Left subclavio-axillary traumatic aneurysm : ligation of subclavian artery in the second part of its course : recovery, with perfect use of arm / by Henry Gray Croly.

Thomas Bryant Esq F.R.C.S. [illegible]
with the writer's kind regards Sep. '99.

LEFT SUBCLAVIO-AXILLARY TRAUMATIC ANEURYSM:

7

LIGATION OF SUBCLAVIAN ARTERY IN THE *SECOND* PART OF ITS COURSE: RECOVERY, WITH PERFECT USE OF ARM.

BY

HENRY GRAY CROLY, F.R.C.S.;

Senior Surgeon, Teacher of Operative and Lecturer on Clinical Surgery, City of Dublin Hospital;

Examiner in Surgery and Operative Surgery, Fellowship and Conjoint Board, Royal Colleges of Surgeons and Physicians;

Past President (1st Biennial), Royal College of Surgeons;

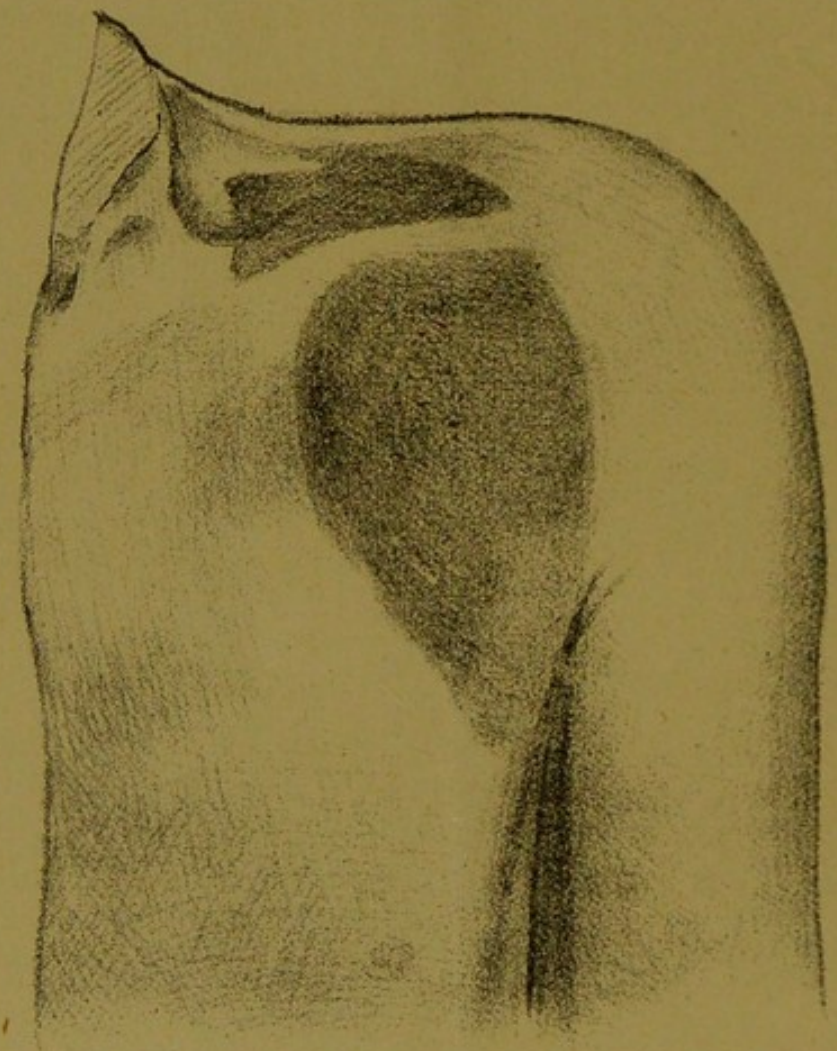
Ex-Member of Council and Member of Council, Surgical Section Royal Academy of Medicine;

Consulting Surgeon, Monkstown Hospital, and Boys' Masonic School, &c., &c.

Reprinted from the Transactions of the Royal Academy of Medicine in Ireland, Vol. XVI.

DUBLIN:
PRINTED FOR THE AUTHOR
BY JOHN FALCONER, 53 UPPER SACKVILLE-STREET.

JUNE, 1899.



The shading on the cast indicates the extent of the aneurysm above and below the clavicle before operation.

LEFT SUBCLAVIO-AXILLARY TRAUMATIC ANEURYSM:

LIGATION OF SUBCLAVIAN ARTERY IN THE *SECOND* PART OF ITS COURSE: RECOVERY, WITH PERFECT USE OF ARM.

BY

HENRY GRAY CROLY, F.R.C.S.;

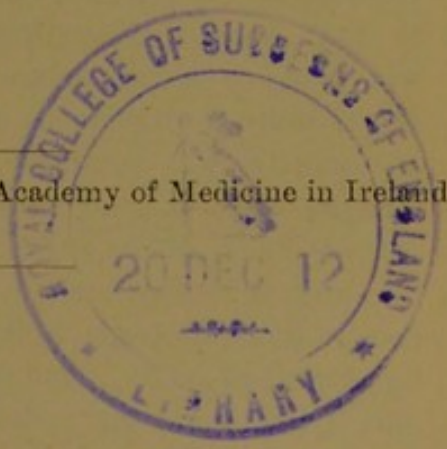
Senior Surgeon, Teacher of Operative and Lecturer on Clinical Surgery, City of Dublin Hospital;

Examiner in Surgery and Operative Surgery, Fellowship and Conjoint Board, Royal Colleges of Surgeons and Physicians;

Past President (1st Biennial), Royal College of Surgeons;

Ex-Member of Council and Member of Council, Surgical Section Royal Academy of Medicine;

Consulting Surgeon, Monkstown Hospital, and Boys' Masonic School, &c., &c.



Reprinted from the Transactions of the Royal Academy of Medicine in Ireland, Vol. XVI.

DUBLIN:

PRINTED FOR THE AUTHOR

BY JOHN FALCONER, 53 UPPER SACKVILLE-STREET.

JUNE, 1899.

LEFT SUBCLAVIO-AXILLARY TRAUMATIC ANEURYSM:

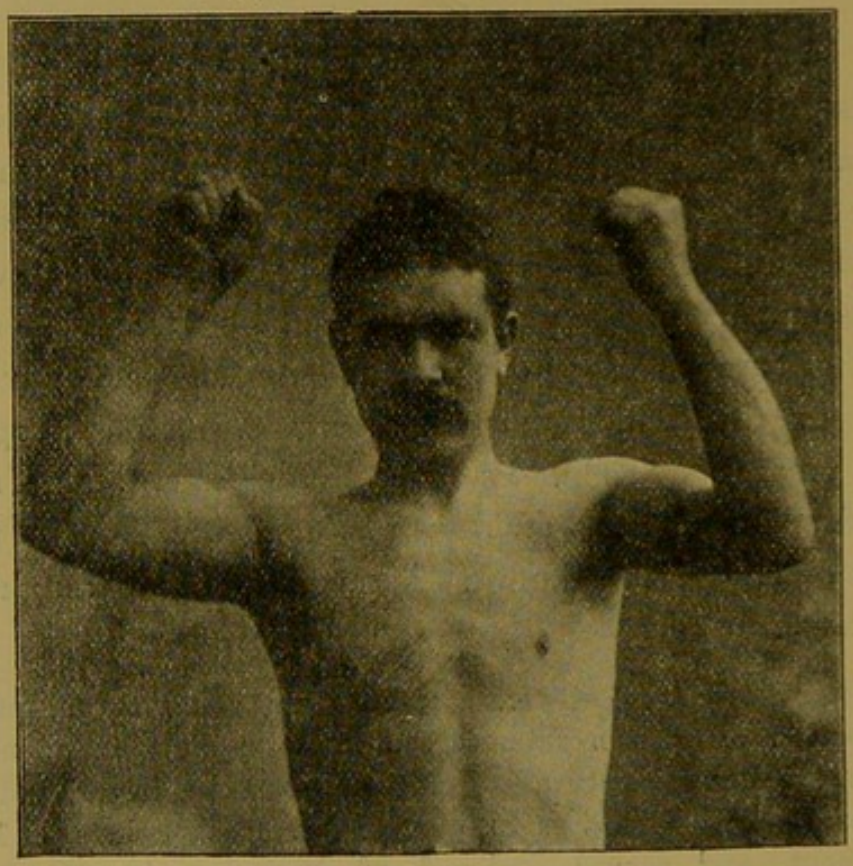
LIGATION OF SUBCLAVIAN ARTERY IN THE *SECOND* PART OF ITS COURSE; RECOVERY, WITH PERFECT USE OF ARM.[a]

I CONSIDER it my duty to this College, to this Section of the Royal Academy of Medicine, to the hospital to which I have the honour to belong, and to the profession generally, to place on record the first Irish case of ligation of the subclavian artery in the *second* part of its course. The treatment of surgical aneurysms in the past has been ably dealt with in this hall by brilliant and illustrious surgeons. The names of Todd, Hutton, Bellingham, and Tufnell are familiar as household words, and the Dublin treatment of aneurysm is known wherever surgery is taught and practised.

History of Case.—Owen O'Neill, aged thirty-seven, present occupation a garden labourer, a strongly-built man, not of temperate habits, naturally healthy, states he never had any serious disease. He was at one time a private in the 102nd Regiment, and served under Lord Wolseley, in Alexandria. In April, 1884, he got a sabre wound on the left parietal bone, which was stated to be fractured. April 29th, 1893, he was in a public-house; some dispute arose, a man rushed at him and stabbed him with a tailor's scissors below the left clavicle, and stabbed him a second time above that bone. The hæmorrhage was profuse. To use the man's own words, "the blood flowed like a fountain." He fell on the floor and became faint and his left arm fell dead at his side. The police were soon on the scene, and O'Neill was conveyed to the City of Dublin Hospital

[a] Read in the Section of Surgery of the Royal Academy of Medicine in Ireland, January 21, 1898.

and admitted under Mr. Fitzgibbon, who was accident surgeon for that week. On the patient's admission there was merely an oozing from the wounds, and a large hæmatoma had formed, conical in shape, and almost as large as half a small-sized cocoanut. The patient was placed in bed, and as he was in a state of profound collapse every possible means were em-



The axilla shows the entire disappearance of the tumour after operation.

ployed to restore him. Compresses and bandages were applied to the wounds. The patient's condition gradually improved. A loud bruit with a distinct pulsation, absence of radial pulse, and powerless condition of arm were noted. Ice-bags were applied to the tumour, and later on shot-bag and Esmarch's bandage were employed, with suitable diet and perfect rest. The arm and hand remained powerless for four months, the ring

and little fingers being the last to regain power. The patient always complained of pains in the axilla. Pressure relieved it. The hæmatoma diminished in size gradually. The pulsation became less forcible, and the man was considered fit for the convalescent home, to which he was admitted November 27th, 1893, nearly seven months from the date of his admission to hospital. He left the home before Christmas, less than a month from admission, and resumed his work. At first he merely led a horse and drove occasionally, and it was not until he commenced the laborious work of pitching manure that the tumour again troubled him. His arm wasted—he suffered from numbness of the hand. The axillary pain was constant, he lost sleep, and was obliged to give up work. February 15th, 1895, he again sought admission to the hospital, having been 14 months at work.

Condition of Patient on Re-admission to Hospital.—His general health was good. A large pulsating tumour occupies the sub-clavicular axillary space, the shoulder is raised, the upper extremity wasted, a loud systolic sound is heard above and below the clavicle and in the axilla, into which the tumour bulges. Treatment was recommenced—"Tufnell" diet, perfect rest, pressure, iodide potassium, and so matters went on for some months. When Mr. Fitzgibbon resigned his hospital appointment, he handed over his cases to me, and thus O'Neill was transferred to my care. I continued the treatment, and I gave in addition digital pressure a full trial, but it soon failed to control pulsation. The casts which I exhibit to the Society show the extent of the aneurysm. He was most anxious to be cured without operation, and was very patient, but at last gave me permission to perform any operation, except removal of his arm. The case attracted a considerable amount of attention, and in addition to the hospital staff, he was examined by a number of hospital surgeons. My friend, Mr. Ballance, surgeon to St. Thomas's Hospital, London, and joint author with Mr. Edmunds of a work on "Ligation of Arteries in their Continuity," being in Dublin, I asked him to see the patient. He did so, made a most careful examination, and fully agreed with me that the time had come when ligation of the artery in its *second* stage should be performed.

On December 2nd, 1895, I proceeded to operate in the presence of my colleagues and a number of other distinguished surgeons and physicians. The patient was anæsthetised. The arm was steadied by my son, Henry Croly, M.D., B.Ch., Ex-House Surgeon,

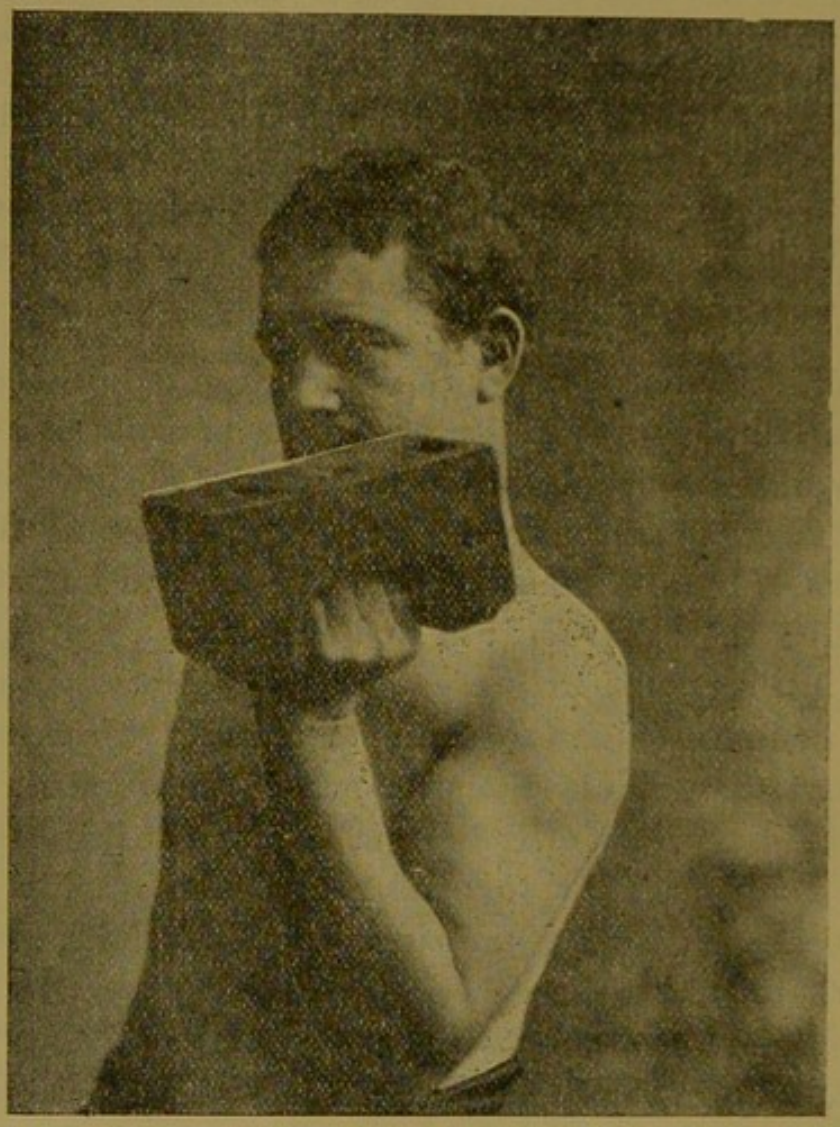
and my former colleague, Dr. Gordon, rendered valuable aid. I commenced by making a vertical incision at the outer edge of the sterno-cleido mastoid muscle. A second horizontal incision was made along the clavicle, almost its entire length—the entire clavicular origin of the sterno-mastoid was divided. When the subclavian triangle was exposed, a large aneurysmal tumour was seen occupying the entire third stage of the artery, the external jugular vein was lying at the outside of the space; the cords of the brachial plexus were not seen; a huge vein like a "gorged leech" was observed parallel with and above the clavicle. I now passed my forefinger along the aneurysm, and felt for the scalenus anticus muscle, the outer border of which was turned backwards by the pressure of the aneurysm. With considerable difficulty I raised the edge of the muscle. The phrenic nerve was seen in its normal position, and when first exposed the patient hiccoughed slightly; with a blunt-pointed scissors I divided nearly one-half of the outer portion of the scalenus anticus. I searched for the subclavian in the bottom of a very deep well, and though the space was clear and there was no bleeding to mask the parts, I found great difficulty in feeling or seeing the vessel. At this stage, which I may term the "halting point," I scraped through the deep fascia, and exposed about a quarter of an inch of the vessel, *which pulsated.* At this moment the cone of the pleura hopped up like the finger of a glove. This fortunately did not recur. I next raised a portion of the sheath in a fine forceps, and made a sufficient opening to allow the passage of the aneurysm needle, which I got made specially with a long deep curve and a large eye. Having steadied the artery with the point of my right forefinger. I passed the needle with my left hand from below and within upwards and slightly outwards; it came under the artery at the first attempt. I then armed the needle with a long ligature made of ox peritoneum, and which was immediately previous to operation steeped in warm solution of carbolic acid. The loop was divided, and the needle withdrawn. I tied the ligature on the side next the heart by the first hitch of a reef knot. The artery grooved like a director. I merely approximated the internal coats, as suggested by Scarpa (1817), and used no violence whatever. The second ligature was applied in the same manner, and finally I drew the *four ends* as a single ligature (holding two in each hand), and thus completing the "stay knot" of Ballance

and Edmunds. I now exhibit a specimen of the ligature (gold-beaters' skin) on a piece of tubing. The aneurysm needle and the ligature was kindly sent to me by Mr. Ballance, who was most anxious to come over for the operation, but was unavoidably detained. When the first half-hitch was tied, I asked if the pulsation in the tumour had gone, and I was told the aneurysm *ceased to pulsate* (the tumour did not collapse), and that the radial pulse was gone. The advantage in using two ligatures is that a greater length of the intima of opposite sides is brought into contact. The wound, a very deep one, was thoroughly washed out with warm carbolic lotion, and the edges closed with gut sutures. The patient bore the operation well. No small vessels required ligatures or clip forceps, and no director was used at any part of the operation.

With the exception of a slight attack of tonsillitis (which ran up the temperature for a time) the patient made an uninterrupted recovery. It was fully a month before any trace of a radial pulse could be felt; the brachial pulse has *not* returned. The axillary tumour got hard, and lessened gradually; the hand, forearm and arm kept a natural heat. The casts [exhibited] were taken from time to time before and subsequent to operation, and it is very interesting to observe the gradual disappearance of the tumour. I exhibited the patient at the Surgical Section of this Academy, and I also took him to London and exhibited him at the Clinical Society, where the case attracted much interest. The man works as well as he ever did, and suffers no inconvenience whatever. A large artery, evidently the "transversalis colli," can be felt about an inch above the clavicle.

The operation which I performed was originally suggested and practised by Dupuytren in 1819. A man, aged 37, received a sword injury, and a subclavic axillary aneurysm formed. As the tumour encroached upon the third stage, Dupuytren divided the outer border of the scalenus anticus; the artery could be seen, and its pulsations were stopped by finger passed to the bottom of the wound. Triple silk thread used; ligatures removed on the eleventh day; wound

nearly cicatrised. Tumour diminished every day; suppuration feared, and on seventy-eighth day the tumour was reduced to one-fifth of original size. Patient made a perfect recovery.



This Photo. shows the patient holding up a half cwt. with the left arm after operation, and also shows the restored muscular development.

Liston's case, 1820.—Coachman, aged 35. Left subclavio-axillary aneurysm caused by a fall on the shoulder; second stage of artery tied; outer half of scalenus anticus divided; external jugular vein was cut; secondary hæmor-

rhage from that vessel; tumour gradually reduced in size. Patient made good recovery. Both these cases, like mine, were traumatic, and are the only cases of the kind on record so far as I can discover.

Auchinloss, surgeon, in 1833, to Town's Hospital, Glasgow, published a case of left subclavio-axillary aneurysm of 18 months' standing in a man, aged 65—a weaver by trade; no history of injury. The artery was ligated in its second stage. Considerable difficulty was experienced from the swollen state of the jugular vein, which, being fully twice the size of the thumb, completely overlapped the anterior scalenus. The operation was greatly facilitated by the use of Abraham Colles' metallic retractors or flexible spatulas. The phrenic nerve was held inwards. In the evening the temperature in the axilla was 94 deg. Fahrenheit. The patient was bled profusely. Comatose symptoms supervened and he died apoplectic, 68½ hours after operation.

Post-mortem.—Aorta atheromatous.

Godlee's Case.—A gentleman, aged 66, admitted to University College Hospital, London. The aneurysm projected into the left axilla, and although it was not to be felt above the clavicle, the pulsation in this situation was much more forcible than that on the opposite side. Symptoms existed for two years. No history of injury, or syphilis, or rheumatism. Tufnell's treatment was first tried, neither phrenic nerve or thoracic duct were seen, four strands of the finest chromic catgut were employed, reef knot. Mr. Godlee writes to say aortic aneurysm subsequently caused the patient's death.

Cases of ligation of the subclavian artery in the second part of its course for traumatism.

1.	Dupuytren, 1819	...	Recovery
2.	Liston, 1820	...	Recovery
3.	Croly, 1895	...	Recovery

Cases of ligation of the subclavian artery in the second part of its course for disease.

1.	Auchinloss, 1833	... ...	Artery diseased; artery divided; died.
2.	Godlee, 1890	... ...	Recovered operation; died subsequently of aortic aneurysm.

A short description of the anatomy of the parts involved in the operation I consider important and instructive.

Dupuytren was the first surgeon and anatomist who divided the subclavian artery into the *three parts*.

The subclavian artery in the *second* part of its course (the site of operation) lies in a remarkable intermuscular space, the scalene triangle, bounded by the scaleni muscles, anticus and medius, and first rib. These muscles are closley approximated to each other at their attachments to the tubercles of the cervical transverse processes; but in descending to their insertions they diverge, leaving between them a triangnlar space, of which the base placed inferiorly corresponds to the first rib and to a small portion of the second. In this space the artery, brachial plexus and *cone of the pleura* are situated. In front the artery is in contact with the anterior wall of this triangle (scalenus anticus). Behind it is separated from the posterior boundary (scalenus medius) by the summit of the cone of the pleura, which ascends thus high into the interval between the scalenus medius and the subclavian artery. Towards the summit of this "scalene triangle" the nerve cords which constitute the brachial plexus are placed along the convexity of the artery—superior and external to it a fleshy slip (scalenus minimus of Sœmmering) is often found to pass from the scalenus anticus to the lower or costal extremity

of the scalenus posticus. In this course it runs between the roots of the brachial plexus and consequently subdivides into two the scalene space. The *lower* compartment contains the subclavian artery, the cone of the pleura, and the inferior portion of the brachial plexus, constituted by the seventh cervical nerve and the cord resulting from the union of the eighth cervical with the first dorsal nerve; whilst in the *upper* compartment corresponding to the apex of the triangle) the fifth and sixth nerves of the plexus are seen to unite into a single trunk.

On the front of the scalenus anticus and separated by that muscle from the subclavian artery are found most inferiorly the subclavian vein lying on the tendinous insertion of the muscle and under cover of the clavicle in the flaccid condition of the vein. Above the vein are the transverse branches of the thyroid axis, supra-scapular, and transversalis colli arteries, the former more inferior, whilst the phrenic nerve descends obliquely inwards towards the tracheal edge of the scalenus anticus and intersects these two arteries by passing between them. Superficial to these important structures is the clavicular origin of the sterno-cleido mastoid muscle. In direction this muscle accurately corresponds to the scalenus anticus, which lies deeper. The separation of the subclavian vein from the subclavian artery in the second part of its course constitutes one of the most remarkable features in its anatomical history. This condition is not, however, constant, for the vein has been found to lie *with* the artery between the scaleni muscles (Blaudin), and in a few other instances the artery has accompanied the vein superficial to both muscles (Quain). The artery has been seen to pass through the scalenus anticus (Quain). The anterior relations of the subclavian artery in the second part of its course are :—

1. Skin, platysma, fascia.
2. Sterno-cleido mastoid (clavicular portion).

3. Subclavian vein, suprascapular and transverse cervical arteries and veins, phrenic nerve—*single or double.*

4. Scalenus anticus muscle.

The *left* subclavian artery is much less liable to vary in the mode of its origin than the right. In a few instances it is fused into the left carotid, and the vessels arising by a common trunk form a *left arteria innominata.* The *left* subclavian artery in its first stage furnishes the superior intercostal, a branch which on the right side more frequently arises under cover of the "scalenus anticus" muscle.

The situation in which the branches arise from any large artery is an important consideration in its history, because of the influence which their presence has on the result of an operation for the cure of aneurysm—and considering the shortness of the trunk, the size of the offsets, and the manner of their arrangement on the parent vessel, it may be confidently stated that there is no artery in which the influence alluded to is more considerable than in the subclavian.

In the *second* part of its course the subclavian artery most frequently gives off but a single branch which soon divides into the cervicalis profunda, and superior intercostal arteries. *The left subclavian rarely gives off any branches in the second part of its course.*

The pleura at its apex projects in the form of a *cul-de-sac* through the superior opening of the thorax into the neck, extending from an inch to two inches above the margin of the first rib, and receives the summit of the corresponding lung. This sac is strengthened by a dome-like expansion of fascia derived from that covering the lower part of the scaleni muscles.

The thoracic duct (of Eustachio) mounts into the cervical region in front of the vertebral artery and vein to the level of the seventh cervical vertebra, opposite to which it begins

to form a curve, first forwards and outwards, then downwards and inwards, striding over the subclavian artery to reach the angle of union between the subclavian and internal jugular vein.

The thoracic duct (of Eustachio) and the internal jugular vein cannot be endangered with ordinary care in ligation of the subclavian in the second part of its course.

The scapular anastomosis (which is very perfect) may be likened to the links of a chain, and includes the union of the scapula with the humerus, the humerus with the forearm, and the forearm with the hand.

In conclusion, I beg to return my best thanks to my friends Professors Fraser and Cunningham, and Dr. G. Jameson Johnston, Demonstrator of Anatomy in Trinity College, and now my surgical colleague, for the opportunities afforded me in the dissecting rooms, and my best thanks are also due to Dr. Paul Carton, my former resident pupil, for the beautiful drawings of dissections which I made of the subclavian arteries. My warmest thanks are also given to Dr. Morton Hewitt, House Surgeon; the Surgical Resident Pupils, Mr. William Chapman Croly and Mr. Scribner; Miss Beresford (Lady Superintendent), and Nurses Skelton and Mutton, for the untiring care and kindness shown to the patient, who is in attendance to be examined by the members after the meeting. He is in perfect health, and his left arm is strong, muscular, and useful as before the infliction of the wounds.

Ballance and Edmunds in their work on "Ligation of the Great Arteries in Continuity" (page 262) say, when showing sections of kangaroo tendon ligatures undergoing absorption to Sir Joseph (now Lord) Lister, he remarked that the best material for an absorbable ligature was white fibrous tissue, of which the outer coat of an artery consists, and that the *purest* white fibrous tissue in the body was the *peritoneum*;

he therefore thought that the best material for a ligature would be the peritoneum—indeed he had himself tried it and with success on an artery of a calf.

Lord Lister has written to me as follows:—

"12 Park-crescent, Portland-place,
"16*th February*, 1898.

"DEAR MR. CROLY,

"Allow me to offer you my congratulations on your excellent case of ligature of the second part of the subclavian, reported in this day's *Medical Press and Circular*.

"I am particularly interested by the fact of your having used ox's peritoneum for your ligature. It happened to be this material which I used in my experiment on the calf's carotid, now many years ago. It showed the most beautiful behaviour, being at the end of 4 weeks replaced by a firm ring of new fibrous tissue, except at the thickest part (the knot), where the middle portion retained its original character, not yet absorbed. It was disappointing to me afterwards to find that catgut, though also formed of fibrous (or connective) tissue, is too rapidly absorbed for the purposes of tying an arterial trunk, unless after special preparation.

"I mentioned this good behaviour of peritoneum to Mr. Ballance some years back, and he told me he should give it a trial.

"In the report of your case it is stated that you used the peritoneum in the form of goldbeaters' skin. May I trouble you to tell me whether this was the case?

"Believe me,
"Yours very sincerely,
"LISTER."

In reply to the above query I wrote to Lord Lister saying that the ligature used by me in ligation of the subclavian artery in the second part of its course *was* goldbeaters' skin, and that Mr. Ballance had kindly sent me the ligature used.

I received the following telegram from Mr. Ballance:—

"December, 1898.

"To Croly, 7 Merrion-square, Dublin.

"Sincere congratulations on successful result of your brilliant operation.—BALLANCE, Harley-street."