INTESTINAL OBSTRUCTION DUE TO FOOD

BY

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Intestinal obstruction due to impacted foodstuffs is a rare but interesting and well-recognized surgical emergency. The incidence of this type of obstruction may be assessed from the analysis by Storck, Rothschild, and Ochsner (1940) of a series of 875 cases of acute intestinal obstruction, excluding those due to herniae, neoplasms, or peritonitis, and treated at the Charity Hospital, New Orleans. Of these, 51 were due to foreign bodies, and of this number five were caused by the impaction of food boluses. Handfield-Jones and Porritt (1948) give the incidence of intraluminal foreign-body obstruction as 0.3% of all cases of acute intestinal obstruction. Latchmore (1940) had the exceptional experience of operating in one year on no fewer than four cases of obstruction due to food. There have been only four such cases at the Radcliffe Infirmary in the last 20 years. One of these was due to orange pith, and has been reported elsewhere by Fleming and Ward-McQuaid (1950).

Elliot (1932) listed 40 cases of food impaction, and Fantus and Kopstein (1940) brought this number up to 75. Since their paper, single instances of small series have been reported. Four further cases are now recorded—two due to orange pith, one to almonds, and one to watercress—so that, including the other case due to orange pith mentioned above, 178 cases have now been traced. Delrio, Paz, and Carpanelli (1944) discussed 31 cases, including 7 of their own; but 13 of these have not been included, as the case histories are not reviewed in full and the relevant original South American publications are not available. It is clear that great numbers of cases occur and are not reported, and perhaps the bizarre examples are more likely to be recorded than those that are less unusual.

Certainly, many foodstuffs have been reported as causing obstruction. In all, no fewer than 45 different obstructing agents have been encountered. In the accompanying list they are given in order of frequency of occurrence.

Obstruction due to the persimmon, the "date-plum" of North America, heads the list with 30 cases, and has been recorded most often from those parts of the United States where persimmons are found. The male predominance has been attributed to the increased consumption of the fruit on hunting trips. The persimmon skin contains shiboul, a cement substance, which is precipitated by the acid in the stomach and agglutinates the seeds and fibres into a type of bezoar called a diosporobezoar. These are not strictly food boluses. Obstruction due to this agent often becomes manifest long after eating persimmons. The subject is well reviewed by Newburger (1941), and is not discussed further in this paper.

Geographical Distribution

The relative incidence of these different impacted foodstuffs varies with the eating habits and economic conditions of the individual and country concerned. A bare recital of the number of times different types of food have caused obstruction gives little idea of the human interest of many of the individual case histories. For example, the case described by Ackman (1939) concerns a choke-cherry-eating competition in which a little Canadian boy of 7 in his enthusiasm swallowed a great number of the cherries whole, some with their stalks, and a few even in small bunches. Before operation coils of small bowel could be felt to be filled with small round hard bodies. He recovered

List of Obstructing Foodstuffs

The 45 obstructing foodstuffs are given in order of frequency, including those now reported. The small numerals indicate the 44 authors not included by Fantus and Kopstein (1940) who are listed in the Appendix.

	No. of Cases
Persimmons 22, 36	30 (not true food boluses)
Peaches 6, 10, 13, 14, 16, 26, 30, 42 ..	18 (10 dried)
Oranges 1, 2, 7, 14, 17, 18, 29, 31, 38 ..	16
Mushrooms	9
Bran 25, 35	8 (3 doubtful)
Apples 3, 11, 31, 32, 33, 37	7 (3 dried)
Figs 14, 19	7
Unspecified fruits 9, 33	6 (4 dried, 2 baked)
Cherries 31 (some including stones) ..	6
Grapes	6
Beans 1	5
Coconut 31, 35	3
Potatoes 11	3
Apricots 28, 40	3 (1 dried)
Carrots 44	3
Ammunition bread ("Kriegsbrot") ..	3
Oats	3
Pears	3 (2 dried)
Water-melons 5, 43 (including seeds) ..	3
Almonds 31	2
Cucumber	2
Gooseberries	2
Grasshoppers ("Sauterelles")	2
Peanuts 31, 43	2
Poppy seeds	2

One each of: banana 41, bones and peanuts 4, butter beans 43, cantaloup 23, chicken skins 34, fish scales, fruit and peas, garlic bulb 12, green corn 41, lettuce leaves 8, orange and seeds, popcorn, poppy seeds, peas and beans, potato and peas, radish and garlic, raisins, sweet potato 43, prunes, sauerkraut, turtle eggs 39, and watercress.

The mention of obstruction from celery 27, collards, or coleworts, which resemble cabbages but have no heart 18, has been encountered, but no actual reference traced.

following enterotomy five days after the eating match, of which, although there is no record, he must surely have been the victor. Elliot (1932) describes how an American "hobo" rode for several days in a freight car and, half starved, entered an orange grove, where he consumed some two dozen oranges. He became acutely obstructed, and in spite of enterotomy died two days later.

The increased consumption of coarse foods, and of the so-called "ammunition bread" containing poppy seeds in Germany and Austria after the 1914-18 war, was responsible for many of the cases reviewed by Elliot (1932). Obstruction from eating oats was encountered in Russia, where a similar state of affairs existed at that time. Three-quarters of the cases he collected had occurred in these countries.

Most of the cases of obstruction from fresh and also from dried peaches have been reported from South America, while several due to various dried fruits were recorded in this country a few years ago. Obstruction due to dried fruits, grouped as a whole, and including dried apples, apricots, figs, peaches, and pears, accounts for almost one-third of the cases not included by Fantus and Kopstein (1940). These authors gave mushroom fibres as the commonest single obstructing agent, as did Elliot in 1932. Delrio *et al.* (1944), dealing largely with cases recorded in South America, gave the order of frequency as peaches, apples, oranges, figs, bananas, and, exceptionally, large lumps of meat. There is, however, no case report of meat as an obstructing agent in their paper, nor can one be traced in English literature.

A vegetable foodstuff was responsible for 172 of the 178 cases listed above: in the remaining six cases the obstructing agent was grasshoppers in two, and fish scales, chicken skins, turtle eggs, and bone (with peanuts), in one each.

Calevaert (1933) encountered the patients who were obstructed by the grasshoppers (translated as "locusts" by Fantus and Kopstein, 1940) in the Belgian Congo. He adds a gastronomic note on the way this dish should be prepared, explaining that these two patients ate the grasshoppers whole, unfortunately with fatal results.

The turtle eggs were consumed whole at a picnic in Ohio while the victim was in a state of intoxication (Rambo *et al.*, 1939). These eggs are considered edible, but they have a thick membranous covering and are often 3 cm. in diameter. The majority of cases of obstruction due to orange pith were encountered in this country or in the United States. It is of interest that 4 of the 16 impactions occurred in patients who had previously had a radical operation for peptic ulceration. Two cases of obstruction by water-melons and one by sweet potatoes were reported from New Orleans (Storck *et al.*, 1940, and Anderson and Anderson, 1930). Impaction of a garlic bulb was reported from Poland by Ciechanowski (1938).

Predisposing Factors

The majority of obstructing foodstuffs are those rich in fibre, desiccated fruits which swell as they take up water, or substances resistant to the digestive juices. The foods are often uncooked, and in the case of fruits sometimes unripe. In many cases only a small quantity of the obstructing foodstuff is taken, but sometimes the amount ingested is excessive. Mastication is often absent or inefficient, either because the patient is edentulous or because he has bolted the meal. Sometimes the food is taken on an empty stomach and squeezed together into a bolus in the small intestine: symptoms are then precipitated by the next meal. At other times an excessive fluid intake dilutes the digestive juices or causes desiccated fruits to swell.

The patient may have had previous similar but less severe attacks, and Caylor and Nickel (1936) report a case in which the ileum of the same patient was obstructed first by parts of apples, with recovery, and later by what was probably raw potato, with a fatal outcome.

Impaction is most common where the ileum is at its narrowest, some 100 cm. from the ileocaecal valve. The bowel at this site is almost always healthy, but impaction may occur anywhere in the intestine, at the site of a benign or a neoplastic stricture. Occasionally the site of obstruction is in healthy jejunum or in large bowel, particularly the rectum. All age groups may suffer from obstruction due to foodstuffs, and the age factor does not seem to be of importance except when associated with an atonic intestine. Constipation due to excessive dehydration is a further possible predisposing cause in large-gut obstruction. Faecal impaction is of course not uncommon in the rectum of the aged, debilitated, or paralysed, but this is another matter.

Impaction of food in the small intestine has on four occasions been reported as following a Polya type partial gastrectomy. Two of these patients suffered from "dumping" symptoms. The obstructing agent was orange pith in those two (Baumeister and Darling, 1947; Fleming and Ward-McQuaid, 1950), and also in one other (Allen and Smithwick, 1942), while impaction of sauerkraut had occurred in the case described by Seifert (1930). Orange-pith obstruction followed gastro-enterostomy in one of the cases recorded by Delrio *et al.* (1944). The stoma allowed the bolus to pass freely into the jejunum of these patients.

It would be interesting to know if any examples of this type of obstruction have followed the Mohammedan practice during Ramadan of fasting from sunrise to sunset, and also whether the dehydrated or concentrated foods, other

than dried fruits, prepared during the last war ever gave rise to intestinal obstruction.

Impaction in animals is not uncommon, and is discussed by Woolldridge (1934) and by Grieg (1946).

Clinical Features

The clinical features of intestinal obstruction due to foodstuffs in man have been well described by many authors, including Elliot (1932) and Latchmore (1940), the latter of whom uses the expressive term "bolus colic" in describing this condition. Brunzel (1918) used the term "food ileus." Many subacute cases recover and are dismissed with diagnoses such as "green-apple colic." It is likely that some cases of "food-poisoning" and many cases of "stomach-ache" are also examples of this condition.

There is often a history of a variation from the normal diet, frequently associated with one of the predisposing causes already discussed. There may have been a previous similar but milder attack. The time of onset after ingesting the obstructing agent is very variable, but when the impaction occurs in the small intestine it is generally of the order of a few hours. Signs and symptoms characteristic of intestinal obstruction appear.

Obstruction due to foodstuffs should be considered when some of the predisposing factors mentioned above are present, especially if the distension is out of proportion to the duration of the obstruction, the constitutional reaction is mild, and there are no signs of peritonitis. Occasionally the loop of intestine containing the impacted bolus may be palpable. Appendicitis may be simulated, as may carcinoma of the colon or rectum when the site of obstruction is in the large bowel.

In late cases the clinical picture is of progressive intestinal obstruction with severe vomiting, dehydration, distension, and rapid deterioration of the general condition. Peritonitis may occur with or without perforation.

Treatment

If the condition is diagnosed before operation, conservative treatment in the form of intestinal decompression, parenteral fluid, antispasmodics, and enemata may be tried. In the absence of improvement in small-bowel obstruction, however, operation must not be long delayed. Enemata are most likely to be successful in large-bowel obstruction, but manual evacuation may sometimes be needed.

In most cases the diagnosis is not made until the abdomen has been opened. The site of impaction is usually found to be in the lower ileum, and the affected loop is often red, engorged, and oedematous. The obstructing bolus can frequently be broken up and "milked" away into the caecum, but more often an enterotomy is necessary. Storck *et al.* (1940) consider that enterotomy is the treatment of choice, regarding the "milking" process as likely to produce paralytic ileus. Frank (1936), who had a death from peritonitis after enterotomy due to thrombosis of the intestinal vessels in a 4-day-old obstruction, and a success after a resection in a case of 24 hours' duration, stated that he would again perform a resection if he encountered a similar case. Covaro and Nunziata (1939), who had four consecutive fatalities, consider that a Miller-Abbott tube should be used as a routine after operation in order to circumvent the dangers of ileus.

The prognosis clearly depends on the duration of the obstructive symptoms and the condition of the patient: the majority of the cases recently recorded have been treated successfully. The fatality rate of 47.8% in the cases operated on in the series collected by Elliot (1932) shows that the condition is a serious one.

Case 1.—Impaction of Almonds in Healthy Lower Ileum

A woman aged 31 was admitted to the Radcliffe Infirmary in August, 1949, suffering from colicky abdominal pains of 10 hours' duration. She had never had a similar pain, and there was no relevant previous history.

After an early breakfast at 5.30 a.m. she had spent the greater part of the day of admission travelling by car to Oxford from the North. She had some coffee and a scone at 9 a.m., and at 11.30 a.m. ate about a score of almonds. These were not chewed well, because she was driving, and one or two of them were bad and were swallowed quickly, followed by others chewed hastily to take the bad taste away. Some two hours later she noticed mild colicky abdominal pains, but she enjoyed a large lunch soon after. The pains became more severe after this meal, and by early evening she was doubled up when she had the pains. She did not eat again that day. She felt sick but did not vomit. Her bowels were not moved during the day, and she passed no flatus after the onset of the pains.

On examination her temperature was 98.4° F. (36.9° C.) and pulse 88. Her general condition was good. She had good teeth and her tongue was slightly furred. The abdomen was slightly distended and moved on respiration. There was some guarding below the umbilicus, more pronounced on the right side, but no release tenderness. Rectal examination revealed tenderness in the midline anteriorly. The most likely diagnosis was obstructive appendicitis with the organ directed medially and downwards.

Operation.—Under general anaesthesia the abdomen was explored by a right lower paramedian incision. On opening the peritoneum distended coils of small bowel presented and much clear free fluid escaped. The appendix was long and retrocaecal, but not inflamed. The terminal ileum was collapsed. The site of obstruction was found some 150 cm. from the ileocaecal valve. The bowel was bright red for some 45 cm. and was distended to over 5 cm. in diameter above a bolus obstructing its lumen. The obstructing agent was a pulsaticeous mass 5 by 10 cm. made up of hard white particles, some of them 1.2 cm. long, and resembling the almonds she had eaten so hastily about 11 hours previously. The bolus was "milked" down to the ileocaecal valve. Appendectomy was performed and the wound closed in layers with nylon. Convalescence was uneventful.

Case 2.—Impaction of Orange Pith in Healthy Terminal Ileum

A man aged 71 was admitted to St. Giles' Hospital, Camberwell, in March, 1936, suffering from colicky abdominal pain of 12 hours' duration. There was no relevant history. On the day previous to admission he had eaten his "high tea" between 5 and 6 p.m. and rounded off the meal with an orange, which was swallowed quickly. He was awakened in the middle of the night by severe intermittent colicky central abdominal pain. The pain became progressively more severe, and he vomited several times. His bowels had been opened the previous day, but not since the onset of the pain.

On examination his temperature and pulse were within normal limits and his general condition was good. His teeth were inadequate for proper mastication and his tongue was furred. The abdomen was slightly distended and moved on respiration. During the examination the patient was seized with a severe bout of colicky pain, and visible peristalsis of the small bowel was seen through the thin abdominal wall. There was fullness, and a palpable mass in the right iliac fossa. This mass was dull to percussion and measured 7.5 by 7.5 cm. No abnormality was found on rectal examination. A diagnosis of acute intestinal obstruction was made, and a carcinoma of the caecum was thought to be the cause.

Operation.—The abdomen was explored by Mr. A. Elliot-Smith through a right lower paramedian incision. On opening the peritoneum clear fluid escaped and distended small bowel presented. The obstructing agent was found firmly impacted about 90 cm. from the ileocaecal valve, and measured 5 by 7.5 cm. The dilated bowel above the obstruction was lilac-coloured, in contrast to the normal colour of the collapsed

bowel distal to the impacted bolus. An enterotomy was performed, the pith from the two halves of an orange was removed, and the bowel closed with two layers of catgut sutures. The bowel above the site of the previous obstruction now regained its normal colour. The mass in the right iliac fossa was found to be a solitary cyst attached to the lower pole of the right kidney. Convalescence was uneventful.

Case 3.—Impaction of Orange Pith at the Site of Kinking in the Jejunum

A chambermaid aged 45 was admitted to the Radcliffe Infirmary under the care of Mr. D. A. Abernethy one evening in October, 1935. She had been well until that morning, when she had been seized by a severe intermittent colicky pain in the left loin and to the left of the umbilicus. She vomited once. The pains lasted three-quarters of a minute and came on every 10 minutes, causing her to roll about in an effort to get relief. Lying on her right side eased the pain. She had some frequency of micturition, and her bowels had opened normally that morning, but not since the pains began. After a time the pain moved to the left iliac fossa. There was no history of a previous attack, and no relevant previous history.

On examination her temperature was 98° F. (36.7° C.) and pulse 96, and her general condition was good. During attacks of pain she screwed up her face and rolled about. Her abdomen was not distended, and there was some guarding but no rebound tenderness in the left iliac fossa. There was tenderness in the left loin. A diagnosis of left ureteric colic was made. A specimen of urine was examined, but was found to be normal.

The pains continued, and she vomited occasionally. Next evening, 24 hours after admission, she did not look so well. The pulse was steady, but there was some lower abdominal distension, especially on the left side. A diagnosis of small-intestine obstruction was made.

Operation.—The abdomen was explored by Mr. A. J. Grace through a left paramedian incision. There was much free straw-coloured fluid, and the upper jejunum was distended. The two limbs of a jejunal loop were found to be bound together by veil-like adhesions so that the bowel was acutely kinked and its lumen narrowed. A bolus was impacted on the proximal side of this kink, and was found on removal to consist of orange pith. The adhesions were divided, and an entero-anastomosis was performed. Recovery was uneventful.

Case 4.—Impaction of Watercress in Healthy Lower Ileum

A housekeeper aged 69 was admitted to the Radcliffe Infirmary in February, 1935, suffering from colicky abdominal pain and vomiting of three days' duration. The pain was at first to the left of the umbilicus, but later became generalized and more severe. Vomiting followed and became persistent. The patient's bowels had not been moved since the onset of symptoms, though they had previously been regular. On the day of admission she was vomiting everything taken by mouth.

On examination her temperature was 99° F. (37.2° C.) and pulse 80. Her general condition was good. There was no distension of the abdomen or any tenderness; no masses were felt, and rectal examination was normal. A radiograph showed no abnormality, but an occult blood examination of the stools was positive.

The patient was observed for two days, but her symptoms did not subside and it became evident that she was suffering from acute intestinal obstruction.

Operation.—The abdomen was explored under general anaesthesia by Mr. D. A. Abernethy through a midline subumbilical incision. The small bowel was distended, and the obstructing agent was found in the lumen of the lower ileum. Enterotomy was performed and a mass some 5 cm. in diameter was removed. It consisted of fibres and faeces, and in texture resembled a loafah. Dissection of the bolus showed that it was made up of the stems and leaves of watercress rolled up and encrusted with faeces. After operation she said that she had eaten a large quantity of watercress at tea the day before her pains began. Convalescence was uneventful.

Comment

These four case histories illustrate many of the features of this type of intestinal obstruction. Orange pith is a relatively common obstructing agent, and, while one case of obstruction due to almonds is already to be found in the literature (Latchmore, 1940), watercress (as in Case 4) has not previously been recorded as the obstructing foodstuff. In both Case 1 and Case 2 mastication was inadequate.

Summary

The great variety of foodstuffs reported to have caused acute intestinal obstruction are listed in order of frequency. In all, 178 cases were traced and obstruction was found to be due to 45 different agents. Of these, persimmons, peaches, oranges, mushrooms, bran, apples, figs, cherries, and grapes were the most frequent, in that order, and accounted for more than one-half the obstructions. Dried fruits accounted for almost one-third of the cases reported in recent years.

The geographical distribution, predisposing factors, clinical features, diagnosis, treatment, and prognosis of this condition are outlined. Oranges appear to be the most common obstructing agent in this country.

Four further cases are reported. Two of these were due to orange pith, one to almonds, and one to watercress: three impactions occurred in healthy lower ileum, and one at the site of an organic stenosis in the jejunum. The almond bolus was broken up and "milked" into the caecum, but enterotomy was necessary in the other three cases. All four patients recovered uneventfully.

I am indebted to Mr. D. A. Abernethy, Mr. A. Elliot-Smith, and Mr. A. J. Grace for permission to publish their cases.

APPENDIX

Alphabetical list of 44 authors not referred to by Fantus and Kopstein (1940), together with the obstructing foodstuff concerned.

- ¹Aird, I. (1949). *A Companion in Surgical Studies*. Livingstone, Edinburgh.—Beans, orange.
- ²Allen, A. E., and Smithwick, R. (1942). *New Engl. J. Med.*, **226**, 864.—Orange.
- ³Alsen, P. (1938). *Nord. med. Tidsskr.*, **16**, 1165.—Dried apple.
- ⁴Altman, G. G. (1931). *Kentucky med. J.*, **29**, 370.—Bone and peanuts.
- ⁵Anderson, A. L., and Anderson, C. W. (1930). *N. Orleans med. surg. J.*, **83**, 256.—Water-melons.
- ⁶Andrews, F. L., and Walker, T. F. (1937). *J. Amer. med. Ass.*, **109**, 431.—Dried peach.
- ⁷Baumeister, C. F., and Darling, D. D. (1947). *Ann. Surg.*, **126**, 251.—Orange.
- ⁸Benzadon, J. (1944). *Bol. Soc. Cir. Rosario*, **11**, 109.—Lettuce leaves. (Not verified.)
- ⁹Bombicino, J. A. (1945). *Rev. Sanid. mil., B. Aires*, **44**, 573.—Dried fruit.
- ¹⁰Canton, R. V. (1937). *Arch. urug. Med.*, **10**, 509.—Dried peach.
- ¹¹Caylor, H. D., and Nickel, A. C. (1936). *Ann. Surg.*, **104**, 151.—Apple and raw potato.
- ¹²Ciechanowski, S. (1938). *Zbl. allg. Path. path. Anat.*, **69**, 357.—Garlic bulb.
- ¹³Covaro, A. A., and Nunziata, A. (1939). *Rev. Med. Cienc. af.*, **1**, 11.—Dried peaches.
- ¹⁴Delrio, J. M. A., Paz, R., and Carpanelli, J. B. (1944). *Rev. Asoc. med. argent.*, **58**, 232.—Oranges, peaches.
- ¹⁵Desjardines and Bondet (1939). *Lyon méd.*, **163**, 708.—Fig.
- ¹⁶Dorling, G. C. (1945). *British Medical Journal*, **2**, 426.—Dried peach.
- ¹⁷Fleming, J. P., and Ward-McQuaid, J. N. (1950). *Aust. N.Z. J. Surg.* In press.—Orange.
- ¹⁸Griffith, F. W. (1936). *Ann. Surg.*, **103**, 769.—Orange (mentions collards).
- ¹⁹Herz (1931). Quoted by Griffith (1936).—Fig.
- ²⁰Roldan (1929). Quoted by Griffith (1936).—Dried peach.
- ²¹Zielke (1933). Quoted by Griffith (1936).—Poppy seeds. In discussion on Griffith's paper:
- ²²Bullock, W. O. (1936).—Persimmons.
- ²³Crisler, J. A. (1936).—Cantaloup.
- ²⁴Frank, L. W. (1936).—Insipissated food containing fibres.
- ²⁵Rhodes, R. L. (1936).—Bran.
- ²⁶Harless, M. S. (1937). *Ann. Surg.*, **105**, 295.—Peach.
- ²⁷Hart, W. E. (1923). *J. Amer. med. Ass.*, **81**, 1870.—Mentions celery.
- ²⁸Johnson, J. A. (1931). *Minn. Med.*, **14**, 635.—Apricot.

- ²⁹Jones, A. S., and Davies, S. W. V. (1945). *British Medical Journal*, **1**, 734.—Orange.
- ³⁰Lambley, D. G. (1946). *Ibid.*, **1**, 684.—Dried peach.
- ³¹Latchmore, A. J. C. (1940). *Lancet*, **1**, 1153.—Almonds, apple, cherries, coconuts, monkey nuts, orange.
- ³²Linton, P. (1937). *Svenska Läkartidn.*, **34**, 593.—Dried apple (not verified).
- ³³Lyall, A. (1945). *British Medical Journal*, **1**, 734.—Dried fruit, dried apple.
- ³⁴McIver, M. A. (1932). *Arch. Surg.*, **25**, 1106.—Green corn, bran.
- ³⁵Mattson, H., and Larson, E. A. (1941). *Minn. Med.*, **24**, 559.—Coconut, chicken skins.
- ³⁶Newburger, B. (1941). *Rev. Gastroent.*, **8**, 293.—Persimmons.
- ³⁷Postel, H. J. (1939). *Ned. Tijdschr. Geneesk.*, **83**, 1959.—Dried apple.
- ³⁸Radcliffe, L. (1945). *British Medical Journal*, **1**, 135.—Orange.
- ³⁹Rambo, C. M., Lasky, L., and Iden, J. F. (1939). *Ohio St. med. J.*, **35**, 261.—Turtle eggs.
- ⁴⁰Ryan, T. F. J., and Nagle, J. (1945). *British Medical Journal*, **2**, 426.—Apricot.
- ⁴¹Santamarina, G. A. R., and Hours, R. D. (1939). *Sem. méd., B. Aires*, **2**, 856.—Banana.
- ⁴²Soothill, E. F. (1946). *Guy's Hosp. Gaz.*, **60**, 164.—Dried peach.
- ⁴³Storck, A., Rothschild, J. E., and Ochsner, A. (1939). *Ann. Surg.*, **109**, 844.—Water-melons, peanuts, raw butter bean, sweet potatoes.
- ⁴⁴Voncken, J. (1942). *Bull. Acad. roy. Méd. Belg.*, **7**, 368.—Carrots.

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INTRAVENOUS IRON IN THE TREATMENT OF ANAEMIA

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It is not uncommon to see patients suffering from a microcytic hypochromic anaemia at hospital out-patient departments who have had oral iron therapy for months or years without benefit.

Excluding those cases in which diseases and deficiencies are present which could account for the continued anaemia, a considerable proportion of cases remain. These include: (1) those who have not tolerated iron in the dosage advised by the general practitioner, and who have failed to take any quantity of the preparations ordered; (2) those who seem unable to tolerate even the smallest doses of iron preparation given by mouth; and (3) those who seem unable to absorb adequate quantities of iron, the response to oral therapy falling far short of expectations. While many patients in Group 1 will tolerate a reduced dose of iron and obtain a satisfactory result, those in Groups 2 and 3 constitute a problem of introducing enough iron into the body to effect a cure.

Goodman and Gilman (1941) have shown that a healthy adult has 150 g. of circulatory haemoglobin containing 2.5 g. of iron. In an anaemic patient 25 mg. of iron must therefore become available to allow a rise of 1% haemoglobin.