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INFECTION OF THE GASTROINTESTINAL TRACT IN SYSTEMIC
DISORDERS:

MEDICAL VIEWPOINT WITH SPECIAL REFERENCE TO CLASSIFICA-
TION OF CASES; THE IMPORTANCE OF ADVANCED BACTERI-
OLOGY AND BIOCHEMISTRY.*

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THERE is no such thing as a "medical case" in gastrointestinal diseases. Every patient should be studied by the internist and surgeon conjointly. Most cases need minor surgery of some sort, but few need major abdominal operations. Infection plays an important role in every case. The profession is fortunately awakening to the necessity of a very complete survey of every chronic intestinal invalid. Without this thorough study, reports and statistics are without value. In the past, and still unfortunately in the present, many an abdominal operation for gall-bladder disease, stomach or intestinal ulcers, adhesions, chronic appendicitis, bowel resections and exclusions has had bad sequelae or at least disappointing results. The reason for this has been due, in numerous instances, to overlooked focal infections or to a disregard to the fact that the abdominal pathology may itself constitute a focal infection and require further investigation.

It has long been known that mouth disease breeds stomach and intestinal disorders, but in spite of this fact the mouth has

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been constantly neglected as an important factor in these ailments. The tendency is quite general to regard the mouth as of secondary importance. Even if so considered it must be conceded that focal infections in the mouth or elsewhere may be a detriment to health and should be thoroughly removed. It is our opinion that these focal infections should be removed when practicable, prior to abdominal operation.

The study of the morphology and function of the gastrointestinal tract has made very rapid strides during the past few years. It is now regarded as a routine procedure always to be employed in the investigation of a chronic digestive disorder, no matter how simple the conditions may appear. Morphologic defects in the gastrointestinal tract should be studied from the bacteriologic standpoint. When the stomach or duodenum are involved, cultures from contents removed through the duodenal tube, according to the fractional analysis method, are frequently of value, not alone for diagnosis but for vaccine therapy. Cotton and Satterlee¹ have noted the high bacterial content in gastric contents that are deficient in free hydrochloric acid and also the converse. After a course in autogenous vaccine or serum therapy, the gastric contents have in many instances returned to normal. It is probable that gastric infection has been responsible for the abnormal gastric contents. Our results have made us believe that the bacteria recovered in this way may not be accidental although the method of obtaining the bacteria is necessarily open to criticism.

A large number of causes of gastric and duodenal ulcer are given, Smithies² cites 10 causes in 522 cases of proved gastric ulcer. In his list of causes he places only 33.1 per cent under the head of acute and chronic infections. However, it seems reasonable to suppose that there is present infection in the ulcer, at least as a secondary occurrence. Smithies recognizes this. Until we have more definite information as to the origin of these ulcers, we must be contented in dealing with them as terminal affairs in the hope of curing them as such with little chance of prevention.

The Medical Treatment of Chronic Intestinal Toxemia. This consists of diet, massage, hydrotherapy and vaccines or serum.

The diet consists of animal protein free food, principally vegetables, fruit and cereals.

Refined white flour is eliminated and whole wheat flour substituted.

The diet at first is very strict; no eggs and very little milk being allowed.

Bran is an essential article and is given once or twice daily—1 to 2 ounces.

¹ Fractional Gastric Analysis, Tr. Section on Gastroenterology and Proctology, Jour. Am. Med. Assn., 1920, 29.

² Jour. Am. Med. Assn., 1920, 74, 1855.

When the stools are dry and hard, agar is given in the food.

A liberal diet is permitted and encouraged, but it is often wise to underfeed rather than overfeed.

All laxatives and cathartics are forbidden. This includes mineral oil. Caster oil is useful occasionally when specially indicated, but only under special instructions. The same is true of enemata and colon irrigations.

Continued use of drugs and irrigations is harmful. Colon massage is of great value in obstinate constipation. Its use should be systematic.

Hydrotherapy, in the shape of eliminating cabinet baths, followed by Seot's douche helps the physical welfare of the patient.

Electrotherapy and mechanotherapy are also of great value, provided the patient can afford the time.

Vaccines and Scrotherapy. It must be constantly borne in mind that the constipation in most of these cases is of toxic origin, probably protective. It is possibly for this reason that laxatives and cathartics are harmful.

It is with this idea in mind that we have practised vaccine and scrotherapy in nearly all our suitable cases, and with satisfactory results. Dr. Cotton has found that vaccines and sera are important aids in the treatment of toxic psychoses, both before and after operation. He and the writer³ practised successfully along these lines before knowing of the other's results. We also had many satisfactory results with the vaccines alone before becoming convinced of the necessity of removing all obvious foci of infection.

The routine procedure for colon vaccines is to obtain the stool after a purgative dose of castor oil. The third stool is preferable, as it contains the virile bacilli from the ceco-colon region. Cultures are taken and a vaccine made from the isolated colon organisms by the usual well-known technic. These vaccines are given as a routine every four days in doses of from 100,000,000 to 300,000,000, depending upon the general reactions. The duration of treatment depends upon the degree of immunity established in the individual case.

Serum Therapy. We owe the serum to Dr. Cotton's researches. It is obtained from a horse that has been immunized by the various strains of streptococci and colon bacilli obtained from cultures from infective foci in the patients at the New Jersey State Hospital.

My own results with this serum have been very gratifying in the few cases in which it has been used. The dosage begins at 1 cc and gradually increases up to the full dose of 10 cc.

The one disadvantage of the serum is the occasional occurrence of serum sickness. The intestinal toxic symptoms subside rapidly after its administration.

³ Satterlee, G. R.: New York Med. Jour., 1918, 107, 971.

Of other therapeutic agents generally employed there is little to recommend. Lactic acid cultures are of little value. Bulgarian bacillary milk has the value of a good milk food and may be of service in some cases.

Saline cathartics are harmful. The intestinal antiseptic drugs recommended, such as salol, creosote, etc., may be of temporary value, but symptomatically alone. Antacids and acids are often necessary and valuable aids, but in final analysis *materia medica* falls down as a curative agent.

Metabolic studies are essential in some patients in which disorders in metabolism are suspected. The diet should be modified to suit the case.

Infections with their consequent toxemias play the important role in most disorders of the alimentary canal.

If Rosenow's⁴ work on the experimental production of gastric and duodenal ulcers following the injection into animals of bacteria derived from cultures from the apices of infected teeth, thereby demonstrating the selective action of bacteria, is as accurate as it appears to be, the value of preventive dental surgery will have been established. Bumpus and Meisser⁵ have recently produced in animals streptococcic kidney lesions from cultures obtained from apices of devitalized teeth in patients showing pyelitis at necropsy. Our clinical experience seems quite in sympathy with this theory of the selective action of bacteria, so much so that we use it as a working premise. This lead follows directly into a most important field, that of *preventive surgery of the mouth*. This new and important branch of preventive medicine is still in the experimental stage, and after the necessary adjustments which will follow upon its extended clinical use, will in our opinion, prove to be of very great value. The question of the day is, "Should this problem be left alone to the laboratory worker or developed both clinically and experimentally? Should we leave these badly necrotic areas alone if no local or positive systemic symptoms exist or should we interfere?"

There is great need for more experimental work, and especially for *coöperation* between the oral surgeon, the dentist, the physician and the surgeon.

The bacteriology of dental and oral infections is studied in the laboratory of our office, cultures being taken from the apices of extracted teeth, necrotic bone areas and opened antra and from all tonsillar tissue removed. The technic employed is that of Hohnau.⁶

The all-important question relates to the effect of these hidden

⁴ Jour. Infect. Dis., 1915, 17, 219.

⁵ Jour. Am. Med. Assn., 1921, 77, 1466-1468.

⁶ The Classification of Streptococcus, Jour. Med. Research, 1916, 34, 377.

chronic infections upon the general mental and bodily condition and on the gastrointestinal tract.

There is every reason to consider the gastrointestinal tract from the lips to the anus as one organ, the structure, development and function being correlated in the closest possible manner. Foci of infection in the mouth or in the rectum frequently give rise to a similar train of symptoms, the predominating ones being constipation and flatulence. The removal of these obvious foci, provided the remainder of the tract is free from focal infection or permanent changes, will frequently clear up the intestinal symptoms and restore, without further intervention, the physical and mental equilibrium.

It is unfortunate, however, that patients are not studied in many instances before the infection has progressed to the stage of gastrointestinal ulcers, gall-bladder disease and permanent changes in the colon, when major instead of minor mutilation is definitely indicated—often with poor results. It is not amiss to speak here of our experience in chronic appendicitis. In a previous paper by one of our group (Satterlee⁷) 25 per cent of the patients with diseased colon had had the appendix previously removed without benefit or with apparent detriment. It is difficult to say just what this means. We incline strongly to the belief that often the primary infection was oral and that by the time the appendix was removed the toxemia had become generalized. When this had taken place the patient's condition was involved and the chances of cure more remote than in the early stages.

From a detailed study of over 1000 chronic intestinal invalids medically treated and of over 200 similar patients in whom a portion or all of the colon had been removed, we have come to the belief that many of these advanced cases with infected colons will not get well until the diseased portion of the organ is removed together with every other local focus. Medical treatment with vaccines and sera is indicated in every case.

The sequence in infective processes of the gastrointestinal tract is difficult to follow and to explain. The infection must travel in one or more of three ways: In the blood stream, lymphatics or lumen of the gut. Our operative experience combined with pathologic and bacteriologic findings leads us to believe that infection from the ceco-colon reaches the body cavity *via* the lymphatics, as evidenced by the enlarged lymph nodes in the mesentery. Colon bacilli and streptococci are frequently obtained from cultures of these nodes. Many observers consider that infections of the kidneys and other parts of the urinary tract originate in this manner.

The protective lymphatic system acts as a barrier to bacteremia from these organisms, many of which are very pathogenic.

⁷ Chronic Appendicitis and Chronic Intestinal Toxemia, New York, Med. Jour., 1916, 104, 882.

Chronic intestinal invalids, therefore do not suffer from a bacteremia but from a *toxemia*. This debilitates and deteriorates but rarely kills the patient directly. The human system may, under these toxic influences, undergo a lowering of resistance and become susceptible to other and perhaps more lethal infections.

It has become my fixed belief from prolonged study of chronic intestinal toxemia that the colon bacillus, perhaps the pathogenic forms only, is the primary cause of this lowered resistance, and that other types of bacteria, notably the streptococcus, are secondary infections. On the other hand, Bumpus and Meisser, in describing infection of the kidney by the colon bacillus, have suggested that the primary cause of this infection may be streptococci carried to the kidney from the colon through the lymphatics and that the colon bacilli as a secondary implantation have overgrown and supplanted the former. Much more study in the line of clinical research and experimentation is needed in this direction.

My own view of this subject is based on the study of over 500 cases of chronic intestinal toxemia treated by autogenous colon vaccines obtained from stools after catharsis. A suitable case, one with symptoms and signs of a chronically diseased ceco-colon, will invariably improve after the administration of autogenous colon vaccines, and also, as we have discovered lately, of an anti-colon and antistreptococcus serum prepared under the direction of Dr. Cotton. The reason for this improvement is, I believe, that the resistance of the individual has been enhanced.

As students of intestinal pathology it has been our misfortune that up to the last three years insufficient attention has been paid to the study and eradication of foci in all other parts of the body. The principal locations of these foci are in the tonsils, teeth, abscesses and necroses in the jaw, in the nasal sinuses, rectum, seminal vesicles and cervix uteri. Some of our former patients, who had been improved but not cured by vaccines and general medical therapy or by resection of the right colon, have since been restored to efficiency after the removal of these obvious foci of infection.

These principles are applicable to other diseased conditions, as, for example, in syphilis. Cotton* has observed chronic cases that could not be improved until the obvious foci of bacterial infection were removed. This has been my own experience in a limited number of cases. I will cite one case as an example: Male, aged forty years, with tertiary lues untreated for several years, severely affecting the heart, aorta and liver. After four years of the usual antiluetic treatment he improved but still showed a four-plus Wassermann and other signs of luetic activity. This year, after removal of an extensive mouth and jaw infection, with-

* Personal Communication.

out further antisyphilitic treatment, the Wassermann dropped to one-plus with other corresponding signs of improvement.

One of the most puzzling aspects of gastrointestinal infection is that it may produce the most profound mental or nervous disturbance, with little or no direct gastrointestinal symptomatology. Attention was called to this by one of our group (Satterlee⁹) in 1917. Careful neurologic study of these patients will reveal no etiologic factor until a detailed and complete study of the gastrointestinal tract and a thorough search for foci in other parts of the body have been made. Eradication of the diseased areas has brought about a return to normal or a great improvement, provided that deterioration has not progressed too far.

In this age of progress a single track is to be avoided and all our faculties must be used in thorough investigation, followed, if justified, by equally thorough treatment.

CULTURES FROM APICES OF EXTRACTED TEETH

Streptococcus mitis recovered in 37 extracted teeth.
Streptococcus salivarius recovered in 24 extracted teeth.
Streptococcus anginosus recovered in 7 extracted teeth.
Streptococcus pyogenes recovered in 6 extracted teeth.
Streptococcus equinus recovered in 4 extracted teeth.
Streptococcus fecalis recovered in 3 extracted teeth.
Staphylococcus albus recovered in 23 extracted teeth.
Staphylococcus aureus recovered in 4 extracted teeth.

Of the streptococci, the *streptococcus anginosus* and *pyogenes* are of the pathogenic hemolytic type, the others—*mitis*, *salivarius*, *fecalis* and *equinus*—are non-hemolytic.

CULTURES FROM NECROTIC BONE AREAS

Streptococcus mitis recovered in 13 cultures.
Streptococcus salivarius recovered in 9 cultures.
Streptococcus anginosus recovered in 6 cultures.
Streptococcus pyogenes recovered in 3 cultures.
Streptococcus equinus recovered in 2 cultures.
Streptococcus fecalis recovered in 1 culture.
Staphylococcus albus recovered in 8 cultures.
Staphylococcus aureus recovered in 1 culture.
 No growth recovered in 11 cultures.

Contamination in 1 culture.

It is thus to be noted that in 80 cases in which dental extraction and bone operation were performed the most frequent streptococci

⁹ Jour. Am. Med. Assn., 1917, 69, 1414-1417.

organisms recovered were from the apices and bone, the streptococcus mitis and salivarius of non-hemolytic type. Next the Streptococcus anginosus and pyogenes of the hemolytic type. The Streptococcus subacidus and equi have not as yet been found from our cases.

In analyzing the physical condition of the patients under treatment no conclusions in reference to the type of the organism recovered and the severity of the symptoms can, as yet be drawn.

Where the hemolytic organisms were recovered with one exception, the patients were distinctly ill. In one patient (M. J. C.), where all of the streptococcus organisms except the streptococcus fecalis, subacidus and equinus were recovered, marked cervical adenitis of persistent character was present.

CULTURES FROM ANTRA DIRECTLY ON OPENING THROUGH THE MOUTH.

Streptococcus mitis, 12	Staphylococcus albus 21
Streptococcus salivarius, 9	Staphylococcus aureus 3
Streptococcus anginosus, 3	Mucosus capsulatus, 1
Streptococcus pyogenes, 5	

These results correspond quite closely to the cultures from the teeth and bone cultures.

CASE I.—A. F., male, aged sixty-one years, retired business man.

Chief Complaint. Blood in the urine for twenty years, with occasionally severe hemorrhages. Renal calculus passed at the ages of twenty-four and forty-four, also gravel at times. Nervous depression and inability to work.

Diagnosis. Chronic intestinal invalidism with secondary renal involvement.

Past History. Scarlet fever twice, at sixteen and twenty-nine years. Slight deafness following otitis media in the right ear. Severe attacks of asthma every summer. Chronic digestive disturbance. Could not carry a light suit-case without a tight abdominal belt.

Family History. Brother has had occasional blood in urine.

Examination. Enteroptosis, including kidneys, three-plus; nutrition poor. Blood coagulation four minutes. Roentgen-ray demonstrated, no renal calculi. Infected teeth with necrosis and infected antrum. Ureteral catheterization showed red blood cells and occasional leukocytes from both ureters and 18 and 13 per cent of phenolsulphonephthalein in four minutes from the left and right kidneys respectively. Cultures from ureters showed Bacillus communior from both sides. Dental extraction and removal of necrotic areas and drainage of antrum done. Strepto-

coccus mitis and salivarius recovered. Vaccines made from the above colon bacillus isolated by ureteral catheterization administered over a period of six months.

Results. Excellent. General condition markedly improved. Patient can play thirty-six holes of golf without fatigue. One slight attack of blood in the urine during vacation when vaccines had been suspended. No attack of asthma this year. Urine examination six months after vaccine treatment began showed no red blood cells and no colon bacilli. Patient has not had so prolonged a period of well-being without hematuria for years.

This case is very suggestive of the connection between oral infection and kidney lesions. It is of speculative interest as to the relationship of the streptococci and the colon bacillus in kidney infections, especially those accompanied by hematuria.

CASE II.—S. F. B., female, aged fifty-four years.

Symptoms. Periodic attacks of loss of appetite; "bilious attacks;" "indigestion;" disgust for food and long periods of self-inflicted starvation. Spasm of esophagus on one occasion. Attacks of diarrhea with severe mental depression. Constipation habitual up to two years ago. Medical treatment for hemorrhoids, flatulence and nervous headaches for the past four years. No improvement. Pronounced neurasthenia and hypochondria; irascibility; incoöperative, incompetent, bordering on severe mental derangement. In bed most of the time.

Examination. Emaciated, anxious, sallow patient. Extensive fixed bridge-work. Numerous capped and crowned teeth. Infected tonsils; hemorrhoids; femoral hernia (reducible). Hemoglobin, 70 per cent, white blood cells, 10,000. Gastric fractional test, 18 per cent subnormal. Mucus 2-plus. Extreme nervous debility.

1. *Dental Operation.* September 26, 1921. Seven teeth removed. All necrotic bone, including floors of both antra, removed. Follicular cysts in the molar areas. Bone necrosis from the roots extended back to the palatal portion of the superior maxilla and to the first bicuspid on the upper right side. In the left antrum there was a catarrhal condition on the nasal side of the antrum opening into the nasal passage. Two openings from the necrosed areas into the nasal passage. Marked improvement.

2. *Tonsillectomy.* Marked improvement.

3. *Hemorrhoidectomy.* Removal of infected crypts. Still more improvement and physical strength greater than in the past three years. Also striking diminution of nervous and mental symptoms. Return of personality to normal.

January, 1922. Bowels regular and practically no digestive disturbance. Enteroantigens (autogenous colon vaccines) caused severe local and constitutional reaction.

This case is one illustrative of marked nervous, mental and physical disorders improved by surgical treatment of certain foci, but not fully relieved until *all* foci had been removed. The improvement in physique and personality has been striking.

CASE III.—A J. LaC., female, aged fifty-two years. Teacher.

Hemicrania; melancholia, suicidal. Progressive constipation for fifteen years. Blood-pressure averaging 235/150. Partial colectomy for diseased ceco-colon and obstructive adhesions in 1914. Marked betterment in mental and physical condition and able to carry on her work. Postoperative condition materially improved by enteroantigens (autogenous colon vaccines). Patient had some dental difficulties with occasional alveolar abscess, but no particular attention was paid to the teeth at the time, 1915-16. Fairly well until 1918, when she had another severe headache with high blood-pressure after extensive dental repair. The phenolsulphonephthalein output on various occasions was well above normal; this with chemical blood examinations demonstrated normal kidney function. In March, 1921, extensive infection in molar regions with necrosis and infected antrum. Operation, with marked general improvement, so that the patient is better today than she has been for over twenty years. Blood-pressure, July 20, 1921, 185/120. This case is typical of the value of the complete removal of all focal infection as early as possible.

INFECTION OF GASTROINTESTINAL TRACT IN RELATION TO SYSTEMIC DISORDERS:

SURGICAL VIEWPOINT: COLECTOMY; INDICATIONS, PATHOLOGY,
TECHNIC, MORTALITY.*

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FROM the standpoint of infection of the gastrointestinal tract, that portion of greatest interest in surgical research is necessarily the colon. This terminal portion of the bowel is of much less vital need to the organism than the central portion; it is frequently diseased and can be dispensed with, entirely or in part, both in human beings and in the lower vertebrates. The entire problem is thus one of engrossing interest to the specialist and to the general practitioner alike.

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