Original Articles.

INJURIES ABOUT THE SHOULDER AT BIRTH.

BY J. S. STONE, M.D., BOSTON.

I HAVE been much interested in the injuries and deformities about the shoulder which are seen not infrequently in the clinics at the Children's and Infants' Hospitals. Most of these cases come under the general head of obstetrical injuries, and in most of them I have become convinced, partly from observation and partly from the rather scanty and very contradictory literature on the subject, that injury to the brachial plexus is by far the most important factor, while direct injury to bone and joint is of only secondary importance.

It has long been recognized that obstetrical paralysis is of Erb's type, that the deltoid is the muscle most seriously affected, and that the other muscles paralyzed are the supra- and infra-spinatus, *teres minor*, biceps, and brachialis anticus, together with the supinators. In some of the severer cases paralysis of some of the extensors of the wrist, or more especially of the fingers, also occurs.

All of the paralyzed muscles are supplied by the circumflex, suprascapular, musculocutaneous, and musculospiral nerves, including with the last its branch, the posterior interosseous. Of these nerves the circumflex, suprascapular and musculocutaneous arise entirely from the fifth and sixth cervical roots. In obstetrical paralysis these nerves are most seriously affected and every muscle supplied by them is usually paralyzed, excepting only the coracobrachialis, which is also supplied in infancy by a separate branch derived from the seventh cervical root.

The only other nerves which arise regularly from the fifth and sixth cervical roots are those to the scaleni, to the rhomboids, and to the subclavius, the posterior thoracic, a part of the external anterior thoracic, a very small part of the median, and the upper and lower subscapular, together with a small part of the musculospiral. Of these nerves the fibres which go to supply the scaleni, the rhomboids and the subclavius, and the fibres going to the posterior thoracic, leave the roots of the plexus almost immediately after their exit from the spinal canal and before the roots have joined to form the cords of the plexus. Furthermore, all of these nerves take a decidedly different course from the other nerves of the plexus. They do not go outward toward the shoulder. The pectoral and the subscapular muscles are supplied only in part by nerve fibres arising from the two upper roots.

As to the causation of the paralysis, I will mention, first, a theory which has been held somewhat in Germany, and which has been put forward in this country by Burr.² It is, in brief, that the lesion is a hemorrhage into the anterior horns of the cord, due to the congestion arising during birth. Burr argues in favor of this theory that sensation is unimpaired. His opponents reply that in infants this is an extremely fallacious sign, that complete recovery from an anterior poliomyelitis is rarely, if ever, seen, and that it is extraordinary that such a lesion should always occur at one particular spot. Furthermore,

as Carter³ points out, injury to the fifth and sixth cervical roots at or before their exit from the spinal canal may be excluded by the fact that the serratus magnus and the rhomboids, though supplied by nerves leaving these roots very soon after their exit from the canal, are never paralyzed. In other words, the lesion must be at a point below the origin of the fibres going to the posterior thoracic, to the rhomboids, and scaleni.

The other theories of the causation have been many. The theory of direct pressure on the plexus in the side of the neck, or axilla, by the blade of the forceps, the finger, or the hook, has been thoroughly discredited by the work of Carter, and more lately by Fieux,⁴ among others. As Fieux puts it, whether the delivery be spontaneous, or whether extraction of the shoulders is necessary, whether coming on after the use of forceps or after a breech delivery, Erb's point is always pressed upon, and in one case by the posterior edge of the clavicle, in another by the fingers, in another by the edge of the forceps blade. Explanations of this sort obviously presuppose too much.

This brings up a point in regard to the etiology, on which there has been considerable discussion, the theory that the paralysis is due to a pinching of the plexus at Erb's point between the posterior edge of the clavicle and the first rib in cases in which the shoulder is carried far back. Some hold that the pinching of the plexus occurs between the clavicle and the transverse processes. These views are held by Oppenheim, Gault, Roulland, Budin, and of late have been advanced in Boston by Walton,⁵ after anatomical study of a fetus at term, and more lately still by Schoemaker.⁶ This pressure of the clavicle against the first rib, or the transverse processes, is an anatomical possibility. It means, however, that the shoulder must be carried considerably downward and very far backward to a degree which is at least not likely to occur during childbirth, although the theory that the pinching results from the rotation of the head, with the anterior shoulder hung up on the pubes, is attractive.

In the dissections on six babies which I have made the anterior curve of the clavicle gave ample space for the plexus not to be crowded. My conclusions agree absolutely with what I have since learned Fieux had done, but with which Schoemaker does not entirely agree; work bearing out in every way the theory ably set forth by Carter, that the paralysis is due to nerve stretching, and, in extreme cases, to nerve tearing.

The plexus arises from the fifth, sixth, seventh and eighth cervical, and first dorsal, nerves. If the shoulder is lowered it is plain that the upper cords must be stretched more than the lower, because the lower have normally a more nearly horizontal course. This is entirely confirmed on the cadaver. The upper two roots become as tight as bowstrings when the shoulder is lowered, while the lower three remain perfectly lax until the upper cords are severely stretched, or even completely ruptured. A pull down on the shoulder of about fifteen pounds is sufficient to break the upper roots when the plexus alone holds the shoulder up. A pull of about forty-five pounds, or three times as much, does the same thing when every-

³ Boston Medical and Surgical Journal, vol. cxxviii, p. 434.⁴ Annales de Gynécologie et d'Obstétrique, 1897, vol. xlvii, p. 53.⁵ Boston Medical and Surgical Journal, vol. cxxxv, p. 642.⁶ Zeitschrift f. Geburtsh. u. Gynäkol., xli, 1.¹ Read before the Boston Society for Medical Improvement, February, 5, 1900.² Boston Medical and Surgical Journal, vol. cxxvii, p. 235.

thing is intact, except for a small incision through which to watch the plexus.

Fieux showed experimentally the amount of the separation of the cut roots of the brachial plexus when the shoulder was held down and the head carried to the opposite side with as much force as occurs in an ordinary delivery. He found that the upper two cords separated from 26 to 28 millimetres, the third only 12 and the lower two only eight. In other words, the upper two separated more than three times as much as the lower, and more than twice as much as the middle. The separation varies with the amount that the head is inclined to the opposite shoulder. It likewise varies with the amount that the shoulder is depressed.

The point at which rupture occurs, experimentally, is from about a quarter to half an inch from the emergence from the spinal canal, at or near the junction of the fifth and sixth cervical roots. The fibres of the suprascapular nerve may be ruptured here or at a point slightly lower. They are always ruptured among the first. This point is a little lower than that mentioned by Fieux, who states that rupture occurred five or six millimetres from the emergence of the nerves. The distance seems to be determined by the strength of the fibrous sheath which surrounds the nerve bundles. Very near the canal the prolongations outward from the dura prevent injury to the nerves. Farther out it is determined by a certain weakest point.

One very important point mentioned by Walton, which is admirably shown experimentally, is the fact that the suprascapular nerve must be severely stretched or ruptured, because it has a comparatively short course and what may be termed a very definite distal attachment where it passes through the suprascapular notch. Similarly, though to a less marked degree, the circumflex has a short course and a definite distal attachment where it winds about the humerus. In other words, these two nerves have but a short distance in which they can accommodate themselves to stretching.

Fieux produced by traction on the necks of rabbits, separating the head from the shoulder, a similar partial paralysis of the foreleg, but did not report the results of post-mortem examinations.

Cases reported by Phillips, Beevor, and Walton show similarly that a violent separation of the head from the shoulder may, in adults, cause a paralysis of Erb's type.

A degree of asphyxia leading to a loss of all muscular tone would obviously increase the danger of injury to the nerves.

In regard to the theory that fracture or dislocation of the bones may cause obstetrical paralysis, it should be remembered that paralysis from this cause in adults is not usually of Erb's type. Furthermore, certain anatomical facts in regard to the bony development at birth must be considered. The clavicle is osseous, except at the two ends, ossification beginning here earlier than in any other bone. The sternal and acromial ends are cartilaginous. The scapula at birth is cartilaginous along its whole inner border, at the angle, and in the acromion and coracoid processes. The main part of the body, the spine and the glenoid fossa are ossified.

The humerus at birth is ossified throughout the shaft; the head is cartilaginous. Thus the outer end

of the clavicle, the coracoid and acromion processes are all cartilaginous and are all firmly united by strong ligaments. These parts making up the prominence of the shoulder are so freely movable and so strongly held by ligaments that injury to them is exceedingly unlikely to occur during birth. Injury to other parts is very much more likely to occur. Experimentally the cartilaginous head of the humerus is separated with great ease. The glenoid cavity may be broken off entirely by the exercise of considerably more force. The clavicle may be broken in its bony portion. The bony shaft of the humerus may be easily broken. Judging from what is seen experimentally, separation of the cartilaginous head of the humerus must be of extremely common occurrence during birth, and must often pass entirely unrecognized and indeed give rise to no symptoms, except the subjective one of pain, with perhaps a very soft crepitus which it would be impossible to detect with certainty during life. A fracture of a portion of the glenoid is impossible to produce experimentally. The whole glenoid may be broken off. This would be an injury detected also with difficulty. Fracture of the clavicle and of the shaft of the humerus is in each case apt to occur about the middle of the bone and is detected with ease.

Experimentally, these fractures occur comparatively so easily that it is impossible by the use of any reasonable amount of force to dislocate the head of the humerus and practically absolutely impossible to dislocate the head of the humerus, if the word dislocation is used in the sense of forcing the head out of the glenoid through a rent in the capsular ligament. It is possible, with considerable force, to stretch and tear some fibres, particularly about the lower posterior part of the capsule.

It is perfectly conceivable that injury to the brachial plexus, through fracture of the clavicle, might cause paralysis of Erb's type, but it is likewise inconceivable that a fracture of the clavicle should very often pass undetected where there is an obstetrical paralysis. It is not possible for injury to any other bone than the clavicle to cause a paralysis of Erb's type.

It is, nevertheless, true that a considerable number of cases are recorded in which there is a backward displacement of the humerus, usually with paralysis of Erb's type, rarely without. My feeling in regard to these cases is that the dislocation, which is usually in the reports considered congenital, is in reality due to the paralysis; that is, that it is due to a slow yielding of the posterior part of the capsular ligament under the pull of the internal rotators. This form of dislocation was described by Dechenne in 1866. One case of backward dislocation has developed within my own observation during the second year of life. The child had a typical obstetrical paralysis, occurring after a version. When first seen the head of the humerus rested in the glenoid and could be slipped back onto its posterior border. When seen, a scant year later, the head rested outside of the glenoid and could be slipped forward onto its posterior border. This child has turned out to be microcephalic.

Another case had typical obstetric paralysis noticed immediately after birth, and examined by the family physician, Dr. Cahill, of Cambridge, who is positive there was no dislocation at first. I saw the child first at six months of age, when it was seen again by Dr. Cahill. The dislocation was then most striking.

Dislocation of this sort secondary to paralysis, whether or not accompanied by more or less tearing and stretching of the capsule at the time of the injury, is made much easier by the relatively small size, at birth, of the glenoid cavity as compared with the head of the humerus. Of course the disproportion is obvious in adults, but in infants at term the joint surface of the glenoid is in breadth only a quarter to a third of the diameter of the joint surface of the head of the humerus, while in adults it is one-half as large. In other words, the glenoid cavity is relatively from half as large again to twice as large in the adult as in the baby.

In obstetric paralysis the position of the arm is characteristic. It hangs at the side, rotated inward strongly, with the elbow slightly flexed, the forearm pronated so that the palm faces backward and outward and the wrist and fingers flexed. The most marked muscular atrophy is in the supra- and infra-spinati and deltoid. The pectoralis major and the subscapularis unopposed by any outward rotator keep the arm so strongly rotated inward that the head of the humerus is constantly stretching the posterior portion of the capsule. This stretching is increased by the backward and the downward pull of the latissimus dorsi. The result is a contracture of the pectoralis major and a gradual yielding of the weak posterior portion of the capsule. A backward displacement inevitably follows. The stronger anterior portion of the capsular ligament and the coracohumeral ligament, which at first prevented any forward dislocation, are not developed normally, and together with the contracture of the pectoralis major, hinder the rotation of the arm outward and the replacement of the head of the humerus in the glenoid cavity. Secondary bony changes may occur both in the glenoid cavity and in the head of the humerus. From disuse of the arm, lack of growth is common. It is possible that in some cases more or less recovery of power may occur in the deltoid and outward rotators, even after considerable displacement of the head of the humerus has occurred. This is probably the manner of production of most of the so-called congenital dislocations of the shoulder, which is, therefore, usually a misnomer.

There are three classes of infantile dislocations of the shoulder. The first includes the true congenital dislocation, where the lesion is due to a true lack of development during intra-uterine life of the glenoid cavity and the head of the humerus, analogous to the congenital dislocation of the hip. This form of dislocation, however, is extremely rare, and many cases reported as congenital dislocations are probably in reality paralytic dislocations. While a lack of development in the acetabulum is the most frequent congenital defect in the pelvis, in the shoulder girdle congenital defect of the glenoid is less common than other malformations, such as absence of the clavicle, congenital elevation of the scapula, exostosis of the scapula, or defect of its lower portion. Lack of development in later childhood or in adult life cannot in any sense be taken to indicate that the dislocation is truly congenital, for in severe cases of obstetrical paralysis lack of development is common.⁷ The association of paralysis with cases regarded as congenital disloca-

tions should lead to the suspicion that the paralysis was the cause of the dislocation, and especially should this be suspected in cases in which there is reason to believe that the paralysis arose from trouble during delivery. If the cases reported as congenital dislocations of the shoulder are studied in this way, a large majority of them must be looked upon as probably of paralytic origin.

Another class of infantile dislocation is the traumatic. It is undoubtedly possible that this may be produced during delivery. Experiments and clinical experience, however, both show that this must be an extremely rare occurrence, simply because any violence sufficient to force the head of the humerus through the capsular ligament would almost invariably produce other injuries which would allow the shoulder-joint itself to escape.

A vast majority of the cases of infantile shoulder dislocations must be regarded as paralytic. The displacement may have been aided by rupture or stretching of the posterior part of the capsule at birth, but they are not true dislocations in the sense that the head of the humerus has passed through a rent in the capsular ligament. They are due to a gradual yielding of the ligament under a constant unopposed muscular pull in one direction.

Before speaking of treatment something should be said regarding prophylaxis. Traction is the cause of obstetrical paralysis. Of course it is often absolutely necessary to use extremely severe force in delivery where the choice must often lie between injury to or death of the child. There are certain times, however, when traction directly on the shoulder may be avoided. Particularly in delivering an after-coming head, the pull may be exerted on the pelvis and chest rather than on the shoulders. In delivering the shoulders after the head is born, direct traction is much more apt to cause paralysis than is the freeing of the shoulders by insertion of a finger in the axilla,—a manœuvre likely of course to fracture the humerus. This accident, however, is far less serious than a paralysis. The suggestion of Walton that the second stage of labor is to be hastened should be limited by the other rule that it should not be shortened by any measure producing traction on the shoulders.

After the injury is done, support for the arm is essential. Thus further dragging on the stretched nerves or separation of their torn ends is prevented, the stretched ligaments are supported and the muscles are given a chance to recover their tone. The muscles should be protected from undue stretching just as in the early stages of infantile paralysis.

Thus for a time further harm is prevented. Later, massage and electricity have their uses. By these simple measures, or even without treatment recovery will occur in probably a considerable majority of the cases. The obstetricians thus regard obstetrical paralysis rather lightly, while the neurologists and orthopedic surgeons, who only see those cases which do not recover, regard the prognosis as bad. This difference is due probably to the varying degree of injury to the nerves; in one case simple stretching, in another a rupture of certain fibres of a nerve, and in the most severe possibly a complete tearing apart of the whole nerve. In cases not improving decidedly within the first six or eight weeks of life a serious injury to the nerves is to be regarded as probable, and consequently the outlook for marked im-

⁷ Une Épidémie de Paralysies Radiculaires Obstétricales. Guilmot: *Annales de Gynécologie et d'Obstétrique*, 1897, vol. xlvii, p. 35. An interesting series of cases occurring in the practice of one midwife, and probably usually due to difficulty in delivering the head after version before full dilatation had occurred.

provement is poor, although improvement has occurred after years.

It is a question whether in certain cases the injury cannot be repaired by surgical interference. The greatest obstacle to any successful nerve suture is that in all probability the nerves are torn by individual fibres as a hemp rope tears, not directly across at any one point. Furthermore, after several weeks there would probably be the greatest difficulty in recognizing in the small nerves of the baby any abnormality without considerable manipulation. And during the interval of waiting for improvement to occur, an ascending degeneration of the torn fibres would probably have occurred which would interfere with a restoration of function, even after approximation of the torn ends. Exploration is possible, however, even in small babies.

In the lower part of the posterior triangle of the neck the upper brachial plexus is comparatively easy of access. It lies back of the sternomastoid, above the omohyoid, in front of the trapezius. The scalenus anticus and the sternomastoid protect the great vessels and the phrenic nerve. The spinal accessory nerve is considerably behind the plexus. The subclavian vessels, thoracic duct and several small arteries running across the neck are all below the omohyoid.

The external jugular vein and the branches of the cervical plexus which wind around the posterior border of the sternomastoid are in danger. The difficulty in reaching the upper cords of the plexus lies chiefly in the shortness of a baby's neck. The outlook for successful interference, however, is doubtful. In one case, in a baby of six weeks, I have cut down on the plexus, but found nothing more than a rather soft spot just below the junction of the fifth and sixth roots. The child died of pneumonia two weeks after operation. In the older cases where dislocation has occurred probably little is to be hoped from nerve suture, although exploration is justifiable.

Leaving aside the possibility of any radical cure of the condition through repair of the nerve injury and consequent restoration of power in the paralyzed muscles, several palliative measures are to be considered. The condition always present and the one for which relief is most often sought is the inward rotation of the arm. The inability to elevate the arm and the other paralyses vary considerably in degree. For the relief of the inward rotation, stretching or section of the contracted pectoralis major is necessary. By means of plaster bandages applied with the forearm flexed to a right angle and the arm rotated outward with the elbow at the side, it is a simple matter in the course of a few days or weeks to overcome the inward rotation and by direct pressure to bring the head of the humerus back into the glenoid cavity, if it is dislocated. It is possible that in a few cases rest of the over-stretched outward rotators may thus enable them to recover their tone and bring about some improvement. Relapse will almost surely occur, however, unless systematic passive motion and massage is used, aided by some orthopedic apparatus to check inward rotation.

In the more marked cases of longer duration section of the contracted muscles will cause a considerable improvement, but here again systematic after-treatment is essential. Several cases, among them one of my own, thus operated upon have been somewhat benefited.

The operative procedure of Phelps⁸ consists in deepening the glenoid cavity, paring off a portion of the head of the humerus and stitching up the lax posterior portion of the capsular ligament. His procedure is based upon the belief that the dislocation results from a fracture of the posterior portion of the glenoid cavity occurring at birth. In one case in which I opened and explored the shoulder-joint in a boy six months old with a typical paralytic dislocation I found no evidence of malformation or fracture of the glenoid or head of the humerus. Stitching up more snugly the posterior ligaments caused slight improvement, although in his case systematic stretching of the anterior muscles probably accounted largely for any benefit obtained. Previous section of the contracted pectoral muscle should be advised.

In certain rare cases there is a marked laxity of the whole of the capsular ligament and an unusually extensive muscular paralysis, allowing the arm to drop downward. Here a shortening of the ligaments in order that the head of the humerus may be brought up into its normal relations will be of benefit. In all cases, however, in which the joint is opened, particularly where any portion of bone or cartilage is excised, the formation of adhesions is to be considered. Of course, in this manner, motion in the shoulder-joint is limited, but this very limitation of motion may still be a means of increased functional usefulness in the arm. In fact, in certain cases, where the paralysis is extensive, an arthrodesis of the shoulder-joint may greatly improve the condition, through enabling the arm to be moved by movements of the scapula.

Another measure to be considered in overcoming the inward rotation of the humerus is a linear osteotomy of the upper portion of the shaft of the humerus, with union of the bone in a position of outward rotation. Another possibility to be considered in overcoming the inward rotation is a transference of the insertion and consequent change in function of the latissimus dorsi. After the section of the pectoralis major, which is the operative procedure usually demanded, the latissimus dorsi might be exposed and cut close to its insertion along the inner edge of the bicipital groove. It might then, by means of a posterior incision, be reached and drawn back to be sutured to the humerus under the posterior border of the deltoid immediately below the insertion of the teres minor and above the origin of the external head of the biceps. In this manner the pectoralis major would be lengthened and the latissimus would be changed from an inward to an outward rotator of the arm, in a manner similar to that in which Tubby, by changing the course of the pronator radii teres, converts it into a supinator of the forearm. Some such measure as this would, if successful, overcome the great obstacle to permanent reduction.

In conclusion I wish to emphasize these points:

True congenital dislocation of the shoulder, that is, defective development of the scapula and head of the humerus, is of extremely rare occurrence.

True traumatic dislocation of the shoulder at birth or in early infancy is of extremely rare occurrence.

Obstetrical paralysis, which, as has long been recognized, is of Erb's type, is due probably almost invariably to a stretching and in some cases a rupture of the two upper roots of the brachial plexus, as is proved by anatomical study.

⁸ Transactions American Orthopedic Association, vol. VIII, p. 239.

Obstetrical paralysis is usually recovered from entirely in the course of a few weeks or a few months. If recovery does not occur within this period the prognosis is very much more serious, although improvement may occur even after the lapse of many years.

After an infant's arm has been held in the position of inward rotation for some months the posterior part of the capsule becomes so stretched as to permit the head of the humerus to slip out of the glenoid cavity posteriorly, while the anterior portion of the capsule and the pectoralis major are shortened. This backward subluxation is always made easier by the relatively small size of the glenoid cavity in infancy. It may be made easier by a tearing and stretching of the posterior part of the capsular ligament through the same trauma which stretched the upper cords of the brachial plexus.

A dislocation of this sort is easily reduced by measures which stretch the inward rotators of the arm, but when thus reduced it is held in place with extreme difficulty, because the cause which originally produced the dislocation, that is, the unopposed action of the inward rotators, is still present.

Any abnormality in the shape of the head of the humerus or in the glenoid in a case accompanied by paralysis or lack of development of the deltoid and supra- and infra-spinatus muscles is probably secondary to the paralysis, and if accompanied by a dislocation is not to be looked upon as the primary cause of the dislocation. Lack of bony development of a paralyzed arm may become very marked after the lapse of years, and this lack of bony development is not in any way to be regarded as proof of a congenital defect.

All early cases of obstetrical paralysis are to be treated by sling or bandage which will support the paralyzed muscles and prevent dragging on the ligaments and injured nerves.

In cases of obstetrical paralysis which persist without improvement there is reason to hope that surgical intervention looking to a union of the torn ends of the fifth and sixth cervical roots at a point from a quarter to three-quarters of an inch from their emergence from the canal may be of benefit.

The subluxation resulting from the paralysis is to be treated by stretching or section of the contracted muscles and ligaments, by osteotomy, arthrodesis, or muscle transfer, according to the conditions present in each case.

STEAM IN THE TREATMENT OF CHRONIC, HYPERPLASTIC, AND SENILE ENDOMETRITIS, PUTRID ABORTION AND PUERPERAL SEPSIS.¹

BY F. W. JOHNSON, M.D., BOSTON,

Visiting Gynecologist, Carney and St. Elizabeth's Hospitals.

WHEN I went on duty at the Carney Hospital in the fall of 1898 I found Dr. Malcolm Storer had been and was using steam in the treatment of the various forms of uterine hemorrhage. This method of treatment appealed to me, and I began its use at once in the treatment of chronic endometritis and menorrhagia.

Concerning this method Prof. A. Dührssen thus writes:² "The method of arresting hemorrhage by

¹ Read before the Suffolk District Medical Society, Section for Obstetrics and Diseases of Women, November 22, 1899.

² *Klinische Wochenschrift*.

steam was first employed by Sneguireff, of Moscow, in 1894, for profuse hemorrhage during the removal of an echinococcus cyst from the liver. Since then experiments have shown that parenchymatous organs can be incised almost bloodlessly, and that hemorrhage from arteries of the size of a dog's femoral can be quickly arrested by a steam jet.

"The technique is simple. A fenestrated uterine catheter is joined by a gutta-percha tube to a small boiler. The steam issuing from it should be at 212° F. Higher temperatures are advocated by some, but the author has never used them, except in experiments on animals. In this way dangerous uterine hemorrhage can be arrested permanently and painlessly without an anesthetic; and serious operations, for instance, hysterectomy for fibroid tumors, may often be avoided.

"The details of the procedure differ according to the age of the patient. If the steam is allowed to act for two minutes, exfoliation of the uterine mucous membrane follows, either *en masse* or piecemeal. A raw surface is left which forms adhesions, which cause obliteration of the cavity and subsequent atrophy of the uterus, and hemorrhage is cured as certainly as though the uterus had been removed. In order to exclude cases which are unsuitable for this treatment, such as malignant tumors or placental remnants, the cervix must always be dilated first. An important detail is that the instrument, when it passes through the cervix, must be encased in a drainage tube, for otherwise the heat may damage the cervical walls, and be followed by obliteration of the cervical canal and hematometra.

"Cases in which this treatment is indicated are exhausting floodings between the ages of forty and fifty, whether caused by chronic metritis, by abnormal friability of the walls of the uterine vessels, or by small interstitial myomata. In this last case the steam probably produces atrophy of the myoma, as well as of the uterus. Where it is required to arrest abnormal uterine hemorrhage without causing obliteration of the uterine cavity, as in young women with too profuse menstruation, the steam must not be allowed to act for more than a quarter of a minute (Sneguireff says one minute, which is certainly too long), and the process should not be repeated until after the next menstrual period. The application of steam for a quarter of a minute successfully sterilizes septic endometritis in puerperal fever, and the raw granulating surface left offers an excellent barrier against the further entry of bacteria into the circulation. Good results have also been obtained in subacute and chronic gonorrhea, and the author suggests its use as an abortive treatment for acute cases.

"If carried out properly the treatment is quite harmless, and has no disadvantages."

Dr. Alexander Rovinsky wrote me that Sneguireff, together with Blogovolyn, had experimented on animals and had come to the following conclusions: (1) Desired portions of the liver could be excised without loss of blood, the animals surviving; (2) any part of the spleen could be cut out without loss of blood; (3) whole lobes of lungs can be removed without any loss of blood; (4) the same applies to the kidney; (5) also to some extent to the brain; (6) it is possible to stop the bleeding from the spongy portions of bones; (7) the marrow of the bone coagulates and the regeneration of the bone takes a normal course;