'EDEBOHLS' OPERATION IN NEPHRITIS
IN CHILDREN *

JOHN LOVETT MORSE, A.M., M.D.

Professor of Pediatrics, Medical School of Harvard University; Visiting Physician, Children's Hospital, and Consulting Physician, Infants' Hospital and the Floating Hospital

BOSTON

Edebohls, in reviewing the clinical records of the patients on whom he had performed nephropexy, found that six of them had also had chronic nephritis. The complete and permanent disappearance of albumin and casts from the urine and the restoration to perfect and enduring health of three of the first five patients, led him to advise bilateral nephropexy in the sixth patient, a sufferer from chronic Bright's disease complicated with movable kidneys, mainly with the object of favorably influencing the chronic nephritis. This operation, performed Jan. 10, 1898, constituted the first operation ever undertaken on the kidneys with the deliberate purpose of curing chronic Bright's disease. The paper in which he reported this case and stated his views was published in 1899.¹

In May, 1901, Edebohls² stated that he was prepared to go a step farther and to propose surgical intervention for the purpose of attempting a cure of chronic nephritis, whether the affected kidney was movable or in place. When the kidney was movable, he advised nephropexy with denudation of the kidney, and when it was fixed, denudation of the kidney of its capsule proper, thus affording free opportunity for the formation of new vascular connections on a large scale between the blood vessels of the kidney and those of its fatty capsule.

In 1901, he published an article³ in which he reported eighteen cases of chronic Bright's disease in women between the ages of 19 and 45 years. In some cases, the disease was unilateral, in others, bilateral. In most instances, it was interstitial in type. In his early operations, he did not excise the whole capsule; in his later operations, he did. He states that excision of the renal capsule proper accurately defines the operation. Eight of nine patients, operated on a year or more before, were cured, while the outcome in the other patients was encouraging. He believed that these results proved that chronic Bright's disease is curable by operation. He stated that the first beneficial effects of the operation, which are shown by an increase in the flow of urine, do not appear before the tenth day.

He explained the good results of the operation on the basis of the conditions found at a second operation on a patient in whom nephropexy had been performed. Strong connective tissue adhesions or bands attached the kidney to its surroundings. These bands contained very large and numerous blood vessels running between the kidney and the adjacent tissues. There was a large excess of newly formed arteries over newly formed veins. In all the arteries the direction of the blood stream was toward the kidney. He concluded, therefore, that "arterial hyperemization of

the kidney is the basic factor underlying the subsequent changes which result in the cure or improvement of chronic Bright's disease after operation."

Edebohls believed that the increased and adequately maintained blood supply to the kidney established by the operation leads to gradual absorption of the interstitial or intertubular inflammatory products and exudates, thus freeing the tubules and glomeruli from external compression, constriction and distortion, and permitting the reestablishment in them of a normal circulation. The result of this improved circulation in and between the tubules and glomeruli is the regenerative production of new epithelium capable of carrying on the secretory function.

He stated that it is self-evident from the above considerations that the cure of chronic Bright's disease is initiated only by the operation, and that it is thereafter necessarily gradual and progressive. It is not a question of the simple relief of renal tension, the beneficial effects of which in acute conditions of the kidneys were described by Harrison in 1896. In these acute cases, the tight fit of the capsule proper is manifest and the kidney bulges at once through an incision or puncture made through the capsule. In chronic Bright's disease, on the contrary, the capsule proper, although it may be abnormally adherent to the kidney, never compresses the latter and may rest loosely on it. Moreover, on cutting the capsule proper, the edges of the incision do not gape.

Edebohls stated that the object of renal decapsulation is to create new and liberal supplies of arterial blood to the diseased kidneys. Both the denuded kidney and its fatty capsule are most liberally supplied with blood vessels. Both are brought together by the operation over the whole extent of the surface of the kidney. The necessary result must be the formation, on the most extensive scale, of new vascular connections between the kidney and the fatty capsule about it. The fibrous capsule proper forms an almost impenetrable barrier to the passage of blood vessels between the kidney and its fatty capsule. He also said that it must be remembered that renal decapsulation is not directly and forthwith curative of chronic Bright's disease, and that it only leads to a cure or improvement of the disease by establishing circulatory conditions essential to such cure or improvement. The attainment of permanent cure will necessarily require time.

In 1904, he admitted that the experimental evidence as to the formation of new vessels was conflicting. He asserted, however, that the results obtained were unimportant and inapplicable, because all the experimental work had been done on animals with normal kidneys or with acute nephritis, and no studies were made on animals with chronic nephritis, which condition he was describing.

He said that Dr. Larkin had made a very complete and careful examination of two kidneys of the same subject, four months after decapsulation, and was able to establish clearly the existence of an abundant vascularization of the new capsules, of direct connection between the vessels of the new capsules and the perinephritic fat, and of direct penetration of the newly formed vessels of the new capsule along connective tissue paths into the substance of the kidney.

In 1904, Edebohls⁴ summed up his results in seventy-two patients operated on before Jan. 1, 1904.

* Read before the Section on Diseases of Children at the Sixty-Eighth Annual Session of the American Medical Association, New York, June, 1917.

* Because of lack of space, this article is abbreviated in THE JOURNAL. The complete article appears in the Transactions of the Section and in the author's reprints. A copy of the latter will be sent by the author on receipt of a stamped addressed envelope.

1. Edebohls: Med. News, 1899, 74, 481.

2. Edebohls: Med. Rec., New York, 1901, 59, 690.

3. Edebohls: The Cure of Chronic Bright's Disease by Operation, Med. Rec., New York, 1901, 60, 961.

4. Edebohls: The Surgical Treatment of Bright's Disease, New York, F. L. Lisecki, 1904.

The time elapsing after operation varied from eight months to eleven years and eight months, the average being two years and ten months.

RESULTS OF OPERATIONS IN FIRST SERIES OF CASES

Three patients had disappeared from observation.

Seven had died within two weeks.

Twenty-two had died later, nine from causes not related to chronic nephritis, thirteen could be fairly ascribed to chronic nephritis. Average duration of life was thirteen months, extremes fifteen days to eight years after operation.

Forty were living; of these, three were unimproved, twenty improved and seventeen cured. The duration since the operation in the cured cases varied from sixteen months to eleven years and eight months, the average being four years.

Only one of these patients was a child; a girl of 4½ years. The diagnosis was chronic parenchymatous nephritis. She was well two and one-half years after operation.

In June, 1908, Dr. Edebohls made his final report on 102 patients operated on up to June, 1906.⁵ He died Aug. 8, 1908.

RESULTS IN SECOND SERIES OF OPERATIONS

Three patients had disappeared from observation.

Ten had died within two weeks.

Thirty-nine patients had died later, ten from causes not related to chronic nephritis, twenty-nine from chronic nephritis. Average duration of life after operation, seventeen months; extremes, fifteen days and eight years.

Fifty patients were living; of these, six were unimproved, eleven improved and thirty-three cured. Average duration after operation five years; extremes fifteen months to fourteen years and ten months.

Average length of time after operation at which urine became normal, interstitial nephritis six months; parenchymatous nephritis fourteen months.

REVIEW OF LITERATURE REGARDING EDEBOHLS' OPERATION

Edebohls' views and statements attracted a great deal of attention when they were advanced. Van Cott⁶ attacked them severely and called attention to the fact, which is unquestionably true, that the blood supply of the kidney comes from the renal artery and that these arteries are terminal arteries, the blood supply from the capsule being insignificant. He also explained that the renal tissue once destroyed does not regenerate. The following are quotations from his article:

On teleological grounds, the renal circulation cannot be restored by decapsulation and substitution of the capsula adiposa . . . No amount of restoration of renal circulation would restore the integrity of the cortex . . . Chronic nephritis, being a local expression of a general disease, will yield only to such treatment as is calculated to cure the general disease; and here there can be hope only of arresting the progress of the renal degeneration. The diseased portion of the organ will never regenerate.

His arguments as to the circulation of the kidney and to lack of regeneration of kidney tissue seem incontrovertible.

Many experiments were undertaken in all countries on animals in relation to the formation of a new capsule with a new blood supply. Most of the experiments demonstrated that a new capsule is formed very shortly, usually being complete in a few weeks, and that this capsule is thicker and denser than the normal capsule. The experiments were all done on normal

animals or on animals with an induced acute nephritis. None of them were studied over long periods of time, a few months being the limit. Most of the observers, outside of Italy, came to the conclusion that the new capsule contains less rather than more blood vessels than the old. Among these writers may be mentioned Johnson,⁷ Emerson,⁸ Hall and Herxheimer,⁹ Ehrhardt,¹⁰ Gifford¹¹ and Stern.¹² They were unable to find evidences of anastomosis between the new capsular vessels and the other vessels of the kidneys.

Asakura¹³ was inclined to favor Edebohls' contention and to believe that the circulation may be improved in chronic conditions. He advanced no evidence, however, to prove this. Zaaiger¹⁴ concluded, from his second series of experiments, that the new capsule had a higher functional worth than the normal, especially on the hilum side. The venous anastomosis was greater than the arterial. He thinks that it is possible that these results may apply to decapsulation in man.

Martini¹⁵ called attention to the fact that a considerable proportion of the circulation in the kidneys comes through the capsules and the anastomoses between the capsular vessels and the others. He believed it theoretically possible, therefore, to establish the circulation through the capsule. He believed that the new capsule was formed from the interstitial connective tissue and the blood vessels of the kidneys. Other writers agree with him. Still other students believe that the capsule is formed from the outside tissues. Martini found a new formation of vessels in the new capsule and that the new collateral blood supply was much richer than the original and the new capsule more vascular. He showed by experiments that, if decapsulation was accomplished some time previously, those dogs would survive operations on the renal vessels while other dogs that had not had their kidneys decapsulated would not recover.

Siter,¹⁶ experimenting on cats and dogs, wrapped the kidney in the omentum. He found that the kidneys increased in size, that a new capsule was formed immediately and a new collateral circulation established in ten days. This new collateral circulation was sufficient to allow the kidney to functionate properly when the renal blood vessels were tied off. The kidneys remained much enlarged. Such a formation of anastomoses between the new vessels of the capsule and the other kidney vessels is, however, according to physiologists and pathologists, impossible.

Murard¹⁷ writing in 1913, called attention to the conflicting results of previous experiments and gave a few of his own. He reviewed the work of other writers, especially in relation to experiments with injections, either through the renal arteries or into the aorta with the renal artery tied. Thelemann¹⁸ injected the renal artery and found no injection of the capsular vessels. Stern¹⁹ found a little color in a few of the extrarenal vessels, but thought that the communications were slight and unimportant. Stursburg,²⁰

7. Johnson: *Ann. Surg.*, 1903, **37**, 592.

8. Emerson: *Tr. Assn. Am. Phys.*, 1903, **18**, 192.

9. Hall and Herxheimer: *Brit. Med. Jour.*, 1904, **1**, 819.

10. Ehrhardt: *Mitt. a. d. Grenzgeb. d. Med. u. Chir.*, 1904, **13**, 281.

11. Gifford: *Boston Med. and Surg. Jour.*, 1904, **151**, 37.

12. Stern: *Mitt. a. d. Grenzgeb. d. Med. u. Chir.*, 1905, **14**, 601.

13. Asakura: *Mitt. a. d. Grenzgeb. d. Med. u. Chir.*, 1903, **12**, 602.

14. Zaaiger: *Mitt. a. d. Grenzgeb. d. Med. u. Chir.*, 1906, **15**, 421.

15. Martini: *Arch. f. klin. Chir.*, 1906, **78**, 619.

16. Siter: *Tr. Am. Assn. Gen. Urin. Surg.*, 1913, **8**, 293.

17. Murard: *Lyon Chir.*, 1913, **10**, 347.

18. Thelemann: *Deutsch. med. Wchnschr.*, 1904, **30**, 538.

19. Stern: *Mitt. a. d. Grenzgeb. d. Med. u. Chir.*, 1905, **14**, 601.

20. Stursburg: *Mitt. a. d. Grenzgeb. d. Med. u. Chir.*, 1903, **12**, 625.

5. Edebohls: *Tr. Sect. Surg. and Anat.*, A. M. A., 1908, p. 707.

6. Van Cott: *Renal Decapsulation from the Pathologist's Point of View*, *Med. News*, 1904, **84**, 970.

on the other hand, found that injections into the aorta, with the renal artery tied, penetrated deeply into the kidneys, even to the papillae. Murard concluded that, from the standpoint of efficient circulation, decapsulation is a useless operation.

PATHOLOGIC REPORTS

These are very few, being limited, as far as I found in the references which I looked up and which seemed likely to contain such reports, to those reported by Edebohls himself and three other writers. Boyd and Beattie's²¹ patient died four months after the decapsulation of one kidney. The necropsy disclosed a dense new capsule. The capsule was vascular and contained vessels which appeared to anastomose with the vessels in the superficial part of the cortex of the kidney. These writers state, however, that "it is doubtful whether the formation of these new vessels could more than compensate for the normal communication between the renal and perirenal vessels, which was ruptured by the operation of decapsulation." The new capsule formation was accompanied by prolongations of new fibrous tissue into the cortex of the kidney. The interstitial changes present before the operation were thus exaggerated.

Gatti²² performed double decapsulation in an adult patient who died twenty months later from nephritis. At necropsy the capsule was found to be thicker than normal, fibrous, compact and with few blood vessels.

Boinet²³ reports the necropsy on an adult patient who died twenty-eight and one-half months after a double decapsulation. There was a new, thick capsule which was but little vascularized. There were fibrous prolongations into the kidneys, contraction of which had tended to increase the process. No new vessels were seen passing into the kidney.

EDEBOHLS' OPERATION IN ACUTE NEPHRITIS IN CHILDHOOD

With the exception of a few who had puerperal eclampsia, Dr. Edebohls' patients all had some form of chronic nephritis. Harrison, however, had begun to operate, in one way or another, on patients with acute nephritis before Edebohls did his first operation for chronic nephritis. Harrison²⁴ reported, in 1896, three cases cured by operation; one of acute nephritis caused by scarlet fever, another following exposure to cold and damp, and one of subacute nephritis, secondary to influenza. He did not decapsulate the kidneys in these cases, however, but either incised or punctured the kidney or its capsule, or both. He believed that the good results were attributable to the relief of renal tension. In a second article,²⁵ this writer proposed incision in acute suppression of urine and in acute nephritis with tenderness on pressure over the kidneys and slow disappearance of casts and albumin. He later reported²⁶ three more cases in which he incised the kidneys for acute conditions in order to relieve tension. It is noteworthy that Harrison's object in incising the kidney was to relieve tension in acute conditions, while Edebohls proposed to promote the formation of a new circulation in the kidney by the removal of the capsule.

I do not know how generally Harrison's advice as to incising the kidneys in acute nephritis was followed,

but, from a rather superficial review of the literature, I am inclined to think that little attention was paid to his suggestions and they were soon forgotten. Edebohls' work on the decapsulation of the kidneys in chronic nephritis naturally called attention to the possibility of performing this operation in acute nephritis for the relief of tension, instead of incising the kidneys, as advised by Harrison. I have found three cases described in which decapsulation was performed in acute nephritis for the relief of tension, and do not doubt that I may have missed a few other reports.

REPORT OF CASES

CASE 1.²⁷—Boy, aged 5 years, had scarlet fever, with anuria for four days. The operation consisted of decapsulation and puncture of kidneys. The kidneys were not large and did not protrude when capsule was split. Patient began to pass urine almost at once and recovery was uneventful.

CASE 2.²⁸—Boy, aged 12 years, had scarlet fever with convulsions and followed by blindness and deafness. There was almost complete suppression of urine, which revealed presence of blood and casts.

The kidneys were very large with a capsule not adherent, so that the kidney bulged through the slit. Patient passed 24 ounces of urine in 24 hours after operation. Sight and hearing returned on third day, and he left the hospital on the eighteenth day, feeling well.

No note was made as to condition of urine.

CASE 3.²⁹—In a girl, aged 6 years, acute symptoms continued for a few days with anuria, convulsions and uremia. Urine contained much albumin but no data were recorded concerning sediment. The operation of decapsulation and incision of right kidney was made. The size of the kidney was not noted, but it bulged through wound and microscopically revealed swelling and exudation in glomeruli and fatty degeneration of epithelium of the convoluted tubules. Patient began to pass urine in a few hours and symptoms of uremia ceased. Five weeks later the patient was symptomatically well and urine contained a little albumin but no renal elements.

The kidneys of two of my own patients who had acute nephritis, suppression of urine and severe symptoms of uremia were decapsulated. The histories of these cases are as follows:

CASE 4.—Boy, aged 13 years, had an attack of tonsillitis, Feb. 10, 1917, which cleared up rapidly. He was nauseated, February 17, and February 20, the urine was scanty, smoky and contained 1.5 per cent. of albumin. The sediment contained large amounts of both normal and abnormal blood, many cells, and many hyaline, granular, epithelial and blood casts. He had a slightly elevated and irregular temperature. Under careful treatment, the urine increased from 3 ounces to 42 ounces, March 7, and the character of the urine also improved, with the amount of albumin going down to 0.1 per cent. At this time, however, although passing urine freely, the patient began to be a little edematous and the urine again became bloody. The amount of urine gradually diminished and the amount of albumin increased. In spite of cutting down the fluid intake and moving the bowels very thoroughly with salts, he began to vomit and the edema increased. March 22 he passed 10 ounces of urine and had fourteen loose stools. At 6:30 a. m., March 23, he had a convulsion. In spite of free catharsis and hot packs, the convulsions continued and there was almost complete suppression of urine, only 6 ounces being passed from that time until the kidneys were decapsulated at 9 p. m. by Dr. James S. Stone. The kidneys were distinctly enlarged, but were more edematous than congested. They bulged somewhat when the capsule was split and the lack of bleeding was very marked. Their appearance was more like that of large, white kidneys than of acute

21. Boyd and Beattie: *Edinburgh Med. Jour.*, 1905, N. S., **17**, 337.

22. Gatti: *Arch. f. klin. Chir.*, 1908, **87**, 658.

23. Boinet: *Arch. gén. de méd.*, 1905, **1**, 660.

24. Harrison: *Lancet*, London, 1896, **1**, 18.

25. Harrison: *Brit. Med. Jour.*, 1896, **2**, 1126.

26. Harrison: *Brit. Med. Jour.*, 1901, **2**, 1125.

27. Schmidt: *Deutsch. Ztschr. f. Chir.*, 1905, **78**, 296.

28. Harding, G. F.: *Decapsulation of Both Kidneys for Acute Nephritis Following Scarlet Fever*, *THE JOURNAL A. M. A.*, July 10, 1909, p. 117.

29. Gümbel: *Deutsch. med. Wchnschr.*, 1911, **37**, 594.

nephritis, and there was practically no bleeding from the organ, the denuded surface not oozing at all. There was, however, considerable edema about the kidneys and in all the tissues of the back. The patient continued in convulsions for an hour after the operation, then quieted down and died at 11:15 p. m. He did not begin to pass urine at all.

CASE 5.—Boy, aged 10 years, had an acute attack of tonsillitis, Feb. 24, 1916. A week later it was noticed that his face was swollen and that the urine was dark in color and diminished in amount. Since then the swelling had become general and he vomited practically everything taken. He was admitted to the Children's Hospital, March 17. Physical examination revealed moderate, general edema and a small amount of ascites. He passed 17 ounces of urine during the next twenty-four hours, and the urine was reddish-brown and contained a trace of albumin. The sediment contained many leukocytes, a moderate number of red corpuscles, and a considerable number of hyaline and blood casts. During the next twenty-four hours he became stupid, had headache, and passed no urine at all. The systolic blood pressure was 160 and the diastolic 104. A double decapsulation was performed, March 19, by Dr. C. S. Mixter. The kidneys were much enlarged, slightly paler than normal; bulged through the incision and the capsule was stripped off easily. The patient passed 8 ounces of urine during the night after the operation. The amount of urine steadily increased, the blood pressure gradually diminished, and beginning March 22, the patient felt well. The phenolsulphonephthalein test, made March 29, was 71 per cent. It had not been done before the operation. April 9, the systolic blood pressure was 90 and the diastolic, 60. At this time the patient was receiving 36 ounces of fluid and passing 27 ounces of urine daily, which contained a slight trace of albumin, a few casts, but no blood.

The patient was discharged from the hospital, May 3, in good physical condition. The urine then contained a faint trace of albumin and the sediment showed a few hyaline and granular casts. His urine continued to show a trace of albumin for two months, although no casts or renal elements were to be found in the sediment. No albumin was present in the urine after this time, although it was repeatedly examined. When last examined in April, 1917, more than a year after the operation, he was perfectly well and his urine was normal. The operation in this case undoubtedly saved his life and gave Nature the opportunity to heal the acute condition in the kidney.

The results of decapsulation of the kidneys in these acute cases are certainly most encouraging. It seems reasonable to believe that all of these children would have died in a few hours, if the operation had not been performed. If this is true, it is evident that the operation saved the lives of four of them, at least for the time being. Except in the case in my own practice, there are no data on record as to whether recovery was complete. In this instance, the boy, at the expiration of a year, is not only symptomatically well, but his urine is normal and has been for some time.

The explanation of the good results obtained by decapsulation of the kidneys in nephritis with suppression of the urine and symptoms of uremia is plain. Under these circumstances, the kidneys are in most instances engorged with blood and as the result, become enlarged. The capsule stretches to a certain extent, but, after a time, further distention becomes impossible and the circulation is then so much impeded that the excretion of urine is impossible. The tension of the capsule and the compression of the kidney are shown by the manner in which the capsule splits apart and the kidney bulges through the wound, when the capsule is incised. The relief of the tension afforded by the decapsulation results in a diminution of the engorgement of the kidneys, an improvement in the circulation and, in favorable cases, the restoration of the excretory function. It is possible that simple

incision of the capsule might be as effectual as decapsulation. It does not seem likely, however, because decapsulation should relieve the tension more completely than simple incision. It is possible that the manipulation of the kidney, which necessarily takes place during the operation, may be beneficial in relieving the congestion and starting up the excretion.

Decapsulation of the kidneys in acute nephritis does not remove the cause of the disease or affect in any way the essential pathologic process in the kidneys. It merely relieves the extreme congestion, which is in many cases the cause of the threatening symptoms, and, except for this, leaves the kidneys as they were before the operation. Hence, the chances of death, of complete recovery or of the development of chronic nephritis are the same as in other cases of acute nephritis in which symptoms due to extreme congestion have not developed. Decapsulation of the kidneys should be undertaken in acute nephritis, therefore, only in those cases in which there is a marked diminution in the amount of urine and symptoms of intoxication are developing. Under these conditions it is not infrequently a life saving operation. It seems only reasonable, therefore, to give every patient the chance which operative treatment affords.

EDEBOHLS' OPERATION IN CHRONIC NEPHRITIS IN CHILDHOOD

All of Edebohls' patients, with one exception, a girl, 4½ years old, were adults. In a fairly careful search through the literature, I have been able to find nineteen cases of subacute and chronic nephritis, including Edebohls' own case, in which decapsulation of the kidneys has been done.

[The abstracts of these cases are omitted because of lack of space.]

SUMMARY OF NINETEEN CASES OF SUBACUTE OR CHRONIC NEPHRITIS IN WHICH DECAPSULATION OF THE KIDNEYS WAS PERFORMED

Dead: Four patients died after 5, 6, 15 and 18 days.

Cured: Three patients seen last after 4 months, 6 months and 9 years.

Cured, but recurrence: One patient well and urine normal for 2 years; recurrence, with second operation and death in six weeks.

Not improved: Two patients living after 5 weeks and 6 months.

Improved: Two. First patient better for one year, but acute exacerbation and death in two weeks; second, improved, but died of bronchopneumonia after four months.

Symptomatically well, but urine containing albumin and casts: Seven patients, after 4½ months, 6 months, 8 months, 10 months, 1 year, 1 year, and 6 years.

I have had decapsulation of the kidneys performed in four cases of chronic nephritis of the parenchymatous type. The histories of these cases are as follows:

CASE 24.—A boy had acute nephritis at 3 years of age as the result of tonsillitis. He was treated in the Children's Hospital at this time and was discharged after five weeks symptomatically well. The urine contained no albumin, but the sediment showed a few hyaline and fine granular casts. He came to the outpatient department at intervals for various slight symptoms during the next three years. His general health was good. The urine was examined three times during this period. It did not contain albumin. The sediment was not examined. Three days before his entrance to the Children's Hospital, Aug. 7, 1915, when 6 years old, his face became puffy and he was nauseated. On admission there was marked edema of the face, moderate edema of the lower back, and slight shifting dulness in the abdomen. The urine contained

a large trace of albumin and many hyaline and granular casts. The phenolsulphonophthalein test showed an excretion of 62 per cent. in two hours. The systolic blood pressure was 110; the diastolic, 85. In spite of careful treatment, the patient became worse. The ascites and edema increased and he failed rapidly in general condition, but showed no symptoms of uremia. The urine was diminished in amount and continued to contain a large amount of albumin and many hyaline and granular casts. The phenolsulphonophthalein excretion was, however, somewhat better, being 71 per cent. Decapsulation of the kidneys was performed by Dr. Charles S. Mixer, Oct. 9, 1915. The kidneys were slightly enlarged and of about normal color, not the color of the typical white kidney. The capsules stripped off easily. During the first week after the operation, the edema and ascites increased enormously and he passed only one-half as much urine as he received of liquid. At the end of a week, he had a severe convulsion and was bled and purged. Soon after this, however, he began to improve, and by the middle of November had no edema and but little ascites. He was eating well, had good color and was much improved in every way. His urine contained the slightest possible trace of albumin and a rare hyaline cast. The phenolsulphonophthalein excretion in two hours was 64 per cent., while the systolic blood pressure was 120 and the diastolic 70.

He continued to improve, so that by the middle of December he looked and acted perfectly normal. The urine contained no albumin and no sediment. The salt and urea excretion were found to be normal. He has been symptomatically well since that time, although the urine at times contained a very slight trace of albumin and an occasional cast up to July, 1916. Since then the urine, on repeated examinations, has shown nothing abnormal. He was last seen about April 1, 1917. The systolic blood pressure in January, 1917, was 90 and the diastolic, 55.

Judging from the history and the condition of the kidneys found at operation, this boy probably had an acute exacerbation of a chronic nephritis. He would have almost certainly died in a few weeks or months without an operation. He is now well and has had a normal urine for eight months.

CASE 25.—A girl, aged 5½ years, entered the Children's Hospital, July 13, 1915. She had had tonsillitis two months before. She was admitted to the hospital because of a severe purpura of nine days' duration. She had bloody stools and joint symptoms in addition to a hemorrhagic eruption. She also had endocarditis and myocarditis. The urine began to contain blood and casts, July 26. Transfusion was done, August 3. This relieved the general purpuric condition, but the urine continued to contain from a slight trace to a trace of albumin, a moderate number of red blood corpuscles and many granular casts. The systolic blood pressure, Aug. 9, 1915, was 140; the diastolic, 90. The phenolsulphonophthalein excretion in September was only 33 per cent., and there was considerable interference with the salt and nitrogen excretion. The phenolsulphonophthalein excretion in November was 60 per cent., but there was no improvement in the excretion of salt and nitrogen. She was sent home, Dec. 8, 1915. At this time the systolic pressure was 125 and the diastolic, 78.

She returned to the hospital March 22, 1916, having shown no improvement at home. She was edematous, extremely pale, was vomiting, and the urine contained a large trace of albumin, many granular casts and a little blood. She was in unsatisfactory condition and operation on the kidneys was delayed until it was decided that her heart would bear the strain of the operation. Her systolic blood pressure at that time was 104 and the diastolic, 60. The phenolsulphonophthalein excretion was 44 per cent. The urine showed an almost complete fixation of gravity, between 1.005 and 1.008.

Decapsulation of the right kidney was performed, May 4, 1916, by Dr. Charles S. Mixer. The kidney was large and pale and the capsule was easily stripped off. The left kidney was nothing but an atrophied, soft mass, looking very little like a kidney. Nothing was done to it, as apparently most of this kidney was destroyed. She was very weak for a number of days after the operation and there was at first no important change one way or the other. Her urine about a month after

the operation contained a distinct trace of albumin, while the sediment showed many red blood corpuscles and an occasional hyaline and granular cast. From this time, her general condition steadily improved so that when seen May 6, 1917, she looked and acted perfectly well. She was well nourished, color was good and there was no edema. Her urine then showed a large trace of albumin. The sediment contained leukocytes and many hyaline and granular casts, but no blood. The phenolsulphonophthalein excretion in two hours was only 25 per cent. The urine still showed a marked fixation of gravity. The level, however, was much higher, being between 1.017 and 1.020.

This girl was changed by the operation from a helpless, bedridden invalid to a normal looking and feeling child. She would probably have lived but a short time without the operation. She is now, one year after the operation, symptomatically well. She is not, of course, cured, and will sooner or later die of her disease.

CASE 26.—A girl, aged 10 years, had had chickenpox but no other contagious disease. Her tonsils had been removed at 7 years, because of their large size, not because of tonsillitis. Her parents had noticed for a year that she tired easily and had lost color. She had occasional headaches, but otherwise seemed well. Early in March, 1915, her physician, who was visiting another member of the family, noticed that her face was puffy and asked for some of the urine. This he found to contain albumin. I saw her first, Sept. 24, 1915. During this period she had been on a careful diet and had improved in general health. She had no headaches, but was always somewhat edematous. The urine was passed freely and usually contained about 0.25 per cent. of albumin and had a specific gravity of from 1.010 to 1.012. The sediment showed leukocytes and red corpuscles with some hyaline casts and a few fatty casts. The sediment had never contained tubercle bacilli. She was a little pale but did not look or act sick. The systolic blood pressure was 108.

Dr. Edward Reynolds decapsulated the kidneys, Sept. 29, 1915. Both kidneys were large, soft and apparently fatty degenerated and the capsule was not adherent. The right kidney was split to determine if there was any local trouble in the pelvis. The left kidney was not split, but the appearance was the same. She stood the operation well and was out of bed in three weeks. The urine continued to contain from 0.125 to 0.25 per cent. of albumin, but had very little sediment, which showed an occasional cast and red blood cell. Her general condition since the operation has been better than before. She has had no headaches but at times has had some nausea but no edema. She has gained in weight and in height. The urine has continued to contain albumin, occasional casts being found; April 2, 1917, it was pale, acid, of a specific gravity of 1.010, and contained 0.125 per cent. of albumin. The sediment showed many squamous cells and a few leukocytes, some large and small round cells, an occasional red corpuscle and rarely a hyaline cast.

After a year and a half she is better than before the operation and apparently has some years of life ahead of her, whereas it seemed before the operation that she had but a few months to live.

CASE 27.—A boy, aged 9 years, had measles and whooping cough at 5 years. His tonsils and adenoids were removed when he was 7½ years old. He had had a discharge from one ear for some time and had had bad teeth for a long time. A month before he entered the Children's Hospital, his mother noticed that his scrotum was swollen. He was put on a careful diet and improved up to two days before entrance to the hospital, when he became very edematous and began to vomit. His eyesight also began to fail.

He was admitted, June 23, 1916. There was marked general edema; the teeth were bad; ascites was present. The systolic blood pressure was 106, the diastolic, 70. The urine was smoky, acid in reaction, of a specific gravity of 1.018 and contained a large trace of albumin. The sediment showed many red corpuscles and an occasional hyaline cast. Under treatment the patient passed considerable urine and the edema diminished. From that time his condition varied; at times being edematous; sometimes he passed urine rather freely.

The urine always contained a considerable amount of albumin, red corpuscles and hyaline casts; and as there was no permanent improvement, decapsulation of the kidneys was decided on.

Decapsulation of the kidneys was performed, Sept. 15, 1916, by Dr. Charles S. Mixter. The left kidney was found to be twice the normal size, soft, flabby and white. The capsule was incised and stripped back from the kidney. It loosened readily. On the right side, the muscles and fascia over the right loin were found to be bound down with old inflammatory tissue. The peritoneum was greatly thickened, and the lower pole of the kidney was adherent to the inflammatory mass. The inflammation arose probably from within the abdomen as the result of retrocecal appendicitis and had involved the kidney capsule. As it was found impossible to deliver the kidney into the wound, the capsule was incised and stripped back with the kidney in position. The right kidney was of normal size, soft, flabby and white. There was little or no improvement after the operation; the ascites increased rapidly, necessitating frequent tapping; the urine was diminished in amount; the blood pressure went up to 120 during the next month. At this time the phenolsulphonephthalein excretion was less than 10 per cent. in two hours and the urine contained a trace of albumin and hyaline and granular casts.

After leaving the hospital the patient had to be tapped frequently for a number of months, but early in May was able to return to school, having had no ascites for some time. The patient was not again examined, but judging from his mother's description, although he felt much better, yet he was not well. The urine, obtained May 20, 1917, was slightly alkaline, clear, straw-colored, and contained a large amount of albumin. There was no macroscopic sediment on standing over night. The centrifugized sediment showed epithelial cells, many hyaline, a few fine granular and a rare waxy cast, with an occasional red cell.

In this instance, it seems fair to assume that the boy was somewhat benefited by the operation, although no good effects were seen for some time. He probably would not have been alive and going to school in May, 1917, if the operation had not been done. His condition is, however, bad and he is not likely to live many months.

COMMENT

It is very hard to understand how decapsulation of the kidneys can be of any benefit in chronic nephritis, either in childhood or in adult life. Nevertheless, it apparently does do good, at any rate in childhood, in a not inconsiderable number of cases. The good which it does cannot be due to the relief of tension and congestion, as in acute nephritis. The facts we know regarding the physiology and pathology of the kidneys, as well as the results of most experiments on animals, show that the improvement cannot be due to the establishment of a new circulation from the outside of the kidney. In lieu of a better explanation, it may be that the improvement is the result of changes in the circulation or functioning of the kidneys, initiated by the handling of the kidneys at the time of the operation.

However that may be, the results of decapsulation of the kidneys in these twenty-three cases are certainly encouraging. All of them were going from bad to worse under medical treatment. Humanly speaking, all the patients would have died in a short time. Apparently as the result of the operation, two patients have been permanently cured, one of them being well and with a normal urine after nine years and another after eight months. Another was well for two years and then died of an acute nephritis in no way connected with the previous illness. Two others were well as long as they were under observation, but the time was too short to consider them cured. Nine

others have been so much improved by the operation, or at any rate the improvement began immediately after the operation, that they have been symptomatically well for months or years instead of being chronic invalids, as they were before the operation. These patients have not, of course, been cured, and will certainly die at some time of their disease. Nevertheless, the addition of months or years of apparent health seems to amply justify the operation in these cases.

CONCLUSIONS

Edebohls' operation is of much value in properly selected cases of nephritis in childhood. It may save life and result in permanent cure in acute nephritis. No child ill with acute nephritis should be allowed to die, therefore, without giving it the advantage of the chance afforded by this operation. It may prolong life for considerable periods in a not inconsiderable number of cases of chronic nephritis, and may possibly, in rare instances, result in cure. It should, therefore, always be considered in all cases of chronic nephritis in childhood which are not responding reasonably well under medical treatment.

70 Bay State Road.

ABSTRACT OF DISCUSSION

DR. J. S. WALL, Washington, D. C.: These kidney cases resemble cardiac cases, in that the patients leave the hospital and come back in two or three months with renal decompensation. They get better, go away, and come back in a very few months with another renal decompensation. I think the proof of the pudding is always in the eating, notwithstanding what the physiologists and pathologists tell us.

It is a striking thing that the puerile kidney withstands the attack of so many affections. We see this in the way it gets rid of uric acid deposits. It does not succumb to septic nephritis, but gets pyelitis, from which the child usually recovers, but from which an adult might not. This same resistance is only possessed, perhaps, by pregnant women, who can recover from a septic pyelitis.

We have some hope in an operation of this sort, because the kidney is growing; it is developing. I think we should determine some sort of criteria by which we might judge when the Edebohl operation is to be selected and when discarded. In a case I have in mind, the child's urine was full of casts. He was most edematous. He was admitted to the hospital in June with extreme anasarca. The urine contained much albumin. The capsule was removed, the operation only taking twenty minutes. The next few days were very stormy. Since that time he has much improved, and I hope in a future report to be able to add him to Dr. Morse's twenty cases.

DR. JOHN LOVETT MORSE, Boston: I want to emphasize the difference in the indications for decapsulation in acute and chronic nephritis. In the acute cases, the operation is done to relieve congestion temporarily, and if the patient can be tided over a few hours or a day or two he has the same chance which every patient with an acute case has. In chronic nephritis, there seems to be no reason for doing the operation, except that experience has shown that a certain number are benefited, and occasionally one is cured. In most cases, I think, life is prolonged.

First Printed American Pharmacopeia.—The earliest American pharmacopeia to be printed was that prepared for use of the Continental Army by Dr. William Brown of Virginia, who succeeded Rush as physician-general of the Middle Department (1778-1780). It was issued from the military hospital at Lititz, Lancaster County, Pa., and appeared anonymously as a Latin booklet of thirty-two pages in 1778.—Lieut.-Col. C. C. McCulloch, Jr., U. S. Army: The Scientific and Administrative Achievement of the Medical Corps of the United States Army, *Scientific Monthly*.