the thrombosis and embolism, and the occasional sudden death which are encountered in gout, are not the result of any diffuse lithæmia, but are the consequences of actual uratoses—that is to say, are due to the precipitation of minute crystals of sodium biurate (microscopic uratoses) either in the substance of the organs or in the blood itself. I hazard this conjecture on the ground of the two following observations: Sir Alfred Garrod found that the blood serum of one of his patients contained uric acid to the extent of one part in 5,714. On the other hand, I found by direct experiment that when blood serum was artificially impregnated with uric acid to the extent of 1 part in 5,000, there could be detected in it after a certain lapse of time minute stars and needles of sodium biurate. It would thus appear undoubted that in some cases of gout the blood may, though probably very rarely, become so laden with uric acid as to be within striking distance of a general uratoses throughout its entire mass. The establishment of the possibility of such a condition would obviously enable us to explain the occurrence of some very obscure incidents in the history of gout.

Secondly, the adoption of the present proposal would enable us to discuss more freely and with greater precision of language the true relation of uratic deposits to the etiological factors which are concerned in their production. According to current views these deposits are regarded as an infallible sign of the existence of the gouty diathesis, however diverse the associated conditions may be. Hence, we are in the habit of speaking of *ordinary* gout, and of *saturnine* gout. Would it not be a more accurate expression of the facts to speak of *gouty uratoses* and *saturnine uratoses*? It is not easy to believe that lead poisoning produces really and truly the same constitutional diathesis as that which exists in true gout. It seems easier to believe that the gouty diathesis and lead poisoning, while differing in all other respects, have one tendency or vice in common, namely, the tendency to uratoses. The possession of this one vice would necessarily give to two otherwise radically distinct primary disorders a very close resemblance in regard to their symptoms and physical signs, because these latter depend almost entirely on the direct local effects of the uratoses which is common to both. This line of argument might be illustrated and strengthened by drawing an analogy between uratic deposits and urinary concretions. A large group of cases of uric acid, gravel, and calculus are the undoubted offspring of gout; but there is also another large group of cases, occurring chiefly among the poor and among rice eating populations, which have no kinship with gout, and are the result of a totally different set of etiological factors. Nevertheless, the clinical and pathological phenomena in the two groups, depending as they do on the mechanical irritation induced by the concretions, are practically indistinguishable. Here then we have a closely analogous example in which two essentially distinct constitutional states produce identically the same morbid precipitation and the same sequential morbid effects.

On the other side, it might be contended that this line of argument is inconclusive, and is directly rebutted by established facts relating to the hereditary transmission of gout, for, as is well known, sthenic gout in the grandfather may reappear in the grandchild as atonic or "poor" gout. These two conditions differ from each other quite as much as does ordinary gout from saturnine gout. Almost the sole point of resemblance between them is the occurrence in both of uratic deposits, and yet they are undeniably of common constitutional origin. To this objection it may be answered that gout is not in reality a homogeneous nosological unity, but a loose bundle of morbid tendencies. And it is quite in accordance with what we know of the laws of heredity that these several tendencies should be transmitted in unequal degrees, or that some of them should not be transmitted at all, while others are transmitted with increased intensity. In this way it might come to pass that a grandchild might inherit from his plethoric gouty grandfather his tendency to uratoses, but not his tendency to plethora—just as he often does inherit the characteristics of his grandfather's eyes and nose, but not those of his forehead and chin.

Then, again, it is admitted that there are other factors which have considerable etiological force in the production of uratic deposits besides the gouty diathesis and lead poisoning, namely, senescence, nervous shocks, local injury, and trophic changes. Two or more of these may act in combination in determining the occurrence of uratic precipitation. Adopting the nomenclature suggested, we could speak of a uratoses of purely gouty origin, of a uratoses in which a gouty tendency was reinforced by lead poisoning,

by senescence, by shock, or by local injury; or we might speak of a purely saturnine uratoses, or of a uratoses in which saturnine poisoning was reinforced by a previously existing gouty tendency—and so forth. By this mode of expressing ourselves we could conveniently indicate the concurrence of several factors in producing uratic precipitations, none of which alone were adequate to determine their occurrence.

Lastly, we should gain something in regard to a clearer apprehension of therapeutical indications. We could, on the one hand, aim at minimising the incidence of the predisposing cause—be it the gouty diathesis, or lead poisoning, or whatever else might eventually come to be regarded as the most important predisposing factor. Or, on the other hand, failing in that direction, we could aim directly at the uratoses itself. In this latter way we might succeed in preventing the more serious consequences of an irremovable predisposition; just as in uric acid gravel we are able, by alkalisating the urine, to guard our patient against calculous accidents in circumstances where we cannot remove the causes predisposing thereto. Uratoses is, like gravel, of and for itself a disastrous pathological accident; and it may induce consequences in the joints or in the kidneys of a permanent character, which far exceed in gravity, and far outlast, the etiological factors which originally gave rise to it.

And should it turn out at last, after further inquiry and investigation, that there does subsist an absolute and invariable solidarity between uratic deposits and the gouty diathesis—and I wish to express no positive opinion on this point—we should lose nothing by adopting these proposals. On the contrary, we should distinctly gain in facility of description and in clearness of conception in regard to the main incidents of the gouty state.

I have, I think, said enough to bring the subject fairly before the Society, and I wish to elicit the opinion of the Fellows on two points, namely, first, whether it be desirable to erect the precipitation of the crystalline urates within the body into an independent symptom or physical sign, with a distinctive name; and secondly, whether the name suggested is worthy of approval.

AN ADDRESS ON ANEURYSM:

ITS CURE BY INDUCING THE FORMATION OF
WHITE THROMBI WITHIN THE SAC.

Delivered to the Midland Medical Society.

By WILLIAM MACEWEN, M.D.,

Lecturer on Clinical Surgery Glasgow Royal Infirmary.

[Concluded from page 1109.]

Let us now turn our attention to some clinical evidence of the value of this mode of treatment in curing aneurysms. In doing so the cases presented are not arranged chronologically, but in pathological order.

Case of Aortic Aneurysm seen at an Advanced Period, when threatened by Impending Death from Dyspnoea, treated by Induction of White Thrombi within the Sac, the Treatment being cut short within the Month by Fatal Dyspnoea; Post-Mortem Examination showing the Interior of the Aneurysm to be filled to Two-Thirds of its Extent by Firm White Thrombi.—S. W., aged 32, an engineer, was seen by me in private, in consultation with Drs. Hunter and Middleton, early in November, 1887, suffering from an aneurysm, which projected from the chest above the clavicle on the right side of the root of the neck, and was supposed to be either purely aortic or an aortic aneurysm involving the innominate. For a year previously he had been affected with symptoms pointing more or less directly to aortic aneurysm. As these symptoms increased he had to desist from work. Subsequently he consulted many surgeons and physicians, principally in England, who all advised him against operative interference. On a number of occasions he had had attacks of breathlessness, so severe as to threaten a fatal termination. There was no syphilitic history.

On examination an eccentrically pulsating swelling was seen at the inner extremity of the right clavicle, occupying the episternal notch, which seemed to cause the sternal end of the clavicle to project forward. The trachea was distinctly pressed to the left,

and somewhat overlapped. On percussion over the upper part of the sternum and its neighbourhood, an area of dulness was detected, measuring from 2 to $2\frac{1}{2}$ square inches. The right pulse was much feebler than the left. There was inequality of the pupils. Patient noticed a marked alteration in tone of voice within the last four months. The slightest exertion caused a feeling of shortness of breath; while, independent of exertion, he had severe attacks of dyspnoea. Severe pains were experienced at times, passing down the right arm. There was no difficulty in swallowing, and his general health was fairly good. Urine normal. His medical attendant stated that his mind wandered occasion-

probability of rapid enlargement of the aneurysm in an anterior direction by removing the controlling support of the deep fascia of the neck extending over it.

A pin was inserted into the aneurysmal sac at the beginning of December, 1887. It was found that the cavity of the aneurysm passed downwards within the thorax towards the aorta. The pin was made to transfix this cavity until it came in contact with the internal wall on the opposite side from the point of entrance. After

Fig. 1.—Aortic aneurysm, two-thirds filled with white thrombi.

ally, and that his articulation became slightly slurred. Neither of these symptoms was detected by me at this examination.

Although the case presented many unfavourable signs, especially the violent paroxysmal dyspnoeal attacks, it was thought that the production of white thrombi within the sac might be induced with comparative safety, especially as the patient did not require to be placed under the influence of an anæsthetic. With any other treatment, such as double ligature on the distal side of the aneurysm, an anæsthetic would have been necessary, the administration of which would have been dangerous in the presence of a displaced and somewhat flattened trachea. To have performed tracheotomy at a part of the trachea sufficiently low to afford relief to the obstruction would have entailed the exposure of the overlapping aneurysmal sac, with the possibility of immediate disaster from damage to its walls, and, failing that, the

Fig. 2.—The same aneurysm laid open.

it had been allowed to remain in one position for about an hour, the point was changed to a fresh surface on the internal wall and so on, until the greater portion of the sac within reach of the pin had its internal wall slightly irritated. On several occasions the pin was placed in such a position that its extremity barely touched the internal wall, while it was left free to move to and fro by the impulse of the blood. In this way a slight scratching of the wall would result. Several times the pins were retained in the sac for twenty-four hours, and once for forty-eight hours.

The pins were inserted on seven occasions, with a few days' interval between each. Considerable consolidation had taken place, although the exact amount could not be measured owing to the impulse of the blood. Hopes were entertained, however, of a somewhat speedy consolidation. Unfortunately, on December 26th, he had an attack of dyspnoea, attributed by himself to a

slight cold. This soon passed off, but was followed by another on December 31st, which was so severe as to raise the question of immediate tracheotomy. The risks of the operation were fully put before him and his medical attendants, but the patient begged for delay, urging that he had been very much worse on several occasions, and had recovered. He thought that he would be right in a very short time. This prediction was, however, not verified, as he succumbed to the dyspnoea a couple of hours after the medical attendants left.

A partial *post-mortem* examination was permitted thirty-six hours after death. The following points are extracted from the report: The lungs were full of dark fluid blood. The larynx, trachea, and bronchi, along with the heart and great vessels, including the aneurysm, were removed *en masse*. The trachea was pressed to the left, and almost flattened in that direction. It was likewise somewhat rotated, the back part appearing toward the tumour. The cartilages on the tumour side were acutely bent into the lumen of the trachea, so that it would have been difficult to have inserted a tracheal tube during life. The heart was large, and the right side much congested. The aneurysm was fixed between the sternum and the spinal column, was adherent to both, and had caused slight erosion of the osseous tissue on both sides. In removing the aneurysm from the sternum a portion of its coat which was adherent to the bone was torn, the rent exposing the white thrombus in its interior.

The aneurysm pressed upon and was organically adherent to the trachea, the lower part of the tumour pressing upon its bifurcation. Its upper border reached the thyroid gland, its lower the aorta. The aneurysm was aortic, springing from that part of the arch from which the innominate takes origin. The opening into the innominate was found half an inch inside of the aneurysm. The innominate vessel passed over the outer wall of the aneurysm, the coats of both being incorporated. The carotid was likewise joined to the aneurysmal sac for a short distance. The vagus nerve was closely adherent to the outer wall of the tumour. The aneurysm was divided as nearly as possible into two equal parts. The whole section of the aneurysm, measuring obliquely from below upwards, was three inches. Its outer wall was an inch and a half in thickness, the cavity an inch, and the inner wall half an inch, so that two-thirds of the interior of the aneurysm had been filled with a white, firm, laminated thrombus, which was greatest on the inside of the outer wall, along which the needles played; much thinner on the inner wall, through which the needles were merely inserted in order to gain the interior of the sac. It was thinnest of all in a small cavity at the upper portion of the aneurysm which extended behind the trachea, and to which no needle had been directed, as it was not known to exist during life.

The specimen, consisting of the aneurysm and its relations to the aorta, great vessels and trachea, is before you (Figs. 1 and 2), so that everyone can see for himself the amount of firm white thrombi produced by this treatment—somewhere within a month. Had the deposition continued at the same rate, it is evident that complete occlusion would have occurred within a few weeks. Had the amount of firm white thrombus, which had occurred within the sac—as we now see it in the specimen—been fully known before death I would have insisted on the performance of tracheotomy, believing that the dangers of exposing the sac were greatly minimised by the presence of this thick wall of fibrin. I regret that tracheotomy was not performed, as a tube might have been passed down to a sufficient extent to have relieved the obstruction. The other lesson to be derived from this case is the important one of endeavouring to ascertain if possible the form of the sac and of bringing the pin into contact with each portion. Here one part escaped which was not known to exist, namely, that minute portion which lay behind the trachea. This is the only part the wall of which was not thickened by layers of fibrin. It is true that, in this instance, it would not have been of much consequence, as the occlusion of the part nearest the aorta was in process of being completed, and had this occurred this diverticulum would soon have shrunk.

Aneurysm of the Upper Part of the Right Femoral, involving External Iliac, measuring 5 inches in diameter, Cured by Induction or White Thrombi within the Sac; Patient Died Thirteen Months Subsequently from Carcinoma of Tongue; Post-mortem Examination showed that the Aneurysm was Obliterated; a Mass of Vascularised Connective Tissue represented the Sac and its Contents.—In March, 1875, a patient presented himself with a large aneurysm occupying the upper part of the right femoral and distal

part of the external iliac artery. There was besides extensive arterial degeneration, a minute aneurysm of the left femoral, and a probable aortic one. He attributed the aneurysms to over-exertion in a hot climate and while suffering from malarial fever. There was no syphilis.³

The aneurysm of the upper part of the right femoral had existed for three years, during which it gradually increased, but much more rapidly just before coming under observation. When examined by me the aneurysm, which was somewhat circular in form, occupied the upper portion of the right femoral and the distal inch of the external iliac. It measured five inches in transverse and a little more in vertical diameter. Its anterior wall was very thin; at one place it seemed as if only the skin and a very thin sac intervened between the examining finger and the circulating blood. The patient was much afraid the aneurysm would burst.

He had undergone prolonged medical treatment, rest, low diet, iodide of potassium, etc., and had been dismissed as incurable. He subsequently consulted a number of surgeons in the hope of having a ligature applied to the external iliac, but they had declined to interfere in this way on the ground of the extensive arterial degeneration. Under these circumstances, he applied to me (I was not then surgeon of a hospital) stating that he was willing to have anything tried which would offer a chance of benefit.

He was then treated by me at his own home. Pressure applied to the common iliac for twenty-four consecutive hours failed to produce the desired effect. This was followed by pressure applied immediately above and below the tumour, maintained for four or five hours daily during a fortnight without benefit. Flexion of the limb on the abdomen was also resorted to without resulting improvement. At the expiry of three weeks of pressure treatment the aneurysm remained in exactly the same state as it was before it was begun.

During the ensuing fortnight all treatment ceased. The patient was out of bed and walked a little every day. At the end of the fortnight he had two days' rest in bed, and on the night of the third day, April 13th, at 12 P.M., pressure was applied to the common iliac artery until the pulsations in the sac entirely ceased. A long steel pin of fine calibre was then introduced into the sac, and passed through it until it touched the internal surface of the opposite side of the aneurysm. It was left in that position for ten minutes, when the point was withdrawn somewhat, and then directed to another part inside the sac, when, after the same interval, it was again shifted to another position. Twelve different parts of the sac wall were thus acted on, the pin being left in contact with each of these places for ten minutes. At the expiry of two hours the pin was removed, pressure over the puncture being maintained for about five minutes. Fifteen minutes subsequently the pressure on the common iliac was slowly removed. The thin wall of the sac then seemed to me firmer, but those who assisted and the patient could not recognise any improvement. The pulsations in the sac were as vigorous as ever. Twelve hours after the walls felt firmer, and everyone admitted that a change had taken place. This thickening of the coats became greater daily, the solidification occurring five days after the insertion of the pin. The aneurysmal sac was then converted into a solid ball, which still moved with the arterial impulse, but there was no eccentric pulsation. Contraction and solidification continued from this time.

On April 28th, fifteen days after the operation, the patient felt so well that he rose from bed and had a short walk in the open air. He did so against orders; notwithstanding this he made a rapid recovery. He went to the country during May and returned to his work in town at the beginning of June, fully restored. He was presented to the Glasgow Pathological Society on October 12th, 1875.

He continued to work, and was in the enjoyment of good health for nearly eight months after. At the end of this time he presented himself with an ulcer of the tongue, which proved to be carcinomatous, and for which he was treated palliatively in the wards of one of the surgeons in the Royal Infirmary, as the case was not considered by him suitable for operation. He was then dismissed, and died at his own house, after a lingering illness, on May 13th, 1876, thirteen months subsequently to the obliteration of the right femoral aneurysm. For four or five days previous to his death he lay in a state of deep coma. A month prior to death

³ Case presented at Glasgow Pathological Society, October 12th, 1875; reported in *Glasgow Medical Journal*, January, 1876, and in the *Lancet*, October 15th, 1877.

the left femoral aneurysm (the one not treated) had increased somewhat and showed no tendency to heal. Twenty-four hours before death it felt firmer though it still pulsated.

In accordance with his often expressed wish, and the provisions of his will, a *post-mortem* examination was to be made, and the

Fig. 3.—Aneurysm of both femorals, the right obliterated by fibrous tissue.

arteries given me for further examination, as he took an intelligent and keen interest in what he was pleased to call his "case."

Confining our remarks to the condition of the arteries, it was seen that all the larger vessels were subject to calcareous degeneration. A large aneurysm existed in the descending part of the aortic arch. There was a small aneurysm on the left femoral, and the remains of an obliterated one on the right. I present the

preparation of these two aneurysms. (Fig. 3.) Looking at the left first—the one which had not been treated—it will be seen that it is filled with a red stratified thrombus, easily separable from the vessel wall. This formed during the many weeks prior to his death, in which he was reduced to the extreme exhaustion and emaciation of a patient dying from carcinoma of the tongue and throat. There was a channel still patent through the aneurysm, by which a diminished blood stream still flowed. The aneurysm of the right side, instead of measuring five inches in longitudinal and transverse diameter, as it did before operation, now measured two inches long and three-quarters of an inch in breadth at its broadest part. It presents a hard solid mass, which on section is seen to be composed of a dense vascularised fibrous tissue. Histologically it presents dense connective tissue interspersed with numerous blood vessels. The femoral vessel below the aneurysm is partly occupied by a thrombus which shows little or no organisation.

Here, then, is obliteration of the aneurysm, its place being taken by a mass of living tissue.

Aneurysm of Abdominal Aorta treated by Induction of White Thrombi in interior of vessel: Cure interrupted by Patient feeling so well that he determined to resume work after about a month's treatment, though tumour not consolidated: Patient still alive two years and a half after.—An aneurysm at the upper part of the abdominal aorta was sent me by Dr. Peden in March, 1888. The patient was an engine driver, and had suffered for many years from pain in the gastric region, but it was only lately that he detected a swelling at that point. The pain and the strong arterial impulse prevented him from working. There was no syphilis. The tumour was situated on the upper part of the epigastric region, was somewhat circular in form, and measured three inches in superficial diameter. The dimensions from before backwards could not be measured, but it presented a marked prominence in front. The stomach and intestines were inflated with gas, in order to determine their relation to the tumour. It was found that they lay below the tumour, and that a free surface of the tumour presented externally. He complained of a constant aching pain of a gnawing character, which was aggravated when he tried to stoop or to bend his back, and seemed to indicate some vertebral lesion, probably produced by pressure of the tumour.

The patient was subjected during the month of March, 1888, on three occasions to irritation of the internal coat of the sac, after each of which there was a notable thickening of the wall; the force of the pulsation diminished at the part, and the pain and the discomfort greatly lessened. As the tumour subsided the stomach began to overlap it in front. At the end of the month the sac had receded to such an extent that it could not be clearly made out other than as an hardened mass heaving with the aortic pulsations. At this stage it was difficult to detect eccentric pulsations. Unfortunately, at the end of this period—one month from the commencement of the treatment—the patient insisted upon returning to his work as he felt so well, believed he was quite better, and could not be persuaded to the contrary. It was with apprehension he was permitted to go, as in that early stage of thrombus formation, with an artery still patent, the increased strain thrown on the coats of the aneurysm by the severe exercise often entailed on an engine driver might undo the good already begun. He, however, continued to work, and was in seeming good health when last seen two years and a half afterwards.

Intrathoracic Aneurysm: Subclavian of Left Side accompanied by Great Swelling, Pain, Numbness, and Loss of Power in the Left Arm, Treated by Induction of White Thrombi within the Sac; Complete Consolidation of Aneurysm and Restoration of Function of Arm.—Mrs. W., aged 44, a housewife, was sent to me by Dr. Glaister on February 23rd, 1889, suffering from a large pulsating tumour at the root of the neck on the left side, accompanied by much swelling and pain of the left shoulder and arm.

The patient, who was rather a stout woman, had been in good health till a year previously, when she began to complain of pains in the left shoulder and shooting down the arm. These she attributed to rheumatism. She found that they were always relieved by rest. Three months previous to admission the left arm began to swell and its power to be impaired. Two months subsequently she experienced a tingling sensation, accompanied by a numbness extending from the left shoulder to the finger tips.

When she was admitted the arm was found to be markedly oedematous. She had little or no grasp, and the power of movement was so deficient that she was unable to lift the arm to the level of the shoulder. Cutaneous sensations were diminished, and she complained not only of shooting pains of great severity pass-

ing from the shoulder to the finger tips but also of numbness in the whole arm.

It was evident that the condition of this arm was due to the pulsating tumour at the root of the neck which occupied the space between the sternum and the vertebral column, exercising pressure upon the subclavian and other veins in the vicinity and greatly stretching the nerves, the cords of the brachial plexus being found extended over its surface. It was diagnosed as an aneurysm of the left subclavian, and although there was a large tumour which could be seen and felt above the level of the clavicle, yet this was merely the dome-shaped roof of an aneurysm existing within the thorax, as was evidenced by an area of dullness extending below the clavicle and over the sternum for a couple of inches in a downward direction.

The upper wall of the aneurysm was very thin. Occasionally she had attacks of dyspnoea, and slight congestions of the lungs, especially the left. It is probable that the first of these was due to pressure either upon the trachea or on the recurrent laryngeal nerve; and the second was possibly due to some slight pressure upon the bronchi and impediment to the pulmonary circulation. There was a marked difference in the strength of the left from that of the right pulse, the former being much weaker.

Treatment.—The skin was first rendered thoroughly aseptic, then, on February 27th, 1889, an aseptic pin was introduced, and the dimensions and form of the internal aspect of the sac were made out as far as possible. For this purpose, a pin of $\frac{5}{8}$ inches in length was used, and the whole of this was inserted with the exception of about an inch, before the opposite wall of the tumour was reached in a downward direction. Deducting half an inch for the thickness of the tissues intervening between the tumour and the skin, that left the diameter of the cavity in a downward direction as somewhere about four inches. The sides of the cavity were much more easily approached, and although it was much more difficult to give the precise dimensions of the breadth of the cavity, it was probably about three inches.

The pin was then permitted to remain in the cavity for about nine hours, its extremity being frequently changed from one part of the sac to another, its point on each occasion being left free to move over the surface of the sac as the force of the stream of blood in the interior might direct. This was repeated on March 3rd, 17th, and 24th, a gradual thickening of the walls of the aneurysm ensuing. This was marked not only by the sensation communicated to the finger externally, but by the fact that on each occasion when the pin was attempted to be introduced greater difficulty was experienced in penetrating the coats of the vessel. While at the outset a pin of very fine calibre was introduced with facility through the sac wall, it required one much stouter and more rigid to penetrate the sac during the last insertions.

So much improvement attended these four introductions that they were discontinued for four months. During this period there was some improvement in the diminution of the swelling of the arm and considerable subsidence of the pain. She was allowed to go about for a time attending to her household duties. Subsequently there was much thickening in the aneurysm and great diminution in the pulsation. It was not so near the surface, but still there was a doubt as to whether it was not eccentric. It might have been that the tumour was pushed upwards with each aortic wave, and, being dome-shaped, conveyed the impression of an eccentric pulsation. On five subsequent occasions a pin was introduced with the object of hastening the consolidation. On each of these it was difficult to say what the internal dimensions of the cavity were, and during the last two of them it was doubtful whether it entered any cavity; the walls were so thick that the pin could not be made to move to and fro as it formerly did; certainly it never reached the opposite wall of the aneurysm, and it was, therefore, questionable whether good was derived from its use. With this feeling the treatment was discontinued.

During the months that followed there was slow but continuous improvement, and a year subsequent to the commencement of the treatment the aneurysm seemed to have completely consolidated, though there was still an impulse apparently communicated from below. From this point the tumour began to decrease in volume. The oedema totally disappeared from the arm, and the numbness and the tingling sensation soon followed.

Till a late period the pulsations of the radial artery continued much as they were before the beginning of the treatment, but gradually they diminished in volume, and for some months it was questionable whether the pulse could be detected at the wrist. (It is now, however, completely gone),

The power of the arm was gradually restored, and she was then able to resume all her ordinary duties. At the present time she is in excellent health, and one can feel a hard mass about a third of the bulk of the original tumour by dipping the fingers somewhat behind the clavicle.

In this case the consolidation has been very gradual, but steady, from the beginning. The treatment was carried out without any hitches, and without the use of an anæsthetic, very little pain being experienced except on one occasion, when a branch of the brachial plexus had been touched by the pin during its introduction.

SUMMARY.

There are here four cases of aneurysm, one involving the innominate, one the left subclavian, one the abdominal aorta, and one of upper part of the femoral, implicating the external iliac. Two of these have been absolutely cured by the induction of white thrombi within the sac. One was so greatly relieved that he was able to resume his work as a locomotive engine driver and to continue it for at least two and a-half years thereafter. One died after a month's treatment from asphyxia, when the aneurysm was two-thirds healed and when complete consolidation was within a few weeks of consummation. In the large aneurysm of the femoral and iliac the circulation within the vessel was arrested for two hours, during which treatment was performed on the sac wall. Consolidation resulted in five days, and he was cured in a month. The aortic and innominate aneurysm was a month under treatment and had pins inserted on seven occasions. The formation of thrombi occurred rapidly and had formed to a greater extent than was known during the patient's life. The aneurysm of the abdominal aorta was a month under treatment, but the aneurysm was not cured, the consolidation being incomplete. The aneurysm of the left subclavian had pins introduced on nine occasions—it is questionable whether the last five produced any effect or whether they were needed. Consolidation occurred within nine months, and the cure was completed within a year.

None of those patients had anæsthetics administered, and they suffered comparatively little pain during the operation. The slowness of the occlusion in the last case, though disadvantageous in some respects, had certain advantages valuable in the presence of advanced arterial disease. It enabled the collateral circulation to become fully established in a very gradual manner before complete occlusion of the sac had occurred and thus saved the collateral vessels from sudden dilatation by increased blood pressure. It protected the heart and blood vessels on the proximal side of the aneurysm from the sudden strain which would otherwise have been thrown on them by ligation of the vessels or by sudden occlusion of the aneurysm. Though the completion of the cure takes long, in certain instances the aneurysm is not left unprotected during that period, as its coats have been lined by white thrombi, forming a firm barrier against further aneurysmal extension.

It is probable that, besides acting locally on the aneurysm, in addition attention to the general state of the individual may facilitate the formation of white thrombi. By placing him in good hygienic surroundings, by limiting or so regulating his diet as to produce an effect upon the leucocytes of the blood, by the administration of drugs, and by keeping the patient in a state of rest—any or all of these may have an effect of hastening the desired end. These are some points to be wrought out in the future. It is well, however, that the fact should be established that white thrombi may be induced simply by direct local action without any aid from other directions. No doubt some cases will be found more suitable for this form of treatment than others; in some the white thrombi will form more readily, in some more slowly. Future experience will decide. I trust that this form of treatment will not be indiscriminately employed upon every case of large aneurysm, especially upon those which are beyond hope, otherwise the method will become discredited. The very simplicity of the treatment, the facility with which it may be carried out, without even the use of an anæsthetic, and with a comparatively limited anatomical knowledge, makes this word of caution necessary. The cases of uncomplicated aneurysm must be few in which the introduction of an aseptic steel pin into the sac would be productive of harm. Disastrous results would easily follow the introduction of a pin carrying septic matter with it.

In conclusion, whether this precise method of inducing white thrombi within the sac be received matters little if we accept the fact that every aneurysm contains within itself a potential cure. We have only to devise methods of calling it forth.