home of many great and good men, who have done, and are continuing to do, so much for the advancement of the science of obstetrics and gynecology. Without deprecating other cities, and other honorable, earnest and conscientious men, Philadelphia may be given the palm for being the home and field of research, of as great and honorable men as have ever wielded a pen, handled a scalpel, or disseminated from the rostrum the sterling truths and doctrines of our science. The names of some of those who have made medical and surgical records were mentioned in connection with the brief review of some of the work which was done earlier in the history of our ASSOCIATION. Nothing could afford me more pleasure than to record at length the work and special merits of all of Philadelphia's obstetricians and gynecologists. My personal acquaintance with some of them makes it nearly impossible to refrain from mentioning those who were my teachers and friends, when only a few years ago I was seeking knowledge in this special field, and received from them such earnest and thorough instructions that, whatever of success may have come to me from that time till the present hour, to the kindness of these great masters is due the entire credit.

Finally, I desire to attempt feebly to express my endless gratitude for the great honor of having been elected Chairman of this Section on this occasion. My sensibilities would, indeed, be obtuse, if I was not inexpressibly thankful for the honor. All that I can say will be merely words. My appreciation is heartfelt and genuine. No greater honor can be conferred on a member of the profession than to be chosen to preside over a body of men so cultured and distinguished in the profession as are you who compose the members of this Section of the AMERICAN MEDICAL ASSOCIATION.

ORIGINAL ARTICLES.

THE DIFFERENTIAL DIAGNOSIS OF SURGICAL LESIONS IN THE RIGHT HALF OF THE ABDOMEN AND PELVIS, WITH ESPECIAL REFERENCE TO THE DIAGNOSIS OF APPENDICITIS.

Presented to the Section on Surgery and Anatomy, at the Forty-eighth Annual Meeting of the American Medical Association, held at Philadelphia, Pa., June 1-4, 1897.

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Inflammatory and other lesions in the right half of the abdominal and pelvic cavities have of late years assumed an increased importance. This is owing to the prominence given to the disease appendicitis, as well as to those inflammatory conditions of the adnexa in women to which the broad term pelvic inflammation is applied.

There can be no question in the minds of those who have given the subject much attention that the inflammatory conditions of the vermiform appendix constitute the most important surgical lesions of the abdominal cavity. This is true both for the male and female sex. While it is true that in the female it is less frequent in its occurrence than in the male, and in addition, the female is subject to inflammatory suppurative conditions peculiar to the sex, yet in estimating the importance of an affection we must take into account

its life-destroying characteristics, the difficulties encountered in its diagnosis, the necessity for prompt action in its early treatment and for highly skilled surgical help in its later stages in addition to the frequency of its occurrence. So far as the danger to life in an unrecognized case is concerned, this is as great in the female as in the male. In the matter of difficulties of diagnosis, these are greatly increased in the female, owing to the possibility of errors arising from the presence of organs in the neighborhood that take on suppurative inflammation, which, in not a few instances, closely simulate that of the appendix; or possibly the occurrence of diseased conditions of these as a complication. The necessity for careful watching and prompt action in appendical lesions, as compared with those of the adnexa, is another feature which emphasizes the importance of the affection in the female. The mistake of postponing interference is more remote in the male than the female, owing to the absence of that element of doubt which must frequently exist in the latter. Upon the basis of these considerations it may be claimed with reason that inflammatory conditions of the appendix in the female lose none of their importance because of the lesser frequency with which women are attacked with the disease as compared to men, since it is in these very cases that errors in diagnosis with resulting failure to operate are most likely to occur. On the other hand, the preponderance of males loses its relative importance when the comparative ease of diagnosing the affection in this as compared with the female sex is taken into account.

All conditions which may be mistaken for appendicitis in the male, with the sole and rare exception of an inflamed right undescended testicle, occur likewise in the female. Some of these occur with even greater frequency in women, these constituting additional sources of error in the case of the latter sex. Of these latter may be particularly mentioned cholelithiasis and gall bladder affections, such as impaction of gallstones and resulting dropsy and empyema of the gall bladder, hyperacute inflammation and occasionally gangrene of that viscus, and angulation or torsion of the ureter occurring in connection with a movable right kidney. Gallstones occur nearly five, and floating kidney six or seven, times more frequently in women than in men. With special reference to the diagnosis of right-sided lesions it should be borne in mind that the right kidney is affected four times as frequently as the left.

When all these circumstances are taken into consideration it will be found that appendical lesions rank first in importance among the surgical affections of the abdominal and pelvic cavities.

With these facts before us the logical course to pursue in the present presentation of the subject will be the consideration of the diagnosis of appendicitis, and the differentiation of this disease from other inflammatory conditions, as well as such neoplasms as may simulate it.

Appendicitis, although in the great majority of cases pursuing an acute course from the commencement to the end of the attack, may be subacute or chronic in the beginning, afterward developing an acute condition; rarely it may remain subacute or chronic throughout its entire course; occasionally a chronic condition may follow an acute attack with the supervention of subacute, acute or even hyperacute exacerbations. Clinically, therefore, the cases may be

divided into the acute, the subacute, and the chronic. It is true that the acute cases may be still further subdivided into the hyperacute and the subacute, and the chronic division into cases which are chronic from the commencement (and remain without acute or subacute exacerbations, a rare occurrence in my experience), and those which follow an acute attack and are subject to more or less frequent relapses of the original acute condition. But for the practical purposes of the surgical diagnostician these subdivisions may be disregarded.

For the sake of laying a proper foundation for our study of the subject I will briefly call attention to the principal points to be borne in mind in the objective and subjective symptoms of these clinical forms of the disease.

Acute appendicitis.—The acute form of appendical inflammation is characterized by: *a*, sudden onset; *b*, colicky or cramping abdominal pains; *c*, vomiting; *d*, localized pain and tenderness; *e*, rigidity of the right rectus muscle; *f*, the presence of a tumor; *g*, fever. The pain is referred at the commencement, in the vast majority of cases, to the region immediately above the umbilicus, but finally becoming diffused in the entire abdominal region. If the patients are asked to point out the place where the pain was first felt they will most frequently indicate the center of the epigastrium. This fact has been a very frequent source of error, particularly when considered in conjunction with the symptom next to be considered. The occurrence of nausea and vomiting is of such frequency as to lead me to pursue the inquiry as to this symptom if it is not mentioned by the patient, and to look upon a case in which it is absent as being irregular or atypical in its development. The pain may be finally localized in the right iliac region, but the usual hypodermic injection which the patient receives at the hands of the attending physician is sufficient to allay all pain at first, both epigastric and iliac, and therefore this symptom does not count for much by the time the surgeon sees the case. Localized tenderness in the right iliac region however, is not so easily abolished although markedly diminished and perhaps more difficult of differentiation from the existence of a certain amount of sensitiveness which many observers have noted as being present in this region in conditions of health, or in connection with abdominal or pelvic lesions other than those of appendical origin, and in hysterical women. Rigidity of the right rectus muscle at its lower part is the result of an instinctive effort to prevent this portion of the muscular abdominal wall from taking part in the respiratory movements. It may likewise be prevented from manifesting its full significance by the attempts made to allay the pain by the administration of opium. The rigidity of neurotic subjects with hypersensitive abdominal surfaces should not be confounded with that arising from underlying inflammation. A tumor in the ileocecal region makes its appearance after the first or second day, and is situated directly opposite to and close upon the anterior superior spinous process of the ilium, or below this point opposite the upper concave portion of Poupart's ligament. When fully formed its presenting area corresponds to that of the superficial tenderness present. Fever is not marked in the commencement; some acceleration of pulse and elevation of temperature however is generally observed.

The variations from the usual and typical charac-

teristics of the acute attack consist of: 1. The occurrence of primary, general abdominal pain rather than localized pain in the epigastrium, or a localization of the pain in the right iliac region in the beginning of attack. 2. Absence of vomiting due to the fact that the stomach is quite free from ingesta, although even under these circumstances nausea will be complained of, and the administration of some domestic cathartic, usually a dose of castor oil, will be almost certain to bring on vomiting. 3. Localized pain will usually be abated, and right iliac tenderness diminished by the administration of opiates. Cases of rapid gangrene of the organ may be unattended by pain in the region of the appendix in the beginning. 4. Opiates may so modify the respiratory movements as to render unavailable for purposes of diagnosis rigidity of the right rectus muscle, as well as to destroy that reflex tension of this muscle so frequently observed when pressure is made upon the wall of the abdomen in the ileocecal region. 5. The presence of a tumor is not usually available for diagnostic purposes until after twenty-four hours at the earliest; it is usually delayed until after forty-eight hours. In an exceptionally long appendix inflamed at its digital extremity, the tumor may be located elsewhere than in the ileocecal region. If the organ points downward and inward the tumor may be in the pelvis; if directly inward, behind the linea alba or beneath the left rectus muscle below the umbilicus; if upward and inward, behind the right rectus muscle and on a level with or even above the umbilicus; if directly upward and under the colon it may be found just beneath or at the usual site of the gall bladder; if upward and outside of the colon it may be found at varying points from the level at the crest of the ilium to the last rib. In deviations from the normal anatomic disposition of the ileocecal junction still further variations of position of the tumor may occur. In this manner cases of left-sided appendicitis, deep pelvic abscesses of appendical origin, and appendical abscesses in the right hypochondrium are to be accounted for. In the same manner and for the same reasons varying points of maximum tenderness occur. 6. *The pulse rate may be but slightly affected in the commencement, and ulceration and perforation of the organ may occur at any time during an exceptionally mild attack, with practically no rise of temperature.*

2. *Subacute appendicitis.*—In this form, as the term implies, the onset is less acute. The attacks may be so mild as to pass for a simple indigestion, or intestinal colic. A number of cases of indubitable appendicitis with hyperacute attacks have come under my observation, in which a history of preceding attacks that had been treated for "colic" or "indigestion" was obtained. Indeed, I have never known subacute appendicitis to be mistaken for anything else. The error is not a grave one, provided opium be not given and the possible onward course to the development of an acute or a hyperacute attack masked. The inflammatory action may now and then reach a sufficiently high grade to call attention to the ileocecal region. Tenderness at the site of the appendix may usually be elicited. There is usually no tumor to be found. In the cases of appendicitis that have come under my care, in which a history of preceding subacute attacks has been obtained, there has usually been found at the operation either one or more hardened fecal masses in the appendix, or an accumulation of secretion; the latter sometimes to the extent of an empyema, the secretion having undergone suppurative changes. In the

latter instances there have been found either partial or complete obliteration of the appendiculo-cecal orifice. This condition may be acquired as the result of previous disturbances, or be congenital in its origin. In any event, if permitted to continue, these cases of subacute appendicitis will almost of a certainty eventuate in an acute attack.

3. *Chronic appendicitis*.—Cases coming under this head may, as a rare circumstance, be chronic from the beginning. In the vast majority of cases they either eventuate from repeated subacute attacks, or follow a well defined acute attack. The characteristic clinical picture is marked by tenderness in the ileocecal region, with or without the presence of a tumor. The latter is usually the case if an acute attack has preceded the symptoms, particularly if this has been recent. The tumor is the result of an inflammatory environment of the organ; exceptionally an empyema of the organ may be sufficiently pronounced to constitute a tumor.

Practically, the differential diagnosis will lie between lesions of gall bladder origin; those originating in the intestine and not of necessity involving the appendix; and tubo-ovarian disease.

Of the gall bladder lesions, those involving the simple passage of a gallstone along the ductus communis choledochus may simulate the occurrence of acute appendicitis. Here the pain may be referred to the epigastrium, as in appendicitis; it radiates, however, toward the shoulder and the angle of the scapula. In the vast majority of cases it starts from the gall bladder as a fixed point. Whatever tenderness exists is referred to the lower border of the ribs and the region of the gall bladder. A gallstone impacted in the cystic duct and followed by dropsy of the gall bladder may give rise to some of the symptoms of chronic appendicitis; the downward projection of the gradually distended gall bladder may give rise to a tender tumor below the level of the umbilicus and beneath the right rectus muscle; infection of the gall bladder contents by bacterial migration through its walls, enervated by extreme pressure from within, may give rise to empyema of the gall bladder and cholecystitis, which in its turn is followed by febrile movement, abdominal pains and increased sensitiveness, all of which in their subjective symptomatology, may simulate appendicitis. On the other hand, even without the downward displacement of the gall bladder, the presence of an unusually long and vertically placed appendix, when inflamed, may complicate the differentiation between this and a gall bladder lesion.

Of the intestinal lesions in the ileocecal region, those involving an acute obstruction or a perforation of the bowel are the most important, as well as, in some instances, difficult of diagnosis, and these require a sharp differentiation and prompt operative treatment. Here the absence of a tumor can not be of practical utility in the diagnosis, since its appearance may be postponed for two or three days, and in the meanwhile the patient will certainly lose the chance of recovery offered by operation. Of less importance are the chronic obstructive conditions and neoplasms, for the reason that these of themselves do not, as a rule, urgently demand operative treatment when first discovered, nor do the appendiceal conditions for which they may be mistaken require that promptness in diagnosis and celerity of action necessary for the proper care of cases of acute appendicitis. The presence of a comparatively insensitive movable

tumor characteristic of a neoplasm of the bowel, or of a doughy mass suggestive of impacted fecal matter, on the one hand, and an immovable and tender tumor on the other, to say nothing of the information to be gained by a close scrutiny of the history, offer a sound working basis for reasoning out the true condition present.

A close study of the question impels me to the belief that the surgical clinician will probably be called upon oftener to differentiate between appendicitis and tubo-ovarian lesions, than between the former disease and all others for which it is likely to be mistaken, combined. As a result of a somewhat extensive experience in appendiceal lesions, as well as in those conditions of the uterine adnexa that have been most frequently mistaken for the former, I would emphasize the following as the most important points to be borne in mind in the differential diagnosis:

Frequency.—Based upon the study of a large number of cases, the proportion is as 1 to 4 (males 80 per cent., females 20 per cent.).

History of the attack.—In a large proportion of cases the history in appendicitis is that of an acute onset. In tubo-ovarian disease a previous history of infection, with endometritis, salpingitis, ovaritis and pelvic peritonitis, and coincident progressive menstrual disturbances, may generally be obtained. Further, in considering the possibility of ectopic gestation in a given case, the fact that the diagnosis may be obscured, in an unmarried woman, by false statements made by the patient regarding the menstrual history, should not be lost sight of.

Pain.—In appendicitis the pain is usually acute and radiating, while in adnexal disease it is more apt to be dull and localized. Three considerations having a bearing in this connection should be borne in mind, however. The first relates to the fact that in subacute and chronic appendicitis the pain may be dull and localized; the second, that in acute appendicitis the pain may have been masked by the injudicious administration of opium; and the third, that the supervention of an acute exacerbation of a chronic pelvic inflammation may give rise to pain sufficiently acute and severe to simulate appendicitis.

Vomiting.—This is exceedingly common in appendicitis, and of much less frequency, relatively, in adnexal disease.

Tenderness.—In the great majority of cases the tenderness, in appendicitis, is located at the site of the appendix, and in tubo-ovarian disease it may be traced to the adnexa. The maximum point of tenderness in appendicitis corresponds to or above the level of the anterior superior spinous process of the ilium, while in adnexal disease it is located well below this level. Considerable force is required to elicit the point of tenderness by the vaginal touch in appendicitis; this is easily accomplished by this route in adnexal disease. *Per contra*, the tenderness brought out by external pressure in the last named, is nothing like as great as that by the vaginal touch, while considerably less pressure in the appendiceal region will show the latter to be extremely sensitive in appendicitis. Movements of the uterus by the examining finger do not, as a rule, give rise to complaints of pain from the patient, in appendicitis, while they are almost certain to do so in adnexal disease. The nearer proximity of the tenderness to the median line and bony anterior pelvic wall, examined either externally or by the vagina, the greater the

chance of pelvic inflammation being present, and *vice versa*. The remarks concerning the possibility of masking pain by opium apply with equal force to the symptom of tenderness.

Chill or rigors.—A chill is of infrequent occurrence in appendicitis, and is a not uncommon symptom in acute exacerbations of adnexal disease.

Fever.—Fever is present in appendicitis, although its grade is of no service in estimating the severity of the attack, particularly in cases in which the temperature is but slightly elevated, and the pulse not markedly accelerated. It may be absent, or nearly so, in chronic adnexal lesions, until a spread of previously existing infection, or the introduction of fresh infectious agents is announced by its presence.

Muscular tension.—While rigidity of the right rectus muscle is occasionally absent in appendicitis, it is almost invariably so in adnexal lesions, unless the latter is complicated with considerable peritonitis. So marked is this difference, as between the two conditions, that this sign is almost pathognomonic in the differential diagnosis. It is rarely marked in tubo-ovarian disease, although like the symptoms of pain and tenderness, it may be masked by opium in appendicitis.

Tumor.—Tumor may be present after the second or third day in appendicitis; rarely before the latter. In tubo-ovarian disease it is usually present when the surgeon is called in. In appendicitis its usual location is beneath the right rectus muscle and opposite the anterior superior spinous process of the ilium, or to the outer side of this area, where it is easily made out by abdominal palpation. In tubo-ovarian disease it is more easily found by vaginal touch, while abdominal palpation may fail to reach it altogether because of its low position behind the pubic arch. It is rare that a tumor of appendical origin can even be felt by the vaginal touch, much less satisfactorily palpated by conjoined manipulation.

Course.—Appendicitis usually follows an acute course, while in adnexal lesions a subacute or chronic course is the rule. In chronic appendicitis there is almost always a history of at least one acute attack and relapses are common as long as there is any impairment of the nutrition of the organ, even with but slight infection present. In adnexal disease, while the chronicity of the course may be disturbed by the supervention of acute exacerbations, it is rare to obtain in the history a statement of a well defined and sudden onset. The practitioner should be well on his guard to distinguish between the last named and chronic relapsing appendicitis. The subjective symptoms alone will not suffice for this, and physical examination only can reveal the true condition of affairs. Rupture of a pyosalpinx offers a grave condition and presents great difficulties in differentiation between this and perforative peritonitis of appendical origin. Fortunate it is that to open the abdomen promptly in either case offers the patient the best chance for recovery.

Of the rarer conditions known to simulate appendicitis may be mentioned a case in which a lithopedion escaped from a right Fallopian tube (Martin of Berlin), a fibromyoma of the ileocecal region (Sonnenburg), a small suppurating dermoid (Bergmann), a ruptured right rectus muscle occurring while the patient was under the influence of liquor, and a ruptured gall bladder under the same circumstances (my own cases). I have been compelled to reopen the

abdomen a second time in two cases in which adhesions formed between the stump of a removed right ovary and tube and the appendix gave rise to symptoms of appendical origin. Since these experiences I have made it a rule to remove the appendix when intraperitoneally located, in all cases of abdominal section. Further, one should not fail to take into account the possibility of the coexistence of chronic and acute lesions of the adnexa and appendix, or the simultaneous presence of an acute lesion of the one and a chronic lesion of the other. The presence of the appendiculo-ovarian ligament of Clado furnishes a route of bacterial migration from the intestine to the right ovary. The presence of the bacterium *commune coli* has been demonstrated by Kiefer in an ovarian abscess, and Dr. Robert L. Dickenson, one of my colleagues at the Brooklyn Hospital, recently operated on a case in which the appendix was directly attached to the right ovary, inflammatory conditions of both coexisting. The focal lesion in this case probably existed in the appendix.

Finally, one should not fail to take into account the difficulties which may present themselves in establishing the diagnosis of appendicitis in the male sex under circumstances of an exceptionally long appendix passing deeply into the lesser pelvis. Sonnenburg reports two such cases where the primary abscess was situated in the Douglas *cul de sac*, in which access was gained to the suppurating mass through an opening made between the rectum and bladder. The following list embraces some of the most important of the conditions which have been mistaken for appendicitis within my own knowledge or have been reported upon good authority:

Acute conditions.—Subphrenic peritonitis, gall bladder lesions, acute intestinal obstructions, paratyphitis, rupture of right rectus muscle, ruptured pyosalpinx, ruptured ectopic gestation, acute torsion of right ovarian cystoma, acute torsion of right hydrosalpinx, right-sided hemato-salpinx, acute peritonitis, paroxysms of pain due to right movable kidney.

Chronic conditions.—Abscess in the abdominal wall, impacted ureteral calculus, fecal impaction, tubo-ovarian inflammation, carcinoma in the ileocecal region, retroperitoneal sarcoma presenting in the right iliac fossa, neoplasms of the right ovary, right-sided chronic salpingitis with recurring acute exacerbations, fibromyoma in the cecal region, adhesions following operations on right adnexa.

In order to facilitate the study of the differential diagnosis of the surgical lesions of the right half of the abdomen and pelvis, I have prepared the following:

ACUTE APPENDICITIS.

Anamnesis, etc.—Most frequent in males (80 per cent.) Rare at the two extremes of life. Previous good health immediately preceding present attack as a rule. History of previous attacks in a certain proportion of cases. Sudden onset.

Pain.—Cramping or colicky and rather constant. Most acute in epigastrium and region about the umbilicus; more or less diffused later on, and may finally center in right iliac region.

Nausea and vomiting.—Present in great majority of cases. Usually ceases when contents of stomach are vomited, unless extensive peritoneal inflammation occurs early. Rarely persistent and intractable.

Tenderness.—Markedly localized in the center of the right iliac region at the commencement, but becoming more diffused with the extension of the peritoneal inflammation. Is frequently marked along the middle of Poupart's ligament. In the rare cases of non-descent of the cecum the tenderness may extend to the parts immediately below the umbilicus or be located to the left of the median line. Present, although in lesser degree in the direction of the ascending colon particu-

larly when the appendix lies to the outer side of the colon and points directly upward. When the appendix is extraperitoneally situated the tenderness may be pronounced in the lumbar region.

Muscular tension.—Right rectus muscle tense at its lower part. Rigidity pronounced in proportion to peritoneal involvement.

Tumor.—Rarely present before the lapse of forty-eight hours following the attack and may be delayed until the third or fourth day. Its location is quite constant in the right iliac region but may vary with abnormalities in the location of the cecum. Is immovable and usually rounded and smooth.

Impairment of function of intestinal canal.—Distension of coils of intestine in the neighborhood. Bowels may be moved by enemata and cathartics before diffuse septic peritonitis sets in.

Fever.—Slight elevation of temperature and acceleration of pulse in the commencement but not a trustworthy guide in their relation to the threatened severity of the attack, particularly when these symptoms are not marked.

SUBPHRENIC PERITONITIS.

Anamnesis, etc.—History and mode of onset will vary with source of peritonitis. Arises most frequently from perforating ulcer of stomach or duodenum; next in frequency from the appendix. Abscess of the kidney, cholecystitis, lesions of the pancreas, and perforation of intestine elsewhere, furnish examples.

Pain.—Pain severe and more constant and less colicky and lancinating in character than in appendicitis. Located in upper part of abdomen.

Nausea and vomiting.—Not marked unless peritonitis becomes general. When due to ulcer of the stomach the vomiting precedes the attack.

Tenderness.—Localized in epigastrium or hypochondrium.

Muscular tension.—Limited to region above umbilicus.

Tumor.—Not discernible until abscess forms. Then demonstrated by percussion. Littre's diaphragmatic sign (drawing in of the intercostal spaces one after another, as contraction of the diaphragm takes place) is of importance.

Impairment of function of intestinal canal.—Not marked.

Fever.—Fever varies with infection. With formation of abscess becomes more marked.

GALL BLADDER LESIONS.

Anamnesis, etc.—Cholelithiasis, the most common underlying cause, occurs five times as frequently in females as in males and in women over thirty as a rule. Dropsy and empyema usually preceded by indefinite feelings of distress referred to region of gall bladder; less frequently by recurrent attacks of hepatic colic, not necessarily accompanied by jaundice. Perforation by gallstone, supervention of suppuration in dropsy, and the occurrence of acute inflammation of gall bladder marked by sudden onset.

Pain.—Less acute and colicky in dropsy and resulting empyema than in acute inflammation of gall bladder and perforation from gallstones. In the latter equally so with appendicitis. More distinctly localized in the commencement in all these than in appendicitis. Generally referred to right hypochondrium.

Nausea and vomiting.—Absent as a rule.

Tenderness.—Present. Marked in acute inflammation and perforation. Less in empyema. Occupies a somewhat larger area in the right hypochondrium than that which is characteristic of appendicitis in the right iliac region, but may extend below the line of the umbilicus when the gall bladder is greatly distended.

Muscular tension.—Upper portion of right rectus, and sometimes both recti, more or less rigid.

Tumor.—Generally present when patient comes under surgeon's care. Is rounded, smooth, immovable, and usually found at normal site of gall bladder. Exceptionally and under circumstances of considerable distension, may reach below umbilicus.

Impairment of function of intestinal canal.—None as a rule. There may be some distended coils in the neighborhood.

Fever.—Fever present and pulse correspondingly accelerated.

ACUTE INTESTINAL OBSTRUCTION.

Anamnesis, etc.—*Invagination*: Two-thirds of the cases occur in males, one-third in females. Three-fourths of all cases of invagination are in the neighborhood of the cecum. It is especially an accident of the young (34 per cent. under 1 year and 56 per cent. under 10.) *Volvulus*: Eighty-seven per cent. occur in large intestine; of these one-half occur in the neighborhood of the sigmoid flexure, and less than one-third in the ileocecal region. Occurs in males in the proportion of two

to one. Most frequently absent between the ages of 30 and 40. *Obstruction of abnormal contents or foreign bodies*: Almost 50 per cent. due to gallstones; 43.5 per cent. due to fecal impaction; remainder due to enteroliths and substances swallowed. Obstruction by gallstones three times as common in females as in males and usually in patients past 50. The ileocecal region the most frequent seat. Usually preceded by hepatic colic, jaundice or symptoms pointing to the entrance of the gallstone into the intestine by ulceration through the gall bladder and bowel wall. *Internal strangulation*: The most frequent cause of intestinal obstruction (35 per cent. of all cases); 90 per cent. in the small intestine; 83 per cent. in lower abdomen; 67 per cent. occur in the right iliac fossa; 70 per cent. occur in males; 40 per cent. occur between the ages of 15 and 20; of these, inflammatory adhesions cause the strangulation twice as often as vitelline remains (Meckel's diverticulum and persistent remains of vitelline blood vessels). Relatively uncommon in childhood, when it does occur is usually caused by vitelline remains. *Strangulated diaphragmatic hernia* occurred in 10 per cent. of 1,134 cases of internal strangulation (Lichtenstein). Usually regarded as a very rare condition. Internal strangulation when due to adhesions may be preceded by history of some inflammatory abdominal or pelvic lesion, recent or remote. *Invagination and volvulus* give us preceding history. *Obstruction by gallstone* is usually preceded by jaundice, hepatic colic or symptoms pointing to entrance of the gallstone into the bowel by ulceration through the gall bladder and bowel wall. In strangulated diaphragmatic hernia there is almost always a history of severe injury, although the original condition may be congenital.

Pain.—Severe and intermittent at first; finally rather constant, with acute exacerbations. Location has no diagnostic value in differentiating between the different forms; most frequent in the neighborhood of the umbilicus. Does not become localized.

Nausea and vomiting.—Frequent and persistent. When contents of stomach are vomited the vomitus is first bilious, then yellow and finally fecal.

Tenderness.—Limited tenderness less easily differentiated.

Muscular tension.—General rather than limited to lower portion of the right rectus.

Tumor.—Rarely present except in invagination, when it may be fixed after inflammatory action occurs. Occasionally found in obstruction by foreign bodies, when it is mobile.

Impairment of function of intestinal canal.—Constipation complete; passage of flatus absent. Tenismus in 15 per cent. of cases of volvulus and in 55 per cent. of invagination. Bloody discharges. Tympany present, increasing with the duration of the obstruction.

Fever.—Pulse more or less accelerated, increasing in frequency with duration of obstruction. Absence of fever in the beginning rather characteristic.

PARATYPHILITIS.

Anamnesis, etc.—Exceptional and of rare occurrence, as compared with appendicitis. Follows inflammatory condition of cecal wall (typhlitis) and of its serous covering (perityphlitis), having its origin in fecal accumulations. History of loss of appetite, disturbance of digestion and constipation. More or less sudden in its occurrence, but less abrupt than in appendicitis. The first acute symptoms may be due to ulcerative perforation of the bowel wall.

Pain.—Dull and constant, and less diffused as compared with that of appendicitis, usually limited to right iliac region from commencement.

Tenderness.—Present and limited to area involved. Less acute than in appendicitis.

Muscular tension.—Marked in proportion to acuteness of the symptoms.

Tumor.—Present early in cases of stercoral origin, in which case the tumor will present as a sausage-shaped mass in the cecal region, which may be indented with the finger. When suppuration has taken place tumor will present same characteristics as in suppurative appendicitis.

Impairment of function of intestinal canal.—Constipation, overcome by cathartics, which in the early stages of the affection sometimes relieve all the symptoms.

Fever.—Slight fever in commencement. With advancing suppuration, becomes more pronounced.

RUPTURED PYOSALPINX.

Anamnesis, etc.—Comparatively infrequent. Pelvic inflammation. Gonorrheal or other infection, pelvic distress and pain varying in intensity, and menstrual disturbances. Onset sudden.

Pain.—Severe, diffused, constant and of long duration.

Nausea and vomiting.—Rarely present or marked until diffuse septic peritonitis sets in.

Tenderness.—Extreme and general below umbilicus. Location of tenderness made most easily manifest by vaginal touch.

Muscular tension.—Absent until diffuse septic peritonitis occurs, which supervenes rapidly in case of rapid emptying of abscess cavity.

Tumor.—Sensitiveness usually so great that induration can only be felt by vagina, and then not always satisfactorily as a distinctly defined tumor.

Impairment of function of intestinal canal.—Not present until intestinal paresis and finally complete paralysis of peristalsis from diffuse septic peritonitis occurs.

Fever.—Steady and marked increase in pulse rate and rise of temperature.

RUPTURED ECTOPIC GESTATION—PELVIC HEMATOMA.

Anamnesis, etc.—More frequent in its occurrence than formerly supposed (35 times out of 3500 autopsies; Formad). Less frequent in young primiparas than in older multiparas. Symptoms referable to normal pregnancy (absence of menses, nausea, swelling of breasts, softening of cervix, etc.). A bloody vaginal discharge may take place subsequently to last menstruation. Labor-like pains, bloody vaginal discharge and if the pregnancy is advanced the casting off of a decidua may precede the rupture of the fetal sac. Onset sudden with symptoms of collapse and internal hemorrhage.

Pain.—Acute and diffuse over lower portion of the abdomen. Is of short duration.

Nausea and vomiting.—Absent.

Tenderness.—Not localized, if present.

Muscular tension.—Absent until peritonitis sets in, then general.

Tumor.—If patient survives primary rupture sufficiently long, the physical signs of pelvic hematocele or pelvic hematoma may be found. These distinguishable by conjoined manipulation and are more easily determined from the vagina than from the abdominal surface. In many cases identification of tumor not at once possible even under an anesthetic.

Impairment of function of intestinal canal.—None.

Fever.—With profuse hemorrhage, pulse rapid and feeble, temperature subnormal, later rising slightly. General symptoms of acute anemia present, such as pallor, thirst, air-hunger, etc.

ACUTE TORSION OF RIGHT OVARIAN CYSTOMA.

Anamnesis, etc.—Occurs in about 10 per cent. of cases of ovarian cystoma. Occurs most frequently in small tumors. If tumor is large a history of such may be obtained. In two out of four cases observed by the writer the symptoms came on while the patients were leaning over a wash tub engaged in rubbing clothes upon a washboard. Sudden onset.

Pain.—Violent pain in the right side of abdomen.

Nausea and vomiting.—Generally present.

Tenderness.—Considerable area of tenderness below and to the right of the umbilicus.

Muscular tension.—Present and somewhat general. Localized rigidity not marked.

Tumor.—Present. Increases rapidly in size.

Impairment of function of intestinal canal.—Absent.

Fever.—Fever absent in the commencement.

TORSION OF RIGHT-SIDED HYDROSALPINX.

Anamnesis, etc.—Rare. The writer has seen but one case and finds no other in the literature. Disturbances of menstruation (frequent, painful, and prolonged flow). Pelvic distress incident to pelvic inflammation in general. Sudden onset.

Pain.—Acute pain referred to entire right side of pelvic region.

Nausea and vomiting.—Absent.

Tenderness.—Localized and marked just above bony brim of pelvis.

Muscular tension.—Absent.

Tumor.—Located just behind insertion of right rectus muscle and extending to the right about half way to Poupart's ligament.

Impairment of function of intestinal canal.—None.

Fever.—Pulse accelerated. No fever.

RIGHT-SIDED HEMATOSALPINX.

Anamnesis, etc.—Infrequent in occurrence. Previous history of menstrual disturbance, the flow usually appearing too frequently and lasting beyond the usual time. Dysmenorrhea. Onset of symptoms rather sudden and usually due to escape of blood from distal end of tube and resulting localized peritonitis.

Pain.—Not marked save when peritonitis occurs. May be

at first localized, afterward referred to the pelvic region generally.

Nausea and vomiting.—Absent.

Tenderness.—Not well marked by palpation from the abdominal surface. If present is below the level of the middle of Poupart's ligament. Usually easily elicited by the finger in the vagina.

Muscular tension.—Absent as a rule.

Tumor.—If felt from without is well below the level of the middle of Poupart's ligament. Is much more readily distinguished from the vaginal than from the abdominal surface.

Impairment of function of intestinal canal.—None.

Fever.—Varies with the acuteness of the inflammatory conditions. Fever not a marked feature.

ACUTE PERITONITIS.

Anamnesis, etc.—Frequency depends upon affections underlying the attack. Idiopathic or primary peritonitis probably never occurs. *Perforative peritonitis* usually results from acute appendicitis, typhoid ulceration, foreign bodies, penetrating wounds, intestinal obstruction, strangulated hernia, blows upon the abdominal surface, and excessive handling of the intestines in the course of operations involving opening of the abdominal cavity. *Infective peritonitis* is caused by extension of infection from inflammatory lesions of the uterus and Fallopian tubes in the female, suppurative hepatitis, gall bladder affections, suppurative kidney lesions, and operative infection. *Symptomatic peritonitis* occurs in the course of an acute or chronic disease such as pleurisy or pneumonia. *Tubercular peritonitis* usually pursues a chronic course. *Syphilitic, rheumatic* and *gonorrheal* peritoneal infection very rare.

Pain.—Varies with the virulence of the infection and the rapidity of the extravasation. At first localized, afterward becoming general; may not be sufficiently prominent to occasion complaint.

Nausea and vomiting.—Early, persistent and intractable nausea and vomiting almost invariably present. Contents of stomach first vomited, then bile, and finally in fatal cases, material from small intestine. Hemorrhage from mucous membrane causes a dark brown vomitus.

Tenderness.—At first localized at point of original infection, then becoming generalized.

Muscular tension.—Progressively increases from original focus of peritoneal infection until in diffuse septic peritonitis the entire muscular abdominal wall becomes excessively rigid.

Tumor.—None present in diffused peritonitis. When more or less circumscribed a sero-purulent collection may occur in the course of time and give rise to a tumor.

Impairment of function of intestinal canal.—Early occurrence of paralysis of peristalsis, and resulting intractable constipation. Distension due to the forcing of gas from the still functionally unimpaired portion of intestinal canal into the paralyzed coils. In some instances the entire tract is almost simultaneously paralyzed, in which case distension may be less marked or absent.

Fever.—The pulse is rapid, out of all proportion to the rise of temperature. Fever is present as a rule.

PAROXYSMS OF PAIN DUE TO RIGHT SIDED MOVABLE KIDNEY.

Anamnesis, etc.—Proportion of women affected greatly in excess of males. Most frequent between the thirtieth and fortieth years. Right kidney twelve to thirteen times more often affected than left. Child-bearing appears to have a decided influence in its production. Previous history of symptoms of movable kidney, viz., dragging, weight and dull pain in loin and side of abdomen, aggravated by exercise and relieved by rest. In women, suffering is increased by menstruation and pregnancy. Occasional sense of something moving. History of previous attacks of paroxysmal pain resembling renal colic. Sudden onset if torsion is present, accompanied by suppression or marked diminution of the quantity of urine.

Pain.—Paroxysmal. Referred to the renal region and extending in the course of crural or sciatic nerves.

Nausea and vomiting.—Frequently present during paroxysm. Tenderness.—Not a marked symptom. Palpation gives rise to a peculiar sickening sensation.

Tumor.—Present and movable. Characteristic outline save where hydronephrosis has supervened as a result of frequent angulation of the ureter. May usually be traced to or replaced in renal region.

Impairment of function of intestinal canal.—None during attack. Disturbances of the large intestine, either diarrhea or constipation may form a part of the history.

Fever.—Negative.

CHRONIC APPENDICITIS.

Anamnesis, etc.—History of at least one preceding acute

attack as a rule, with relapses. Rarely the clinical picture presents as a chronic condition from the commencement. This, however, may obtain in tubercular infection of the appendix.

Pain.—Referred to right iliac region between relapses.

Nausea and vomiting.—Not marked. Generally absent.

Tenderness.—Marked. Located at site of appendix.

Muscular tension.—Not marked.

Tumor.—Present. Immovable and usually located opposite middle of Poupart's ligament and attached to extreme right lateral lining of abdomen.

Impairment of function of intestinal canal.—Not marked.

Fever.—Fever not marked.

ABSCESS IN THE ABDOMINAL WALL.

Anamnesis, etc.—Is quite frequently of appendical origin, and therefore may give a corresponding history.

Pain.—Present. Strictly localized at the inflamed point.

Tenderness.—Localized. Greatest at most prominent part of tumor.

Nausea and vomiting.—Absent.

Muscular tension.—Not marked. Secondary induration may be mistaken for it.

Tumor.—Present. Fluctuating when sufficiently advanced. May be demonstrated in abdominal wall by lying patient prone and having him voluntarily lift occiput or feet from table.

Impairment of function of intestinal canal.—Absent.

Fever.—Present. Subject to remissions as in suppurative processes elsewhere.

IMPACTED URETERAL CALCULUS.

Anamnesis, etc.—Previous attacks referable to nephrolithiasis, viz., lumbar distress aggravated by exercise; pus, blood and albumin in the urine; vesical irritability; pain in testicle, etc. Attacks of renal colic preceding the impaction and diminution of amount of urine excreted accompanying it.

Pain.—Dull, boring, intensified and becoming paroxysmal by spasmodic contractions of ureters. Radiates toward the groin and testicles, and sometimes to rectum.

Nausea and vomiting.—Not a frequent nor prominent symptom.

Tenderness.—Present, but not so definitely marked or fixed as in appendicitis.

Muscular tension.—Usually absent. When present, spasmodic.

Tumor.—Absent.

Impairment of function of intestinal canal.—None.

Fever.—Absent as a rule. At no time a marked symptom.

FECAL IMPACTION.

Anamnesis.—Follows most frequently a constipated habit and is observed ofttest in females and the aged. Favored by sedentary habits. May give a history of previous attacks. Hysterical and hypochondriacal, as well as spinal cord affections may form part of the history. Gradual onset.

Pain.—Not marked. Dull and obscure when present.

Vomiting.—Not a characteristic feature.

Tenderness.—Slight as compared with that of appendicitis.

Muscular tension.—Absent.

Tumor.—Presents itself as a doughy swelling.

Impairment of function of intestinal canal.—Constipation. Sometimes obstruction; but this rarely intractable.

Fever.—Absent.

TUBO-OVARIAN INFLAMMATION.

Anamnesis, etc.—History of menstrual disturbances usually of the too frequent type. Flow apt to become dark and clotted, thin leucorrheal, vaginal and muco-purulent discharge from endometritis. Symptoms gradual in their early development, but occasional acute exacerbations may simulate chronic relapsing appendicitis.

Pain.—Not severe, as a rule, save in acute relapses. With peritoneal involvement it may be sharp, but is constant, and not paroxysmal. Referred to iliac region, extending at times down the thigh and frequently accompanied by backache. Increased by over distension of bladder, distension of the intestines with gas; pressure and walking, riding or jarring aggravate it.

Nausea and vomiting.—Absent as a rule. Where present, accompanies supervention of an acute exacerbation.

Tenderness.—Not so marked as in acute appendicitis. More easily elicited by vaginal examination than external manipulation.

Muscular tension.—Absent.

Tumor.—The formation is an inflammatory mass. Combined manipulation maps it out distinctly and locates it in vaginal fornix. Uterus is pushed forward by mass. An exceptionally long appendix may give rise to a similar tumor.

Impairment of function of intestinal canal.—Constipation

as a rule. This may be occasionally due to adhesions between adnexa and intestines. It is most apt to take place upon left side, the sigmoid flexure approximating more closely the left broad ligament. The appendiculo-ovarian ligament takes but little part in inflammatory attachments. Flatulence.

Fever.—Present in the relapses, and absent or nearly so in the intervals.

CARCINOMA IN THE ILEOCECAL REGION.

Anamnesis, etc.—Symptoms come on slowly and increased by occurrence of constipation. Cancerous growths of bowel most frequently found in large intestine. Ten out of thirty-seven cases involved the cecum (Frank).

Pain.—Dull, with occasional exacerbations of lancinating pain.

Vomiting.—Absent.

Tenderness.—Usually spread over a larger area than in appendicitis.

Muscular tension.—Absent.

Tumor.—Hard, irregular, not of large size, and movable through a limited area. Not usually limited to cecum, but involves either ileum or colon.

Impairment of function of intestinal canal.—Obstruction to passage of intestinal contents when disease is advanced. One case of primary carcinoma of the appendix observed by the writer (see *Brooklyn Medical Journal*, April, 1897, p. 252).

Fever.—Absent.

RETRO-PERITONEAL SARCOMA PRESENTING IN THE RIGHT ILIAC FOSSA.

Anamnesis, etc.—Progressive loss of health and strength in youth or early adult life. Less frequently observed in those at or past middle life.

Pain.—Dull, aching, constant.

Vomiting.—Absent.

Tenderness.—Present; not distinctly defined or limited to point of invasion.

Muscular tension.—In advanced cases the corresponding thigh may be retracted from involvement of psoas muscle suggesting morbus coxarius.

Tumor.—Fixed, smooth and broadly definable.

Impairment of function of intestinal canal.—Absent.

Fever.—Absent.

DISCUSSION.

Dr. J. McFADDEN GASTON of Atlanta.—Some years ago I undertook to lay before this ASSOCIATION a paper upon the surgical lesions of the ileocecal region and it was upon such points which at that time were likely to attract attention. Dr. Fowler has brought forth a subject of great interest at this day. When we come to the bedside we have much difficulty in analyzing these points, especially in the case of families where one suspects appendicitis complicated with peritonitis. There are several points in connection with the troubles in this region that Dr. Fowler did not allude to. I had quite a puzzling case myself in this very line. The general symptoms simulated typhoid, but the local indications pointed to a local development of inflammation, and we thought of appendicitis. By temporizing, the case turned out to be one of typhoid. You have all seen cases of extreme sensitiveness in the ileocecal region in typhoid fever. There is sometimes also an inflammation of Brunner's glands which leads to the development of a tumor; and some of you have probably also met with cases in which you have had enteroptosis occurring in the ileocecal valve. I remember such a case in which death resulted in forty-eight hours. Even after death the grip of the valve was so tight that it would have torn it rather than give it up. In a simple case of contraction of the valve the intestine was readily liberated. There are other troubles that one can have at this point and it is important that we should study the matter up.

Dr. HOWARD A. KELLY of Baltimore.—I have been accustomed to pay close attention to this matter for some years and there are a number of diagnostic points which are very important and satisfactory. One can localize appendical inflammations in a woman and differentiate them from pelvic inflammations by paying attention to several points. In spite of the difficulties which may be maintained and demonstrated in most cases, there are cases of inflammation of the appendix and the right adnexa, probably 10 or 15 per cent. In one case reported in the Johns Hopkins Hospital Reports, a streptococcus inflammation was found in both the tubes and the appendix. I can hardly agree as to the propriety of removing the appendix, but I would rather get the meso-appendix and lift it up over the pelvis. I know of three cases, like those the author has described, in which the appendix has become attached to a stump, and I operated on one case a year ago. One was also operated on by Dr. Hunter Robb and one by Dr.

Maguire. They found adherent appendices being pulled upon. Dr. F. W. McRAE of Atlanta, Ga.—In two of the cases I have had; the only symptom present for the first forty-eight hours was pain in the bladder, and in both cases there was retention of urine. The cases did not occur in my practice and the trouble with the appendices was not discovered for several days.

Dr. GARDNER of Rome—In reference to the class of cases of which Dr. McRae speaks I can report one. The patient was attacked suddenly with pain over the entire abdominal cavity. I saw him a few hours after the first attack and my diagnosis was a probable recurrent appendicitis, as he had had appendicitis one year before. The pain grew rapidly worse but was not altogether on the right side. The patient died in thirty-six hours and postmortem examination revealed the fact that an adhesion existed underneath the bladder.

Dr. FOWLER—In reply to Dr. Gaston, who stated that I did not mention typhoid, I would state that I came as near to it as I dared to, consistent with the title of my paper. There is a suppurative condition which occurs around the appendix giving rise to abscess, but all abscesses in the iliocecal region are not of appendical origin. I have knowledge of one case in which a perityphlitis formed about the site of an appendix, that had been removed. It was a case of secondary infection and the gut showed marked thickening. There was a history of impacted feces. The co-existence of ovarian and appendical disease is very important. Whenever I open the abdomen for appendical disease, and the inflammation is confined to the appendix, I carry my finger down into the pelvis and ascertain the condition of the adnexal organs. I have found in a good number of cases that a cirrhotic condition of the right ovary is frequently present as compared to the left. This is the case in that peculiar anatomic condition known as Clado's ligament, which is a peritoneal fold from the meso-appendix to the ovary itself. There is a constant irritation arising from this connection which will give rise to changes in the appendix. These inflammatory conditions, which evidently give rise to the cirrhotic condition of the ovary, may have their origin in the bacterium *commune coli*. As to receiving the appendix when you open the abdomen for other purposes, this is a question. If I thought its removal would add to the dangers of the patient I should prefer to let the patient take the chances of having appendicitis rather than remove it. In a typical excision of the appendix I use the thermo cautery so as to thoroughly sterilize the point of section, and with this precaution I believe it is safe to remove the appendix in any operation that you may do. The method which I employ takes no longer than does any other. Dr. Kelly's suggestion to elevate the appendix may be a good one, but he evidently overlooks the fact that this may imperil the integrity of an organ which already possesses but a low degree of vital resistance and in which inflammatory conditions may easily follow circulatory disturbances. The latter may be induced by the altered position of the meso-appendix which he brings about.

THE ETIOLOGY AND CLASSIFICATION OF TUMORS.

Presented to the Section on Surgery and Anatomy at the Forty-eighth Annual Meeting of the American Medical Association, at Philadelphia, Pa., June 1-4, 1897.

BY SAMUEL H. FRIEND, M.D.

MILWAUKEE, WIS.

A comparative histologic study of normal cells, those of all tumors and the two malignant growths, cancer and sarcoma, indicates some striking similarities and differences. These cells arising as they do from previously existing normal cells, this is not especially remarkable, though it is worthy of note. Enumerated these differences are: 1, a limiting membrane; 2, fibrillar; 3, protoplasmic; and 4, nuclear structure in all. In benign growths this varies in predominance according to structural origin; but in the two malignant growths there is: *a*, an increased thick limiting membrane in cancer and a normal one in sarcoma; *b*, an increased protoplasmic structure and nuclei in both, especially striking in cancer where the nuclei predominate. The study of the biology of these malignant tumors indicates this: 1, that they are rapidly growing cells; and 2, that this rapid growth is

intimately associated with the predominance of nuclei in the cell. An examination of all of the different cells of the tissues of the normal organism gives but two sets of cells which bear a striking resemblance to these cells as to nuclei and protoplasmic structure present. These are the ovum and spermatozoa and the leucocytes of the blood. This similarity is suggestive. Tracing the origin of the leucocytes of the blood, from the work which the investigations of Ehrlich stimulated, and the zeal of Schwartz, Golasch, Fink, Gabriczewski, Müller, Reider, Neusser, Weiss Piorry, Boeckmann, Halla, Tumas, von Jaksch, von Limbeck,¹ Péé, Goldscheider, Jakob and many others roused, all indicate that these leucocytes are, 1, locally increased whenever any cause determines blood to a part; and 2, generally increased in all digestive processes, in diseases of the blood-making organs and in most acute febrile and in many chronic conditions, irrespective of the organ or organs diseased. Cohnheim² first advanced these theories, Neusser³ further advanced them and Weiss⁴ directly suggested them. The leucocytes are produced by any and all tissues of the organism. The inductions of Cohnheim, Neusser and Weiss, taken with the following, indicate the truth of such an interpretation and its application to pathologic phenomena.

As first observed by John Hunter and as others have confirmed, there is an increased number of leucocytes at the seat of a cut. I will simply draw the attention to this phenomenon as occurring not only in all traumatisms but, as above stated, in all normal functional action and conditions where there is a sudden or a prolonged determination of organic, inorganic, mechanical, electric and chemic action and matter to a part. As to the place of the leucocytes in physiologic activity and in the healing processes, details are unnecessary. Though their origin in traumatisms has been determined, yet a recapitulation may prove suggestive. If a cell or cells of the skin or muscle be cut or bruised, or if it be stimulated beyond a definite range, the immediate effect is to determine excessive blood containing excessive leucocytes to the parts and to stimulate the entire cell. So it not only attempts but does rapidly reproduce itself. While in a normal condition of the organism the phenomenon of cell division is produced within a definite range of time, by karyokinesis in an abnormal state, as in traumatisms, etc., the phenomenon is hastened and, as a result, borne out by investigation, the normal cell stimulated and, as if to compensate for the new environment of the tissues, reproduces itself not only by normal but also abnormal karyokinesis, and likewise by simple division and gemmation. A cut, a bite of the skin, etc., irrespective of the structural or functional agent, affects the true skin, all of the cells⁵ which make it up as an organ and the entire organism. Locally the structure of the blood vessels, blood, lymphatics, hair and sweat follicles, muscles, etc., have their reproducing powers augmented as enumerated, and the result is an innumerable number of new cells having the characteristics of leucocytes. An investigation of the blood demonstrates that these cells and those brought to the parts are thrown in and about the wound, and that some leucocytes, more than normal, independently find their way into the blood by their very motion. The fact that infection progresses and becomes general or special either through the agency of the leucocytes containing the organism or by their