bony opening, and, lastly, to facilitate the drainage of subdural blood and cerebrospinal fluid from the middle fossa at the lowest point. The fibers of the temporal muscle are merely separated longitudinally so that they can easily be reunited after the underlying bone has been removed. A rubber tissue drain is left at the lower angle of the incision for two days, and in this manner there is a free outlet for any subdural hemorrhage; usually, the cerebrospinal fluid becomes clear within thirty-six hours.

As the majority of fractures of the skull occur in the middle fossa and the squamous area of the vault, the subtemporal decompression exposes this area most directly, and allows a careful exploration of the middle meningeal artery, which may be torn. The operation is not a formidable one; naturally, perfect asepsis is essential. The anesthetic should be administered by an expert.

CONCLUSIONS

The mortality of brain injuries in adults is high chiefly because patients are allowed to reach the dangerous stage of medullary compression—the result of extreme intracranial pressure and a condition that should be and can be in most cases anticipated by careful examinations and then avoided by an early decompression. Patients, however, should not be operated on when in a condition of shock sufficient to produce a pulse rate of over 120.

All depressed fractures of the vault should be elevated or removed for fear of later complications.

Naturally all fractures of the skull are not operated on—the expectant palliative treatment alone is in most cases all that is necessary to obtain an excellent recovery, but there is a large number of patients, less than 50 per cent., who do require the operative relief of the increased intracranial pressure due to hemorrhage or to an increase in the amount of cerebrospinal fluid sufficient to produce a wet edematous swollen brain.

The posttraumatic conditions are frequently the result of this prolonged increase of the intracranial pressure, and a large percentage of these conditions can be improved by lessening this intracranial pressure even months after the injury.

The operation of choice in both the selected acute and the chronic cases of brain injury is the subtemporal decompression.

20 West Fiftieth Street.

Public Health in Queensland.—The annual report of J. I. Moore, Commissioner of Public Health of Queensland, to June 30, 1915, shows a gratifying state of the public health for the period named. The estimated population for 1914 was 674,932, an increase of 22,377 over 1913. The crude birth rate per thousand on the estimated population for 1914 was 29.46 as against 30.26 for the preceding year. Though this presents a slight decrease, it is shown that it compares favorably with eleven other countries, none of which exceeds the figure for Queensland, that for Germany being 28.3 and that for France being as low as 19. The crude death rate for 1914 was 9.97, which is said to compare favorably with other Australasian states, and is lower than that of twelve other countries, the figures for which for the year 1912 range from 12.4 for Canada to 18.2 for Italy. The infant mortality rate per thousand born for children under 1 year was 63.87, an increase over the previous year, when the figure was 62. This again is shown to be lower than the figures of other countries for the years 1912 and 1914, which range from 69.7 for New South Wales to 147 for the German Empire in 1912. The marriage rate, 8.73, showed a slight increase over the previous year when it was 8.68.

SEX GLAND IMPLANTATION

ADDITIONAL CASES AND CONCLUSIONS TO DATE

G. FRANK LYDSTON, M.D.

CHICAGO

Reports¹ have been published of the experimental work which I have performed in sex gland implantations with material taken from dead bodies. The reports comprise certain physiologic and therapeutic observations and conclusions based on the experiments, together with illustrations of the microscopic and histologic results of the implantations. In summary, my various contributions present the following:

1. For hormone therapy purposes, successful total or partial hetero-implantation of human sex glands in both male and female is practicable. By "successful" implantation, I mean the formation of new blood supply, and a more or less prolonged existence of the gland with coincident hormone production.

2. The prospect of success from anastomotic implantation—with resulting generative functioning—at present is not brilliant, although possibly not hopeless.

3. Glands taken from the living subject are most desirable, though rarely obtainable.

4. Glands taken from the healthy dead body at any time prior to the beginning of decomposition are of therapeutic value equal to that of those taken from the living, if implantation is successful.

5. In human beings the glands of the male may be successfully implanted on the female, and probably the reverse obtains. The hormone of the one possibly is useful to the other.²

6. The tissues of the female apparently are more hospitable to the implanted male sex glands than are the tissues of the male.³

7. The physiologic and therapeutic results occur independently of the site of implantation, but the vicinity of the peritoneum (extra-abdominal) and the canal of Nuck in the female, and of the tunica vaginalis in the male, are the sites of election.

8. Blood pressure apparently is modified, suggesting improved nutrition of the heart and vessels.

9. The development of senility possibly can be retarded and longevity increased by internal sex secretions derived from implantation.

10. That arteriosclerosis in its early stages will be benefited by sex gland implantation is probable. Inferentially, senile dementia, if taken early, possibly may show beneficial results.

11. The climacteric probably may be postponed, or at least the disagreeable features of the climacteric may be relieved.

12. Defective and aberrant psychic or physical sex development and differentiation—inversions and perversions—are definite indications for sex gland implantation. Certain cases of cryptorchidism and imperfect testicular development are an especially promising field.

13. Certain psychopathies, such as dementia praecox, possibly may be benefited by implantation.

14. Chronic diseases of the skin, due to or modified by nutritional disturbances—notably certain types of chronic eczema, psoriasis and ichthyosis—in a certain

1. Lydston, G. F.: Bull. Chicago Med. Soc., March 7, 1914; New York Med. Jour., March 21, April 4, July 11, Oct. 17, 24, and 31, Nov. 17, 1914, and March 27 and April 3, 1915.

2. In a recent experiment with domestic fowls the male gland seemingly disturbed the normal sex development of the female, notably retarding, possibly preventing, egg production, while apparently increasing general physical development.

3. This is not borne out by my subsequent experience.

proportion of cases are likely to benefited, possibly cured, by sex gland implantation.⁴

15. All conditions incidental to sex gland mutilations in either sex afford a positive indication for sex gland implantation, the probability of benefit being inversely as the length of time that has elapsed since the mutilation, and dependent on the age at which it occurred.

16. In properly selected cases, successful implantation ought inevitably to increase physiologic efficiency with all the benefits accruing therefrom. With increased physiologic efficiency come individual and social efficiency.

17. In general, all morbid conditions in which malnutrition exists are likely to be benefited by the sex hormone, which is a powerful physiologic cell stimulant and nutrient.

As I elsewhere have shown,⁵ microscopic sections of implanted glands apparently show regeneration of the circulation and of the interstitial connective tissue which, inferentially, produces the so-called internal secretion. What is true of the sex glands also is true of all other glands which produce hormone. All hormone-producing glands from dead bodies are available sources of material for hormone therapy. Emulsions of glandular organs from dead bodies apparently are available sources of material for hormone therapy. Emulsions of glandular organs from dead human bodies, acting in less degree but in manner similar to implantation, may be of therapeutic value, and possibly superior to so-called extracts and to desiccated substances from the glands of the lower animals.⁶

In the papers mentioned, I have presented in detail certain features of my experimental work, with additional observations which, I hope, have served to make the work more comprehensive, complete and convincing.

I present herewith brief reports of four additional cases of successful testicle implantations. I will at this time say but little further than I already have said regarding the physiologic and therapeutic effect of sex gland implantation. Suffice it to state that not only have previous observations been verified, but also I have noted certain apparent results which still further confirm my present belief that in the sex gland hormone we have the most powerful cell stimulant, nutrient and regenerator at present available to medical science. I reserve a detailed discussion of the additional apparent

evidence until such time as I feel that the facts are established on a reasonably firm basis, free from the suspicion of coincidence or intercurrent factors. Note in this connection the case of double testicular implantation herein reported. This case apparently is conclusive.

REPORT OF CASES

CASE 1.—The subject was a young man, aged 22, with a neuropathic and psychopathic heredity. There was an obscure history of a head injury four years before, which probably had nothing to do with his psychopathy. Three years prior to the time I first saw him, the patient developed psychopathic symptoms, and the case was diagnosed by competent authority as dementia praecox. In my opinion, the case at the time I first saw it was a typical dementia praecox. As previously reported,⁷ the condition was as indicated in Figure 1.

At present, more than fifteen months after the implantation, a nodule of gland tissue about the size of a hazelnut still is perceptible at the site of the implantation. When the case was last reported there had been considerable improvement in the patient's condition. He had ceased his frequent writing of incoherent, rambling dissertations on architecture and kindred topics, and no longer complained of hearing enemies whispering criticisms adverse to him, which symptoms had been very prominent. His mother stated that he was more ambitious and energetic. At present he is attending school and appears to be getting on fairly well with his studies. He is distinctly more vigorous than at any time since his illness began.

I, of course, am not prepared to say that the improvement is due to the implantation, or to share in the enthusiasm exhibited by his family. That the improvement may be due to a remission is obvious. I present the case as merely worthy of note.

CASE 2.—This is by far the most remarkable of my entire large series of implantations, and to my mind is as conclusive evidence of the value of the work as a single case possibly could be. It is especially weighty evidence when considered in connection with the apparent results of my other implantation work.

A man, aged 29, sustained an injury to his testes while playing football, twelve years before he consulted me in July, 1915. His right testicle was enormously swollen (probably hematocoele) and very painful. When the swelling subsided, the gland had entirely disappeared. The remaining testicle atrophied to a moderate degree. Virility was unimpaired, and the patient married three years later. No children were born of the union.

About two months prior to my examination the patient, without preceding trauma or known infection, suddenly developed pain in the left ileolumbar region, left spermatic cord, and the remaining testicle. The testicle did not swell, but, the patient stated, the veins above it were swollen. The temperature record was not available. There were no urinary symptoms. At the end of three weeks the testicle had completely atrophied, and some weeks later the case was referred to me.

7. This case was reported in full in the New York Medical Journal, April 3, 1915.

Fig. 1.—Testis from a body dead ten hours from cocaine poisoning, implanted in a case of dementia praecox; A, implanted gland. Implantation eleven hours later—twenty-one hours after death. Drawing made six weeks after the implantation. Seven months after the implantation the implanted testis was a firm, characteristically shaped body about one-half its original size.

Fig. 2.—Double implantation of testes from a dead body in a case of double complete atrophy.

4. Note in this connection a severe case of psoriasis of many years' duration which cleared up completely within two weeks after an implantation.

5. Lydston, G. F.: New York Med. Jour. (Footnote 1).

6. Lydston, G. F.: Experiments with Emulsions of Organs Taken from the Dead Human Body and of Sex Glands from the Lower Animals, Am. Med., December, 1914.

I found a healthy-looking subject, overfeminine secondary sex characteristics. The testes were negligible; the mammae moderately enlarged; the penis distinctly broader than the normal masculine. The patient stated that his physique had shown these characteristics increasingly since his injury, twelve years before, but that his sexual power had been "satisfactory" until after the loss of the second testicle. During all these years he had not been physically as fit as before, and for about a year he had with difficulty met the physical and mental exigencies of his business, this lack of efficiency having rapidly increased since the loss of the remaining testicle. Since the loss of the second testicle there had been complete impotence.

Examination showed scarcely a vestige of tissue at the end of the spermatic cords—nothing, indeed, that could be accepted as even a remnant of gland tissue. The penis was of only moderate development, with a long prepuce, but otherwise normal.

Aug. 1, 1915, I implanted on this patient both testes taken from a boy of 14, dead of a crushing injury. The subject was just approaching puberty, and not well developed. The testes were removed six hours after death, and kept on ice in sterile salt solution until the operation, thirty-nine hours after the death of the donor. The implantation was made in the scrotal sac on each side, at the normal site of the testes. The glands were implanted entire, the epididymes not being removed. Healing was prompt; there was only 1 degree of transient febrile reaction, and very slight inflammatory swelling about the implanted glands. Five days after the implantation I performed a circumcision. The patient returned home in two weeks. Vigorous and painful erections occurred after the eighth day, and required an ice bag. Successful coitus was practiced three weeks after dismissal from the hospital. At present, seven months after operation, the patient reports that he is perfectly normal, is taking active gymnastic exercise, and has lost nearly 20 pounds of his flabby fat. Erections are vigorous and more frequent than in the average normal subject of similar age. The patient lays especial stress on his mental and physical fitness for business. The implanted testes have atrophied only moderately, and are of relatively fair size and fairly normal consistency. The epididymes are plainly distinguishable. As Dr. William T. Belfield, who courteously examined the case and questioned the patient, remarked, "The testes, while small, are as well developed and apparently as normal as in many perfectly virile men who come under our observation."

In passing I wish to state that, for a while after the implantation, the patient experienced normal orgasms without emission. He stated to Dr. Belfield and myself that after a few weeks he began to have emissions of a considerable amount of fluid, and that these emissions were almost constant. The emitted fluid, while it has not been examined, of course is not testicular secretion—no anastomosis having been done—but comes from the urethra, Cowper's glands, the prostate, and the seminal vesicles. In brief, it probably is composed of all the usual normal elements of the normal semen, save the testicular secretion, of which the spermatozoa are the important element.

For some weeks after the implantation the patient complained of "frightful nervousness." As he described them, his symptoms were not unlike those produced by strychnin and

similar spinal excitants. The "nervous" symptoms finally disappeared. I attributed them to the unwonted dose of hormone supplied by the implanted testes, to which the nervous system gradually became accustomed.

A feature of the foregoing case that is worthy of especial comment is the preservation of virility—until the loss of the remaining gland—after the accident of more than twelve years ago, despite the subsequent impairment of development of masculine secondary sex characteristics. It would seem that: 1. A relatively large dose of hormone is necessary to perfect development of secondary sex characteristics. 2. A very small dosage is sufficient to preserve virility. 3. Once virility is established, an extremely small dosage of sex hormone will preserve the psychosexual and physiosexual sex characteristics that are so essential to potency. It has been observed that individuals possessed of exceedingly rudimentary testes often are virile. Indeed, it has been my observation that such persons sometimes are possessed of more than the average degree of virility. I recall several cases of cryptorchidism coming under my observation in which there was a normal degree of virility with complete sterility.

I will not enter here into an exhaustive study of the physiologic and therapeutic suggestions offered by the foregoing case, as they have been comprehensively discussed elsewhere.⁵ This much appears evident, namely, that my implantation work has passed the experimental stage. It would require a degree of skepticism which I am free to say does not inspire me at this stage of my work to attribute to psychic impress such results as have been obtained, notably in the case of double implantation herewith recorded.

It will be interesting to note the further progress of the case relative to atrophy of the implanted glands. Thus far there has been less atrophy than in my other cases, in a similar length of time. Possibly the preservation of the epididymis has something to do with this. As to how long the therapeutic results will endure, one cannot predict. Possibly permanently, or at least long after the last vestige of implanted gland tissue has disappeared. I am confident that, as long as even a small portion of the implanted tissue remains, its favorable effects will endure. Even though an occasional

repetition of the implantation should prove necessary to maintain the patient's normal sex standard, the result still would be remarkable and the scientific status of the method sustained.

CASE 3.—This case was purely experimental, and no exhaustive report will be made at this time. The subject was a healthy professional man, aged 58, who submitted himself to the experiment from purely scientific motives. The companion testis of that used in Case 2 was employed. The implantation was made in the left scrotal sac. The local

Fig. 3.—Experimental implantation of a single testis from a dead body.

Fig. 4.—Experimental implantation of a single testis from a dead body.

result of the implantation was what I now feel justified in calling "typical," save that the subject got about on his feet after twenty-four hours, which resulted in considerable swelling and tenderness of the operated region. When the patient keeps to his bed, the reaction is very slight, compared to the tissue "insult."

In this case there was a rise of temperature of 1 degree, which subsided in twenty-four hours. Seven months after the implantation a nodule about the size of a good-sized grape is still perceptible.

Certain oddities of apparent physiologic effects were noted in this case, which, if sustained by future observation, will be reported.

CASE 4.—A man, aged 60, apparently normal in every respect, submitted to implantation, with the view of increasing physical vigor and endurance in general, and sexual vigor in particular. I secured the necessary material from an apparently healthy lad of 17 years of age, dead twelve hours of crushing injury of the head. Death had occurred about four hours after the injury. The operation was performed shortly after that in Case 2, so that at present, over seven months have elapsed since the implantation. The testes were refrigerated for about forty-eight hours. A single gland, the right, was employed. The epididymis was removed, and numerous areas of the cortex denuded. The implantation was made in the right scrotal sac. The implantation was perfectly successful. There was practically no febrile reaction, and very little swelling at the site of the implantation. No opportunity has presented itself for a review of the case, but the patient writes that he is well satisfied with results, and that there still is "quite a lump" at the site of the implantation.

CONCLUSION

Not only do I feel strengthened in my heretofore published impressions of the value of sex gland implantation, notably in the matter of increasing physical efficiency, and especially physiosexual efficiency, but also I am convinced that, when technic and material are right, and the recipient properly selected, preservation of hormone production by the implanted gland for at least a prolonged period is certain. That permanent physiologic and therapeutic advantageous results are equally certain, I now am strongly inclined to believe. Thus far I have observed no case in which the implanted tissue had completely disappeared, or even practically so, prior to from twelve to eighteen months.

32 North State Street.

INTRAVENOUS INJECTIONS OF SODIUM CITRATE

WITH REFERENCE TO TRANSFUSION

A. L. GARBAT, M.D.

Assistant Pathologist and Adjunct Visiting Physician, German Hospital
NEW YORK

The sodium citrate method of transfusion as developed by Lewisohn and by Weil is gradually being recognized by different observers as a reliable and efficient procedure. Before its adoption can be more universal, two points of prime importance will have to be definitely established:

1. Is the sodium citrate per se harmful? Can it be repeatedly injected?

2. Is the blood when suspended in sodium citrate and transfused still viable and able to functionate?

The last question will be answered by more numerous statistics than at present available. Thus far, most of the reports show encouraging results. From my experience of forty transfusions at the German Hos-

pital, the beneficial effects compare those obtained by methods in which it is not used. (A more detailed account of the future.)

As for the first question, Lewisohn found that 1.5 gm. of sodium citrate was a fatal dose for a dog weighing 11 pounds. Fifteen gm. would then be a fatal dose for a patient weighing 110 pounds. The usual quantity employed in transfusions is 2 gm. — 100 c.c. of a 2 per cent. solution of sodium citrate plus 900 c.c. of blood (a 0.2 per cent. solution of sodium citrate). No references to the repeated use of sodium citrate in man are available. Such statistics were furnished by experiments undertaken in connection with the therapeutics of thrombo-angiitis obliterans as started by Dr. Willy Meyer.

Four patients not suffering from any anemia received repeated intravenous injections of a 2 per cent. solution of sodium citrate in distilled water:

CASE 1.—A. S., man, aged 35, weight 125 pounds, received in all 9 gm. of sodium citrate from June 6 to July 28, in seven doses of 50 c.c. (1 gm.) and one dose of 100 c.c. (2 gm.).

CASE 2.—M. F., man, aged 32, weight 135 pounds, received in all 13 gm. from June 16 to August 4 in five doses of 50 c.c. and four doses of 100 c.c.

CASE 3.—J. C., man, aged 42, weight 165 pounds, received in all 12.5 gm. from June 6 to August 25 in seven doses of 50 c.c., two doses of 100 c.c. and one dose of 75 c.c.

CASE 4.—I. F., man, aged 43, weight 190 pounds, received in all 19.5 gm. from June 6 to November 4 in six doses of 50 c.c., six doses of 100 c.c. and one dose of 75 c.c.

By far the majority of the injections were well tolerated and were not followed by any apparent untoward symptoms. After eight of the total forty injections, the patients experienced a slight chill and a rise of temperature of from 1 to 3 degrees, from one to two hours after the treatment. One patient was not more susceptible than another, and the reactions did not come with any particular solution. The examination of the urine showed no evidence of renal irritation.

Thus, it was concluded that sodium citrate per se is not harmful, even if repeatedly injected over a long period of time.

Since these observations, I have employed a 2.5 per cent. stock solution of sodium citrate (100 c.c. plus 900 c.c. of blood, that is, a 0.25 per cent. final solution of sodium citrate) in my transfusions, as I have repeatedly observed that a 0.2 per cent. solution was not sufficient to keep the blood of some donors from clotting. Nothing is more discouraging than to find that the 900 c.c. of blood collected had entirely or partially clotted. Thus far no such accident has been noted when 100 c.c. of a 2.5 per cent. solution of sodium citrate was employed for 900 c.c. of blood.

CONCLUSIONS

1. The sodium citrate method of transfusion is not to be considered in any way dangerous because of the sodium citrate employed.

2. A 0.25 per cent. solution of sodium citrate has been found more reliable in preventing coagulation.

Knowledge Derived from Antiquity.—Every generation enjoys the use of a vast hoard bequeathed to it by antiquity, and transmits that hoard, augmented by fresh acquisitions, to future ages.—Macaulay.