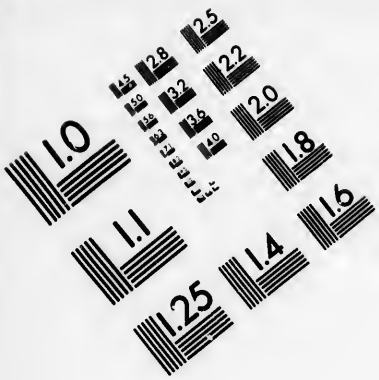
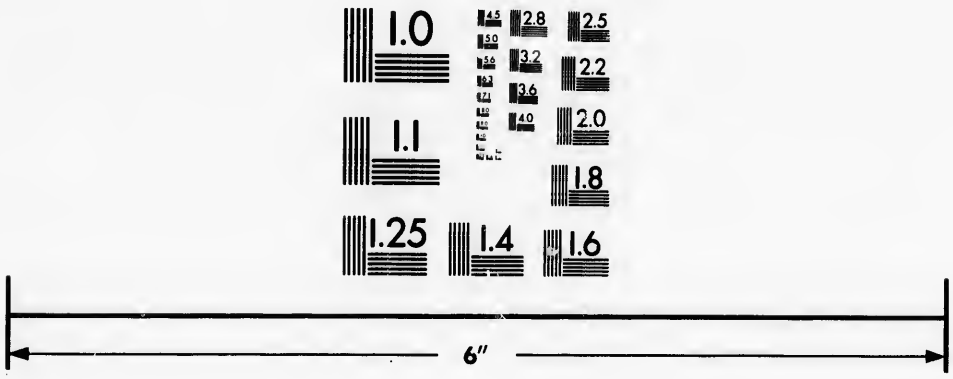
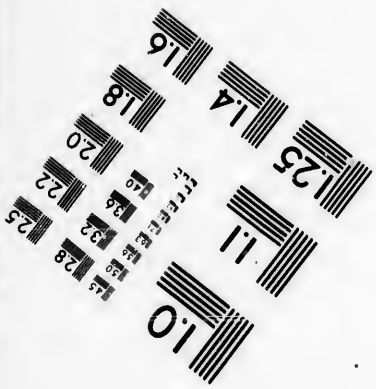
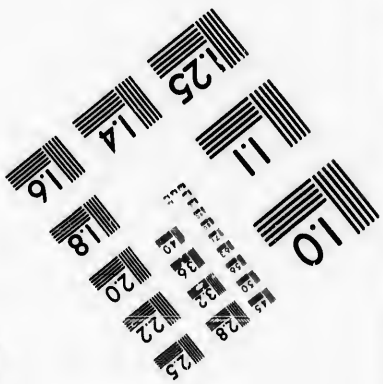


IMAGE EVALUATION TEST TARGET (MT-3)







Photographic Sciences Corporation

23 WEST MAIN STREET
WEBSTER, N.Y. 14580
(716) 872-4503

Technical and Bibliographic Notes/Notes techniques et bibliographiques

The Institute has attempted to obtain the best original copy available for filming. Features of this copy which may be bibliographically unique, which may alter any of the images in the reproduction, or which may significantly change the usual method of filming, are checked below.

- ☐ Coloured covers/ Couverture de couleur
- ☐ Covers damaged/ Couverture endommagée
- ☐ Covers restored and/or laminated/ Couverture restaurée et/ou pelliculée
- ☐ Cover title missing/ Le titre de couverture manque
- ☐ Coloured maps/ Cartes géographiques en couleur
- ☐ Coloured ink (i.e. other than blue or black)/ Encre de couleur (i.e. autre que bleue ou noire)
- ☐ Coloured plates and/or illustrations/ Planches et/ou illustrations en couleur
- ☑ Bound with other material/ Relié avec d'autres documents
- ☐ Tight binding may cause shadows or distortion along interior margin/ La reliure serrée peut causer de l'ombre ou de la distorsion le long de la marge intérieure
- ☐ Blank leaves added during restoration may appear within the text. Whenever possible, these have been omitted from filming/ Il se peut que certaines pages blanches ajoutées lors d'une restauration apparaissent dans le texte, mais, lorsque cela était possible, ces pages n'ont pas été filmées.

L'Institut a microfilmé le meilleur exemplaire qu'il lui a été possible de se procurer. Les détails de cet exemplaire qui sont peut-être uniques du point de vue bibliographique, qui peuvent modifier une image reproduite, ou qui peuvent exiger une modification dans la méthode normale de filmage sont indiqués ci-dessous.

- ☐ Coloured pages/ Pages de couleur
- ☐ Pages damaged/ Pages endommagées
- ☐ Pages restored and/or laminated/ Pages restaurées et/ou pelliculées
- ☑ Pages discoloured, stained or foxed/ Pages décolorées, tachetées ou piquées
- ☐ Pages detached/ Pages détachées
- ☑ Showthrough/ Transparence
- ☐ Quality of print varies/ Qualité inégale de l'impression
- ☐ Includes supplementary material/ Comprend du matériel supplémentaire
- ☐ Only edition available/ Seule édition disponible
- ☐ Pages wholly or partially obscured by errata slips, tissues, etc., have been refilmed to ensure the best possible image/ Les pages totalement ou partiellement obscurcies par un feuillet d'errata, une pelure, etc., ont été filmées à nouveau de façon à obtenir la meilleure image possible.

☑ Additional comments:/ Commentaires supplémentaires: Pagination as follows : [7] - 12 p.

This item is filmed at the reduction ratio checked below/
Ce document est filmé au taux de réduction indiqué ci-dessous.

10X	12X	14X	16X	18X	20X	22X	24X	26X	28X	30X	32X
						✓					

24

TREATMENT OF WOUNDS OF THE ANTERIOR TIBIAL ARTERY, COMPLICATING COMPOUND FRACTURE OF THE LEG; WITH REPORT OF A CASE.[1]

By FRANCIS J. SHEPHERD, M. D., C. M.,

OF MONTREAL,

SURGEON TO THE MONTREAL GENERAL HOSPITAL.

J. F., aged 50, native of France, quarryman, on the 19th of January, 1884, whilst at his work in the quarry, was struck on the right leg by a large stone, which fell from some distance above him. He was immediately brought to Hospital, where on examination it was found that he had sustained a compound fracture of both bones of the right leg, about the junction of the middle with the upper third. The wound in the soft parts was situated on the front of the leg, and extended from one inch below the tubercle of the tibia in a direction downwards and outwards. The fracture of the tibia was oblique, the upper fragment overlapping the lower; the fibula was fractured higher up through the neck. When the man was admitted, his leg was enveloped in a tight bandage, on the removal of which very free bleeding took place; this was easily controlled by sponge pressure. The wound was washed out with a solution of carbolic acid 1–40, and the limb was encased in plaster bandages, an opening being left opposite the wound. The wound was dressed with iodoform and antiseptic gauze, and a carbolized sponge placed over the layer of gauze, and firmly kept in position by an evenly applied antiseptic bandage. By this means the hemorrhage was almost completely arrested,

The next day, owing to the free oozing of blood, the dressings had to be renewed. After this there was no more oozing, and the case went on well till the fourth day, the temperature never having risen above 99° F. On January 23, the man complaining of uneasiness and a throbbing sensation, the dressings were removed, and at the site of the wound, which had become closed by blood clot, a pulsating swelling, about the size of an egg, was seen. From the situation of the swell-

[1] Read before the Canada Medical Association, August, 1884.

ing, and from the fact that the posterior tibial could be felt pulsating behind the internal malleolus, I concluded that I had to deal with a laceration of the anterior tibial artery.

Next day the pulsating swelling had markedly increased, so, after consulting with my colleagues, I decided to cut down and tie the anterior tibial artery at the site of the injury, if possible. On removing the plaster bandage, the leg was found to be much swollen and congested. The man having been placed under ether, and an Esmarch bandage having been applied, I enlarged the wound on the front of the leg till it was between three and four inches long, turned out the blood clots, and began my search for the injured vessel. I had originally intended performing the orthodox operation of cutting between the tibialis anticus and extensor longus digitorum muscles, but owing to the torn and infiltrated condition of the muscles, this I found to be no easy task, so I then endeavored to reach the artery by increasing the separation which already slightly existed between the tibialis anticus muscle and the bone. Separating the muscle carefully, I soon came upon the interosseous membrane, and a little later made out the anterior tibial nerve, with the artery to its inner side. The injured portion was then searched for; by carefully tracing the artery from below up and occasionally relaxing the Esmarch bandage, it was found, to be almost immediately in front of the place where the vessels pierced the interosseous membrane. Fortunately the artery was not completely torn through, for, no doubt, had it been it would have retracted through the opening in the membrane, and ligature of it would have been impossible. The site of the wound in the artery was discovered with the greatest difficulty and after considerable time was spent in the search, for, owing to the depth of the wound and the darkness of the day, but little could be seen, until with the aid of a lamp and throat mirror the parts were tolerably well brought into view. Ligatures were now placed above and below the bleeding-point. The upper ligature, owing to want of space, was applied with the greatest difficulty, and after several failures. Carbolized Chinese silk was used, because it was more easily manipulated and could be tied with greater security than catgut. The vessel having been secured, the Esmarch bandage was removed, and it was now seen that the hemorrhage was completely arrested.

The fracture of the tibia was then attended to; about half an inch of the lower end of the upper fragment, which had a tendency to protrude and was completely denuded of periosteum, was cut off, and the two fragments of the tibia brought into accurate apposition by a strong silver wire suture. A rubber drainage tube was passed into the wound and brought out at the most dependent point at the outside of the leg,

in front of the fibula, to ensure thorough drainage. The wound having been washed out with carbolic acid 1–40, and dusted over with powdered iodoform, was closed with catgut sutures, and dressed as before with iodoform gauze and borated cotton; the leg was then put in a McIntyre splint, and kept in place by a bandage.

For two days after the operation the patient had some elevation of temperature — 101°–102° F. On January 26, some staining of the dressings appearing, they were removed. The wound looked well, the lower part suppurating a little. Two days later the discharge was very profuse, and pus had burrowed almost as far as the ankle between the skin and fascia. This was apparently caused by the breaking down of the blood clot produced by the bruising at the time of the accident. Free incisions were made, and drainage tubes inserted, and the burrowing of pus was thus arrested. By the 3d of February the wound was suppurating freely, the stitches had given away, and bare bone could be seen and felt through the wound. The wound had always been sweet, and the temperature, after the first three days, had never reached 100° F. Owing to the profuse suppuration the dressings were changed every other day, and the wound washed out with 1–40 carbolic acid solution.

The following note was made on February 15: "Patient going on well; discharge much lessened, some large shreds of sloughy fascia having come away from the deeper parts. The bare bone is becoming covered with granulations. The silver wire which united the broken ends of bone gave way some days ago, but is still holding a little, and helps to keep the fragments in position. Temperature for the last week has been 100° F. at night, and 98½° F. in the morning. Appetite fair, and general condition good. Takes a pint of claret daily."

From this time the case progressed most favorably, and the temperature soon became perfectly normal. For some time there was free suppuration, and many sloughs of cellular tissue came away, as did also several pieces of dead bone.

On March 15 the silver wire was removed, and the drainage tubes were dispensed with, only a small sinus being left at the site of the old wound, through which some bare bone could still be felt. Several small pieces of dead bone came away on the 30th of March, and also one of the silk ligatures which had been placed on the anterior tibial artery. There was now firm union of the bones.

The man was about on crutches early in April, and seemed to be going on well, when, crossing the ward one day, he slipped, fell and re-fractured his tibia. He was immediately put to bed, the splint re-applied, and the wound, from which there was a good deal of bleeding, dressed as before. The leg now became much congested, swollen and painful, but in a day or two these symptoms subsided.

By the end of May the bones had again united, and although there was still a small sinus, no bare bone could be felt. He was discharged from Hospital June 28, 1884. When seen in July, he was walking about with a stick. The wound in the leg had completely healed, and he said that he could walk a mile without much difficulty, and that his condition was improving daily.[1]

Ligature of the anterior tibial artery is an operation which is rarely called for. The low operation is comparatively an easy one, but the high operation, owing to the depth at which the vessel is placed, presents many difficulties, and is rarely performed except on the dead subject. In the case narrated above, the great depth of the vessel, and the narrowness of the space in which it lay, as well as the infiltrated condition of the neighboring tissues, made the operation a most tedious and difficult one, but, on the whole, fewer difficulties were encountered than I expected. As I remarked in narrating the case, I was unable to satisfactorily follow the line of division between the anterior tibial and long extensor muscles, so reached the vessel by separating the anterior tibial muscle from the bone; in this way the artery was easily seen, and the advantage of having one side of the wound bounded by bone and thus, so to speak, fixed, was evident, for, only one retractor being necessary, more room was obtained.

Laceration of the main arteries in the leg, due to fracture, is not a common injury. Dupuytren, in twenty-three years, saw seven cases of diffuse aneurism due to fracture of the leg, and advocated ligature of the femoral, in preference to amputation, in such cases. This procedure Dupuytren advocated in fractures, both simple and compound, where the artery was wounded and a diffuse aneurism had formed.[2]

Erichsen (Vol. I., p. 252, 2d ed.) says: In most cases it is not practicable to carry out the instructions of some surgeons, to enlarge the wound and attempt to tie the artery where it has been injured, as the surgeon would have to grope in the midst of bleeding and infiltrated tissues, and would experience the greatest possible difficulty in finding the wounded vessel,

[1] The patient was exhibited to the members of the Association at the August meeting.

[2] Mr. Guthrie (*Wounds and Injuries of Arteries*, 1830) strongly condemns the proceeding of Baron Dupuytren, and insists on ligature of the vessel at the injured point. John Bell (*Principles of Surgery*, Vol. IV., 1826) advocates the same practice.

after a search which would materially tend to increase the disorganization of the limb. If pressure fails, and the artery wounded be deep, he advises immediate amputation.

Frank Hamilton says very little about wounds of arteries in fractures; he merely remarks (p. 69, 6th ed., 1880): "Ruptured arteries, if within reach, ought always to be tied; and if arteries situated remote from the surface bleed freely and for a long time, we may make some effort to find the open mouths in the wound; but in this we rarely succeed, nor is it safe generally to trust to the ligature of a main branch which supplies the part. Fortunately, this bleeding, although at first profuse, generally ceases in a few hours under the steady employment of cold lotions, moderate compression and rest. If it does not, the chances are the case will call for amputation."

Agnew (*System of Surgery*, Vol. I., p. 997), in speaking of hemorrhage in fracture of the leg, says: "If it is at the upper part of the leg, and the bleeding is persistent, we have but one recourse—amputation."

In rupture of the tibial arteries in simple fractures of the leg, Mr. T. Holmes (*System of Surgery*, Vol. III., 1883, p. 86) does not advise surgical interference, and says that, as a rule, these cases do well if treated by position, rest, and light and even compression. In compound fractures he lays down the general rule that the wound must be enlarged, and the wound of the vessel treated, irrespective of the fracture.

Petit, in a case of simple fracture with wound of the anterior tibial and the formation of a traumatic aneurism, cut down and successfully tied the bleeding vessel.

Verneuil, in 1859, made use of a different method of treatment; he compressed the femoral on the pubis by the finger and with bags of shot. The successful case reported by him was rupture of the anterior tibial with simple fracture of the bones.

Vallette obtained a good result by the same means in a case of compound fracture of the leg with wound of the artery.

In cases of simple fracture with wound of the artery, rest, position, even pressure, and, if this fails, compression of the femoral are, no doubt, the best means to first employ, a compound fracture being thus avoided. Many successful cases have been reported where there was no surgical interference.

When, however, there is already an external wound communicating with the fractured bone, it seems to me that the simplest, surest and best practice, especially in these days of Esmarch's bandage and antiseptic surgery, is to enlarge the wound and search for the bleeding-point, as I did in my case. If we delay, the chances are that the limb will have to be amputated. Compression of the main artery, in a limb whose vitality is already impaired by severe injury, offers no special advantages, delays union, and may lead to serious consequences. Dr. Lidell, in his valuable article in the *International Encyclopædia of Surgery* on "Injuries of Blood-vessels," tabulates sixteen cases of wounds of arteries of the leg treated by various methods. In three cases ligature was applied to the wounded vessels, and two died. In three cases where compression of the femoral was employed all recovered. The cases of ligation, however, were before the days of antiseptic surgery, so Dr. Lidell's condemnation of ligature in these cases does not hold.

Had I to treat a similar case, I should employ the same method as being the most direct and certain, and quite as safe as any other.

NOTE.—Since writing the above I have seen another case of rupture of the anterior tibial artery. This occurred in a patient in the Montreal General Hospital, under the care of Prof. T. G. Roddick, to whom my thanks are extended for the courteous manner in which he has allowed me to make use of this case.

The case was one of injury received while coupling cars. There was a simple fracture of both bones of the leg, high up, and when patient was admitted into Hospital, two days after the accident, his limb was enormously swollen, discolored, painful, and cold in parts. The swelling fluctuated freely, especially below the knee. The posterior tibial artery was felt pulsating behind the internal malleolus, but the anterior could not be made out. The swelling increasing rapidly, and the general condition of the man being unfavorable, Dr. Roddick, though suspecting rupture of the anterior tibial artery, wisely decided on amputation, because of the obscurity of the case, and the unfavorable condition of the limb, which was gangrenous in parts. The limb was removed, and the man recovered without a bad symptom. On examining the amputated limb it was found that there was complete rupture of the anterior tibial vessels where they passed through the interosseous membrane; the upper end of the artery had retracted through the torn membrane, and was found, only after a careful search, imbedded in infiltrated muscle; the lower end was some two inches distant from the upper. There was an oblique fracture of the tibia at the junction of the middle and upper third, and fracture of the fibula through its neck. The vessels had evidently been ruptured by the tearing of the interosseous membrane, and were clearly not injured by the fractured bones. Had ligature been attempted in this case, failure to find the upper end of the wounded vessel would have resulted, and amputation would have been necessitated under much less favorable circumstances.