Laxative-induced Diarrhoea: A Continuing Clinical Problem

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Summary

Seven women spent an average of 127 days in hospital and were extensively investigated, including a laparotomy, before their complaints of abdominal pain, diarrhoea, and weight loss were shown to be due to excessive taking of laxatives. All denied taking laxatives and in none were the characteristic features of the effects of cathartics on the colon seen on sigmoidoscopy or radiological examination.

Hypokalaemia and other electrolyte abnormalities were common and were thought to be due to a combination of severe diarrhoea and vomiting. The rectal mucosa was seen to be abnormal on biopsy only in the three patients who had taken senna preparations. The diagnosis was not easy and was finally established either by analysis of the urine and stools or by searching the patient's ward locker.

Introduction

It is well recognized that excessive laxative consumption may have grave consequences (Witts, 1937; Sladen, 1972). The

classical features of the syndrome include diarrhoea, abdominal pain, thirst, muscular weakness, hypokalaemia, melanosis coli, and characteristic radiological appearances of the colon (Aitchison, 1958; Coghill *et al.*, 1959; Litchfield, 1959; Kramer *et al.*, 1964; Rawson, 1966; Wolf *et al.*, 1969). Weight loss, oedema (Heizer *et al.*, 1968), bone pain (Meulengracht, 1938; Frame *et al.*, 1971), skin pigmentation (Graeff *et al.*, 1960; Ramirez *et al.*, 1970), and steatorrhoea (French, 1956; Coghill *et al.*, 1959) have also been reported. Unfortunately the diagnosis is difficult and often made only after numerous hospital admissions and investigations. Because the metabolic consequences are serious early diagnosis is important. We report the case histories of seven patients with diarrhoea due to laxative abuse which illustrate the diagnostic problems. The salient clinical features are summarized in the table.

Case Reports

CASE 1

A 47-year-old married woman was admitted to hospital in 1967 with a two-year history of episodic upper abdominal pain radiating into the back, weight loss, and occasional vomiting. Though her bowels were irregular and she had occasional diarrhoea she denied that this was a problem. She was thin, with downy hair over her back and had generalized abdominal tenderness. Barium meal and follow-through, jejunal biopsy, and coeliac axis arteriogram gave normal results. Five-hour urine xylose excretion was 2.8 g (after 25-g dose); three-day faecal fat, 6.9 g/day; Lundh test, mean tryptic activity 9.1 μ l/ml/min (low normal). Jejunal culture grew excessive numbers of bacteria and a glucose tolerance test showed a diabetic curve. Her symptoms did not improve with antibiotic treatment and a diagnosis of chronic pancreatitis was made. She was treated with a low fat diet and pancreatic supplements. She was readmitted in 1968 with similar symptoms and physical signs. The steatorrhoea persisted at 8.9 g of fat/day but a pancreatic scan gave a normal result. No abnormality was found at laparotomy, and the findings of operative cholangiogram and of hepatic and pancreatic biopsy were also normal. Postopera-

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Clinical Details of the Patients

Case No.	Age	Sex	Main Complaints	Length of History (Years)	No. of Hospital Admissions	No. of Days in Hospital	Type of Laxative Used	Laparotomy	Barium Enema	Rectal Biopsy	Additional Abnormalities	How Diagnosed
1	48	F.	Abdominal pain, weight loss	3	2	83	Phenolphthalein	Yes	—	—	Steatorrhoea, GTT Hb 77%, low xylose excretion, jejunal bacteriology, personality disorder	Stool test
2	50	F.	Diarrhoea, abdominal pain, vomiting	4	6	162	Phenolphthalein	No	Diverticula	Normal	Tetany, depression	Stool test
3	26	F.	Vomiting, diarrhoea, abdominal pain	8	11	202 +	Senokot	Yes x 2	Normal	Inflammation Hypertrophy of muscularis mucosae	Oedema, clubbing, hiatus hernia, low enteroglucagon, anorexia nervosa	Locker search
4	46	F.	Diarrhoea, abdominal pain	20	4	59 +	Cascara	Yes	Abnormal	Inflammation Hypertrophy of muscularis mucosae	Pyelonephritis, cataracts, low B ₁₂	Locker search
5	65	F.	Diarrhoea, Abdominal pain, vomiting	10	6	180	Phenolphthalein	Yes	Diverticula	Normal	Gastric ulcer, alopecia artefacta	Stool test
6	26	F.	Abdominal pain, vomiting, weight loss	1	3	89 +	Vegetable laxative	Yes	Normal	Normal	Pancreatic scan, serum amylase	Locker search
7	47	F.	Diarrhoea	2	8	111	Phenolphthalein + senna (Nylax)	Yes	Normal	Inflammation Melanosis	Pancreatic scan, achlorhydria, oedema, raised secretion	Stool test

tively the copious, fluid nature of the stools was noted. They became red on alkalization, suggesting that the patient was taking a phenolphthalein-containing compound. This was confirmed on several successive days.

The patient denied taking laxatives, but her husband admitted to bringing a variety of aperients for her to use in hospital and said that she had always taken them for fear of becoming "clogged up." She was discharged and followed up by both physicians and psychiatrists, but she became hostile and uncooperative and developed many new unrelated symptoms. She did not keep appointments and was lost to follow-up after three months.

Comment.—This patient concealed both her diarrhoea and her laxative-taking. The steatorrhoea and Lundh test result suggested pancreatic disease, which was not confirmed at laparotomy. There was no electrolyte disturbance. Colonic function was never investigated because the diarrhoea did not become apparent until the end.

CASE 2

This 50-year-old married woman gave a four-year history of copious fluid diarrhoea, poor appetite, vomiting, and central abdominal pain. She had been admitted on four occasions to two hospitals for investigation, but always with negative results. On her final admission in 1970 she was depressed and taking a cocktail of drugs including thioridazine, amitriptyline, phenelzine, prochlorperazine, bendrofluazide, methylcellulose, and butobarbitone. In spite of this she appeared well and had not lost weight. Sigmoidoscopy, rectal biopsy, barium enema, barium meal and follow-through, three-day faecal fat excretion, jejunal biopsy, hepatic and pancreatic scans, lactose and sucrose tolerance tests, and the Schilling test gave normal results. The serum potassium varied between 3.2 and 3.5 mEq/l. and the serum bicarbonate was 28–33 mEq/l. with normal levels of sodium and urea. Daily faecal weight was 350–550 g. The 24-hour electrolyte losses averaged 35 mEq of sodium in stool and 45 mEq in urine and 25 mEq of potassium in stool and 50 mEq in urine. A provisional diagnosis of a pancreatic, diarrhoea-producing tumour was made, but on addition of sodium hydroxide to the stools a red colour appeared: this was confirmed in several specimens. An alcoholic extract of the stool showed an intense purple colour on alkalization which disappeared when the pH rose to 11. The absorption spectrum at pH 7 was identical to that of phenolphthalein in both the visible and ultraviolet range.

The patient vigorously denied taking purgatives and seemed offended that this possibility had crossed her physician's mind. During the next two days the phenolphthalein disappeared from her stools and she became constipated. Later she discharged herself and was followed-up in the psychiatric department. Eventually she admitted to taking laxatives. She continued to be a problem of management and was recently described by her psychiatrist as "a neurotic personality of an hysterical type."

Comment.—This is a clear example of factitious diarrhoea without the characteristic radiological, sigmoidoscopic, or histological features. Apart from mild hypokalaemic alkalosis her physical condition was good but there was a background of psychiatric disturbance.

CASE 3

This 26-year-old married, state-registered nurse presented in 1965 with attacks of vomiting. Barium meal showed "duodenal ileus" and at laparotomy the ligament of Treitz was divided. The vomiting soon recurred and in 1966 a duodeno-jejunal anastomosis was performed. Again the vomiting recurred, accompanied by watery diarrhoea. During the next four years she was admitted to four hospitals, on two occasions requiring intravenous fluid therapy. After detailed but negative investigation in 1970 the vomiting was thought to be psychogenic in origin. It subsequently became infrequent while the diarrhoea worsened. When readmitted in 1972 she appeared fit in spite of severe diarrhoea to the extent of 2–2.5 kg of stool/day. She had mild ankle oedema and clubbing of the finger nails. Investigations, which gave normal results, included haemoglobin; erythrocyte sedimentation rate; serum electrolytes; sigmoidoscopy and barium

enema; faecal fat excretion; Lundh test; jejunal biopsy, bacteriology, and bile salt levels; water and electrolyte absorption during jejunal and ileal perfusion studies; serum prostaglandins and fasting pancreatic glucagon concentration. Barium meal and follow-through showed a hiatus hernia; rectal biopsy showed hypertrophy of the muscularis mucosae with hypertrophy of the muscle layer. Mouth to anus transit time (80% shapes) was 11 hours (normal=1–5 days). Plasma enteroglucagon levels—fasting and during a standard glucose tolerance test—were low (peak 30 fmol/ml, normal=>100 fmol/ml). Repeated alkalization of the stools failed to show phenolphthalein and urinary magnesium excretion was normal (68.4 mg/day).

Finally, about 2,000 Senokot tablets were found during a search of her locker. Anthraquinone excretion products were then found in her urine on several occasions. She discovered that she had been found out by reading her own notes. At first she was extremely distressed, but later she was quite relieved to be able to unburden herself of the secret of her purgative abuse and handed over a large number of Senokot tablets. Her bowel habit promptly returned to normal and she was referred to a psychiatrist. She did not resume the purgative habit and had no diarrhoea, but she was considered to be suffering from a form of anorexia nervosa.

Comment.—This patient's abuse of cathartics was not associated with either melanosis coli or with radiological changes. Having been extensively investigated for vomiting she progressed to factitious diarrhoea. Despite the gross diarrhoea her plasma electrolytes remained normal.

CASE 4

A 46-year-old divorced woman, a doctor's receptionist had developed diarrhoea 20 years previously while in New Zealand. After sigmoidoscopy and barium enema ulcerative colitis had been diagnosed. By 1962, when in Britain, she had worsening diarrhoea, an inflamed rectal mucosa, and narrowing of the terminal ileum and ascending colon was seen on x-ray examination. A right hemicolectomy was performed. The ileum was found to be normal and the caecum, ascending colon, hepatic flexure, and proximal half of the transverse colon were mildly diseased. The serosal surface was injected and slightly oedematous with enlarged lymph nodes. Histopathological studies showed superficial ulceration of the mucosa with non-specific inflammatory changes. Crohn's disease was diagnosed. She improved slightly but in 1966 a right nephrectomy for pyelonephritis was performed. She had persistent diarrhoea which was investigated without success between 1966 and 1968, and in 1969 she was admitted to a fifth hospital complaining of abdominal pain and vomiting in addition to the diarrhoea. Investigations, which gave normal results, included haemoglobin, erythrocyte sedimentation rate, faecal fat excretion, barium meal and enema, jejunal biopsy, alkalization of the stool for phenolphthalein, stool test for excess sulphate, and serum folate. Her vitamin B₁₂ was low (45 pg/ml), she had become hypokalaemic (K⁺=2.1 mEq/l., and had a raised blood urea of 51–69 mg/100 ml. Her serum bicarbonate levels were normal.

The diagnosis was finally made in 1971. Her faecal output was then between 1,100–1,800 g/day. The metabolic disturbance was worse with serum K⁺ 2.1–2.6 mEq/l.; blood urea 86–94 mg/100 ml; serum creatinine 3.3 mg/100 ml; and creatinine clearance 12 ml/min. Mouth to anus transit time (80% shapes) was five hours. Sigmoidoscopy showed a reddened, friable mucosa and rectal biopsy showed thickening of the muscularis mucosae but no evidence of melanosis coli. The thickening of the muscularis mucosae suggested that the patient might have a cathartic colon. The histology of the 1962 resection specimen was reviewed and thought to show mild, non-specific inflammatory changes. A search was made of her locker and a large store of cascara tablets found. She vehemently denied taking laxatives but said she had a life-long fear of constipation and had been given regular laxatives as a child.

Comment.—It took many years to arrive at the correct diagnosis in this patient. The histological changes were suggestive though there was no melanosis. Childhood impressions may well have influenced her attitude towards bowel habit and led to the fear of constipation and thus the laxative-taking. She suffered severe renal damage, presumably secondary to the hypokalaemia.

CASE 5

A 65-year-old single woman was first seen in 1961 with frequent attacks of abdominal colic and watery diarrhoea. Physical examination, barium enema, and sigmoidoscopy gave normal results. In childhood she had been given regular laxatives for constipation by her mother who had life-long diarrhoea but had lived to the age of 90. She claimed to have been overweight as a teenager but a close relative remembered her being excessively thin. She had been treated at several hospitals for a delayed menarche. She also claimed to have undergone gastric and gall-bladder surgery in 1950, but subsequent barium meals and a cholecystogram gave normal results. By 1964 she was losing weight and was admitted to hospital. She looked well, but there was tenderness in the left iliac fossa. Investigations, which gave normal results, included haemoglobin, erythrocyte sedimentation rate, sigmoidoscopy, stool culture, serum proteins, urine test for porphyrins, and serum electrolytes. A barium enema showed a few diverticula in the descending colon. A course of tetracycline did not help her, nor did treatment with diphenoxylate, promazine, and a milk-free diet.

In 1968 she developed vomiting and was admitted to hospital twice. Extensive gastrointestinal radiological examination gave normal results. By 1969 she was suspected of taking laxatives and was again admitted. The results of stool and urine tests for phenolphthalein were negative and repeat investigations, including faecal fat excretion, gave normal results. Psychiatric help was sought but eventually a sigmoid myotomy was performed because of the diverticular disease and pain. The diarrhoea did not improve and she began to get severe indigestion. A small gastric ulcer was found on radiological examination but it healed quickly. Studies of gastric secretion, jejunal biopsy, and investigations of protein bound iodine, serum folate, and electrolytes gave normal results. She was admitted in 1971 to a metabolic unit. Her bowels were open six times a day with a daily output of 700 g. Transit time (80% shapes) was 19 hours. Sigmoidoscopy, rectal biopsy, and investigations of faecal fat excretion and plasma electrolytes again gave normal results. On this occasion the test for phenolphthalein was positive on several specimens of stool. She strongly denied taking anything to cause the diarrhoea but became completely constipated for the next 10 days. Subsequently she continued to have diarrhoea. The blood urea rose slowly to 50-75 mg/100 ml but there was no hypokalaemia. Her psychiatrist thought it would be unwise to confront her with the fact of laxative-taking as she would probably react with denial and resentment. She is supported at frequent outpatient attendances.

Comment.—This patient spent over six months in hospital during 10 years and underwent numerous uncomfortable investigations. She has made over 80 visits to outpatients and 20 to the x-ray department. Though suspected of taking laxatives for two or three years before the final diagnosis was made the radiology, histology, and first chemical tests of the stool did not confirm this.

CASE 6

A 26-year-old single woman presented in May 1972 with a four-week history of severe intermittent epigastric pain, nausea and vomiting, weakness, weight loss of 9 kg, and diarrhoea. She had had a similar episode one year earlier. Her childhood was stormy. During adolescence she had lost weight for a time and had amenorrhoea, and when 18 she had had an attack of "mumps" with jaundice and abdominal pain. Subsequently she had drunk heavily and smoked 30 cigarettes daily. At the time of her first admission she admitted to taking occasional laxatives. She was emaciated (weight 38 kg) and dehydrated (haemoglobin 18.1 g/100 ml). There was profuse, watery diarrhoea, which grew *Staphylococcus aureus* on culture. Her serum electrolytes were Na^+ 130, K^+ 2.3, Cl^- 89, HCO_3^- 27 mEq/l., with a blood urea of 51 mg/100 ml. Sigmoidoscopy, barium enema, and rectal biopsy findings were normal but duodenography showed an abnormality of the second part of the duodenum suggestive of inflammatory disease of the pancreas. Serum amylase (during an attack of pain) was 530 Somogyi units and pancreatic scan showed a moderate, generalized abnormality. She improved after treatment with antibiotics and intravenous fluids but in view of the possibility of pancreatic disease a laparotomy was performed: no abnormality was found.

Six months later she was admitted with a recurrence of abdominal pain, partly relieved by vomiting; further weight loss; and

considerable weakness. She had severe watery diarrhoea with stool volumes of 800-2,750 g/day. First investigations showed haemoglobin 17.0 g/100 ml, white blood cells 13,500/mm³, serum Na 127, K 1.9, Cl 89, HCO_3^- 19 mEq/l., and blood urea 150 mg/100 ml. Barium meal and follow-through showed multiple fluid levels in both small and large gut and the pancreatic scan was again normal. Faecal occult blood tests gave positive results. Investigations, which gave normal results, included faecal fat excretion, intravenous pyelogram, cholecystogram, gastric secretory studies, coeliac axis arteriogram, stool culture, Lundh test, and serum gastrin and secretin assays. Repeated tests on the stools for phenolphthalein and senna gave negative results. Faecal electrolyte losses were approximately 100 mEq Na^+ /day and 65 mEq K^+ /day. Renal losses of electrolytes were very low—for example, Na^+ 0.4 mEq/day and K^+ 3.11 mEq/day. A provisional diagnosis of hormone-secreting tumour of the pancreas (W.D.H.A. syndrome) was made, but while a second laparotomy was being considered 63 laxative tablets were found in the patient's locker. These were returned and three days later only 42 remained. Her boy-friend said he had been asked to bring 300 vegetable laxative tablets "for another patient." The patient denied taking the laxatives but later admitted it and stopped taking them. The diarrhoea and abdominal pain disappeared immediately and she was discharged. After a holiday she was admitted to a psychiatric hospital where she continued to take laxatives surreptitiously and attempted suicide. She was not rehabilitated and made a second attempt to commit suicide.

Comment.—This was a patient with a disturbed background who had many features of pancreatic disease and was willing to undergo the pain and inconvenience of investigation and laparotomy while concealing her laxative-taking. Despite suspicion, the laxatives were not detected by chemical means.

CASE 7

This 47-year-old single woman presented in 1969 with a one-month history of urgent, watery diarrhoea of sudden onset associated with left-sided abdominal pain. Previously she had been constipated. For 15 years she had had ankle swelling which had been treated with a diuretic: her doctor had noticed recurrent hypokalaemia despite potassium supplements. Physical examination and sigmoidoscopy showed no abnormality. Rectal biopsy, however, showed mild, subacute inflammatory changes. She admitted to having taken at one time four senna pods nightly for a period of two years but denied current purgative consumption. Blood count, serum electrolytes, stool culture, faecal fat excretion, barium meal and follow-through, barium enema, and thyroid function tests all gave normal results. She became constipated and was discharged. During the next year her diarrhoea persisted and she was readmitted three times. Serum potassium fell to 2.9 mEq/l. but other electrolytes were normal. Pancreatic function tests (secretin-pancreozymin and scan), glucose tolerance test, and jejunal biopsy and bacteriology gave normal results. Urinary indole acetic acid excretion and jejunal bile salt levels were normal. Nevertheless, a pentagastrin-fast achlorhydria was found twice and a gastric biopsy specimen showed an inflammatory infiltrate suggestive of gastritis. The serum B_{12} levels were normal. She then developed rectal bleeding and became anaemic with a haemoglobin of 8.9 g/100 ml and a serum iron of 26 µg/100 ml.

The combination of watery diarrhoea, hypokalaemia, and achlorhydria suggested a pancreatic tumour. A secretin bioassay (Dr. J. Scratchard, Edinburgh) showed raised levels of circulating secretin. At laparotomy the pancreas and the colon were normal. Histology of the tail of the pancreas, removed because its shape was unusual, showed a threefold increase in the number and size of the islets. Her diarrhoea stopped after the operation but by the middle of 1971 it had returned and she remained hypokalaemic with a blood urea of 54 mg/100 ml. Further metabolic studies of the total exchangeable sodium and potassium gave normal results. She was transferred to another hospital where alkalinization of both stool and urine suggested the presence of phenolphthalein on several occasions. She again denied taking laxatives but her sister found some tubes of Nylax—a laxative containing phenolphthalein and senna—at home. The patient denied taking these and refused psychiatric help.

Comment.—Suspicion that this patient was taking laxatives was aroused by was confounded by her denials and by negative results of radiological investigation, urine tests, and a locker search. The achlorhydria with hypokalaemia and diarrhoea suggested a pan-

creatic tumour but this was not substantiated. It took seven hospital admissions and a laparotomy before her laxative-taking was diagnosed.

Discussion

Laxative-taking is entrenched in Western culture and there are vast annual sales (Darlington 1966). More than 30% of people over 60 take a weekly dose of cathartic (Connell *et al.*, 1965). The dangers of excessive purgation are now recognized and more than 100 cases of purgative abuse have been reported. The patients described in this paper illustrate some of the difficulties of diagnosis. All seven concealed the fact that they were taking laxatives and two (cases 1 and 6) also concealed their diarrhoea despite large daily stool volumes. Such patients often go to great lengths to hide the cause of their illness (Love *et al.*, 1971). None of them had typical radiological features but histological changes suggestive of cathartic colon were present in three (cases 3, 4, and 7). The presenting complaints of vomiting, abdominal pain, diarrhoea, and weight loss are common to a number of illnesses. Their complete investigation, particularly to exclude the more recently recognized diarrhoeal syndromes such as those due to polypeptide hormones (Booth, 1973), may be a formidable task. Finally, simple tests to exclude laxative-taking are lacking, particularly for the vegetable and saline laxatives which are almost impossible to detect by chemical means.

HISTOLOGICAL AND RADIOLOGICAL FEATURES

Sigmoidoscopic evidence of melanosis coli is a feature of laxative abuse (Jones, 1968) and histological changes including mucosal inflammation, melanosis, and muscle abnormalities have been described (Morson, 1971; Smith, 1972 a). Nevertheless, sigmoidoscopy gave normal results in four of our patients (cases 3, 5, 6, and 7) and showed only non-specific changes in two others (cases 2, and 4) without melanosis. Rectal biopsy findings were abnormal in three patients (cases 3, 4, and 7) and one showed melanosis (case 7). All three showed subacute mucosal inflammation and two (cases 3, and 4) hypertrophy of the muscularis mucosae. Characteristic radiological changes have been described. The colon is dilated, losing its normal haustral and sometimes mucosal pattern. Pseudostrictures appear which may be related to the hypertrophied muscularis mucosae (Goulston *et al.*, 1969) and there may be ileal abnormalities. The right side of the colon is predominantly affected (Heilbrun, 1943; Jewell *et al.*, 1954; Heilbrun *et al.*, 1955; Plum *et al.*, 1960). None of these changes were present in any of our patients.

The presence or absence of radiological and histological changes might be related to either the length of history or the type of laxative taken. The lack of the typical radiological features in all of our patients, even after 20 years of laxative-taking (case 4), suggests that the length of history is not the only factor; possibly the dose level is also important. The type of laxative taken is probably a more important variable. The anthraquinones (senna, cascara, and aloes) have been implicated as the cause of the histological changes (Smith, 1968 and 1972 a and b), and this is borne out by the presence of histological abnormalities in all three patients (cases 3, 4, and 7) taking these preparations. Though melanosis coli was not prominent in our patients its presence at sigmoidoscopy or on rectal biopsy should suggest laxative-taking (Bartle, 1928). In a large series 850 out of 887 patients with melanosis coli used laxatives habitually and the pigmentation disappeared in 4-12 months after stopping them (Wittoesch *et al.*, 1958).

Daily faecal weights and serum electrolytes in seven patients abusing laxatives (O) and nine patients with diarrhoea due to other causes (●). Horizontal bars indicate normal range. (Faecal weight not available in Case 1; serum HCO₃ available in eight patients with non-laxative diarrhoea).

ABNORMALITIES OF ELECTROLYTE BALANCE

The figure compares the serum electrolyte values and mean daily faecal weight in the seven patients with a group being studied over a similar period whose diarrhoea was due to other causes. While the severity of the diarrhoea is comparable between the two groups, four of the patients taking laxatives (cases 4, 5, 6, and 7) had a raised blood urea and four (cases 2, 4, 6, and 7) were hypokalaemic. Alkalosis was not a major problem. Patients with laxative diarrhoea seem to suffer from electrolyte and renal problems more often than those with diarrhoea due to other causes. Faecal potassium losses are slightly increased in any form of diarrhoea (Fordtran, 1966) and may be further increased in laxative abuse by aldosterone secretion (Sladen, 1972). Aldosterone increases mucosal loss of potassium in the colon (Shields, 1968) and secondary hyperaldosteronism occurs in these patients (*British Medical Journal*, 1966; Wolf, 1968; Fleischer, 1969; Love, 1971; Van Rooyen, 1972). Aldosterone secretion is stimulated by sodium depletion which may occur in any diarrhoea in adults, because sodium losses increase almost linearly with the severity of the diarrhoea (Fordtran, 1966). Nevertheless, the faecal potassium excretion in our laxative-taking patients was in the range found in the other patients suffering from diarrhoea. Other factors must therefore contribute to disturbed potassium balance.

Prolonged hypokalaemia can cause renal damage which may lead to further potassium loss (Perkins *et al.*, 1950). This sequence of events has been clearly seen in laxative abuse (Schwartz *et al.*, 1953; Houghton *et al.*, 1958). Moreover, aldosterone increases excretion of potassium by the kidney (Fleischer *et al.*, 1969). A further factor in the development of hypokalaemia is the associated vomiting, present in five of our patients (cases 2, 3, 5, 6, and 7). Reduced food intake will also aggravate the problem. Laxatives have been shown specifically to affect mucosal transport of sodium, glucose, and water (Philips *et al.*, 1965; Adamic *et al.*, 1967; Hart *et al.*, 1968) but it is not known whether potassium is similarly affected.

DIAGNOSTIC PROBLEMS

Chronic self-medication with laxatives causes many changes in gastrointestinal, renal, and hormonal function, the mechanism of which is obscure. These changes often produce

abnormal results in the battery of tests these patients are subjected to before the diagnosis is made. In six of our patients one or more of the following abnormalities were found: steatorrhoea, low urinary xylose excretion, low B₁₂, duodenal ileus, abnormal pancreatic scan, abnormal gastro-intestinal hormone assays, achlorhydria. It is striking that these findings, together with the radiological abnormalities, led to laparotomy in all but one of the patients. None of these operations resulted in the diagnosis being made and no patient improved postoperatively for long.

There is no single diagnostic test for laxative abuse. A high degree of suspicion is necessary. The diagnosis should be considered in a woman, who may be related in some way to the medical profession, presenting with chronic diarrhoea, abdominal pain, and vomiting and who has other bizarre or inexplicable illnesses or psychiatric disorders. The serum potassium must be measured and a sigmoidoscopy and rectal biopsy performed. Barium enema is essential to exclude other colonic disease, but will probably give a normal result unless the patient has been taking anthraquinone purgatives for many years.

The diversity of laxative preparations makes comprehensive chemical tests impossible. Nevertheless, the urine and stools should be alkalinized to test for phenolphthalein (French, 1956). Anthraquinones may be detected by modifying the existing assay procedures for senna (*British Pharmacopoeia*, 1973). Estimation of faecal inorganic sulphate may help, because sulphate excretion in normal subjects and in cases of organic diarrhoea is less than 4.5 mEq/l. (Goiffon *et al.*, 1961; Wrong *et al.*, 1965; Wiggins, 1973) but it increases when sodium sulphate (Glauber's salt) is given (Metcalf-Gibson *et al.*, 1967). All chemical tests should be repeated several times, because the patients may be taking the laxatives intermittently or may change from one type to another and they may be rapidly excreted from the body. There are no suitable tests for vegetable laxatives. Though perhaps distasteful, a search of the patient's locker and possessions should be made: this confirmed the diagnosis in three of our patients. For this procedure to be effective the patient should preferably be in a single side ward. It is prudent to arrange for the search to be carried out by two people together—for example, the physician and the ward sister.

MANAGEMENT

The management of these patients is an unresolved problem. The first major decision to be faced is whether to tell them that their surreptitious purgation is known to the physician. No dogmatic advice in this can be offered. Four of our patients (cases 1, 2, 6, and 7) were told the true diagnosis. Two continued to deny taking laxatives and refused further help and follow-up (cases 1, and 7). The other two remain under psychiatric care, one (case 6) having twice attempted suicide. The patient (case 3) who discovered that she had been found out has since continued to receive psychiatric help. Two patients (cases 4, and 5) have not been faced with the truth. They are supported by regular outpatient visits, where their electrolytes are carefully monitored.

Clearly psychiatric help should be sought for these patients. It may also be possible to wean the patient from the potentially more dangerous laxatives before permanent bowel damage has occurred (Smith, 1968) and to regularize their

bowel habit with bulk purges or a high fibre diet. Colectomy and ileorectal anastomosis may also have a role in some cases (Plumley, 1973; Todd, 1973).

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References

- Adamic, S., and Bihler, I. (1967). *Molecular Pharmacology*, 3, 188.
 Aitchison, J. D. (1958). *Lancet*, 2, 75.
 Bartle, H. J. (1928). *Medical Journal and Record*, 127, 521.
 Booth, C. C. (1973). In *Ninth Symposium on Advanced Medicine*, ed. G. Walker, p. 421. London, Pitman Medical.
British Medical Journal (1966). 1, 1344.
British Pharmacopoeia (1973). p. 418. London, H.M.S.O.
 Coghill, N. F., McAllen, P. M., and Edwards, F. (1959). *British Medical Journal*, 1, 14.
 Connell, A. M., *et al.* (1965). *British Medical Journal*, 2, 1095.
 Darlington, R. C. (1966). *Journal of the American Pharmacology Association*, N.S.6, 470.
 Fleischer, N., *et al.* (1960). *Annals of Internal Medicine*, 70, 791.
 Fordtran, J. S., and Ingelfinger, F. J. (1968). In *Handbook of Physiology*, ed. C. F. Code, Section 6, Vol. 3, p. 1457. Washington, American Physiological Society.
 Frame, B., *et al.* (1971). *Archives of Internal Medicine*, 128, 794.
 French, J. M., Gaddie, R., and Smith, N. (1956). *Lancet*, 1, 551.
 Goiffon, B., and Fron, G. (1961). *Gastroenterologia (Basel)*, 69, 312.
 Goulston, S. J. M., and McGovern, U. J. (1969). *New England Journal of Medicine*, 281, 290.
 Graeff, J. de, and Schuur, M. A. M. (1960). *Acta Medica Scandinavica*, 166, 407.
 Hart, S. L., and McColl, I. (1968). *British Journal of Pharmacology and Chemotherapy*, 32, 683.
 Heilbrun, N. (1943). *Radiology*, 41, 486.
 Heilbrun, N., and Bernstein, C. (1955). *Radiology*, 65, 549.
 Heizer, W. D., *et al.* (1968). *Annals of Internal Medicine*, 68, 839.
 Houghton, B. J., and Pears, M. A. (1958). *British Medical Journal*, 1, 1328.
 Jewell, F. C., and Kline, J. R. (1954). *Radiology*, 62, 368.
 Jones, F. Avery, Gummer, J. W. P., and Lennard-Jones, J. E. (1968). *Clinical Gastroenterology*, 2nd Edn., p. 57. London, Blackwell.
 Joint Committee of the Pharmaceutical Society and the Society for Analytical Chemistry (1965). *Analyst*, 90, 582.
 Kramer, P., and Pope, C. E. (1964). *Archives of Internal Medicine*, 114, 634.
 Litchfield, J. A. (1959). *Gastroenterology*, 37, 483.
 Love, D. R., *et al.* (1971). *Gut*, 12, 284.
 Metcalf-Gibson, A., *et al.* (1967). *Clinical Science*, 33, 89.
 Meulengracht, E. (1938). *Lancet*, 2, 774.
 Morson, B. C. (1971). *Gut*, 12, 867.
 Perkins, J. G., Peterson, A. B., and Riley, J. A. (1950). *American Journal of Medicine*, 8, 115.
 Philips, R. A., *et al.* (1965). *Nature (London)*, 206, 1367.
 Plum, G. E., Weber, H. M., and Sauer, W. G. (1960). *American Journal of Roentgenology, Radium Therapy and Nuclear Medicine*, 83, 919.
 Plumley, P. F. (1973). *Proceedings of the Royal Society of Medicine*, 66, 243.
 Ramirez, B., and Marieb, N. J. (1970). *Connecticut Medicine*, 34, 169.
 Rawson, M. D. (1966). *Lancet*, 1, 1121.
 Schwartz, W. B., and Relman, A. S. (1955). *Journal of Clinical Investigation*, 32, 258.
 Shields, R., Mulholland, A. T., and Elmslie, R. G. (1966). *Gut*, 7, 686.
 Sladen, G. E. (1972). *Proceedings of the Royal Society of Medicine*, 65, 288.
 Smith, B. (1968). *Gut*, 9, 139.
 Smith, B. (1972 a). *Proceedings of the Royal Society of Medicine*, 65, 288.
 Smith, B. (1972 b). *The Neuropathology of the Alimentary Tract*, p. 92. London, Edward Arnold.
 Todd, I. P. (1973). *Proceedings of the Royal Society of Medicine*, 66, 244.
 Van Rooyen, R. J., and Ziady, F. (1972). *South African Medical Journal*, 46, 998.
 Wiggins, H. S. (1973). Unpublished observations.
 Wittoesch, J. H., Jackman, R. J., and McDonald, J. R. (1958). *Diseases of the Colon and Rectum*, 1, 172.
 Witts, L. J. (1937). *Lancet*, 1, 427.
 Wolf, H. P., *et al.* (1968). *Lancet*, 1, 257.
 Wrong, O., *et al.* (1965). *Clinical Science*, 28, 357.