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RAPID BEDSIDE METHOD FOR DETERMINATION OF BLOOD-GLUCOSE CONCENTRATION

Specific glucose oxidase impregnated paper-stick tests for determination of glucose in urine have been in use for several years (Testape, Eli Lilly and Clinistix, Ames). The Ames company have now modified the same basic method for rough estimation of the concentration of glucose in blood (Dextrostix). This depends upon the conversion of glucose into gluconic acid and hydrogen peroxide under the influence of glucose oxidase. Peroxidase, which is also incorporated in the stick, then frees nascent oxygen from the peroxide which oxidizes the dye (orthotolidine) in the paper, so producing a colour varying from pale grey to bright blue. Red cells in the blood are prevented from entering the paper by a semipermeable membrane and can be washed off.

The procedure consists of matching the colour produced when one drop of blood is added to the stick with the colour-chart provided, corresponding with a range of blood-glucose values of between 40 and 'over 200' mg. per 100 ml. It is usually easiest to use fresh blood (capillary or venous)—fluoride cannot be used. The indicated side of the stick is covered with blood, which is rapidly washed off in a stream of water from a wash-bottle after exactly one minute's contact. The colour is then immediately compared with the chart.

Marks and Dawson have recently published a critique of the Dextrostix method, based on 356 individual determinations which were compared with glucose estimations performed on the autoanalyser. Within the range 40 - 200 mg. per 100 ml. the results obtained with Dextrostix differed by less than 20 mg. per 100 ml. from the true value in 73% of the cases. In the remaining 27% larger errors were present—these tended to occur more often with high than with low blood-glucose levels. The errors were not consistently in one direction ; overestimation of the glucose content by Dextrostix occurred slightly more often than underestimation. The percentage of large errors by different observers was similar. Nevertheless, important differences were noted between different observers—some tended consistently to overestimate, others to underestimate. In the majority of cases there was no difficulty in matching, but more importance was attached to similarity of shade than intensity of the colour. Hesitation increased the chance of error, and hasty decisions were more reliable than 'considered' judgments.

In 50 consecutive cases with blood glucose above 200 mg. per 100 ml. Dextrostix indicated 10 as being below 200 mg. ; however, in none of these was the level actually above 250 mg. Blood-glucose values below 40 mg. per 100 ml. were consistently accurately estimated by Dextrostix. No instance of hypoglycaemia was wrongly diagnosed.

The method was found unsuitable for use with cerebrospinal fluid.

Marks and Dawson conclude: 'There is good agreement with conventional methods of blood-glucose measurement in the physiological and hypoglycaemic range. The technique is useful for recognizing, but not quantitating, blood-glucose concentration in the hyperglycaemic range.'

From our smaller experiences with Dextrostix we would agree with Marks and Dawson. This method can certainly not replace older and more accurate estimations in general use and certainly not if quantitation of high bloood-glucose levels are required (e.g. in the management of diabetic coma), or in the glucose-tolerance test. We can, however, foresee considerable use for Dextrostix in the following circumstances:

1. Diagnosis or confirmation of hypoglycaemia.
2. In infants, because of the small amount of blood required.
3. In diabetics with renal glycosuria, when urine tests are useless, especially during pregnancy.
4. In the opposite condition of high renal threshold, where again urine tests are useless.
5. For watching the blood-sugar level during and after anaesthesia in diabetics, making catheterization even less necessary than it was before.
6. In routine testing in casualty or outpatient departments when glycosuria is found ; a reading of 'over 200' would confirm that diabetes is present, while a lower one might call for a glucose-tolerance test.
7. In population surveys, a reading of under 130 mg. per 100 ml. after a test-meal could be taken to exclude diabetes.

A few additional points should be made. The sticks are at present expensive, but will often prove far less expensive than the employment of a pathologist. Their shelf-life does not appear to be known for certain. Every few weeks it will be necessary to check the activity of a sample stick until more is known of this. Finally, it must be remembered that all glucose oxidase methods of estimation of blood sugar yield values considerably below other methods. The normal fasting range is given as 50 - 90 mg. per 100 ml. (as opposed for example to the Hagedorn-Jensen ferricyanide method, with a range of 80 - 120 mg.).

Marks, V. and Dawson, A. (1965): Brit. Med. J., 1, 293.

HIPOFISE-BYNIER-REAKSIE NA STEROÏEDBEHANDELING

Die moontlikheid van bynierkollaps ontstaan dikwels gedurende langdurige behandeling met kortikosteroïede. Sekere vrae kan gestel word: vir hoe lank en in welke dosis kan sulke middels met veiligheid toegedien word? Behoort ACTH gedurende of teen die einde van 'n behandeling met kortikosteroïede gegee te word? Hoe lank sal

dit duur voordat die onderlinge werking van die hipofise en bynierkliere normaal verloop? Is kortikosteroïede ooit die oorsaak van bynier-traagheid? Kan bynier-traagheid voorkom word deur intermitterende behandeling? Danowski en sy kollegas van Pittsburgh het, soos ander navorsers, gehelp om heelwat lig te werp op sekere van hierdie vrae.[1]

Hulle het ses verskillende groepe pasiënte ondersoek en waargeneem—'n groep van 117 vroue wat klein ('vervangingsverplasing') dosisse van steroïede ontvang het; 'n groep van 3 diabetiese en 42 gesonde volwasse mans wat ononderbroke klein dosisse van hidrokortisoon of deksametasoon vir 36 maande ontvang het; 'n groep van 6 pasiënte wat 4 jaar lank farmakologiese dosisse van steroïede geneem het; 5 volwassenes wat groot dosisse van steroïede vir proteïenurie geneem het; 11 gesonde volwasse mans wat daagliks 300 mg. steroïede vir 30 dae geneem het; en ook 2 volwasse vrouelyers aan Cushing se sindroom wat die gevolg was van adenoom van die bynier.

Uit hierdie ervaring blyk dit dat klein dosisse van bynier-steroïede aanhoudend oor 'n tydperk van jare toegedien kan word sonder kliniese bewyse van hipofise-bynier traagheid. Dus het die daaglikse inname van 20 mg. hidrokortisoon of verwante steroïede in ooreenstemmende dosering (d.w.s. in vervanging of vervangingsverplasing dosisse) oor 'n tydperk van etlike jare in pasiënte met aknee, hirsutisme, ens. geen aanduidings van hipopituitêre werking of hipoadrenokortisisme getoon nie. Op 80 geleenthede het hierdie pasiënte sonder voorval spanningwekkende diagnostiese prosedures, wigreseksies van die ovaria, ens. deurstaan sonder addisionele steroïede, en selfs sonder hul gewone klein dosisse van steroïede.

Metopiroon lei gewoonlik tot 'n verhoogde uitskeiding van 17-hidroksikortikosteroïede in die urine. Hierdie reaksie ontbreek as die wederkerige werking van die hipofise en bynier belemmer is. Danowski het gevind dat die reaksie gebrekkig mag wees vir binne-aarse metopiroon tydens langdurige en ononderbroke toediening van klein hoeveelhede steroïedbehandeling, dog dit was slegs 'n tydelike verskynsel en het nie daarop gedui dat chirurgiese spanning gevaarlik sou wees nie.

Die toediening van hidrokortisoon (20 mg. en 10 mg.) en later 0·75 mg. deksametasoon per dag aan 42 gesonde volwasse mans vir 3 jaar lank was dus gekenmerk deur hipofise-bynier weerstand teen binne-aarse metapiroon gedurende hierdie tydperk, maar nie 5 weke later nie. Vyftien groot of kleinere operasies is op hierdie mans uitgevoer gedurende tydelike onderbreking van die steroïedbehandeling, sonder sirkulatoriese kollaps of ander ongewenste verskynsels.

Danowski en sy medewerkers het ook gevind dat groot dosisse steroïede vir minstens een maand gegee kon word sonder daaropvolgende hipofise-bynier hipofunksie. So het die daaglikse inname van 300 mg. hidrokortisoon vir 30 dae deur 11 gesonde volwassenes nie die gewone steroïedreaksie vir binne-aarse metopiroon verander toe hulle 5 weke na voltooiing van die behandeling getoets is nie. Verder het hul resultate aangetoon dat groot daaglikse toedienings van steroïede vir 'n jaar lank of langer in sommige persone volgehou kan word sonder oorblywende hipofise-bynier hipofunksie. (Nietemin huldig ons nie die mening dat dit vanselfsprekend is dat iedereen groot dosisse van steroïede vir 'n maand lank kan neem sonder ontwrigting van die hipofise-bynier spil nie.)

Indien groot dosisse van steroïede dan wel vir 'n lang tydperk moet volgehou word, stel Danowski 'n intermitterende skedule voor (3 - 5 agtereenvolgende dae se toediening van die middel elke week) wat gewoonlik nie gepaard gaan met hipofise-bynier hipofunksie nie. Dit word getoon deur 10 pasiënte wat oor 'n tydperk van 7½ jaar op 'n dergelike skedule behandel is en by wie die reaksie op metopiroon normaal was by nege en slegs verlaag, maar nietemin teenwoordig was, by een. Thorn en sy kollegas[2] het aangetoon dat dieselfde uitwerking verkry kan word deur een enkele toediening van 'n gewone 2-daaglikse dosis van steroïede elke 48 uur.

1. Danowski, T. S., Bonessi, J. V., Sabeh, G., Sutton, R. G., Webster, M. W. en Sarver, M. E. (1964): Ann. Intern. Med., **61**, 11.
2. Harter, J. G., Reddy, W. J. en Thorn, G. W. (1963): New Engl. J. Med., **269**, 591.

PROFESSIONAL PROVIDENT SOCIETY OF SOUTH AFRICA

After seeing the recently published report and accounts of the Professional Provident Society for 1964, we feel compelled to comment on the remarkable growth of this Society which was founded by the professions some twenty years ago exclusively for the benefit of professional people.

The assets of the Society increased by the record figure of R1,124,307 and amounted to R4,770,009 by the end of 1964. The income from investments rose to R226,752 while the subscriptions paid by members, including contributions to the various supplementary schemes offered by the Society, were just short of R1.5 million. Over R250,000 was paid to members and their dependants in sick pay, hospital, life assurance and provident fund benefits. R557,120, representing over 86% of the subscription income, was credited to members' provident fund accounts by way of the annual dividend allocations, while the interest credited to these accounts at the rate of 6·25%, amounted to R174,207.

An interesting fact pointed out in the report is that, because of the dividend allocation, the average actual cost of R325 per month sickness insurance was only R30 *per annum*. Younger members paying the minimum subscription rate only paid R6.50 *per annum* for the same cover.

It is also mentioned that the development and experience of the Society have been such that its Board has proposed a substantial increase in benefits without any increase in contribution rates.

In the light of this it is surprising that there are still many professional people eligible for membership who have not yet availed themselves of the benefits and financial security which the Society offers. Full details can be obtained from: The Manager, Professional Provident Society of S.A., P.O. Box 6268, Johannesburg.