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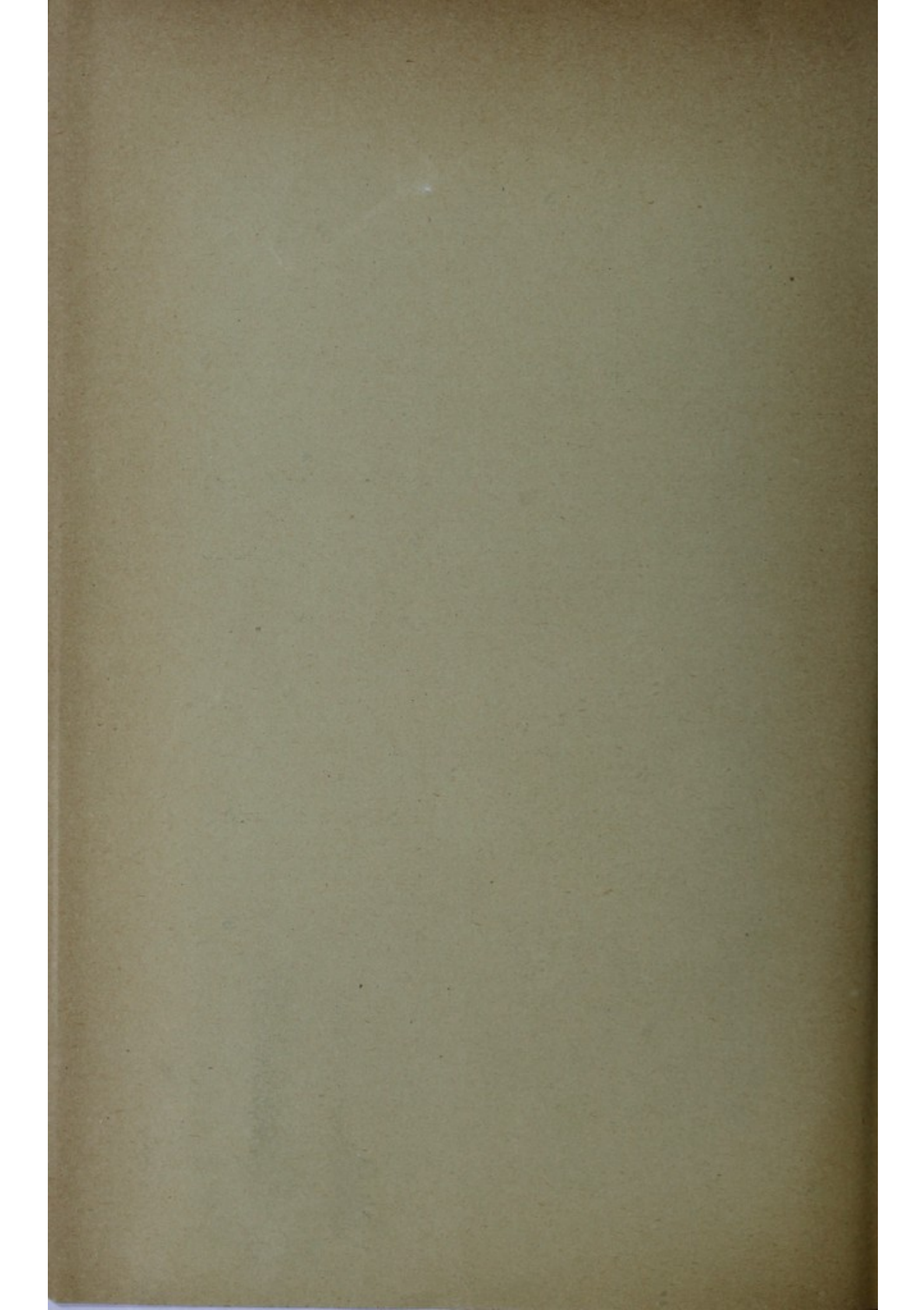
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JULY, 1901

Aneurism of the Thoracic Aorta, of Traumatic Origin; Treatment by Introduction of Wire and Electricity.

BY DE FOREST WILLARD, M.D.,
OF PHILADELPHIA,
Surgeon to the Presbyterian Hospital.





ANEURISM OF THE THORACIC AORTA OF TRAUMATIC ORIGIN; TREATMENT BY INTRODUCTION OF WIRE AND ELECTRICITY.¹

By DE FOREST WILLARD, M.D.,

OF PHILADELPHIA,

SURGEON TO THE PRESBYTERIAN HOSPITAL.

J. S., aged twenty-three years; male; was injured in November, 1899, by a heavy box, weighing 500 or 600 pounds, which fell two feet, striking him upon the chest. He was unable to work for six weeks, but at the end of that time resumed his labor, complaining, however, of a tightness and pain in his chest, which he considered a heavy cold. He was able to work at intervals, though with difficulty, for more than six months, when the pain and pulsation of his chest, steadily increasing, disabled him. He was told at that time that his heart was injured, and he was put to bed. His cough soon became troublesome, and the pain in the chest was severe, especially at night. There was occasional expectoration of bloody mucus. Worked a little through the autumn. Admitted to the Presbyterian Hospital, Medical Ward, in charge of Drs. Musser and Stryker, December 9, 1900, being thirteen months after the injury to his chest. Married; one child; *no history of syphilis*; no palpable or visible change in arteries; only slight pulsation visible in neck; no tracheal tugging; no suprasternal pulsation along carotids, subclavians, or innominate.

Right Thorax Anterior.—Powerful distinct systolic uplifting over whole right thorax at each pulsation, most noticeable in thin area at junction of third and fourth ribs with their cartilages. Slight thrill. Right axillary vein distended. Respiratory sounds practically absent over right lung. Dulness on percussion over whole chest. Systolic blowing heard from first interspace, downward throughout entire chest, and outward to axilla.

Left Side Anterior.—Violent heaving pulsation of heart's apex diffused for three inches below the normal position. Loud systolic murmur and loud first sound over entire upper left thorax.

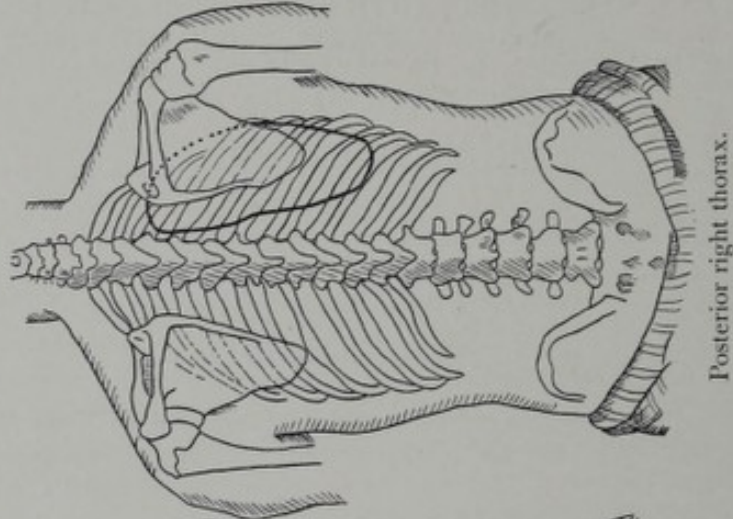
Posterior Right Thorax.—Decided pulsation visible and palpable over entire right chest. Long, loud systolic murmur over entire area, especially loud at base. Resonance of lung only feebly heard. Has bloody expectoration; cough; dyspnoea.

¹ Read before the Philadelphia Academy of Surgery, February 4, 1901.

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Skiagraph taken, but not satisfactory.

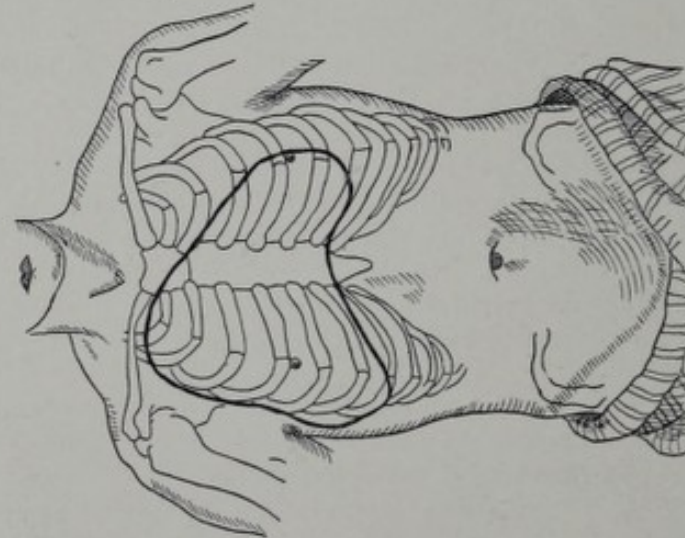
Patient was put at rest, with large doses of iodide of potassium and restricted diet, for five weeks. Ice-bags for pain. Dyspnœa, pain, cough,



Posterior right thorax.



Left side anterior.



Right thorax anterior.

and bloody expectoration grew steadily worse, and the anterior wall became perceptibly thinner. Pain increased, depriving patient of sleep, even under large doses of morphia.

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The position of the tumor, the absence of pulsation in the neck, and the character of the chest sounds enumerated above, indicated a traumatic lesion of the descending thoracic aorta rather than of the arch or of ascending portion, unless the dilatation was at the very origin of the vessel. As the conditions were growing worse, and rupture certainly approaching, the patient consented to accept the risks of the only operation that offered any chance of success, the introduction into the sac of a certain quantity of wire as a framework or skeleton, each coil of which might form a nucleus for coagulation, producing eddies in the sac and final consolidation. (Moore, 1864.) To facilitate coagulation upon and around this wire framework, the coagulating power of galvanism was brought to bear. (Corradi.)

Ligation was of course out of the question; in the ten cases in which the aorta has been ligated, the result has been uniformly fatal.¹ Scarification of the interior of so large a sac was not hopeful, and the simple introduction of horsehair or catgut certainly did not offer as reasonable chance of success as did the more complete method advocated by Corradi, D. D. Stewart, and others. Simple galvanopuncture urged by Cini-cellì, since it leaves behind no framework for deposit of clot, was obviously less certain in its permanent results. The injection of about 300 cubic centimetres of a 1 or 2 per cent. solution of gelatin was considered, but rejected on account of the large size of the sac.²

In this operation of wiring, it is essential that strict asepsis be secured, and that no elements of suppuration be introduced, since sepsis and faulty technique are the most frequent causes of death.

In order to protect the skin and subcutaneous tissues external to the wall of the sac from the destructive effects of the electrical current, a vulcanite cannula (size No. 7, French catheter scale) was constructed with a steel trocar (size No. 4, French catheter scale). The thickness of the vulcanite made the introduction difficult, requiring a slight nick of the skin with a scalpel. (A veterinary hypodermic needle, three inches long, and of calibre of 24, is better. It can be insulated by several coats of shellac varnish, best French lacquer set by heat, or by a porcelain coating.) The trocar was introduced in the fourth interspace, the thinnest point of the sac, just outside the costal cartilage, and was driven well into the sac. Upon the removal of the trocar a current of blood spouted three feet into the air at each pulsation of the heart, which, owing to the size of the cannula, made the loss of blood quite serious. It was, however, controlled by the finger until the wire was threaded in. Gold wire No. 35 had been procured, but proved entirely too fine, as it would not thread through the cannula without crinkling, and I was obliged to resort to silver wire No. 24. During the operation I fortunately had the benefit of the assistance of Dr. Guy Hinsdale, who furnished the following notes: "After six or eight feet had been inserted, the wire was connected with the copper conducting cord of the positive pole of a galvanic battery. The current was supplied by the electric lighting plant of the hospital, reduced by a current controller. A chloride of silver dry cell battery does well. The negative pole was attached to a large,

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flat, electrode sponge-covered pad, placed between the scapulæ. Five milliamperes were turned on at first, and the force of the current was increased by fives, the patient perceiving plainly each addition, and complaining of pain chiefly in his back, especially when new pieces of wire were connected. More wire was threaded in through the cannula until about twenty feet of coils were inserted. The strength of the current was increased until, during the last fifteen minutes of the hour, eighty milliamperes were measured; eighty-five only for a moment." In my judgment, the current used was too strong, and if equally good coagulation will take place under one of moderate strength, the danger of burning the walls of the sac is lessened. Finney obtained his results with only ten to twenty milliamperes. Coagulation of the blood in the cannula took place very soon after the current was applied, preventing further hæmorrhage, and, on withdrawal of the cannula, the wires having been pushed in as far as possible, there was no hæmorrhage. The opening was closed with gauze and aristolated collodion, and the patient confined rigidly to bed. Aside from the first shock at the sight of the spouting blood, the patient suffered no serious inconvenience, save for the pain in the back, at the negative electrode, and talked cheerfully throughout the operation. He slept the greater part of the night, the next day was much better, and in five or six days was anxious to sit up, although he was not permitted to do so. The only burns were at two areas, of the size of peas, upon the back. The cathodal negative pad should have been of larger size. In a week he could with difficulty be restrained in bed; was eating and sleeping well; had no pain; was able to stop the use of morphia, and had much less oppression. The pulsation in the thorax was lessened at the end of the operation; was still less on the following day, and in a week was diminished at least 25 per cent. His statement is that he is "twice as good as before operation." The original point of thinning anteriorly is much more solid, but laterally below the axilla the pulsation is slightly increasing, and will probably require a repetition of the operation.

In the third week a dilatation of the sac outward into the axilla gave torturing pains in right arm for two days, but this pain was speedily relieved, although the pulsation in axillary region has increased, and I propose to repeat the operation. His sac may be multilocular, or the coagulum in one district may have altered the direction of the blood current, causing dilatation of a new area. Nine weeks after the operation the man was so well that he could not be restrained, and he left the hospital in spite of my earnest protest. Good consolidation of the anterior portion of the sac at the seat of operation was positive.

Abstract from notes by Drs. Musser and Stryker, on admission: "Temporal artery not visible; neck full, only slight arterial pulsation; resonance in both supraclavicular fossæ; percussion resonance on right side beginning at eleventh dorsal spine, crossing to tenth rib at posterior axillary line; no distinct respiratory movements; vocal resonance and tactile fremitus greatly exaggerated, with bronchovesicular breathing over the compressed lung which lay posteriorly near the spine; outside and

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anterior to this area respiratory sounds very faint, or lost. Anterior thorax very prominent on the right side over level of fifth rib and over sternum to anterior axillary line. Vocal resonance entirely lost anteriorly; upper thorax anterior, first sound soft and blowing, second sound faintly heard. Left side anterior, apex beat at fifth space from nipple to anterior axillary line exceedingly powerful. Auscultation at apex, loud systolic murmur with first sound; faint diastolic shock and prolonged diastolic murmur. Fourth interspace, fainter systolic murmur, louder second sound, with prolonged diastolic murmur; third interspace, short fainter systolic, long soft diastolic sound; second interspace, dull rough systolic, faint and prolonged diastolic murmur. Aortic, faint first sound; loud, clear second prolonged diastolic murmur. Left lung, respiration normal at apex; vocal resonance slightly increased. Tympanitic resonance from fifth interspace to axillary. With this saccular aneurism of the ascending portion of the arch there is evidently an aortic insufficiency, with hypertrophy and dilatation of the left ventricle."

The man returned to the hospital two months later suffering with increased pain and dyspnoea. The tumor beneath the pectoral muscle at the anterior border of the right axilla had decidedly increased in size, having evidently eroded the ribs. The principal suffering, however, was in the left chest posteriorly, probably from erosion of the vertebræ.

Twenty feet of No. 24 silver wire were inserted through a long hypodermic needle, and a galvanic current of eighty milliamperes applied for one hour. The patient bore the operation well and was relieved of pain even on the left side, owing probably to change in the direction of the blood-current. The wire, however, evidently failed to produce coagulation in the right thorax, and the tumor, having lost the restraining power of the ribs, increased rapidly in size, lifting the entire right pectoral. Although the walls became very thin the sac did not burst, and the patient died slowly from exhaustion four weeks after the second operation, five months after the first operation.

In spite of every effort I was unable to obtain permission for an autopsy, and the exact point of rupture of the aorta must remain in doubt.

Since the above report was written, Dr. Matas (*American Medicine*, June 22, 1901, p. 546. Transactions of the Southern Surgical and Gynecological Association, 1900) has published an able article on this subject, and Dr. Leonard Freeman also read a paper before the American Surgical Association at Baltimore, May, 1901.

REMARKS.

Technique.—The size of the wire should be thoroughly graduated to the calibre of the needle, which latter should be tested to ascertain the smoothness of its bore, as it is essential that the wire should slip easily through it. I see no practical difference between silver, gold, and platinum wire. Size 27

to 30 is probably about the best diameter. Finney uses silver alloyed with copper, 75 copper to 1000. This, when drawn down from No. 8 to No. 27, makes a close coil, is very pliable, and corrodes moderately with galvanism. Stewart,³ who has given careful attention to this subject, found that iron wire was undesirable, for the reason that the passage of the current rapidly decomposed it and liberated iron chloride and oxide in such quantities as to be dangerous if washed into the vessels, with a probability of causing thrombi. Steel wire coils better than silver, but is too stiff, and may injure sac.

The amount of wire should be regulated by the size of the aneurism, its object being to form a skeleton for a clot; the amount should be so regulated that it will fully reach all portions of the sac, for which reason it should be previously wound so as to coil and snarl in different directions. The wire for a large aneurism can be wound upon a sterilized rolled towel, so as to make large spirals in the sac; for a smaller sac, it should be wound upon a glass or spool; in either case it should be carefully arranged and prepared so that there will be no delay or kinking during the process of feeding the wire in through the cannula. If the wire kinks, other needles may be inserted at different points of the aneurism, all the wires being attached to the positive current. The arrangement of the coils can be well observed by feeding the wire into a glass flask. If the wire is properly wound before operation, it is very improbable that the initial point will strike the opposite wall. If too large a quantity is used, pressure upon the sac from within might cause ulceration and rupture, and might also interfere with contraction of the sac; moreover, if coils lie against the wall and the current is too strong, the sac may be burned. Moore used as high as 108 feet, and Abbe, 150; Roosevelt introduced 225 feet of steel piano wire, applying a galvanic current of twenty-five milliamperes for thirty minutes. Probably five to twenty feet would be the proper amount.

It is very important that the tissues be protected from the galvanism, lest an open sloughing track be made into the

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aneurism. For insulation of the needle, glass, sealing-wax, caoutchouc, etc., have been tried, but best French lacquer or varnish, set by heat, seems best. Lacquer will not stand boiling nor soaking in a carbolic solution, but it can be thoroughly sterilized by dry heat carried up to 300 degrees; then wrapped in a sterile towel. A long veterinary hypodermic is better than a trocar and a cannula, even of same size, since the wire can be inserted half-way into the needle before the puncture is made, and assists in controlling primary hæmorrhage when the needle is inserted.

There is always risk that the wire may enter the aorta, as has happened in several cases, and minute or larger clots may be washed off and form emboli.

Traumatism as a cause of aortic aneurism is not largely mentioned by authors, although cases are reported by Lancesi, Munro, Sansom, and others, even where the arteries were normal.

Traumatic aneurism of the thoracic aorta is rare (Brown, of St. Bartholomew's Hospital, found only eight among 228 aneurisms), since it is better protected than most of the vessels, and the arch is more liable to atheromatous degeneration.

Riesman⁴ reported a case in which there was limitation of motion in the spinal column, with no tenderness over the vertebral spines, but with torturing pains. An exploratory incision was made over a tumor in the back, but finding that the tumor pulsated violently, the operation was wisely abandoned and the wound closed; the aneurism burst later into the left pleural cavity.

A traumatic thoracic aneurismal sac may leak slightly, as in the case which I reported⁵ in which a man sixty-four years of age was injured by a bale of carpet weighing three hundred pounds falling upon his shoulders. He lived two days with a rent in his thoracic aorta one-half inch long. The outer coat or adventitia, however, was not perforated. The inner and middle coats having been torn, the blood dissected its way between the muscular layer and the outer coat

throughout the entire extent of the thoracic aorta, and down the abdominal for five inches. The only symptom was the intense pain in the thorax and back, aggravated by every movement, this pain slowly extending from thorax to abdomen. There was no cough. On the second day the outer coat gave way about one inch below the original rent in the inner coats, and the patient died in a couple of minutes from the gush of blood which entirely filled the left pleural cavity. The arch of the aorta was not atheromatous, and in the thoracic aorta the only point of visible atheroma was at the area which gave way.

In aneurism of the thoracic aorta there is usually urgent dyspnœa and a sensation of distress and fulness in the chest. In time there is nearly always an erosion of the bodies of the vertebræ, and a rupture may take place either into the mediastinal connective tissue or into the pleural cavity.

Stewart,⁶ Hershey,⁷ and Hunner⁸ report twenty-three cases treated by this method, and my own makes the twenty-fourth. The article of Hunner is most complete.

Rosenstirn, in an aneurism of the ascending aorta in a member of a rowing crew, first tried iodide of potassium, Tufnall's rest treatment, and barium chloride, then used two feet of No. 28 wire, passing a current of seventy milliamperes for thirty minutes; two years later the man was reported in good condition.

Stewart in his first and unsuccessful case, in a huge aneurism of thoracic and abdominal aorta, occurring in a wrestler, six years' duration, inserted two and one-half feet of No. 23 wire (wound upon a two and one-half inch roll to make spirals), and passed a current of seventy milliamperes for one hour. The sac was firmer on the third day, but ruptured on the ninth. Firm clots were found in all portions of the aneurism, and it was difficult to separate the clots from the wire. He used a needle insulated with shellac varnish, but the coating became softened too much by hot water. The use of carbolized glycerin as a lubricant he also found disturbed the insulation. For the negative pad he used a large moist felt plate at the back. In his second and successful case (with Salinger) of aortic and innominate aneurism, size of a foetal head, he used ten feet of No. 30 gold wire, passing a current of thirty to eighty milliamperes one and one-quarter hours.⁹ Galvanism was applied to several wires introduced through hollow needles placed at separate points and connected to the same rheophore. Pulsation and expansion lessened on the second day, also thrill. Four weeks later, second opera-

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tion in upper part of sac. The patient lived three and one-half years, although he had endarteritis with extensive renal and cardiac disease at the time of operation, was syphilitic and of intemperate habits. He died from a thrombus in the middle cerebral artery. A thoroughly consolidated organized fibrous clot was found deposited about the coils of wire, and the cavity of the sac was completely obliterated.

Stewart's¹⁰ third case was a fusiform aneurism of the abdominal aorta, which was made more prominent by a retroperitoneal tumor, lifting it forward. An abdominal section was done by Drs. Deaver (H. C.) and Neilson, and ten feet of silver wire introduced. A current of fifty milliamperes was passed by the anode for half an hour. On the fifth day the patient died suddenly. Large amount of blood in stomach and upper bowel. A tumor springing from the bodies of eroded vertebræ surrounded the aorta at celiac axis; thoracic aorta above dilated. There was a small saccular aneurism of the splenic artery. The wire had entered both the saccular dilatation and the dilated aorta, but no clots were found adhering to the wire. The case was evidently not a suitable one for operation.

His fourth case was a syphilitic, who for fourteen months had suffered severe pain in the chest, with pulsating tumor in left posterior thorax. Fourteen feet of gold were introduced. Galvanic positive current applied, increasing from twenty to eighty milliamperes for eighty minutes; immediate diminution of pulsation and great relief from pain and other symptoms for eight and one-half months, when death occurred. No autopsy.

His fifth case¹¹ (with Dr. Noble), a syphilitic drunkard, had suffered from severe abdominal pain for more than a year; was greatly emaciated. Celiotomy done by Dr. Noble, exposing an aneurism of abdominal aorta. Nine feet drawn gold wire, No. 30, introduced; galvanic positive anodal current sixty-five milliamperes passed for an hour. Improvement immediate and progressive, pain lessened, and, all symptoms of aneurism having disappeared, in five months resumed his work. Died at end of nine months of acute dysentery, with no symptoms of return of aneurism.

In another case, a large thoracic aneurism, Stewart introduced wire on three different occasions, with good temporary result. Man died in nine months from rupture of sac.

In another case, seen with Dr. Hare,¹² a syphilitic man with aneurism of transverse aorta, accompanied by pain, dyspnoea, and cardiac disturbance, nine feet of gold wire were introduced through an insulated needle, and the anodal current, seventy milliamperes, passed for an hour. Pulsation and bruit diminished at end of operation, and bruit disappeared at end of forty-eight hours. Five weeks later patient was sitting up without pain. Bruit, pulsation, and thrill had entirely disappeared, cough had ceased, and patient greatly improved. Died seven months later from pressure of sac on trachea.

Hare¹³ reports another case, man, thirty-eight years of age, large aortic aneurism; patient in bed for seven months and had lost sixty pounds. Ten feet of gold wire, current up to 100 milliamperes for one

and one-half hours. Contraction of sac and great relief. Second similar operation at end of several months. Died in seven months from rupture of sac. No autopsy. Life prolonged and made much more comfortable.

Hershey¹⁴ reports a case of aneurism of the innominate and aorta which had deep-seated pain in chest beneath and to right of sternum; dyspnoea and bulging. Treated by complete rest; Valsalva's diet; barium chloride, three-quarters grain, three times a day. Later he introduced wire, 14 carat gold, gauge 28; wire snarled in order that it might bunch rather than coil, wrapped on glass vial, placed in clear carbolic solution. Hypodermic needle, 22 gauge, insulated by layer after layer of shellac varnish, each layer set by heat. Thirty-celled galvanic battery; milliamperemeter. Wire kinked after two and one-half feet had been passed. Positive pole attached to wire; negative pole, flat sponge six by eight on on back. Pain in negative electrode considerable. Increased current to seventy, continued for one hour, then diminished to forty. On removing needle, wire was cut and pushed in. Evidences of immediate consolidation; patient able to sleep that night; gain in flesh. Nine and one-half months later was living, with considerable pain in chest, but was able to work. Died at end of a year, rupture of sac.

Kerr, in an aneurism of aorta, inserted ten feet silver wire; galvanic current one-half hour; patient feeling as well as ever one year later.

Kerr, ascending aorta, six feet wire; current fifty minutes; death eighteenth day; firm clot about the wire.

Burresi, ascending aorta, wire No. 30, seventeen inches, current twenty-five minutes; immediate signs of consolidation; death in 100 days.

Barwell, ascending aorta, ten milliamperes, seventy minutes, in twelve hours had signs of consolidation, death on seventh day; had thick, firm decolorized clot in sac.

Roosevelt, aortic; 225 feet steel piano wire, galvanic current, twenty-five milliamperes for thirty minutes. Death on twenty-third day.

Abbe, innominate; 150 feet wire. Current reversed during later part of operation, which tended to disorganize the clot, an error in technique of vital importance as pointed out by Stewart. Death second day.

Halsted. Man, twenty-seven years of age, pulsating abdominal tumor. Celiotomy performed. Five feet of No. 27 wire introduced and anodal current up to 100 milliamperes passed for one and one-half hours. Died in forty hours from rupture into pleural cavity. Wire coils found to have pressed against walls, probably injuriously. Loose, easily detachable coagula upon the wire coils.

Reeve.¹⁵ Aneurism abdominal aorta; epigastric tumor; great pain controlled by large doses of morphia. Celiotomy. Seven feet silver-plated copper wire. Eighty milliamperes for fifty minutes. Patient lived twenty-four hours. One loop of wire was found to have passed ten inches up the aorta, while a single strand had reached the aortic valve of the heart. Aneurism distinctly sacculated; opening into sac one inch in diameter.

Corson.¹⁶ Man, aged thirty-one years; excessive user of alcoholics. Pulsating tumor in neck. Six feet wire. Eight cells of a dry battery

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for two hours. Partial immediate consolidation. Died on second day. Wire found to have coiled closely in contact with sac, probably because pure silver was used and not drawn wire, which latter coils better.

Finney.¹⁷ (Osler.) Aneurism; thrill and pulsation. Man, twenty-five years of age. Bookkeeper. No traumatism. Celiotomy; pancreas flattened over tumor. Five feet silver copper alloy (75/1000) wire, drawn from No. 8 to No. 27. Galvanic current increasing from thirty to seventy milliamperes; one hour. Thrill disappeared in one-half hour. Sac firmer; had pain after operation; required one-quarter grain morphia every two to four hours. Temperature 103.7° F., caused probably by slough from negative pad on back and infection of abdominal wound. Temperature remained high for two weeks. Died on twentieth day, from hæmorrhage through external wound from slough. Autopsy: Diffuse arterial sclerosis. Opening in aorta one and one-half centimetres in diameter. Aneurism was of the superior mesenteric artery. Wire had entered sac, and one loop had burned side of sac, causing hæmorrhage. Transverse portion of duodenum necrotic, from interference with circulation in superior mesenteric artery, and filled with bloody fluid where oozing had taken place. Clots about the wire and in aneurism fairly firm.

Finney.¹⁸ Man, fifty-one years of age. History negative as regards syphilis. Sternum lifted at each systole. Pulsation extending to right. Was given nine gelatin injections of 250 cubic centimetres of 1 per cent. solution before operation, and sixteen of a 2 per cent. solution afterwards. Ten feet of silver wire alloyed with copper; current of ten milliamperes for one hour; twenty milliamperes for fifteen minutes additional. Pulsation diminished after third day, but on the twelfth day pain moved towards the left side. Gelatin injections recommenced. Two months later resumed work, but died six months afterwards at sea, presumably from rupture.

Finney.¹⁹ (Osler.) Man, thirty-nine years of age, history of alcohol, tobacco, and syphilis; also a heavy eater. Bulging right side of chest; great cyanosis and dyspnœa. Several aspirations of right pleural cavity; withdrew blood-tinged serum. Diagnosis: Aneurism near the heart or in thoracic portion. Ten feet drawn silver wire alloyed with copper, ten milliamperes, one hour. Patient felt each progressive increase in the volume of the current. Condition improved greatly for fifteen days, but right pleural cavity required frequent aspirations. Similar operation twenty-four days later. Third similar operation nineteen days later. Died eleventh week after first operation, with symptoms of pressure upon trachea. No autopsy.

Finney.²⁰ (Osler.) Man, thirty years of age. Abdominal aorta. Celiotomy. Eight feet of highly drawn wire of sterling silver, ten milliamperes, one hour. Section of the overlying pancreas was avoided by drawing the liver to the right and making the puncture in the upper right quadrant of the sac. Aneurism probably of the superior mesenteric. Greatly improved in symptoms; not much change in physical signs at the date of his discharge from the hospital six weeks later.

In summing up this record, we find that permanent cures are few, as must necessarily be the case in so fatal a condition as aneurism of the aorta, yet in one-half the cases operated upon life was certainly lengthened, and all of those who survived the immediate effects were rendered vastly more comfortable. This result is certainly satisfactory when the fact is taken into consideration that these cases were necessarily fatal ones if untreated.

Ten cases undoubtedly had their lives shortened by the procedure, but several of the patients had fusiform aneurisms and were not proper subjects for the operation.

Rosenstirn's case was alive eleven years after the operation. The post-mortem of one of Stewart's patients made three and one-half years later showed a solidly coagulated tumor. Kerr's case at the end of ten months showed no signs of the aneurism. In Noble's patient all symptoms had disappeared, and another patient died of dysentery nine months after the operation. Finney's fourth case was at last report living, with great improvement in symptoms. My own patient at nine weeks is too recent to permit of any conclusion save that great comfort and relief from pain and dyspnoea have been secured.

Ten cases then have been positively benefited, one is uncertain, and while the remainder died at various periods within a year, yet nearly all of those that survived the immediate effects of the operation were rendered decidedly more comfortable.

This method, therefore, of dealing with a most serious condition seems to offer a more reasonable hope of success than any other plan at present discovered.

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- ¹⁶ Corson: Johns Hopkins Hospital Bulletin, November, 1900, p. 271.
- ¹⁷ Finney: Johns Hopkins Hospital Bulletin, November, 1900, p. 273.
- ¹⁸ Finney: Johns Hopkins Hospital Bulletin, November, 1900, p. 274.
- ¹⁹ Finney: Johns Hopkins Hospital Bulletin, November, 1900, p. 275.
- ²⁰ Finney: Johns Hopkins Hospital Bulletin, November, 1900, p. 276.





