

LIGATION (PARTIAL OCCLUSION) OF THE ABDOMINAL AORTA FOR ANEURISM*

REPORT OF A RECENT CASE WITH A RÉSUMÉ OF PREVIOUS CASES

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JUST one hundred and four years ago, Astley Cooper did the first operation of ligation of the aorta and the operation has been performed about nineteen times since, but in no case can it be said to have been successful in man according to the cases reported up to the present time. Death has always followed in from a few hours to a few months from shock, hemorrhage, infection or something directly connected with the operation, except Hamann's case which died from hemorrhage from a bedsore.

Experiments on the lower animals, dogs, sheep, and goats, by Luigi Porta in 1838-40, both by partial and complete occlusion of the aorta by ligature, proved that such operations were by no means necessarily fatal, and he published some beautiful drawings of the collateral circulation established in animals whose aortas had been ligated more than a year before.

In more recent years the work of Halsted along the line of partial and gradual occlusion of large arteries by means of metallic bands has been of great value in demonstrating a method of occlusion without causing ulceration of the walls of the vessel.

In five of the twenty cases mentioned in this article, including my own, there was no ulceration, and in none of the five was there complete occlusion of the lumen of the aorta, and these were the only patients, excepting Keen's, who lived long enough to give any expectation of complete recovery from the operation. Tillaux's patient lived thirty-nine days, Halsted's two patients forty-one and forty-seven days respectively, Hamann's six months and two days, and my patient is still living and working, one year and four months after operation.

H. B., male, white; age thirty-nine, bricklayer, was referred to me by Dr. James A. Gannon.

History.—Had typhoid fever at ten years of age, "blood poisoning" at nineteen, and soon after that a chancre. For three years he has been suffering with pain in the abdomen and back. Two years ago his appendix was removed, and as he continued to have pain and developed a swelling in the abdomen just above the navel he was again operated on, November 5, 1919, when the aneurism was discovered and the operation was carried no further. As the patient gave a positive reaction to the Wassermann test, he was treated for a while for syphilis. This had no appreciable effect on the aneurism; therefore I decided

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to try ligation of the aorta according to Halsted's principle of incomplete occlusion of the lumen of the vessel, using a piece of tape instead of the metal bands. January 23, 1920, the abdomen was opened, the aneurism, about one inch and a half in diameter, seemed of the saccular type and sprang from the left side of the aorta behind the pancreas about opposite the origin of the superior mesenteric artery. It was decided to place the ligature below the aneurism according to the Brasdor method. The peritoneum was opened, the aorta exposed and a piece of cotton tape one-half inch wide was carried around the vessel about two inches above its bifurcation and just below the origin of the inferior mesenteric artery. Two turns of one end of the tape made the surgeon's or friction knot, which was drawn gradually tighter and tighter until pulsation was no longer perceptible in the iliacs and barely so in the aorta below the ligature, then the knot was completed, the ends of the tape cut off and the abdomen closed.

Nothing unusual was noticed afterwards, such as increased blood pressure and pains in the lower extremities when the patient recovered from the anæsthetic.

Next day his condition was satisfactory—no pain or paralysis of legs, and the color and temperature were good. Pulse distinctly felt in left foot but none in the right—both equally warm and comfortable. A slight blowing sound could be heard by the stethoscope over the left external iliac, but none over the right. Pulsation was faintly perceptible in the left iliac but absent in the right.

Recovery from the operation was normal but patient was kept in bed most of the time for two months and potassium iodide was given. When he left the hospital March 30th the pain in back and abdomen was much less, the murmur of the aneurism was not as loud but was softer and more musical in character.

Some time during the month of May, against advice, patient returned to his work as bricklayer.

June 18, 1920, he was examined. Says he feels better than he has for years—no pain of consequence and he eats, sleeps and works well. The aneurism seems about one-half its original size. A soft whining sound is heard directly over the aneurism and a rough sound over the aorta just below—both systolic. No sound over external iliacs. A feeble pulse is felt in the left iliac and none in the right.

August 29, 1920. Examined patient. Thinks he is entirely well, no pain, has gained twenty pounds in weight, and does eight to ten hours work bricklaying daily. The tumor cannot be made out by its pulsation. The circulation in the lower extremities is the same as before described.

February 13, 1921, when the last examination was made, one year and twenty-one days after the operation, everything seemed satisfactory except the patient's habit of going on occasional alcoholic sprees. He was hard at work and looking well. No aneurismal pulsation could be felt but a soft whining note ending in a rough note below could still be heard in the region of the aneurism and the aorta just below. A faint pulsation could be felt in the left iliac and dorsalis pedis, none

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in the right iliac or vessels below, yet the two feet were normal in color, temperature and sensation.

When last heard from in May, 1921, one year and four months after operation, patient was in good condition, but just recovering from a spree.

Below is given a résumé of nineteen previous cases of ligation of the aorta and five cases of suturing or plugging of aneurisms of that vessel.

LIGATION

1. June 25, 1817, Astley Cooper ligated the abdominal aorta for a left iliofemoral aneurism in a man thirty-eight years of age. Death in three days.

2. July 5, 1829, James ligated the abdominal aorta for aneurism of the left external iliac artery in a man forty-four years old. Death from shock three and one-half hours later.

3. January 26, 1834, Murray ligated the abdominal aorta for right iliofemoral aneurism in a man thirty-three years old. Death in twenty-three hours.

4. August 5, 1842, Monteiro ligated the abdominal aorta for right iliofemoral aneurism in a man thirty years old. Death from hemorrhage ten days later.

5. June 21, 1856, South ligated the abdominal aorta for aneurism of the right common and external iliac arteries in a man twenty-eight years old. Death forty-three hours later.

6. March 8, 1868, Wm. Stokes ligated the abdominal aorta just above the bifurcation for right iliofemoral aneurism in a man fifty years old—silver wire ligation. Death from shock twelve and three-quarters hours later.

7. March 30, 1868, Hunter McGuire ligated the abdominal aorta for aneurism of the left external, and both common iliacs and the aorta, in a man thirty years old—the left ureter was included in the ligation. Death in a few hours.

8. August 6, 1869, P. H. Watson ligated the abdominal aorta for iliac aneurism in a patient, sex and age not given. Death from gangrene sixty-five hours later.

9. August 19, 1870, Czerny ligated the abdominal aorta (thinking it was the iliac) for gunshot wound of the thigh in a soldier twenty-seven years old. Death in twenty-six hours.

10. January 19, 1879, Czerny ligated the abdominal aorta between the two renals for tumor of the left kidney in a man fifty years old. Death in ten hours.

11. July 3, 1890, H. Milton ligated the abdominal aorta just below the renals for a ruptured aortic aneurism in a man forty-five years old. Death from anæmia and shock twenty-four hours later.

12. December 12, 1899, W. W. Keen ligated the abdominal aorta just below the diaphragm, for ruptured aortic aneurism in a man fifty-two years old. Patient lived forty-eight days. There was *no suppression of urine* and the bruit in the aneurism did not disappear. Death from hemorrhage from the ligation cutting through.

13. January 20, 1900, Tillaux ligated the abdominal aorta just

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above the bifurcation for ruptured left iliac aneurism in a man fifty-six years old. Death thirty-nine hours later. He grew gradually thinner until death. There was no ulceration at the point of ligation and the lumen of the aorta was not completely obliterated, permitting the passage of a grooved dissector.

14. May 1, 1901, R. T. Morris occluded the abdominal aorta just above the bifurcation with a soft rubber catheter and clamp forceps for aneurism proximal to the ligature in a woman twenty-four years old. Death fifty-three hours later from infection caused by gangrene of bowel in contact with the forceps.

15. June 20, 1904, A. Guinard ligated the thoracic aorta about the level of the ninth dorsal vertebra for aneurism of the end of the arch. Death three days later from suppression of urine. Guinard remarks that ligation above the renal arteries is incompatible with life, evidently not knowing the history of Keen's case.

16. January 1, 1905, W. D. Scott ligated the abdominal aorta just above the bifurcation for gunshot wound of the aorta and intestines, using a soft rubber catheter and forceps, in a negro woman twenty years old. Death one hour later.

17. December 18, 1905, W. S. Halsted applied his aluminum band to the thoracic aorta about 7 cm. above the diaphragm, partially occluding the lumen, for aneurism of the upper abdominal aorta. Pain was much relieved. January 10, 1906, twenty-three days later, a second band was applied to the abdominal aorta just below the inferior mesenteric artery distal to the aneurism, just occluding the femoral pulse. Death eighteen days after the second operation from rupture of the aneurism. No ulceration at sites of bands.

18. February 23, 1909, Halsted applied his band to the aorta between the renal and superior mesenteric branches for aneurism extending from the renal arteries to the bifurcation of the aorta in a physician fifty-three years old, producing partial occlusion. Great relief from pain. March 5th there were enlargement of the aneurism and signs of infection, and Finney wired the aneurism March 12th. Death April 11, 1909, from infection from a psoas abscess.

19. September 11, 1917, Hamann ligated the abdominal aorta just above the bifurcation for a pulsating tumor in the pelvis for which the right internal iliac had been ineffectually ligated, in a man fifty-one years old. Death March 13, 1918, six months and two days later, from hemorrhage from a bedsore. At necropsy no aneurism was found and the aorta at the site of the ligature was found only partly occluded having a lumen less than $\frac{3}{16}$ inch in diameter.

SUTURING AND PLUGGING OF THE SAC

1. April, 1906, R. Lozano reports an operation on the abdominal aorta by Matas' endo-aneurismorrhaphy for aneurism. Death eight hours later from shock and hemorrhage—the diseased artery walls would not hold sutures well.

2. In the summer of 1906, John C. Munro ligated the right phrenic artery and the coeliac axis and sutured with catgut the stump of the

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sac of an aneurism of the aorta above and behind the coeliac axis, in a man thirty-nine years old. Death that night from hemorrhage.

3. July 30, 1904, Tuffier exposed by dissection an aneurism of the arch of the aorta threatening to rupture through the skin. No pedicle to the sac was found and adhesions were extensive, so extirpation was abandoned and the thorax closed. Death five days later, suddenly—the operation not having hastened his death.

4. October 29, 1909, Tuffier operated on a man forty-nine years old, the aneurism showing as a pulsating tumor in the right upper sterno-costal region over which the skin was thin and adherent. In exposing the aneurism by turning back flaps, it was ruptured, and, to stop the bleeding, the tip of the gloved left index finger was thrust into the opening. A tampon was then made by stuffing the finger of a glove, the finger was withdrawn and the stuffed glove finger substituted and sewed into place and the wound closed with drainage. The patient was up on the eleventh day and walking on the thirteenth. Next day, the fourteenth, the tampon was replaced by a new one of the same kind. Two days later death occurred suddenly, but not from hemorrhage or asphyxia.

5. Kümmel reports, in the *Deutsch. med. Wochenschrift*, April 2, 1914, the case of a man forty-five years old, with an aneurism of the thoracic aorta just above the diaphragm. The aneurism was exposed by resecting three ribs close to the spine and just above the diaphragm, the aorta was controlled above and below with fingers, the aneurism slit open, the clots turned out, and the walls of the sac united with two rows of continuous sutures down to the lumen of the artery. Death in a short time from shock.

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