acute cholecystitis.

Both SGOT and serum glutamic-pyruvic transaminase (SGPT) are elevated in the presence of liver disease involving cellular necrosis, SGPT being the more sensitive index. Elevation of serum-enzyme levels occurs 1-4 weeks before other clinical or laboratory evidence of liver injury becomes manifest in patients exposed to infectious hepatitis. Lesser elevations of SGOT and SGPT are found in cirrhosis of the liver, obstructive jaundice and metastatic carcinoma of the liver. SGOT is an index of liver-cell injury and does not necessarily correlate with the usual tests of liver dysfunction.[11] More recently Latner and Smith[12] have used the SGOT/alkaline-phosphatase ratio in an attempt to differentiate hepatocellular jaundice from extrahepatic jaundice.

Transaminase activity in the cerebrospinal fluid has been measured and is about half that of the serum.[13] GOT levels are elevated in patients with acute non-haemorrhagic cerebral vascular accidents (cerebral thrombosis and embolism). The greater the infarcted area of the brain, the higher is the increase in enzymatic activity of the cerebrospinal fluid. Other conditions associated with raised transaminase activity include head injuries, and some cases of cortical degeneration, while intracerebral tumours, multiple sclerosis and epilepsy have normal cerebrospinal-fluid GOT values. While it is still disputed whether there is an effective blood/spinal-fluid barrier to transaminases in man, it seems certain that conditions associated with an elevation of the cerebrospinal-fluid transaminases may, in addition, show increased activity of the enzymes in the serum.[14]

1. Meister, A. (1957): *Biochemistry of the Amino Acids*. New York: Academic Press Inc.
2. Mason, J. H. and Wròblewski, F. (1957): Arch. Intern. Med., **99**, 245.
3. Karmen, A., Wròblewski, F. and LaDue, J. S. (1955): J. Clin. Invest., **34**, 126.
4. Walters, M. N. I. and Littlejohn, P. G. (1958): Med. J. Austral., **1**, 76.
5. Chinsky, M., Shmagranoff, G. L. and Sherry, S. (1956): J. Lab. Clin. Med., **47**, 108.
6. LaDue, J. S., Wròblewski, F. and Karmen, A. (1954): Science, **120**, 497.
7. LaDue, J. S. and Wròblewski, F. (1955): Circulation, **11**, 871.
8. Chinsky, M., Shmagranoff, G. L. and Sherry, S. (1955): Clin. Res. Proc., **3**, 200.
9. Kattus, A. A., Lemenson, C. and Watanabe, R. (1955): Circulation, **12**, 729.
10. Manso, C., Taranta, A. and Nydick, I. (1956): Proc. Soc. Exp. Biol. (N.Y.), **93**, 84.
11. Wròblewski, F. and LaDue, J. S. (1955): Ann. Intern. Med., **43**, 345.
12. Latner, A. L. and Smith, A. J. (1958): Lancet, **2**, 915.
13. Lieberman, J., Daiber, O., Dulkin, S. I., Lobstein, O. E. and Kaplan, M. R. (1957): New Engl. J. Med., **257**, 1201.
14. Fleisher, G. A., Wakim, K. G. and Goldstein, N. P. (1957): Proc. Mayo Clin., **32**, 188.

DIE KLEIN BEROERTETJIE

Die *groot* onvermoë en ongeskiktheid wat so dikwels ontstaan as gevolg van 'n *klein* beroertetjie word al te dikwels nie raakgesien of behoorlik na waarde geskat nie. Dat daar verskil van mening bestaan oor die opvatting van 'n ‚klein beroertetjie', ly geen twyfel nie. En dat interniste en neuroloë dikwels skepties staan teenoor die diagnose van 'n klein beroertetjie, tensy daar duidelike liggaamlike tekens is, is ook duidelik. Tóg voel ons dat die begrip van die

klein beroertetjie, selfs sonder duidelike liggaamlike tekens, in die belang van praktisyns en pasiënte duideliker omskryf en beklemtoon behoort te word. Baie onnodige verdriet en lyding, en ook baie onnodige onkoste, word veroorsaak omdat hierdie saak nie helder gestel word nie.

Beroertes word gewoonlik veroorsaak deur serebrale vaatversteuring. Die algemene voorbeelde van sulke vaatversteurings is trombose, bloedings, en embolie. Ons moet egter altyd in gedagte hou dat 'n beroerte 'n enkele voorval is in die proses van 'n algemene gestelsiekte, aan die grond waarvan ateroom, arteriosklerose, hipertensie, maligniteit en baie ander patologiese prosesse kan lê. Deur hierdie stelling te maak gee ons dus alreeds te kenne dat ons bewus is van verskillende moontlike onderliggende toestande, en veronderstel ons dat 'n volledige ondersoek van die pasiënt uitgevoer moet word.

Die gewone kliniese gronde waarop die diagnose van 'n beroerte gemaak word, is duidelike liggaamlike tekens, byvoorbeeld, verlamming van die onderste gedeelte van die gesig (en versteuring van spraak indien die spraaksentrum aangetas is), verlamming van die hand, been en voet, ens. Die punt wat ons wil maak is dat ons in ons teken-kompleks ook minder direkte tekens moet insluit soos effense versteuring van fynere funksies van die vingers (‚my linkerhand voel dom as ek klavier speel'), effense versteuring van spraak (‚my tong wil nie reg val vir al die klanke nie'), en emosionele versteurings.

'n Duidelike beroerte met duidelike tekens kom dikwels eensklaps aan. So 'n toestand behoort nie moeilikheid wat betref kliniese diagnose op te lewer nie. Dikwels egter is daar 'n geskiedenis van herhaaldelike klein aanvalle van skerp hoofpyn met verbygaande tydperke van verwarring, verlies van selfvertroue, bangheid, onvermoë om so vinnig te reageer soos vroeër, ens.—en hierdie geskiedenis word dikwels die eerste keer ontbloot nadat daar 'n groot aanval gekom het met duideliker tekens. Ons moet in staat wees om hierdie tekens reeds al vroeg te erken en na waarde te bepaal. Ook moet ons in staat wees om tekens van versteuring van geestesfunksie as tekens van beroerte te erken. Dit sal ons in staat stel om baie besorgdheid vir ons pasiënte en vir ons self te bespaar. Ook sal dit ons in staat stel om meer positief te kan optree.

Die vroeë diagnose van vaatversteurings is nie soos in die verlede slegs van akademiese belang nie. Ook op die gebied van terapie het vroeë diagnose belangrik geword. In 'n onlangse inleidingsartikel[1] toon *The Lancet* aan ‚dat die hantering van 'n pasiënt wat beroerte gehad het in die verlede geen probleem opgelewer het nie. Die dokter se keuse het gelê tussen meesterlike onaktiwiteit en knaphandige verwaarlosing. Die toestand van sake is nou anders en moeilik. Met antistollingsmiddels soos fibrinolisien, met hipotensiemiddels, met vergrote kennis van die fisiologie van die hart, met hipotermie, en met 'n aantal suksesvolle chirurgiese behandelings tot ons beskikking, kan die dokter nie meer so seker wees dat dit die beste aanbod is wat hy het om aan sy pasiënte te maak *om niks te doen* nie'. Daarby is die sielkundige behandeling van die geval van die allergrootste belang.

Die dokter moet dus in staat wees om vroeg al te weet wat sy pasiënt makeer, om hom nie onnodig met bekommernis of uitgawe te belas nie, en om te kan oordeel of hy sy pasiënt in vrede moet laat en of aktiewe behandeling onderneem moet word. Die grondslae vir die praktiese benadering van hierdie probleem is reeds 'n geruime tyd gelede al geformuleer deur Alvarez[2] in sy boek *The Neuroses* wat getuig van veel mensekennis en uitmuntende praktiese oordeel. Elke praktisyn behoort hierdie boek te besit.

1. Editorial (1959): Lancet, **1**, 293.
2. Alvarez, W. C. (1951): *The Neuroses*, p. 194. Londen: Saunders.