(1) Pathophysiology of malabsorption syndrome

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Of the nutrients, the disturbance of fat digestion-absorption occurs the most often and the severest, because there are many complicated steps in the course of the digestion-absorption of fat. The present study was undertaken for the elucidation of the mechanisms of the disturbance of fat absorption in the malabsorption syndrome, by means of measuring the fatty acid binding protein (FABP), fatty acid: CoA ligase (FA ligase) and acly-CoA: monoglyceride acyltransferase (MG transferase) in the intestinal mucosa of the rats, comparing the young and the aged, and the malabsorptive, which were caused by the injection of 5 fluorouracil (5FU) and aminopterin (AMP). Intestinal FABP was partially purified as the fraction of 12,000 mol. wt. from intestinal mucosal 105,000 g supernate on Sephadex G-75. Fraction containing FABP was identified by the analysis of thin layer gel electrofocusing. FA ligase was measured by employing the hydroxamate trapping technique. MG transferase was assayed by using DTNB on the continuous recording spectrometry. The binding capacity of partially purified FABP was larger in the aged than in the young, while smaller in 5FU and AMP treated rats. FA ligase activity was increased in the aged. However, MG transferase activity was decreased in the aged. The activities of both enzymes were decreased in 5FU and AMP treated rats. The inverse proportion between MG transferase activity and aging was observed in the mucosa obtained from surgical intestinal specimen of human subjects. It was interested that the specific decrease of MG transferase activity was investigated in the aged, while three steps were disturbed in 5FU and AMP treated rats. The increase of MG transferase activity seemed to cause the increase of FA ligase activity and the binding capacity of FABP. Conclusion 1) FABP is possibly one of the rate-limiting steps. 2) The decrease of the reesterifying enzymes activities is observed in 5FU and AMP treated rats. 3) The disturbance of fat absorption in the age is caused by the specific decrease of MG transferase activity. 4) Fat absorption is affected by FABP, FA ligase and MG transferase activity of intestinal mucosa.

Reference

(2) Iron and vitamin B₁₂ absorption studies with plastic whole body counter in patients with gastroenterological operation

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Iron and vitamin B₁₂ (B₁₂) absorptions were
determined by a plastic whole body counter and fat absorption by $^{131}$I-triolein excretion. Mean B$_{12}$ retention in 41 control subjects was 71.0±9.8% (S.D.) and that in 7 patients with atrophic gastritis was significantly less than control, 58.2±12.1% (p<0.05). Mean B$_{12}$ absorption is subtotal gastrectomized patients was significantly less than that in partial gastrectomized ones (p<0.05).

We confirmed a close relation between B$_{12}$ absorption rates and IF contents secreted in gastric juices after gastrin stimulation. Mean iron absorption was significantly increased in iron deficient patients than control subjects.

Five total pancreatectomized patients demonstrated a marked B$_{12}$ malabsorption when they were given B$_{12}$ alone. However, the addition of pancreaticin, or of pancreatin and IF, showed a remarkable improvement.

There was a close relation between the degree of B$_{12}$ malabsorption and the extent of ileal resection in operated cases. Colon resection did not affect B$_{12}$ absorption. It is concluded as follows; (1) a whole body counting technique is convenient and reliable as it do not need collection of urine or feces, injections of cold B$_{12}$, or admission to hospital, (2) the exocrine secretory function of the pancreas is essential for normal B$_{12}$ absorption, (3) the distal 50 cm ileum is necessary for normal B$_{12}$ absorption and our technique for B$_{12}$ absorption is useful for an accurate prediction of ileal disorders, (4) fat and iron absorption tests are not suitable for the precise diagnosis of affected segments of the small intestine.

Results are as follows:
1. The incidence of diarrhea caused by fat and protein malabsorption was 3.5 percent in Billroth I patients, whereas 6.6 percent in Billroth II patients. Isotopic fat and protein studies have indicated that the absorption defect following Billroth II is similar to that found in patients with pancreatic insufficiency.
2. The incidence of diarrhea caused by rapid emptying of gastric remnant with distention of small bowel was 13 percent. The pathogenesis of this type of diarrhea is explained by hyperperistalsis caused by 5-HT released from the upper small bowel.
3. The Achlorhydria following gastric operation resulted in fat and protein malabsorption and iron-deficiency anaemia.
4. The Vit B$_{12}$ malabsorption following total gastrectomy was caused by the deficiency of intrinsic factor. The blood Vit B$_{12}$ level was within normal range in the total gastrectomy patients who have been followed-up for 3 years after operation.

(4) Intracellular fat transport and its disturbance

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(1) Differences between olive oil and castor oil in intracellular transport.
A time sequence study was undertaken to investigate some differences between olive oil and castor oil in absorptive process.

Results obtained were as follows:
1) Duodenal mucosa became deep white after both castor and olive oil administration, but was more profound after the administration of the latter.
2) In intracellular transport, castor oil was less transported and matrix lipids were observed in absorptive cells 4 hours after castor oil administration in stomach.

(2) Some cases associated with disturbance of intracellular fat transport.
We observed some patients associated with disturbance in intracellular fat transport and named “duodenal white spot syndrome”.

(3) The pathophysiology of malabsorption syndrome following gastric operation

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Eighty-nine cases of patients with diarrhea who underwent different types of gastric operation for the treatment of peptic ulcers between January 1960 and December 1974 have been followed-up. We investigated the pathogenesis of diarrhea following gastric operation. Also $^{131}$I-Triolein test and $^{131}$I-Albumin test were performed and serum iron, blood Vit B$_{12}$ and blood 5-HT were examined.