beneficial influence upon all these women. We have made no observations of its effect upon the opsonic index or leucocytosis.

The explanation of the action of fresh air and sunlight in the treatment of puerperal infection appears to lie in increasing the patient's resistance by increasing the hemoglobin or by decreasing the hemolysis.

In urging the importance of outdoor treatment, the writers do not wish to be understood as condemning other methods except such as have appeared valueless or dangerous. Nevertheless, there has been a marked tendency in later years to conservatism in intra-uterine manipulation, which has been given its most pronounced expression by Winter¹² and Carstens.¹⁵ It is our experience that, in all cases of puerperal sepsis, intra-uterine treatment should be avoided, if possible; and in the most severe types, the cavity of the uterus is much better untouched and the sole treatment directed to preserve the general condition of the patient, taking care, however, that free drainage of the uterus is maintained.

The writers consider the outdoor method the most valuable means we possess at present for treating severe puerperal sepsis, and one which in no way interferes with whatever additional measures may be considered beneficial to the disease.

The manner of carrying out this treatment at the Boston City Hospital is as follows:

The patient is kept out of doors on a wheel bed which can be moved into the ward whenever attentions of any kind are necessary. Sunlight seems to be quite as important as air, and, except in very hot weather, the patient is placed directly in the sun.

The majority improve rapidly. The pallor disappears, appetite improves, flesh and strength increase and they become deeply tanned. The effect on temperature is not immediate, but gradual, as the patient's resistance increases. The most striking results are seen in the prolonged pyrexias, where after several weeks of high temperature the general condition is wonderfully maintained.

Of drugs, iron and arsenic are valuable aids to sun and air in replacing hemoglobin. Strychnia is given as a stimulant to the vascular and nervous system. Alcohol increases the appetite and stays the loss of flesh in long-continued fever.

Fluids are supplied copiously by mouth, and in severe cases salt solution is given by rectum to increase the urinary secretion and aid the excretion of toxins. Alcohol and cold sponge baths are given for the pyrexia.

Hot or cold applications are used to relieve abdominal pain and distention.

This completes a brief résumé of the treatment as carried out at the Boston City Hospital. The charts of a few of the cases which recovered under this treatment are appended to give a better idea of their severity.

SUMMARY.

1. The outdoor treatment has reduced the mortality of severe puerperal infections by nearly 20%.

2. This treatment probably exerts its action chiefly by increasing the amount of hemoglobin in the blood.

3. Sunlight is probably quite as important as fresh air.

4. Curettage is contra-indicated in puerperal infection, because it increases the mortality nearly 10%.

5. A single intra-uterine douche of sterile salt solution should be the only local treatment, and some writers deny the value of even this.

6. Antistreptococcic serum and vaccines have not proven of much value.

7. The outdoor treatment is the most effective known at present for puerperal infections, but the search for new methods should be continued.

REFERENCES.

- ¹ Stone: *Med. Rec.*, 1907, lxxi, 246.
- ² Watkins: *Jour. Am. Med. Asso.*, 1909, liii, 1386-1389.
- ³ Lea: *Puerperal Infection*, 1910, p. 260.
- ⁴ Vineberg: *Trans. Am. Gynec. Soc.*, 1903, xxviii, 84-102.
- ⁵ Lenhart: *Die deptschen Erkrankungen*, Wien, 1903.
- ⁶ Semon: *Monatschr. für Geburtsh. und Gynäk.*, xxxiii, 148-161.
- ⁷ Young and Williams: *BOSTON MED. AND SURG. JOUR.*, 1911, clxiv, 871-876.
- ⁸ Williams: *Obstetrics*, 1908, 885.
- ⁹ Edgar: *Practice of Obstetrics*, 1907, 756.
- ¹⁰ v. Herff: In *Winckel's Handbuch der Geburt.*, Bd. iii, Heft 2, s. 910.
- ¹¹ Pinard: *Ann. de Gynec.*, 1909, ii, s. vi, 577-599.
- ¹² Winter: *Centralbl. für Gynäk.*, 1909, xxiii, 962.
- ¹³ Carstens: *Jour. Am. Med. Asso.*, 1910, iv, 475-477.
- ¹⁴ Williams, Pryor, Frye and Reynolds: *Trans. Am. Gynec. Soc.*, 1899, xxiv, 80-110.
- ¹⁵ Marmorek: *Ann. de l'Inst. Pasteur*, 1895, ix, 593-620.
- ¹⁶ Bumm: *Berl. klin. Wochenschr.*, 1904, s. 1344.
- ¹⁷ Pronsohn: *Ibid.*, 1902, ii, 979-982.
- ¹⁸ Peham: *Arch. für Gynäk.*, 1905, lxxiv, 47-69.
- ¹⁹ Young: *BOSTON MED. AND SURG. JOUR.*, 1905, clii, 212-216.
- ²⁰ Williams, Cragin and Newell: *Trans. Am. Gynec. Soc.*, 1910, xxxv, 81-200.
- ²¹ Fehling: *Monatschr. für Geburtsh. und Gynäk.*, 1902, xvi, 506-514.
- ²² v. Herff: *Deutsche med. Wochenschr.*, 1908, xxxiv, 1041-1141.
- ²³ Trendelenburg: *München. med. Wochenschr.*, 1902, xlix, 513-516.
- ²⁴ Bumm: *Med. Bl.*, Wien, 1905, xxviii, 19.

TUBERCULAR EPIDIDYMITIS; END RESULTS OF SEVENTY-ONE CASES.

BY J. DELLINGER BARNEY, M.D., BOSTON,

Genito-Urinary Surgeon to Out-Patients, Massachusetts General Hospital; Assistant in Genito-Urinary Surgery, Harvard Medical School.

IN a recent communication¹ the writer presented an analysis of 153 tubercular epididymes, occurring in 120 patients at the Massachusetts General Hospital. As a sequel to this it is now my purpose to discuss the end results of 71 of these cases, 69 of which had one or more operations.

Of these, 22 were personally examined by the writer on one or more occasions, 41 were seen by other physicians at the hospital, while 8 were followed by letter only. Twenty-six patients were seen after unilateral operation and without involvement, when seen, of the opposite side; 23 returned as re-entries to the hospital with infection of the second epididymis; 20 were examined after bilateral operations. Of the 2 remaining, one was seen by the writer before and after a subsequent double epididymectomy, while the other case is still unoperated.

This paper is presented for two reasons: First, because of the intrinsic interest of the cases; secondly, because it shows, even more forcibly

¹ *BOSTON MED. AND SURG. JOUR.*, Dec. 14, 1911.

than did our first communication, that orchidectomy is no more curative than epididymectomy, and, except in rare instances, is an unjustifiable procedure. If, in any way, this paper helps to place the former operation higher on the shelf, along with castration for prostatic hypertrophy, its purpose will have been served.

It will be seen from the charts which follow that certain facts have been sought for and pretty generally obtained.* In some instances the figures are too few to be of conclusive value, and must be considered only as statistical straws in showing the direction of the wind. After completing the grand totals certain features of these cases were compared before and after operation, but in the same patients. In this way only can a true estimate of the real conditions be obtained. Such results are of great interest and importance, as will be seen later. An additional nail has been driven into the coffin of orchidectomy by comparing the results of this operation with those of epididymectomy. Even though the numbers of the latter are far less than those of the former, it will be seen that the comparison is largely in favor of epididymectomy.

Taking up the items in their order of arrangement it is seen that 76% of those operated on are now in good condition, in spite, in some cases, of the presence of tuberculosis. This means an appearance and feeling of good health, ability to do a day's work comfortably, and without undue fatigue, good appetite, restful sleep, regularity of the bowels and, generally speaking, a gain of weight. As to this point, it was found that 51% had definitely gained weight, while in 17% there was no change, in other words, no loss of weight.

The question of tuberculosis elsewhere, past or present, was carefully inquired into. In my first paper it was shown that in 64% there was no demonstrable evidence of tuberculosis, in 6% there was a history or physical sign of some old process, while active foci were found in 29%. In the cases under consideration it is found that tuberculosis is now absent in about two thirds (62%) and present in one third (37%), while before operation its absence was noted in a little more than half (55%). In the comparison of this item in the same cases before and after operation it is found that tuberculosis is more often absent before and after (51%) than present before and after (35%). The fact that in 8% it is absent now, but was present before operation, while in 5% it is present now and was absent before operation, would indicate that the removal of an active focus, such as the epididymis, had put a damper on other foci.

It is important to note that the process was found to be localized in the lung, both before and after operation, in about half the cases (50% before, 48% after), while bone was attacked in about 25% of instances (23% before, 28% after). In many, bone and lung were, or had been, simultaneously involved. The path of the tuber-

cle bacillus in all was devious and irregular. In some it began in lung to end in epididymis, sometimes pausing in bone *en route*. In others the order was reversed, or took an irregular, moth-like flight. This was also noted by Keyes, Jr.,² and seems to be characteristic of such cases.

Renal tuberculosis complicated the picture in 3 cases only, once before, twice after operation. From this fact two conclusions are to be drawn: First, that epididymal tuberculosis is rarely an evidence of a general genito-urinary infection; second, that infection of the epididymis is but seldom the result of the descent of a renal process. On the other hand, it shows convincingly that renal tuberculosis rarely follows an infection of the lower urinary and genital tract, either by an ascending process or through the blood stream. This is well illustrated by a case operated on by the writer about eighteen months ago. At that time cystoscopy showed a typically tubercular bladder, the lesions being well marked about the ureteric orifices. Catheterization of each ureter showed perfectly normal urine, although in a bladder specimen there were pus, blood and tubercle bacilli (guinea-pig test). Both epididymes were removed, together with a portion of each testicle, which was tuberculous. The prostate and seminal vesicles were extensively involved. A recent cystoscopy shows but little bladder tuberculosis, catheter specimens from each kidney are normal, the bladder urine is clear, and, microscopically, shows but little pus. The guinea-pig test, however, still shows the presence of tubercle bacilli. In this case the conditions were admirable for renal involvement, but with the marked subsidence of the vesical and prostatic lesions, after removal of the active foci, it is more than likely that extension to the kidney by any route will not now occur.

Out of 10 urines, with which the guinea pig was inoculated, 8 showed the presence of the tubercle bacillus, a fact which demonstrates the extension of the disease from prostate and vesicles to bladder.

In regard to post-operative sinuses in the scrotum, or at the site of amputation of the vas deferens, we have found them present in not quite 25% of cases. We are confident that this figure would be much smaller had more time elapsed since operation. This statement is based on the fact that many cases, seen at a more or less remote period from operation, gave a history of a sinus persisting for several months with ultimate spontaneous and complete closure. A glance at the table of time elapsing from operation to date of examination shows that 64% were seen during the first year, a fact which helps, at least, to explain the presence of many sinuses. Generally speaking, the wounds were found to have healed, either by first intention, or, in some instances, within a very few weeks after leaving the hospital. In only one of the cases followed did the stump of the vas give trouble. In this instance bilateral operation was done, the ends of the vasa being ligated and cauterized with

* In the estimation of percentages, fractions have been omitted for the sake of simplicity.

² Ann. Surg., June, 1907.

95% carbolic acid in the usual manner. All wounds healed practically *per primam*. Five months later a mass the size of a walnut appeared on the left, at the site of the internal inguinal ring. This increased slowly in size, became red, moderately tender, and fluctuant. Finally it ruptured, allowing the escape of considerable pus and slough. Frequent dressings and regular

complete operation, such as partial epididymectomy, curetting of a sinus, etc., had been done, and where, as is to be expected, the disease has once more broken into activity. Of the 15 on whom epididymectomy was performed, not one has returned later with an outbreak of tuberculosis in the corresponding testicle. It would appear, therefore, that those who regard epididy-

CHART 1.
A comparison of the facts in the cases as a whole, together with those of 12 epididymo-vasectomies and 27 orchido-vasectomies. The figures indicate the percentages.

weekly injections of tuberculin produced good results, but the sinus did not entirely close for some months. It seems probable that the infection occurred by leakage from the stump of the vas. This is clearly a rare sequel of the operation and seems worthy of note more on that account than because of its importance.

The condition of the side operated on was found to be normal in 87% of cases. The 13% of abnormalities includes cases where only an in-

mectomy as an incomplete procedure have little ground for their contention. Attention is called again to a case cited in our first paper. Epididymectomy was done some months previously, the patient returning with a fresh outbreak of the disease in the same side of the scrotum, which clinically had every appearance of testicular involvement. Operation showed the testicle to be perfectly normal, the peritesticular and scrotal tissues alone being involved.

Prostate and vesicles were found to be tuberculous (diagnosis made by palpation) in 57%, whereas before operation they were noted as being abnormal (tubercular) in 63%, indicating an improvement of the condition by removal of active foci. This supposition is strengthened by a comparison of these findings in the same cases, both before and after operation. Here, nearly twice as many (44%) prostates and vesicles were abnormal as normal (25%), and further, 18% abnormal before operation were normal when finally examined, whereas only 11%, normal before operation, were recorded as abnormal after it. Let it be said at once that in the diagnosis of prostatic and vesicular disease, we must, of necessity, rely very largely on rectal palpation,

there was a general miliary tuberculosis, practically every tissue being invaded, including the prostate and seminal vesicles, but in each the remaining testis and epididymis were intact. In the third case the cause of death does not seem to be clear, and there was no autopsy, but a general tuberculous infection is suspected. While a mortality of less than 6% is not high, it is significant when compared with that of more serious operations for tuberculosis, such as nephrectomy, with a mortality of only about 3%. The operation of epididymectomy, or of orchidectomy, *per se*, does not kill, but it very clearly does set free, more often than nephrectomy, the legions of tubercle bacilli which rapidly overcome their host.

CHART 2.
A comparison of the same facts in the same cases. The "Odd" cases are those in which the condition was known only after operation. The figures indicate the percentages.

and that unquestionably there is a large chance for error. But that this error is generally in detecting small, early and centrally located tuberculous foci in prostate or vesicles, we think is obvious. We have no hesitation, therefore, in declaring that the prostate is very generally diseased, and, we believe, is the source from which the epididymal process springs. Could we explore the prostate, as we can the epididymis, when the disease is in its infancy, this point could be definitely settled. As it is, the clinical evidence at hand is our only guide to the truth. We are glad, however, to present one argument against our contention, offered by one of our cases which died after operation of a general miliary tuberculosis. Autopsy revealed a perfectly normal prostate and seminal vesicles, although practically every other organ was invaded. Here, then, is a case to which those of us who believe that the prostate is the primary focus must doff our hats.

Of the other 3 cases (constituting our mortality of 4, or 5.47%), 2 came to autopsy. In each

Two other cases of this series are known to have died, one after three years, of tuberculosis, with many outbreaks of the disease, and with as many operations for its relief; another died six years later, after an operation for the relief of diverticulitis, and even here the urine still contained tubercle bacilli. No autopsy was obtained in either case. The bull-dog tenacity of the tubercle bacillus is thus well exemplified.

Returning to our statistical table it is found that subjective urinary symptoms, such as frequency and dysuria, were absent in the majority of cases both before (62%) and after (71%) operation, and correspondingly the urine was likewise normal in 55% before, and in 54% after, operation. Similarly it is found, in the comparison of these facts in the same cases, that urinary symptoms were absent in 51%, both before and after operation, while the urine itself was normal in 41% on the same occasions. Thus, broadly speaking, a small majority of cases have a normal urine and no urinary disturbance both before and after opera-

tion. But in a comparison of the same cases it is to be observed that an evident change for the worse has taken place in both these points. For example, in 18% there are now disturbances of micturition which were absent before operation, while the reverse is true of only 6%. Also, as regards the urine itself, in 11% it has become abnormal since operation, whereas in only 8% has it become normal. The figures on which these percentages are based are small, but seem to us to be at least suggestive.

A disease which so thoroughly permeates the genital tract as tuberculosis, and of which an affection of the epididymis is the most common index, must necessarily influence the sexual function. This is particularly true after the performance of any operation for its relief. The state of the sexual function was inquired into carefully, and to our surprise was found to be "good" in 77% before and in 60% after operation. In a comparison of the same cases 61% were found to be good both before and after operation, while 23% were poor before and after. The chief complaint was lack of sexual desire, or inability to get an erection, even in the presence of a normal appetite. In this connection the semen was carefully examined for the presence of spermatozoa in 13 cases. In 11 (85%) there was complete azospermia, while in two cases having a unilateral operation, spermatozoa were found. From this it is clear that, although the majority have the desire and ability to continue their sexual activity, the power of procreation is lacking in nearly all. Our observations on this point are substantiated by the findings of others, notably Keyes, Jr. It is our firm conviction, from the results so far obtained, that, given a case of tubercular epididymitis, we shall find azospermia in a very large majority, whether the case be early or far advanced. This conviction, and our belief that the prostate is the source from which the epididymal disease takes its origin, mutually strengthen one another, and, we believe, are fully substantiated by the clinical findings already set forth. Nor are we a whit dismayed by the statement of three patients, all of whom claim to have become fathers since the onset of their disease. In the words of Keyes, "Honi soit qui mal y pense."

In regard to the use of tuberculin after operation, and of its beneficial influence, we have no doubt. It was hoped that we could give here some conclusive figures as to its advantages. Unfortunately only 12 cases are known to have had tuberculin since operation, and in only 8 of these has its use been regular for any length of time. So small a number offers no fair chance for comparative statistics. We shall, therefore, await the accumulation of a larger amount of data on this point before making a report. The necessary regularity of attendance on which the successful use of tuberculin depends is well known to be difficult to bring about in hospital cases. We are, however, doing our utmost to improve this situation.

In closing, let me call attention, especially

that of the advocates of orchidectomy, to the table in which the results of epididymectomy and orchidectomy are compared. These figures are based on 15 cases of epididymectomy, and on 42 cases of orchidectomy, each with and without vasectomy. A glance through the columns will show the most enthusiastic orchidectomist that his claims for the necessity, or better results, of the procedure are not backed up by the facts. Also how is he who performs orchidectomy to justify himself in the removal of the second testicle, especially in a young subject, a feat which he must perform, sooner or later, after removal of the first? The records show that in a total of 43 of these cases, the infection of the second epididymis, in a very large majority, occurred within one year of the time of involvement of the first. It has also been found that the time of return of the disease to the second epididymis is uninfluenced whether operation is performed or not. Experience has shown that infection of the second epididymis may occur as late as four and one-half years after resection of the first side, while without operation this event may hang fire for six years. If, after the lapse of this period of time, no tubercle bacilli have sought out the second epididymis, or in the event of a bilateral operation, at one or more sittings, the patient may confidently expect his share of good health and comfort.

From this analysis of the end results of seventy-one cases of tuberculosis of the epididymis we can draw the following conclusions:

1. After the removal of one or both epididymes the large majority of patients are found to be in good condition and to have gained weight.

2. In two thirds of the cases there is no demonstrable evidence of tuberculosis elsewhere than in the genito-urinary tract. When present it is most commonly found in the lungs or bones, but any organ may be attacked.

3. Renal tuberculosis rarely follows an infection of the epididymis.

4. Tubercle bacilli were present in eight out of ten urines as shown by the guinea-pig test. These urines also contained blood and pus, while those giving a negative reaction were normal.

5. A small majority of cases have a normal urine, and no urinary disturbances either before or after operation.

6. Post-operative sinuses are found in 25% of cases, but as about two thirds of the patients were seen during the first year after operation, and as many sinuses remain open for several months, this figure would be ultimately much reduced.

Although we have not, as yet, any large number of cases to prove it, we are firmly convinced that the use of tuberculin after operation hastens convalescence and the closure of sinuses more than any other measure.

7. No case on whom epididymectomy was performed is known to have had a recurrence in the corresponding testicle.

8. Tuberculosis of prostate and vesicles is found in more than half, and it is probable that

this number would be greater were our methods of detecting early and centrally located lesions more accurate.

9. In a very large majority the sexual function is undisturbed, but the semen is found to be sterile in 85%.

10. A comparison of many orchidectomies with a few epididymectomies show the latter to have resulted more favorably. It is a fact, however, that infection of the second epididymis is to be expected, with or without operation on the first epididymis, and whether that operation be epididymectomy or orchidectomy.

11. The mortality of operations for tuberculosis of the epididymis is 5.47%, the cause of death being a general miliary tuberculosis.

THE BONE LESIONS ACCOMPANYING CHRONIC LEG ULCERS.*

BY WM. PEARCE COUES, M.D., BOSTON.

CHRONIC leg ulcers, the bane of the surgical out-patient, have had many causes assigned to account for their existence and persistence. Many of these seem satisfactory when accepted without more than superficial examination. If we take the most commonly accepted view we shall charge the condition of varicose veins of the leg with being responsible for many if not the majority of cases. The old description of causation, constant standing, weakened veins, sedentary life of women and pelvic troubles incident to their sex, is doubtless applicable to many cases; but with all these reasons for leg ulcer given, both for the etiology and for the stubbornness of the cases in healing, I have not been able to accept these dicta as explaining all the cases, varicose, specific or both. Why do not these cases get well, at least some of them, in reasonable time, with decent treatment and care, is a question I have often asked myself.

Some few years ago I began having x-rays taken of numbers of these cases; pictures of the tibia and fibula of cases of chronic, resistant leg ulcers, whether seemingly varicose, or those with the sharp eaten-out appearance supposed to be more or less diagnostic of specific ulceration, occurring on the upper parts of the leg without marked varices. The results were most interesting, and I think it is fair to say that a knowledge of the bone conditions underlying the ulceration of the soft parts of the leg has been a great aid in arriving at a definite diagnosis of the cases.

I believe the reason very many of these ulcers do not heal well is on account of the underlying bone conditions rather than on account of weakened veins, poor musculature and blood supply.

The fact that certain changes in the bones of the leg may occur during continuous ulceration of the superimposed soft tissues is not new; such findings have been noted as occasional occurrences; at the same time the study of the different bone lesions by x-ray pictures and the

attempt to differentiate specific from varicose ulcers by this means is, I believe, new.

Long-continued irritation of the periosteum from the ulcer over it at last stimulates its osteogenetic layer; osteoblasts are formed, the bone thickens and we get the characteristic pictures seen in the radiograph. At least this is the interpretation I put on the process purely from the clinical standpoint.

According to Beck,¹ most inflammatory bone lesions are caused by the invasion of the bone by micro-organisms, mostly reaching the bone by way of the blood stream and only occasionally from the outside by direct extension, as in the above supposition. The infective material, Beck says, comes in emboli of clusters of organisms from the minute arteries to the capillaries, the capillaries becoming the seat of embolism. These are the end capillaries of the nutrient vessels of the bone. It is from this reason and the constant placing of the nutrient artery that purely inflammatory bone lesions have such a constant site, according to this author; different organisms having different predilections, the tubercle bacillus, the epiphyses, cocci, the diaphysis, particularly the distal parts, specific disease the length of the diaphysis or some considerable part of it, most particularly the periosteum.

Post was the first, I believe, to point out the predilection of lues for the tibia. In the series of radiographs I have had taken of leg ulcer cases I have found that in the cases showing what I judged to be specific bone disease, the fibula was as often, perhaps oftener, affected, and I have learned to give great weight to a roughening and thickening of any considerable part of the fibula in the question of diagnosis of doubtful leg ulcers. It must be remembered in interpreting these leg ulcer cases clinically that many a case has accompanying varicose veins and yet that ulcer may very probably be specific, and a radiograph of the leg bones show specific changes. The question of diagnosis by the x-ray of the long bones is one in which a good deal of legitimate difference of opinion can naturally exist. X-ray experts and clinicians will sometimes differ. There may be a periostitis accompanying leg ulcer that is not specific. It differs in appearance in my opinion, however, to a marked degree. Roughness, general thickening and much increased density of bone through a considerable length of the bone are most suggestive of syphilis.

A glance at the pathology of bone syphilis from Keyes'² excellent article is of interest in this connection.

"The bone may be secondarily involved by syphilis of the surrounding tissues, or the inflammatory action may be primary in the bone itself or in its periosteum. The connection between trauma and syphilis is best illustrated by lesions of bone; gumma of bone often follows a contusion or blow."

This brings home well the fact of how often we see a supposed varicose ulcer develop after traumatism, and then get thickening of bone from periostitis and all the signs of a specific ulcer.

* Read at a clinical meeting of the staff of the Boston Dispensary, Feb. 2, 1912.