The relationship between hypoalbuminaemia and the radiological appearances of the jejunum in tropical sprue

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ABSTRACT

Hypoalbuminaemia has been implicated as a possible cause of the radiological abnormalities of the small intestine in tropical sprue. Barium follow-through examination was performed in 35 southern Indian patients with documented tropical sprue, and jejunal width and fold pattern abnormalities were compared with those of a local age-matched control group.

Although hypoalbuminaemia was present in 66% of patients with tropical sprue, in only one case was an increase in jejunal calibre associated with a serum albumin concentration below 27 g/L, the threshold below which jejunal dilatation occurs in hypoalbuminaemia alone. These findings suggest that other factors, such as the extent of the mucosal injury, are likely to be more important than hypoalbuminaemia in producing jejunal dilatation in this condition. Abnormalities of fold pattern occurred more frequently than increase in jejunal calibre and appear to be a more sensitive indicator of disease.

More than 90% of patients with tropical sprue have radiological abnormalities of the small intestine, including flocculation and segmentation, jejunal dilatation with thickening of the transverse folds and variable prolongation of transit time (Floch et al, 1962; Paterson & Baker, 1965; Caldwell et al, 1965). The patho-physiological mechanisms underlying these changes, however, have not been determined, although it has been suggested that hypoalbuminaemia may be responsible for some of the radiological abnormalities (Golden, 1950; Paterson & Baker, 1965; Marshak et al, 1967; Baker & Mathan, 1971). An inverse linear relationship exists between jejunal calibre and serum albumin concentration in patients without gastrointestinal disease, and an “albumin threshold” below which jejunal dilatation occurs has been defined (Farthing et al, 1981). This paper evaluates the importance of hypoalbuminaemia as a possible mechanism of the radiological changes in the small intestine in tropical sprue.

PATIENTS AND METHODS

Thirty-five patients with tropical sprue (median age 40 years, range 11-68) from rural southern India, diagnosed by previously established criteria (Baker & Mathan, 1971) and 13 age-matched controls without malabsorption were studied. Fifteen of the patients were affected during an epidemic of tropical sprue. Barium follow-through examination was performed using a standard 8 oz Micropaque barium suspension. Prone, overcouched films were obtained at 30 min and one hour. Radiological assessment was based on two quantifiable parameters, jejunal calibre and fold pattern. Mean jejunal width was derived from transverse measurements at five different sites in the jejunum where the bowel was not involved in active peristalsis (Farthing et al, 1981). The fold pattern was assessed using a previously described five point scale (Kumar & Bartram, 1979) where grade 1, the normal fold pattern, progresses through three stages of fold thickening to effacement of the fold pattern in grade 5 (Figs. 1-5). Radiological
assessment was made without knowledge of the patient’s diagnostic group or other clinical or biochemical details. Hypoalbuminaemia was defined as a serum albumin below 35 g/l. Statistical analysis was by the Mann-Whitney U test and correlation coefficients were determined by linear regression analysis.

RESULTS
Control subjects had significantly higher serum albumin concentration (median 40 g/l, range 35–52) than patients with epidemic (median 34 g/l, range 22–41; p < 0.01) and endemic (median 32 g/l, range 21–45; p < 0.001) tropical sprue.

Mean jejunal width of patients with endemic sprue (median 28 mm, range 21–39) was significantly greater than that of epidemic sprue (median 25 mm, range 20–36; p < 0.01).

The relationship between serum albumin concentration and mean jejunal width in control subjects and patients with (a) epidemic and (b) endemic tropical sprue.

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| TABLE I |
|---|---|---|---|---|
| | Fold patterns* | | | |
| | of patients | No. of patients (%) | 1 | 2 | 3 | 4 | 5 |
| Epithelial sprue | 15 | 2(13) | 0(4) | 0(0) | 0(0) |
| Endemic sprue | 20 | 5(25) | 5(25) | 0(0) | 0(0) |
| Control | 13 | 1(7) | 0(0) | 0(0) | 0(0) |

* Fold pattern grades defined in Fig. 1.

than that of control subjects (median 24 mm, range 21–30; p < 0.01). Although four of the epidemic sprue patients had increased jejunal width, as a group (median 35 mm, range 21–37), they did not differ significantly from the control subjects. There was a significant negative correlation between serum albumin and jejunal width in patients with endemic sprue (r = 0.45, p < 0.05) but no such relationship was demonstrated in the epidemic group (Fig. 4). Although four patients in each group showed jejunal dilatation, in only one of these patients was the serum albumin < 27 g/l, the serum albumin concentration at which increases in jejunal calibre have been shown to occur (Farthing et al., 1981).

Abnormalities of fold pattern were demonstrated in 87% of patients with epidemic and 75% of patients with endemic tropical sprue (Table I). Serum albumin concentration was significantly lower in patients with grades 2-4 fold pattern abnormalities (median 31 g/l, range 21–43) than in patients with normal jejunal appearances (median 34 g/l range 32–46; p < 0.05). Three patients in the control group who presented with diarrhoea were found to have minor changes in fold pattern.

**Discussion**

The reported upper limit of normal jejunal width in the United Kingdom is 25 or 26 mm (Farthing et al., 1981; Kumar & Bartram, 1979; Haworth et al., 1967) and values between 26 and 30 mm have been regarded as "borderline abnormal" (Lawn et al., 1963). The higher upper limit of normal calibre (30 mm) in the present study in southern Indian controls may be related to differences in diet and possibly the higher consumption of dietary fibre.

In the present study increased jejunal calibre (greater than 30 mm) was found in only 8 of 35 patients (23%) with tropical sprue. Previous studies have observed jejunal dilatation in 50–85% of patients (Fisch et al., 1962; Paterson & Baker, 1965; Gardiner, 1956). The low prevalence of dilatation may be the result of different methods of assessment, criteria of normality and severity and duration of disease in the present group of patients. Serum albumin concentration was low in 60%, of patients with tropical sprue, but it was below the "albumin threshold" of 27 g/l (Farthing et al., 1981) in only one patient with jejunal dilatation. The jejunal calibre was within the upper limit of normal in seven other patients with tropical sprue, despite of serum albumin concentrations below 27 g/l. There was significant correlation between mean jejunal width and serum albumin concentration in patients with endemic sprue, but not in the epidemic group. 80% of patients with tropical sprue demonstrated abnormalities of fold pattern and although these changes were more prevalent in those patients with hypoalbuminaemia, there is no direct evidence to suggest that they are causally related. Serum albumin concentration in patients with tropical sprue has been shown to be related to the severity and duration of the disease (Baker & Mathan, 1971).

The findings of the present study are similar to findings in patients with coeliac disease (Farthing et al., 1981) where the reduction in serum albumin concentration was found to be insufficient to affect jejunal calibre. It is therefore likely that, in both of these diseases with jejunal mucosal lesions and malabsorption, it is the extent of the mucosal lesion, rather than hypoalbuminaemia, which has the most profound effect on the radiological appearances of the jejunum.

This work was carried out at the Wellcome Research Unit, Christian Medical College Hospital, Vellore, Tamil Nadu, South India.

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**References**


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This book is in fact the Proceedings of the 11th Annual Symposium on the Sharing of Computer Programs and Technology in Nuclear Medicine organised by the Computer Council of the American Society of Nuclear Medicine. It therefore contains papers on a variety of different topics associated with data processing in nuclear medicine. An attempt has been made to group together a series of papers on “functional imaging” which occupies almost exactly half the book. Functional images (alias “parametric” images) are merely images of derived variables, such as wash-out rate or time to peak, etc., extracted from a dynamic sequence of conventional images spaced in time.

The first section, therefore, groups together papers on functional images of organs other than the heart. Following a helpful introduction by Barbara Croft, the brain is treated by a group from Vanderbilt, specifically showing positron and NMR images of remarkably poor quality providing an illustration of how rapidly those two types of imaging procedures are developing. This is followed by two papers on the thyroid, an interesting kidney paper, a lung paper, and a discussion of a technique for motion correction of liver scans.

The second, cardiac, section is probably the most useful, and two on phase imaging, plus three on miscellaneous topics. These form quite a reasonable overview of the subject.

The third section, of rather variable quality, is concerned with isotope tomography. In the fourth section, on image display, Steve Pizer presents material on variable histogram equalisation applied to CT and isotope data, potentially of great interest. In the final section on “Computers and Instrumentation” there are two papers on the implications of uniformity correction with respect to computers, an important topic in nuclear medicine.

The book is really a pot-pourri of assorted papers, but of generally high standard. It is not of value as a text-book, but is certainly of considerable value to physiologists, computer scientists and other specialists working in the area of nuclear medicine data processing, and merits a place on their bookshelves.

ISBN 0-8151-3295-6

Although there are a large number of books on “nuclear physics for non-physicists”, this seems to be the first attempt at a text on “chemistry for non-chemists”. Given the number of physicists (or non-chemists) working in radiochemistry and related fields, this is a welcome innovation.

In the Preface the authors state that the book is based on the Canadian nuclear medicine technologists’ syllabus and that it was written to provide basic principles rather than as an “in-depth” text on nuclear chemistry. The latter statement is certainly true since, in thirteen out of the twenty short chapters of the book, the reader is taken from a definition of an atom through oxidation-reduction reactions, co-ordination chemistry and protein structure to the structure and function of cell membrane phospholipids. The last six chapters are devoted to instrumentation and methodology—balances, microscopes, centrifuges, chromatography, etc.

The first thirteen chapters should be useful at least for learning current chemical nomenclature. However, one would have preferred to see a list of references at the end of each chapter in addition to, or even instead of, sets of problems. The subject matter of the last six chapters is well chosen but dealt with at a very superficial level. Their usefulness, if any, is again that they introduce (and no more) the reader to the terminology of the methods and instruments to be found in a modern radiochemical laboratory.

The idea behind the book is good but this first attempt has been somewhat less than entirely successful—this often happens when lecture notes are transposed “in toto” into book form—and one would find it difficult to justify disbursing £19.75 for it.

ISBN 2-225-74129-8

The title of this French textbook is (in English), “The detection and visualisation of events in nuclear medicine”. It is essentially a description of atomic physics relevant to detectors as used in Nuclear Medicine. However, it is not obvious for whom it is written. It is at times very dense and detailed, requiring a reasonable grasp of quantum mechanics. It quite clearly is not appropriate for a (French-speaking) medical student (e.g. PCEMI) as it is insufficiently didactic. On the other hand, it does not seem to be aimed at physicists for whom it does not go into sufficient depth to be an adequate substitute for alternative texts. Likewise, for the purposes of French “Certification” in Nuclear Medicine (Saclay), it does not give the impression of being suitably comprehensive or comprehensible, especially in the area of instrumentation. In summary, it is difficult to imagine at whom precisely this book is aimed.

It comprises four parts: the “Signal”, or a description of radioactive decay (about half the book); the “Detector”, being gas detectors, solid and liquid scintillators, and semiconductors; “Statistics”, in 10 pages; and “Signal Processing”, in only 11 pages! The level is very mixed, ranging from overdetailed discussion of, for example, the interaction of charged particles with matter, to the other extreme, for example the lack of any information about instrumentation (the gamma-camera is not mentioned as such, although details are given about different types of photomultipliers.) The book is however well indexed.

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