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## Original Articles.

### NOTES ON ADRENALIN AND ADRENALIN CHLORID.\*

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During the first week of January, a well-known manufacturing house sent me some of the active principle extracted from suprarenal glands, in powder known as adrenalin, and in several solutions varying from 1 to 1000 to 1 to 10,000 of the chlorid of adrenalin in distilled water or in normal salt solution. I experimented with this on numerous cases, and kept careful records until I became satisfied of its activity. In Cases 1, 2, 3, 4, 6, 9, 11, 12 and 17, I applied a very small quantity of a spray of one part of chlorid of adrenalin to 10,000 parts of water to the nasal cavities, with the effect of blanching the mucous membrane quickly, and in most cases of causing contraction of the swollen tissues in the same way that they are contracted by applications of cocain. The first solution that I used was made with distilled water, and in Cases 2, 3, 4 and 9, it caused smarting, which in one case was intense. I wrote to the firm about this, and they suggested that I employ, instead, the solution of adrenalin in normal salt solution. After using this there was no more smarting excepting in two or three instances where I was led to believe that a little formalin remained on the end of the atomizer, which had been washed in a strong solution of formalin after being used in another case; indeed, the smarting in some of the previous cases may have been due to this cause, for it is my custom always, after using an atomizer, to wash it thoroughly, then dip it in a strong solution of formalin and put it away without wiping.

Dr. S. A. Friedberg, one of my assistants, used the same solution in several cases, and reported that he thought its effects were considerably less than those obtained from a solution made by macerating and filtering 30 grains of the desiccated adrenals to the ounce of water. This preparation I have used with much satisfaction for a couple of years. It is fairly stable, lasting from two to four months without material change. The formula is as follows: Adrenals,  $\text{3i}$ ; boric acid, grs.  $\text{xvi}$ ; aqua cinnamomi,  $\text{3iv}$ ; aqua camphoræ (hot),  $\text{3i}$ ; glycerin,  $\text{3i}$ ; aqua dist. (hot), q. s. ad  $\text{3ii}$ .

In Cases 5, 7, 8, 10, 13, 15, 26 and 27, I used a powder containing 1.5 per cent. each of baborate of soda and bicarbonate of soda and 3 per cent. of the light carbonate of magnesia with one part of adrenalin to 5000 of sugar-of-milk. I found that when the nasal cavities were stopped by swelling of the turbinated

bodies, this powder cleared them out quickly, and in most instances they remained open for a considerable length of time, but in Cases 7, 26 and 27 the nose stopped up again within a few minutes, whereas, when sprayed with the solution made with 30 grains of the desiccated adrenal glands to the ounce of water, it would remain open for several hours. In Case 15, it was found that the powder, which was used daily for about three weeks, would usually open the nose quickly, and this would remain for several hours, but it seemed to cause some insomnia. I have used a similar powder mixed in various proportions with mildly astringent or antiseptic powders, in several nasal cases, with the effect of opening the nares when obstructed by swelling, and diminishing the secretions decidedly.

In Case 28 the patient had suffered from epistaxis almost daily for several weeks. I gave her a solution of adrenalin, 1 to 10,000 parts of water, to be used as a spray three or four times daily. As the result, she has had no nose bleed for over three weeks.

In Cases 29 and 30 I used the solution of adrenalin with 8 grains of boric acid to 5000 parts of water, as a spray in the nasal cavities, with the effect of opening the cavities immediately, when they were closed by swelling, and keeping them free for several hours. I have used the same spray in several other similar cases with good results, but did not keep accurate memoranda.

In Case 14—a patient who was under my care for nasal trouble—the conjunctiva became very much congested from over-use of the eyes. I gave him a solution of one part of the adrenalin to 10,000 parts of normal salt solution. This was dropped into the eye with the effect of blanching it completely within three or four minutes. At the end of five hours the congestion was about three-quarters as bad as it had been before; more of the solution was dropped in with the same effect as previously. The pupil was not at all affected. The disagreeable feeling of the eyes immediately disappeared. One hour later congestion was about one-half as bad as it had been when the solution was first dropped in. Another application was made with the effect of blanching it promptly. In this case the remedy was used several times afterward, and the conjunctivitis speedily disappeared, the patient in the meantime being able to use his eyes with little discomfort. There was no smarting from this application.

In Case 19 there was congestion and swelling of the conjunctiva and lids, such as the same patient had experienced several times in the beginning of attacks of hay-fever. In this case one or two drops of the 1 to 5000 solution of adrenalin in normal salt solution were employed, with the effect of removing the congestion in two or three minutes. About three hours later the congestion had reappeared and another application was made, blanching it at once. The swelling of the lower lid was also considerably reduced by these two

\* Read before the Chicago Laryngological and Climatological Society, Feb. 28, 1901.

applications. The uncomfortable smarting sensation, which was associated with the congestion and swelling, was relieved within a very few minutes after the application. About four hours after the second application the congestion began to reappear and another application was made in the evening. The next morning there was still a little redness and swelling of the lower lid, but no congestion nor swelling of the conjunctiva. A couple of applications were made this day and by night the conditions were normal.

In Case 20 a small amount of formalin was accidentally sprayed into the eye with the atomizer, which contained one part of adrenalin to 10,000 parts of normal salt solution; very great smarting and intense congestion speedily followed, but was relieved in three or four minutes by dropping into the eye 2 or 3 minims of a 1 to 10,000 normal salt solution. About six hours later the eye again felt badly and I applied to it a minim of 1 part in 5000 normal salt solution; blanching occurred in a minute. The next morning the eye was still somewhat congested, though much improved, and the inflammation was practically aborted, though the solution was applied two or three times during that day, and the eye was then perfectly well.

Case 16 showed congestion of the upper part of the larynx—above the cords—of about 25 per cent. I applied a solution of 1 to 10,000; this reduced the congestion about one-tenth within three minutes.

In Case 22 I applied a similar solution once to a congested larynx and reduced the congestion about three-quarters.

In Case 23—chronic laryngitis with a congestion of about 20 per cent.—I applied a 1 to 10,000 in normal salt solution two or three times. In the course of five minutes the congestion had been considerably reduced, but the throat had closed so that it could not be applied very thoroughly to every part, and only the parts actually touched by the spray were found to be blanched, while those it had not touched were of the same degree of congestion as before. From the parts that had been touched, about one-half of the congestion had been removed. In several other cases it was noted that the blanching process did not extend at all beyond the part actually touched.

Case 18, acute laryngitis with edema of the glottis, occurred in a patient of Dr. O. T. Freer, whom he referred to me at the Presbyterian Hospital. There was great swelling and redness of the epiglottis, with difficult respiration which seemed likely to necessitate a speedy tracheotomy. I directed the interne, Dr. Smith, to apply to the larynx, every three or four hours, a spray of one part of adrenalin to 10,000 normal salt solution. This was done with the effect of giving the patient speedy relief. He said that he felt as though the parts had been contracted. In addition to this treatment the patient was given  $\frac{1}{4}$  gr. of nitrate of pilocarpin, which caused free salivation and profuse sweating. This was repeated twice a day for two days, therefore we can not tell just what the influence of the adrenal was; however, its immediate effects were good, as demonstrated several times. The patient made a speedy recovery.

In Case 25 the fauces were congested about 20 per cent., and I applied a spray of 1 to 10,000, but at the end of five minutes the blanching was hardly perceptible.

In Case 24, one of acute coryza, the nose was sprayed four or five times with a 1 to 10,000 normal salt solution, resulting in a speedy cure.

In Case 26, chronic laryngotracheitis with acute ex-

acerbation, the cords were congested about 25 per cent. In this case I applied a 1 to 1000 in normal salt solution, which speedily reduced the congestion about three-fifths. The patient said he felt a drawing or astringent sensation in the throat; there was no smarting, and he seemed decidedly improved. The throat felt very much better for the next eighteen hours. A few hours later, when I saw him, the congestion appeared about as great as on the previous day. I made the same application again, with an air-pressure of about 40 pounds, but after waiting several minutes I found that there was no apparent blanching of the mucous membrane, and the patient did not feel the astringent or drawing sensations which he had noticed the day previously. Concluding that the failure arose from using too great force, I made two applications of the same solution, with 15 pounds of pressure about five minutes apart, and five minutes afterward found that at least four-fifths of the congestion had been removed. The patient said that the larynx felt very much better.

In Case 31, of subacute laryngitis with marked congestion, I applied a solution of 1 to 5000 in normal salt solution containing also 8 grains of boric acid to the ounce. It gave the patient very great relief, and for several hours he found his voice much better. The next day the larynx was much improved and a similar application was made. The following day he was practically well.

I have used this solution several times in preparing for operations in the nose, and have found that 1 to 5000 acts with about the same rapidity and intensity as the solution made with 30 grains of the desiccated adrenal glands to an ounce of water. In solutions of 1 to 5000 in normal salt solution, which were opened frequently, I found that a fungus formed at the bottom within a few days, but this has not yet appeared at the end of several weeks, in solutions made with 1 part of adrenalin to 5000 of liquid containing 8 grains of boric acid, 2 drams of cinnamon water, 2 drams of camphor water and 4 drams of distilled water. From the experiments thus far made, I am satisfied that this remedy will be of great value in the treatment of acute inflammatory affections of the nasal cavities either in sprays of about 1 to 5000, or in powders of from 1 to 5000 to 1 to 2500 of sugar-of-milk. These may be used several times daily, and we may confidently expect that in the majority of cases they will promptly remove the congestion and swelling, and that they will keep down the swelling for two or three hours or more. In acute coryza and in hay-fever, I have reason to believe we will get great relief from a solution of gr. 1/10 of adrenalin chlorid in camphor water or in equal parts of camphor water and distilled water with about 8 gr. of boric acid to the ounce. In epistaxis from various causes, a similar solution used several times a day will undoubtedly be productive of very great benefit, and in many cases it will speedily effect a cure. In acute inflammation of the fauces, it is probable that solutions of 1 to 1000 would have good effects, but the weaker solutions, such as were used in the nares, are of little value. In acute and subacute rhinopharyngitis, from the experience already obtained, I have reason to believe that great benefit will be found from using a spray of 1 to 5000 four or five times a day. In several cases in which I have already used this remedy in chronic rhinitis, the secretions have been markedly checked, though I can not tell what the result will be. In acute or subacute laryngitis, I believe that a solution of 1 to 1000, applied with moderate force, will give very great relief, and it

appears to me probable that, when applied to acutely congested cords, in vocalists, it will reduce the swelling and congestion so thoroughly that the voice may be used for two or three hours with comparative ease, and possibly with normal efficiency.

### HYPOSPADIAS.

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Hypospadias of some degree is one of the most common malformations of man. According to Rennes, Kaufman and others this deformity occurs in one of every 350 males.

There are several theories as to the cause of this condition. Some claim that from atresia of the urethra there is fetal retention of urine and finally a giving way of the urethra, or that the same result is caused by a delay in the development of the glandular urethra. The most probable is that of Reichel, who states that hypospadias is merely an arrest of development and the

some degree of incontinence and many are compelled to pass the urine in a sitting posture from the difficulty of directing the stream. In many cases the urethral opening is so small that there is difficulty in evacuating the bladder. The penis, from imperfect development of the corpus spongiosum, may be deformed, curving downward and at times adherent to the scrotum, perfect erections or coitus being impossible; and the majority of even the balanic type of cases are sexually impotent. It is a matter of interest in this connection that several aboriginal tribes of Africa and Australia make a fistula or slit in the urethra to prevent impregnation.

*Operations.*—There are several methods of operation for the relief of hypospadias, which Van Hook classifies according to the principles involved: 1. The method of simple canalization. 2. That by denudation and suture. 3. That by the use of penile flaps. 4. That by taking flaps from the abdomen or scrotum. 5. That by the combination of these fundamental methods. To these must be added a sixth: That by mobilization and dislocation of the urethra.

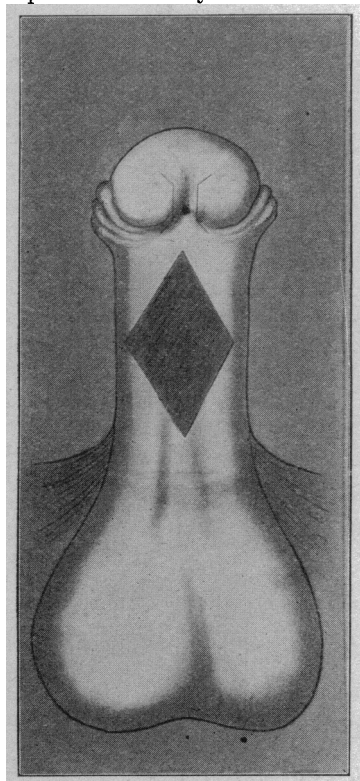


Fig. 1.—Duplay and Bouisson.

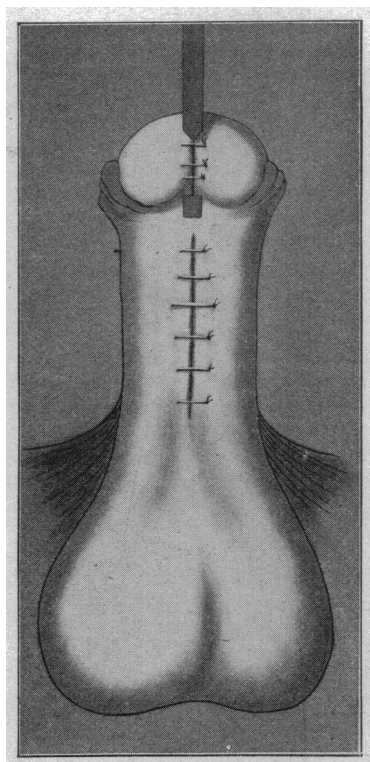


Fig. 2.—Duplay and Bouisson.

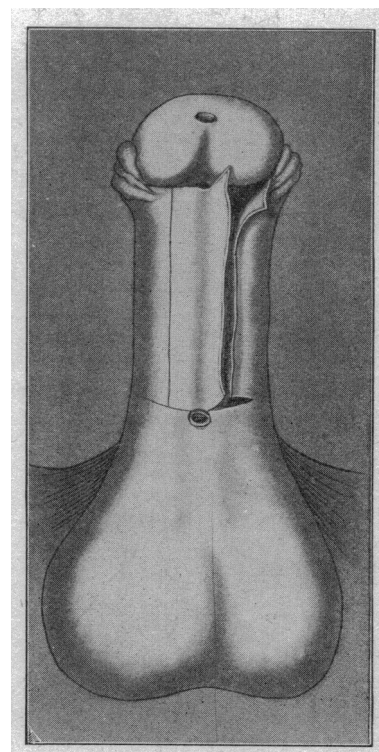


Fig. 3.—Duplay.

degree of deformity is an indication of the period of intrauterine life at which it occurred. Perineal openings develop in the sixth or seventh and glandular from the twelfth to the sixteenth week.

The more common variety is the glandular or balanic, in which the urethral opening is situated back of a broad, flattened and curved glans, the frenum being absent. The penile type of hypospadias opens at some point between the scrotum and glandis corona. The scrotal variety is presented by those cases with the urethral opening at the junction of the penis and scrotum, called peno-scrotal or in the extreme cases perineo-scrotal in which the scrotum is divided.

There is no malformation which may be the cause of more mental suffering and physical discomfort than the one under consideration, the trouble being none the less from its secret nature. A limited number have

The operation of Dieffenbach, first made in 1838, consisted in piercing the glans penis from its summit to the normal urethra, and allowing a canula to remain in position until the canal became lined with epithelium, the previous opening of the urethra being closed. This operation was abandoned from the difficulty of maintaining the lumen of the canal when formed. Dieffenbach was also a pioneer in the operation by denudation and suture. The flap operation of Duplay has until recently been the one most commonly employed. The first step was Bouisson's principle (Fig. 1), to straighten the penis by transverse incision at the point of greatest curvature and, after straightening the organ, to close the lozenge-shaped defects by skin grafts or sliding flaps. (Fig. 2.) The age of choice for this operation is 4 years.

The second step is the formation of the new urethra