Analyses of all these cysts show, not saliva, but some other substance. What are these cysts? If they are from the salivary ducts, why does the saliva entirely disappear, as shown by microscopic examination, none of the elements of normal saliva being revealed? And why do we find mucus in quantities and its elements in these cysts? Are they retention cysts, or are they true cystomata?

DR. VIDA A. LATHAM, Chicago: In Dr. Gilmer's experience are not these ranulae or cystic growths more common on the left than on the right side? Can he explain it from the anatomy? I reported thirty such cases for the Massachusetts State Dental Society and I think that only two were located on the right side. I do not know why. This report was published in the *Dental Cosmos*, 1906. The pressure of badly fitting plates seems to have some injurious effect. I have had four patients with this trouble in one week, and each one was relieved as soon as I could reduce the stenosis and remove the plate. A glandular secretion, together with the mucous or salivary secretion, forms a kind of colloid secretion. It is ropy and thick and of different color; it does not look like mucus, but more like the colloid secretion in thyroid tumors. The dilatation causes stenosis through spasm of the contractile tissue of the duct, just as pressure would cause a breaking up of a fluid. It is to be hoped that dentists and medical men will cease to employ iodine and other stimulating agents in these conditions. In one of the worst cases of this kind that I ever saw the surgeon consulted wanted to incise the cyst right away as a suppurating gland. To this the patient would not consent, so the surgeon painted the cyst with iodine. At 2 o'clock in the morning I was called to see a desperate case of dyspnea from the swelling that had occurred, which was so great that the respiratory apparatus was practically shut off. Only by inserting tubes and administering oxygen could relief be obtained. Another case of sublingual cyst was treated in a similar manner; the tongue swelled and prevented proper respiration. That kind of treatment should be abolished in these cases. Dead teeth, especially the lower first molars, also cause obscure conditions. This possibility should be borne in mind in our differential diagnoses. A patient came for operation for removal of the mandible; when we explored it was agreed that the trouble was caused by dead teeth. We opened up the molar and passed a fine wire through and on into the submaxillary gland and found that this was not a case of malignant disease, but simply one of dead teeth with necrosis and a sinus. The patient promptly recovered when the pulp canals were cleared and filled.

DR. HERBERT A. POTTS, Chicago: The condition which seems to me more nearly to merit the name "ranula" is a transparent, thin-walled, chronic tumor developing in the floor of the mouth, microscopic sections of which show either the whole or parts of the sublingual, not the submaxillary, gland plastered out over the walls of the cyst. The cyst walls are non-inflammatory and very thin, and rich in capillary supply. It is to this that the name "ranula," if it is to be continued at all, should, I think, be applied. Bernard and Recklinghausen have been unable to produce ranula by ligation of Wharton's duct. In this connection we are reminded that ligation of the ureter does not cause a cystic kidney. The large cystic kidney is not due to the sudden shutting off of the normal secretion of the gland, but to a chronic condition. The sudden shutting off of the excretion of the gland causes its atrophy. Suzanne and Hippel have shown this in a large number of cases. It has also been demonstrated by anatomic dissection that, in the normal individual portions of the sublingual gland have been found, as stated by Dr. Gilmer, in the fibers of the mylohyoid muscle, also beyond that. It is to this fact that we may ascribe the tumors appearing under the chin rather than in the mouth until they become so large that the fibers have separated and they have been visible both inside and out. These tumors may exist for a long time unobserved. They are undoubtedly chronic. The application of iodine as well as irritations of various sorts, causes a sudden effusion into the cyst from the rich supply of capillary blood vessels around it, and a palpable tumor results. In a series of, I believe, forty cases, Künmel was able in every case to pass a probe into a patulous Wharton's duct showing no connection whatever be-

tween that and the ranula. These tumors are easily removed. They are covered, and very loosely, by the mucous membrane of the mouth. In some cases, when the patient closes his mouth, the tumor may be seen beneath the chin; when he opens his mouth it is gone and is in the mouth. In most cases, after incision of the mucous membrane, they may be shelled out with the fingers. Of course, they may become infected, and then the proposition becomes a difficult one.

In view of the fact that these tumors seem to merit the name "ranula" more than any other, I think that if the term can not be excluded from our nomenclature it should at least be confined to these. In *THE JOURNAL A. M. A.*, May 30, 1908, the term "acute ranula" is applied to an abscess which was opened and was healed within a few days. In regard to Mikulicz's disease, the etiology of which is rather obscure, a number of the cases which have been collected, about 30 in all, I believe, were found to be simultaneous with enlargement and involvement of the lymph glands and lymphatics. The blood findings in many of these cases are such as are observed not only in leukemia, but in pseudo-leukemia. The microscopic sections of local parts of the salivary glands show an increase in lymphoid material, and this increase is at the expense of the parenchyma of the gland. It is rather strange, too, that the submaxillary gland, in the substance of which it is doubtful if there is any lymphatic tissue, although there are a few lymph glands at the bifurcation of the artery which supplies the gland, also enlarges in this condition either on one side or both sides, usually on both. Mikulicz has described the symmetrical swelling of these glands, in which this gland is also involved.

DR. THOMAS L. GILMER: In answer to Dr. Latham, I have found these conditions existing on the left more frequently than on the right side, but do not know the reason.

THROMBOSIS OF SUPERIOR LONGITUDINAL AND LATERAL SINUSES COMPLICATED BY PREGNANCY.

TREATED BY OPENING THE TORCULAR HEROPHILL.

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The following case is reported somewhat fully, for the following reasons: First, it is an extreme case of uncomplicated infective thrombosis of the superior longitudinal and lateral sinuses arising from a chronic purulent otitis media and mastoiditis; second, during the course of the illness, which was most profound, the patient carried a five to seven months fetus, later giving birth to a healthy child, and third, one of the operative procedures, which was directly accountable for the patient's recovery, I believe to be the first on record. I make this last statement with some hesitancy, but I have been emboldened to do so on account of the various answers to communications I have had with several authorities, both in this country and in Europe; also because my attempts to find a similar case have been futile.

History.—Mrs. T. J., aged 18, entered Mount Zion Hospital Oct. 9, 1907. For eleven years she had had a purulent discharge from the right ear, with earache and tenderness over the mastoid at various times. Father, mother and sisters were well and she showed no evidence of previous sickness other than that from her ear. The right ear became unusually painful three days previous to her entrance, with great tenderness over the mastoid, and profuse discharge from the meatus.

Examination.—The mastoid was normal in appearance, sensitive to touch, and the auditory canal occluded with polypi. The patient was delirious; her temperature 102.4 F.; pulse 144. Blood count showed 11,300 leucocytes with 85 per cent. of polymorphonuclear leucocytes. Patient was five months pregnant and had a bloody and purulent vaginal discharge. Fundi of the eyes were normal. At ten o'clock in the evening the patient was taken to the operating room.

Operation.—There was no swelling or redness over the mastoid region, neither were there any outward indications of cerebral complications or thrombosis. The auditory canal was cleared of polypi, and an incision made over the mastoid. While separating the periosteum from the posterior superior wall of the osseous meatus a quantity of foul smelling pus, under pressure was evacuated. This came from the mastoid cells and had opened under the periosteum of the osseous meatus; it was packed off and the mastoid cells entered directly through a hard lamella of bone, when more pus of the same nature was freed. The opening was enlarged, and a quantity of granulation tissue and several small sequestra of bone were removed. The sigmoid sinus was exposed for an inch and a half past the knee into the lateral sinus. The sinus was found to contain no blood and without effort a probe was passed through an opening in its wall which was gangrenous and irregularly discolored. The opening into the antrum was next enlarged and the superior posterior wall of the osseous meatus chiseled away, much of which was found to be carious. The bone of the facial canal was unaffected. My intention was to perform a radical operation with the removal of the contents of the tympanic cavity, but after finding that the tegmina atri and tympani were intact and that the infective process had not extended in that direction I satisfied myself with a thorough curettage of the antrum and aditus, and on account of the grave condition of the patient, directed my attention to the sinus. The sinus was slit open, and some foul pus and debris liberated. A blunt curette was passed towards the bulb followed by free bleeding. The sinus was then curetted in the opposite direction for a distance of three and a quarter inches with but slight bleeding; it was then packed in both directions. The advisability of ligating the jugular at this time was considered, but on account of the free hemorrhage obtained from the inferior petrosal sinus or jugular vein and the very poor condition of the patient, it was deemed best to await further developments. Immediately following the operation the patient was exceedingly weak with temperature of 103.2 F., pulse 138 and respirations 28.

Postoperative History.—October 10: Temperature normal with pulse 108 and respirations 20. Patient vomited all fluids and heroin was given to relieve the pain which seemed to be localized in the ear.

October 11: Condition same. Temperature normal, vomited often, complained of severe pain in head. Wound dressed with little bleeding, from the sinus. Abdominal pains.

October 12: Patient more quiet. Temperature rose for a short interval from normal to 100.2 F. Pulse from 96 to 110. Respirations normal; no vomiting; eggs and broth retained. Vaginal discharge examined, and found to contain gonococci. Blood showed 15,200 leucocytes and 84 per cent. polynuclears.

October 13: At 6 a. m. patient had a chill lasting twenty minutes; at 10 a. m., temperature was 105.4 F., pulse 160. At 12 o'clock temperature was 101.8 F. and at 2 p. m. it was normal with pulse 120 and respirations 20. Heart and lungs examined and found to be normal, fundus of eyes normal. There was no question now that the thrombosis had again become active and that infective material was being liberated into the circulation, either directly by the jugular vein or through the torcular Herophili to the lateral sinus of the opposite side.

October 14: Patient was very restless; complained of pains in the back and abdomen, but an examination failed to reveal an infection of any organ. At 5 p. m. she had a chill lasting half an hour and at 7 p. m. the temperature was 105.3 F., pulse 168, respiration 34. At 10 p. m. temperature was 100 F. and pulse 134.

Second Operation.—At 11 p. m. the patient was again taken to the operating room with the idea of resecting the jugular vein, but owing to the very depressed condition following her rise of temperature a hasty and simple ligation of the jugular was made at the level of the cricoid cartilage. Blood count during the day showed: Reds, 4,200,000; whites, 13,000; polynuclears, 83 per cent.; large lymphocytes, 2 per cent.; small lymphocytes, 15 per cent.; hemoglobin, 70 per cent.

October 15: Very restless and irritable, pain over the right side of head. Rectal saline infusion of 500 c.c. was used with apparent benefit. At 2 a. m. she had a chill followed by a temperature of 104.8 F. returning to normal at 6 a. m.

October 16: Patient very depressed, could not retain nourishment. At 4 p. m. she lapsed into a state of complete collapse, respirations and pulse apparently ceasing. She was revived by a high rectal saline infusion and hypodermics of nitroglycerin, strychnin and brandy, with a return to consciousness in about 20 minutes. Temperature did not rise over 100.8 F., during the day and was subnormal most of the time—97.2 F. White blood cells, 15,200; polynuclears, 82 per cent.

October 17: Nutrient enema of whiskey, peptonized milk and egg. Could not retain food on the stomach. At 12 m. she had a chill; highest temperature, 105.6 F.; pulse 168. Saline rectal infusion followed by marked improvement, and later enema of coffee and whiskey. At 11 p. m. patient had so improved that it was decided to resect the jugular above and below the previous point of ligation.

Third Operation.—The vein was ligated well above the entrance to the facial vein, and resected to within one inch above the clavicle. A small clot was dislodged from the upper part of the jugular after removing the ligature, but there was no evidence of the infective process having extended down to the point of ligation; this was confirmed later for the wound healed within a few days with the aid of small cigarette drain.

Postoperative History.—October 18: At 6 a. m. patient had a severe chill lasting 59 minutes. Saline infusion of 250 c.c. was given and later an enema of coffee and whiskey; all were retained. She became delirious, the temperature rising to 104.4 F. and pulse 162; descending to 97 F. with pulse 104.

October 19: Patient irritable and restless; heroin given. She retained on stomach peptonized milk and whiskey which was used as freely as possible. At 1 a. m. she had a chill lasting 50 minutes, temperature rising to 105.6 F., pulse 193, respiration 28. After each rise of temperature it always descended in from two to six hours to normal or subnormal, the pulse remaining comparatively high.

October 20: Patient retained some nourishment by stomach. The lungs, heart, kidneys, liver, urine, etc., were found to be normal, and fetus alive though she complained of abdominal pains. She had a chill at 4 p. m.; temperature 106.4 F., pulse 166. At 10 p. m. temperature was normal.

October 21: Patient was delirious, restless and vomited continually. At 10 a. m. the temperature was 106.4 F., which descended slowly, reaching normal at 6 p. m. A bacteriologic examination was made. The arm over the median cephalic vein was thoroughly sterilized, and the vein exposed, from which blood, uncontaminated from external sources, was extracted. After incubation it was shown to contain a pure culture of *Staphylococcus pyogenes aureus*. From the above culture a vaccine was made, according to Wright's method, for the purpose of combating her general septic condition. It was never used on account of subsequent developments.

October 22: Patient vomited continuously, was delirious much of the time and general condition very poor. At 12 m., after a chill, her temperature rose to 106.2 F., pulse 180, and respiration 36. The wound was dressed each day and the sinus irrigated and packed. The foul odor so noticeable at first had decreased, the probe and the blunt curette were used in the lateral sinus posteriorly as far as the torcular without showing a trace of blood. There was no bleeding noticeable from the direction of the bulb where the inferior petrosal sinus empties.

October 23: Patient had a chill, the temperature rising to 107.2 F., pulse 190, respiration 38. Later the temperature was 97.4 F., and pulse 104. Fetus was alive.

October 24: Patient very weak; vomited all food. Chill, temperature to 105.4 F., down to 97.2 F.

October 25: At 10 a. m. the patient's temperature rose to 107.4, pulse about 200. Lowest temperature 97.2 and pulse 98. At 3:20 p. m. the patient was removed to the operating room with the intention of opening the torcular Herophili through the occipital protuberance

The question of meningitis, epidural abscess, cerebral and cerebellar abscess was considered. The temperature course would almost exclude a meningitis. The complete absence of pressure symptoms, such as headache, reduced pulse rate and changes in the optic nerve, with the great variation of temperature and the fact that by further exploration, the walls of the antrum, aditus, and tympanic cavities were found to be intact, seemed to exclude cerebral and epidural abscess. There were two questions remaining, a possible cerebellar abscess, which frequently exists with masked symptoms, and a simple infective sinus thrombosis. The close proximity of the cerebellum to a gangrenous and infected sinus, rendered likely an abscess of this part. One thing was certain, that the real source of infection and the chief cause of the symptoms was the dislodgement into the circulation of infective material containing staphylococci, and coming from one of the venous sinuses of the brain. The lateral sinus could be probed from the mastoid to the torcular and seemed to be free of infective material as well as blood. I was compelled to conclude that either the straight, the superior longitudinal, or the lateral sinus of the opposite side was affected. The possibility of the thrombus extending along the superior and inferior petrosal sinuses from the sigmoid to the cavernous sinus was considered, but the absence of all eye symptoms directed my attention again to the sinuses in the posterior region of the cranium. An infection through the posterior condyloid and mastoid emissary veins which communicated with the subclavian and innominate veins, seemed hardly possible.

Fourth Operation.—Never having heard of the torcular Herophili being operated on, and knowing the great danger of opening this confluence of all the sinuses, thereby shutting off the venous circulation of the brain, I went with some trepidation to the task, realizing that my patient would die

the cranium in this region, and the hemorrhage from the bone in enlarging it. The lateral sinus was readily distinguished at its exit from the torcular, and also by the fact that at this point it was collapsed and discolored. An incision was made in it, extending into the torcular followed by only a slight oozing of blood. A curette was inserted a distance of four inches into the superior longitudinal sinus with no signs of blood, but a quantity of dark and foul smelling material was removed. The probe was then passed toward the left lateral sinus and some bleeding occurred. This encouraged me to use the curette, which was followed by a gush of venous blood that was checked by compression. A strip of gauze was inserted into the superior longitudinal sinus for a distance of two inches, and a piece of gauze was carried along the lateral sinus to its opening in the mastoid. The wound was dressed and patient returned to bed.

Postoperative History.—October 26: Patient was in fair condition; restless; vomited frequently. At 5:30 p. m., twenty-five hours after the operation, she had a chill lasting half an hour. At 6:30 p. m., the temperature was 105.8 F.; pulse 175. Temperature descended to 97.4 F. in a few hours. A nutrient enema of whiskey one ounce, digitalis 20 minims and milk 4 ounces was given and retained.

October 27: Patient same as day before, vomiting, etc.; nutrient enemas with whiskey in large doses were given; highest temperature 103.2 F. A quantity of dark and purulent detritus with foul odor removed from the longitudinal sinus.

October 28: Ice cap was applied. Patient vomited, but retained some peptonized milk and whiskey. During the dressing, pressure was removed from the left side of the torcular and a blunt curette gently passed into the left lateral sinus; twelve ounces of blood was extracted, which came in a

Temperature chart of Mrs. T. L.: a case of thrombosis of the superior longitudinal and lateral sinuses. Treated by opening the torcular Herophili. Complicated by pregnancy. Recovery. K, operation on mastoid and lateral sinus; L, ligation of jugular vein; M, resection of jugular; N, opening of torcular Herophili through occipital protuberance; O, extracted 12 oz. blood from left lateral sinus; P, extracted 8 oz. blood from left lateral sinus.

at any moment as she was rapidly growing weaker, and the temperature variations were becoming more marked. The superior longitudinal sinus as a rule empties more directly into the right lateral sinus, while the straight sinus empties even more directly into the left lateral sinus. As the right side of the torcular, where the lateral sinus starts, was apparently occluded, I determined to trephine directly over this region and endeavor to enter the superior longitudinal sinus through the torcular Herophili. As a preliminary procedure the cerebellum was opened at a point one and one-half inches posterior to the auditory meatus and one-half an inch below, the dura incised and a bistoury passed into the cerebellar substance in various directions without revealing any pus. I then selected a point one-half an inch to the right, and slightly below the occipital protuberance for the purpose of entering the torcular Herophili. A chisel and gouge were used to thin the bone, preparatory to the trephine. The cranium in this region is very thick, cancellous and filled with blood vessels that bleed freely; the latter were controlled by the use of sterilized paraffin. Rongeur forceps were quite inadequate in this region, but several adjacent trephines aided by the gouge and mallet gave an opening sufficiently large to work on the torcular Herophili with its several confluent sinuses. One must be in a position to check bleeding from one or more sources and still be able to continue the operation. A circular opening at least two inches in diameter, with its precipitous edges well chiseled away, seemed sufficient. A larger area was impracticable owing to the great thickness of

gush. My idea was to carry outward, if possible, any thrombotic material which might be lodged in the straight, the occipital or the left lateral sinus. The temperature that day did not rise above 101.6 F.

October 29: Patient vomited to some extent, but was not so restless; very irritable temper. Nutrient enemas and temperature again to 105.6 F.; pulse 140.

October 30: I decided to repeat the same procedure of two days before, and removed 8 ounces of blood. This was followed by a rise of temperature to 100.5 F.

October 31: Patient ate and retained eggs, fish, toast and coffee. Temperature rising for a short time to 100.4 F., with pulse 140. The latter remained high regardless of the temperature.

November 1: Highest temperature 99.2 F.; pulse 138. The temperature after this date never rose above normal, though on November 4 it descended to 96.2 F., with some depression.

This case was an uncomplicated thrombosis involving the entire right lateral sinus, and superior longitudinal sinus, with unquestionably the inferior petrosal, straight, and occipital sinuses and torcular Herophili involved in the same process.

Over fourteen inches of venous blood current were obliterated, including the right jugular vein, sigmoid, lateral and superior longitudinal sinuses. After occlusion of the right lateral and superior longitudinal

sinuses, blood was freely extracted from the left lateral, straight and occipital sinuses through the torcular Herophili which procedure marked the termination of her general sepsis.

On January 31, four months after the illness, the patient gave birth to a remarkably fine child weighing seven and one-half pounds. On March 15 the wound had entirely cicatrized over the posterior part of the cranium. A small fistulous opening remained in the mastoid which communicated directly with the tympanic cavity.

The radical operation which had previously been so rudely interrupted was now completed. The malleus and incus were removed, also the outer attic wall and the Eustachian tube obliterated. The area over the region of the sigmoid and lateral sinuses was covered by a dense mass of fibrous tissue which was left intact. The mastoid wound was entirely closed and healed by first intention. Two months later the tympanic cavity and antrum are well lined with skin and the patient discharged. Hearing in that ear is the watch at 16 cm. ($6\frac{1}{2}$ in.).

THE FACTORS IN THE ESTIMATION OF BLOOD PRESSURE.*

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The first factor in the interpretation of blood pressure must be a satisfactory instrument. It should, to be of service for general work, be portable, quick of adjustment and accurate. These qualities are possessed in eminent degree by the tonometer of Recklinghausen. It does not detract from the achievement of Riva-Rocci that later modifications have improved the technic; his merit will always lie in the impetus given to the study of blood pressure as a routine feature of the general examination; the aim now must be to analyze the findings properly.

The tonometer of Recklinghausen is based on the principle, first introduced into physical science by Bourdon and later incorporated into the kymograph of Fick, that if a very shallow, curved, elongated air chamber, fixed at one end, communicate at one end of the arc with a pressure apparatus, while the other is closed, any increase of pressure will be made manifest by a flattening or elongation of the arc, thereby imparting a certain movement to the end that is free. By a very simple device this movement of the air chamber is communicated to an axis, on which, guarded by a hair-spring, there is fastened a long needle, whose tip is made to move along a graduated scale, previously standardized, and the final figures are read off from the dial.

A notable advantage in the Recklinghausen apparatus is found in the pump. A metallic air-pump, constructed somewhat on the principle of the bicycle pump, is substituted for the ordinary double rubber bulb. The pump permits of increase or decrease of pressure at the will of the examiner; the instrument is at all times under perfect control; measurements can be made with greatest accuracy and promptly verified. By an ingenious arrangement of valves, easily controlled, this increase or diminution of pressure can be made to take place slowly. The whole apparatus is manipulated, without any force,

by one hand, while the other is free to take the pulse. The pump is light, durable and only requires an occasional application of vaselin to valves and piston head.

The cuff is very broad, has a relatively small elastic chamber and a very strong band of thick canvas. It is applied by a buckle and strap, so that it can be snugly fitted to the arm. It is 12 cm. wide. The distention of the rubber pocket can never be very great, though the pressure run to considerable figures. The whole apparatus has, when packed, a weight of four and one-half pounds, and can be easily carried to the bedside of the patient.

The distinct advantage of the Recklinghausen apparatus is in its ability to measure both systolic and diastolic pressures. It will be seen that the mere determination of systolic pressure, though a step in advance, offers little help in the solution of clinical problems; the important thing is the relation of systolic and diastolic pressure. Aside from the actual pressure, measurable directly in centimeters of water, the tonometer makes it possible to observe the rhythm in time and power of the heart's contractions. It will frequently happen that the pulse seems perfectly regular at the wrist, when the ocular evidences of the slightly unequal movements of the needle will show the contrary; the pulse may seem to show an equal filling of the artery at each contraction, but the dial will record differences in this regard. Again, in many organic affections of the heart, a peculiar vibratile oscillation of the needle accompanies the excursions of the pulse, instead of the gradual rise and undulating decline, so that the tonometer offers all the advantages of a sphygmographic tracing, along with the information as to blood pressure.

Care must be taken that the examinations are not too long continued, for the interruption of the circulation in an extremity, if prolonged, will of itself cause changes in the blood pressure.

I start with this postulate: The arterial system has a capacity such that, if all arteries were perfectly limp and dilated, it could never be filled by the available amount of blood. The conditions necessary for a proper circulation are only secured by a certain permanent state of contraction common to all, or nearly all, of the arteries; a state of contraction still further increased with the functional inactivity of the parts supplied, and diminished, but never wholly relinquished, with the proper exercise of function. This brings the general conception of the circulation directly into line with what is known of the safeguarding devices with respect to the heart proper, and, as Gad has shown, with respect to the respiration, in which a state of partial but permanent inhibition always supplies a natural reserve to meet emergencies of all kinds.

This view is directly at variance with older physiologic doctrine. Thus Landois says:

The system of blood vessels, with its many ramifications and subdivisions endowed everywhere with contractility and elasticity, is not only filled with blood; it is overfilled. Hence the mass of blood produces a certain pressure, which produces a stretching of the elastic vessel wall. This, of course, applies only to conditions during life; after death the muscular tissue of the vessel walls becomes relaxed and some fluid finds its way out into the tissue.

In the same way the doctrine that frequency of pulse-beat increases the blood pressure will doubtless receive revision. Foster says:

If, while the force of the individual beats remains constant the frequency is increased or diminished, and, vice versa, if

* Read in the Section on Practice of Medicine of the American Medical Association, at the Fifty-ninth Annual Session, held at Chicago, June, 1908.