Two cases of ligature of the left carotid for aneurysm of the arch of the aorta: with the post-mortem specimens of four cases / by Christopher Heath.

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Heath, Christopher, 1835-1905. Royal College of Surgeons of England

#### **Publication/Creation**

London: Royal Medical and Chirurgical Society, 1903.

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(9)

### TWO CASES

OF

# LIGATURE OF THE LEFT CAROTID

FOR

# ANEURYSM OF THE ARCH OF THE AORTA

WITH THE POST-MORTEM SPECIMENS OF FOUR CASES

BY

### CHRISTOPHER HEATH, F.R.C.S.

CONSULTING SURGEON TO UNIVERSITY COLLEGE HOSPITAL

[From Volume 85 of the 'Medico-Chirurgical Transactions']

#### LONDON

PUBLISHED BY THE ROYAL MEDICAL AND CHIRURGICAL SOCIETY AND SOLD BY H. K. LEWIS, 136, GOWER STREET, W.C.

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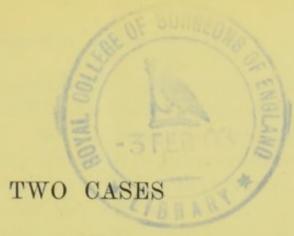
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Received October 29th, 1901-Read February 11th, 1902

The following are the notes of the sixth and seventh cases in which I have tied the left carotid for aneurysm of the arch of the aorta. I briefly referred to the sixth case in some "Remarks on the Distal Ligature in the Treatment of Aneurism," published in the British Medical Journal' of February 19th, 1898, but the seventh case occurred after that date.

Case 6.—Martha Fogarty, aged 61, following the occupation of a monthly nurse, came under the observation of Dr. Robinson at the Mile End Infirmary in July, 1890.

Since her husband's death she had supported herself by monthly nursing and the letting of lodgings, and never undertook anything like hard work. Three years before she experienced pain in her right shoulder, which was shortly afterwards followed by the discovery of a pulsating swelling above the right clavicle. She thereupon went to the London Hospital and remained there three weeks. It was then proposed to perform some operation for her relief, but this she declined, and took her discharge.

In December, 1889, when nursing a lying-in case, she noticed that the act of coughing caused her great pain in the supra-clavicular region, and about the same period her voice became cracked. Soon after Christmas of 1899 she could not lie comfortably on her back, and when she did so experienced a feeling of impending suffocation.

In July, 1890, she was admitted to the Mile End Infirmary, when Dr. Robinson noted a marked pulsation in the supra-sternal notch. She was kept closely in bed, and iodide of potassium was administered in full doses for many weeks, but no alteration in the pulsation resulted. She suffered a good deal from cough, and complained of constant pain in the neighbourhood of the pulsation, and this was much intensified during the act of coughing. Over the pulsation a marked bruit was audible, a similarly well-marked systolic bruit being heard at the apex-beat. The pulses in the wrist were equal in volume and regular, 92. There were no signs of arterial degeneration in the superficial vessels anywhere. Her invariable position in bed was a sitting one, with the knees drawn up and her head resting upon them. On the slightest inclination backwards there was an increase of the dyspnœa, and inspiration was accompanied by stridor.

The patient was small and of spare build. Her hair was turning grey, and the arcus senilis was well marked. Her complexion was sallow. There was no local cedema. After the treatment by rest and the iodide had been pursued for some weeks without any improvement in the patient's condition, the advisability of submitting

to an operation was placed before her by Dr. Robinson, and she consented to it. Accordingly, Mr. Heath applied a carbolised silk ligature to the left carotid, above the omo-hyoid, on November 16th, 1890, no anæsthetic being employed. On the evening of the operation the temperature of the left side of the face was 82°, that of the right side being 94°. The pulse in the left radial was noticed to have diminished in volume considerably. The patient at this time complained of a throbbing pain in the neighbourhood of the incision, and also of dysphagia. The pain in her right shoulder she declared to be gone.

On November 19th (third day) it was noted that respiration, which had been distinctly noisy, particularly inspiration, was now unaccompanied by the least noise. The patient was much better, able to recline against her pillows and indulge in sleep, and declared herself quite comfortable. The pupils were noted to be equal and active.

On November 22nd she was able to sleep for seven hours, a thing she had long been a stranger to. wound healed by first intention, and her progress was uneventful until January 3rd, 1891, when she complained of some return of the pain in the right shoulder and in the interscapular region. She had occasional attacks of epistaxis about this time without obvious cause, and some cough of a laryngeal character persisted. In February, 1891, the pulsating tumour above the sternum, though still visible, was thought to have contracted, and the patient was able to lie and sleep in any position without discomfort. On April 3rd (five months after the operation) she complained of some return of dysphagia. June, as she complained of some recurrence of pain in the right shoulder, and the pulse was full and hard, Dr. Robinson ordered her tablets of nitro-glycerine, under which the pain subsided. She continued to improve, and was discharged from the infirmary at her own request on August 8th, 1891.

This patient was admitted to the London Hospital

under Dr. Gilbart-Smith on September 3rd, 1891, when a pulsating tumour existed at the inner end of the right clavicle, and could be just felt about it. About the middle of November she began to complain of great pain shooting through the sternum and between the shoulders, and died suddenly on November 29th, 1891, more than a year after the operation.

For the following abstract of a case of aneurysm under the care of Dr. Roberts, I am indebted to Mr. Bucknall, late Surgical Registrar of University College Hospital.

Case 7.—James Smith, aged 36, a labourer, was admitted November 4th, 1898, complaining of "pain in the chest." From boyhood till the age of twenty-six he served as a hand on a fishing smack. Since then he has worked as a rough labourer, doing heavy lifting. For seventeen years he has served his time in the Militia Artillery, "lifting guns." Was in bed with rheumatism for seventeen weeks at the age of twenty-two. Had some swellings in the groins once, but no syphilis. Often drunk, and smoked half an ounce of shag daily.

Family history.—Father died of consumption aged twenty-eight.

Present illness.—Began in April, 1898, with pain behind the sternum, which came on when he ceased working, and lasted till he settled to work again, and "warmed to his work."

In September the pain became worse, and spread over the right upper chest to the scapula, and ran down the right arm as far as the internal condyle. He had to give up work and go to bed for four days.

The pain continued to get worse, and was least felt whilst doing manual labour.

During October, 1898, he had a cough.

State on admission (November 5th).—Patient presented all the signs of an aneurysm projecting forwards

in the first and second right intercostal spaces. The first and second right spaces were bulged, and dull on percussion for a distance of one inch from the sternal margin, and pulsation of an expansile character could be seen and felt here, and in the episternal notch and right supra-clavicular fossa.

The inner ends of both clavicles were projected forwards by the swelling, especially the right, and each beat of the pulse threw them further forward, and caused a heaving of the upper part of the chest.

Some dilated veins lay over the front of the chest, and

the jugulars were also distended.

Patient had a frequent brassy cough, and the voice was harsh; but the laryngoscope showed that both cords moved equally. There was marked "tracheal tugging," the right pupil was larger than the left (slightly), and the right radial pulse might have been a shade earlier than the left; it was certainly much larger in volume. The pulse was regular, 68 to the minute, high tension, large, collapsing rapidly during diastole in a manner typical of aortic regurgitation. Heart apex-beat heaving in fifth space, in the nipple line.

On auscultation a blowing systolic murmur could be heard over the aneurysm; the second sound could be clearly heard in the second right interspace, and along the left border of the sternum a murmur could be heard following the second sound, and running through the whole period of diastole. A blowing systolic murmur could be heard at the apex. The lungs were examined

and found healthy.

Notes before operation.—During November and December, 1898, and the first half of January, 1899, patient had severe attacks of pain in the shoulders, back, and side of the neck and face. The aneurysm at first became smaller, but during January it increased in size, and definite swelling and pulsation appeared beneath the pectoral just below the right clavicle. During this

period patient's temperature remained normal. On January 18th patient was transferred for operation.

Operation (January 18th, 1899, by Mr. Heath).—The left common carotid was ligatured with carbolised silk opposite the cricoid, eucaine  $\beta$  being used as a local anæsthetic. There were no succeeding nervous sym-

ptoms.

On January 19th and 20th the patient slept badly, owing to pain in the region of the aneurysm. On the 20th the pulsation in the aneurysm was distinctly less marked, and daily improvement was noted until February 1st, when he returned to the Medical ward with the operation wound healed. The pulsation was now much less distinct and forcible, and patient was free from pain and had slept well since January 20th. His cough was less frequent, and less brassy in character.

On February 16th patient complained of pain in the chest and cough, and, on listening to the chest, râles and

rhonchi could be heard scattered over both lungs.

On February 17th his temperature shot up to 103°, and from this date till the day of his death (March 21st) he had constant remittent fever varying between 100° and 104°, usually about 102°, with daily remissions of two to three degrees. The lungs showed all the signs of rapid and wide-spread tubercular infiltration and consolidation, and later cavity formation at the apices was evident.

The patient grew thinner and weaker daily, and expectorated copious purulent sputa containing tubercle bacilli. He sank and died on March 21st, having been ill a little over a month. The aneurysm gave rise to no symptoms during this time, and was daily less evident.

The post-mortem specimens from patients on whom I have tied the left carotid for aortic aneurysm are four in number.

1. The patient was a labourer who had had a pulsating swelling in the neck for nearly a year, and was under the

late Dr. Cockle when I tied his left carotid with catgut in February, 1872. "The symptoms due to the pressure of the aneurysm at once abated." When seen in March, 1873, he was in a very satisfactory condition, but in June, 1875, after resuming his laborious occupation of hedging and ditching, a pulsating tumour much larger than before the operation projected above the sternum. The aneurysm burst externally in September, 1876. (See 'Clin. Soc. Trans.,' vol. v, p. 183, and vol. x, p. 96.)

"The arch of the aorta is generally dilated; upon the anterior surface of its ascending portion is an oval opening, about an inch and a half in diameter, which communicates with a large sacculated aneurysm. The aneurysm projects forwards, and ascends in the neck beneath the sterno-hyoid and thyroid muscles as high as the cricoid cartilage, where there is a large opening, at which it had burst through the skin. The transverse portion of the arch is compressed by the sac, and the left brachio-cephalic vein is obliterated. The posterior surface of the sternum is eroded and forms part of the wall of the aneurysm, which had also compressed the left lung. The left carotid artery is obliterated and contracted at a point half an inch below the cricoid cartilage, where a ligature has been applied; it contains a fibrinous coagulum only adherent at the seat of ligature. There is no evidence that the internal coats of the artery were divided by the ligature" (College of Surgeons Museum, 3167).

With regard to this last statement, I may mention that the catgut broke in tying, and that I then doubled it and tied the artery as firmly as I dared. The drawing given by Messrs. Ballance and Edmunds ('Ligation in Continuity,' p. 193) of this preparation is in my opinion incorrect. It will be noticed that the sac contains no clot, for the reason that the examination took place three days after death in very hot weather, and in the country, and the decomposed condition of the clot necessitated

the washing of it away. This was most unfortunate, as it has led to the idea that no coagulum had formed as a result of the operation, whereas a large amount of clot had formed, and had led to the apparent cure of the aneurysm until the patient resumed his labour, when it again grew and burst externally, four and a half years after the ligature was applied.

Specimen 2, from a man aged 38, whose case is reported in the Clinical Society's 'Transactions' for 1891, by Dr. H. E. Harris, under whose care the patient was in the St. George's-in-the-East Infirmary. I tied the left carotid on March 8th, 1890. For a fortnight the aneurysm appeared to decrease in size, but the patient was more distressed with dyspnæa and cough. After that date it again increased in every direction and became more prominent, and the patient died suddenly on May 12th, two months after the operation.

The aneurysm springs from the upper and anterior part of the transverse portion of the arch, with which the sac communicated by a rounded opening of  $1\frac{1}{8}$  inches diameter. The opening is entirely to the proximal side of the great vessels, and the sac projects upwards and to the left, its summit being  $1\frac{3}{4}$  inches above the sternal notch.

The sac is entirely filled with clot, of which the outer layer, from \(\frac{3}{4}\) to 1 inch in thickness, is composed of decolourised fibrin, while the central portion is made up of ordinary red coagulum.

From the orifice of the aneurysm ante-mortem clots extend in a radiate fashion into the aorta, and into the innominate and left subclavian arteries, in which they tail off to threads. This clot, after being subjected to the action of weak spirit, was smooth, well defined, of considerable consistence, and separated like a membrane from the body of the clot. A section of the main clot showed it to be fleshy, and slight pressure caused it to split up into laminæ. Just above the aortic opening

the clot was distinctly adherent over a surface nearly an inch in length to the concavity of the arch, which was extensively calcareous.

A ligature had been applied to the left carotid five eighths of an inch below the bifurcation of the artery, at which point the vessel is interrupted for about half an inch by a mass of fibrous tissue. Above, the artery is completely filled by an organised but still coloured clot. Below, a completely decolourised clot extends along and is firmly adherent to the posterior wall of the vessel; this clot ceases one and a quarter inches above the commencement of the artery, with the exception of an exceedingly fine filament, which is continuous with the clot in the aneurysm. The remains of a ligature may be observed embedded in the fibrous tissue, which has also entangled the pneumogastric nerve (College of Surgeons Museum, 3167A) (Plate I).

Specimen 3 was from Dr. Robinson's patient (Case 6). The first part of the arch of the aorta is uniformly dilated. From the right superior aspect of the transverse arch, in front of the innominate artery, which is dilated and involved, springs an aneurysmal sac of the size of a small orange, with an opening into the aorta of the size of half a crown. The sac was adherent to the trachea, and is almost completely filled with laminated clot. The left carotid is filled with firm adherent clot, and higher up is obliterated by a ligature, which has disappeared. The clot in the left carotid does not extend into the aorta. The aorta was extensively diseased (University College Museum, 1233) (Plate II).

Specimen 4 was from Dr. Roberts's patient (Case 7). There are two aneurysmal sacs, a large one springing from the ascending aorta, and a smaller one arising from the back of the innominate artery. Both contained laminated clot.

The aortic aneurysm forms a tumour as large as a

clenched male fist, lying to the right of the extra-pericardial ascending aorta, and communicating with its lumen by an orifice the size of a florin. This pierced the antero-external wall of the vessel about midway between the pericardium and the origin of the innominate. The fibrous tissue forming the wall of the aneurysm extended around the vena cava and the origin of the innominate, and to the jugular vein. The manubrium sterni and ribs are adherent to the sac.

On opening the aneurysmal sac it was found to be filled with clot, the central part soft and rather fluid, the main mass distinctly laminated. The most peripheral portion was decolourised.

The innominate aneurysm forms a tumour as large as a hen's egg arising from the artery a quarter of an inch from its bifurcation. It lay behind and to the left of the larger aneurysm, to which it adhered, being in close contact with, and adherent to, the trachea on the inner side. It contained laminated clot, and communicated with the larger sac by its lower end.

The left carotid is obliterated an inch below the bifurcation and converted into a fibrous cord half an inch long. Below that there is solid clot filling the vessel to within half an inch of the aorta close to the larger sac. The aorta is extensively diseased. The lungs were universally adherent and solid with tubercles, which had broken down beneath the apex of both upper lobes, leaving a ragged cavity the size of a small hen's egg in each (University College Museum, 1234) (Plate III).

That the application of a ligature to the left carotid has an effect upon an aneurysm of the transverse portion of the arch of the aorta is, I think, sufficiently shown by the cases just read. In the woman it is noted that on the third day after the operation the respiration, which had been distinctly noisy, had become quiet, and the patient was able to recline against her pillows. On the sixth day she was able to sleep for seven hours consecutively. In the man, on the third day the pulsation of the aneurysm was distinctly less marked. But the relief in my first case (Dr. Cockle's patient) was even more marked, for I brought him before the Clinical Society more than a year after the operation, when it was recorded that "the patient is in perfect health, and feels no inconvenience from his chest. He sleeps well and can lie on either side equally well. The right chest wall in front is quite restored to its natural shape, or if anything is a little flatter now than its fellow. On palpation, the heaving impulse formerly existing over the right anterior chest wall is almost entirely gone. On percussion, the right anterior chest wall, formerly so dull, has, to a considerable extent, recovered its normal condition" ('Clin. Soc. Trans.,' vol. vi, 1873).

The preparation from this patient shows no clot, for the reason I have already given, but the other three preparations show thick laminated clot in each sac, and in the last case (Dr. Roberts's) the second or innominate aneurysm was also full of clot.

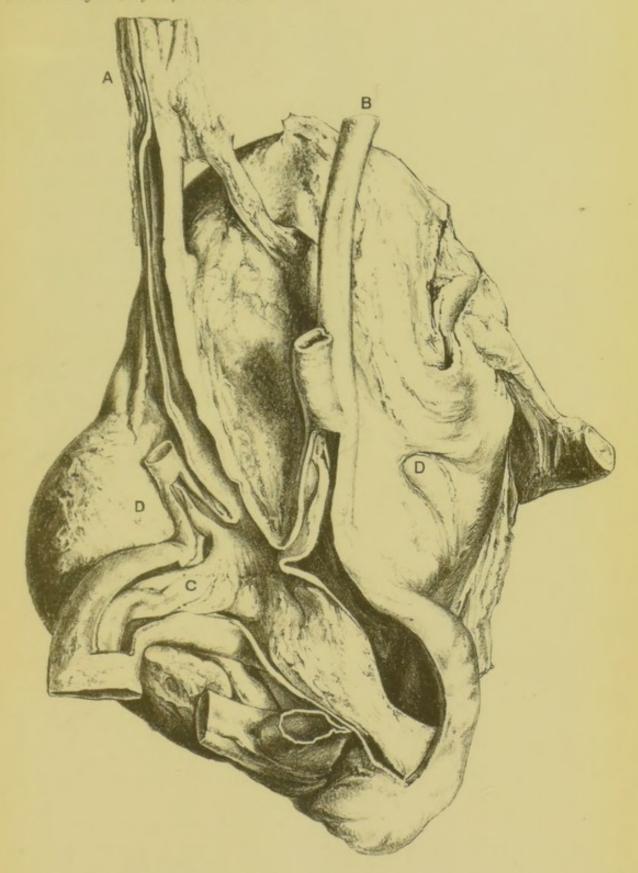
Various theories have been advanced to account for the formation of laminated clot in these cases. The simplest was that it depended upon the enforced rest in bed following the operation; but the fact is that in every case the effect of prolonged rest in bed had been tried for many weeks without the slightest benefit. Next it was suggested that the clot, beginning at the point of ligature, spread down into the aneurysm, and thus led to the formation of a coagulum in the sac. This is contrary to fact, as shown in the preparations before you, for in no single case was the left carotid involved in the sac, and it is noted that the small thread-like clot, which, in some instances, spread down the carotid, in one case only extended into the aorta, and joined that in the aneurysm. I maintain the view which I have always held about these cases, viz. that the distal ligature affects the current of blood in the aneurysm, probably by

retarding it, and thus causes it to flow around the sac instead of directly through or past it, and in this way leads to the deposit of laminated fibrin on the probably roughened wall of the sac.

When this normal cure of the aneurysm has gone on for some time, there is no doubt a tendency for the small remaining cavity to become blocked with soft coagulum, and this is probably a critical moment for the patient, and may account for the sudden deaths which have occurred at considerable periods after the operation. An aneurysm which is semi- or completely solid must necessarily exercise much greater pressure on its surroundings than one which only contains fluid blood, whilst the sudden arrest of a stream of blood through a sac so near the heart would be likely to interfere with its action and lead to syncope.

For the drawings of three of the preparations illustrating this paper I have to thank Mr. T. W. P. Lawrence, F.R.C.S., Curator of the University College Museum.

Heath: Ligature of Left Carotid. Plate I.



CASE 5.

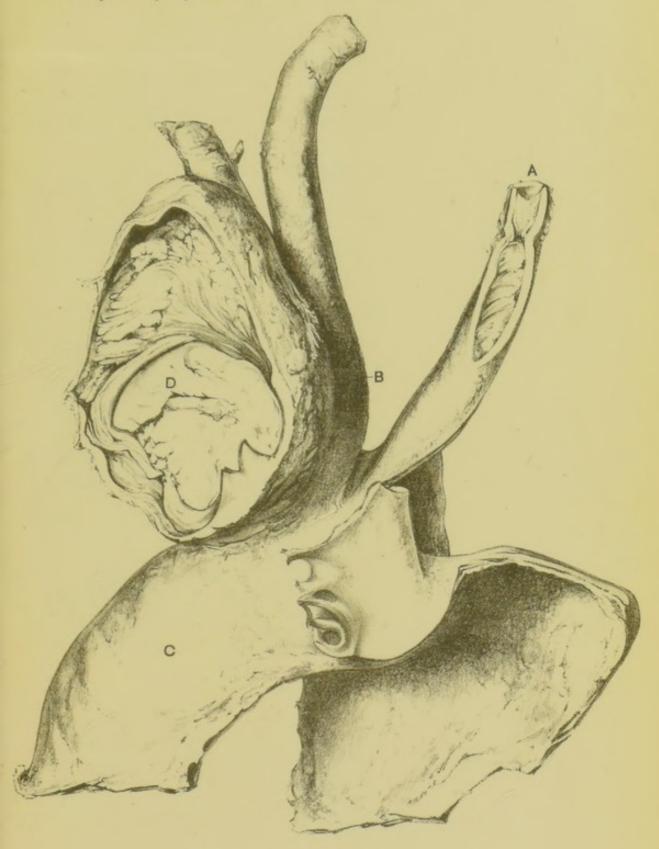
A Left carotid at ligature. C Loose clot in Aorta.

B Right carotid.

DD Aortic Aneurysm.



Heath: Ligature of Left Carotid. Piate II.

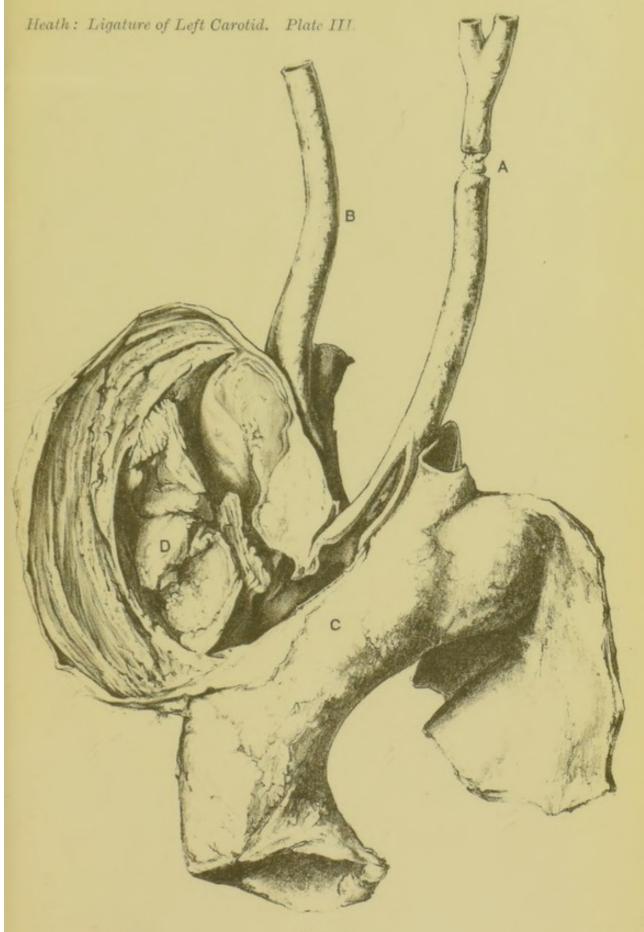


CASE 6.

A Left carotid at ligature. C Arch of Aorta.

B Innominate artery. D Clot filling Aneurysm.





CASE 7.

A Left carotid at ligature. C Arch of Aorta.

B Right carotid.

D Clot filling Aneurysm.



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