

Anwendung dieser Grundsätze werdet ihr den Kriegern unendliche Schmerzen und dem Staate Millionen ersparen.'

Von Kern's method, which was essentially water dressing—a septic dressing—and which I mention chiefly as a matter of history, was adopted by VON WALTHER in Bonn, and by FRITZE in Prague. It was brought to England more especially by LISTON, and up till 1860 was pretty generally adopted in this country.

It did not spread much in France; and here is ROCHARD'S<sup>1</sup> explanation, which is well worthy of careful attention: 'Si ce mode de traitement, si rationnel et si économique, n'a pas pu se généraliser en France, cela tient surtout aux conditions hygiéniques des hôpitaux de nos grandes villes. Les Anglais, plus favorisés que nous, ne voient pas l'infection purulente incessamment suspendue sur la tête de leurs malades, et c'est cette menace qui a de tout temps préoccupé les chirurgiens de Paris. *Les pansements à l'eau ne leur ont pas offert contre elle une garantie suffisante; il fallait des préservatifs plus certains,*<sup>2</sup> ou qui du moins parussent l'être, et à l'époque à laquelle nous nous reportons (1860) ils se livraient à cette recherche avec une ardeur et une fécondité d'imagination des plus louables.'

In the further history of this subject we must, up till quite recent times, confine our attention to the progress of wound treatment in other countries. In England, where better hygienic conditions prevailed, this subject was almost entirely neglected; and the chief aim of the surgeon was to perfect the methods and instruments for operating, and to attain great speed and dexterity in the performance of operations.

<sup>1</sup> *Histoire de la Chirurgie Française*, 1875.      <sup>2</sup> The italics are mine.

## CHAPTER XV.

## HISTORY OF ANTISEPTIC SURGERY—(continued).

History of the various methods. Incubation: Guyot. Subcutaneous surgery, preliminary attempts: Stromeyer: Dieffenbach: Jules Guérin: Langenbeck: Other authors. Occlusion: Jules Guérin: Chassaignac—Rochard's remarks: Pansement ouaté—Alphonse Guérin, method and results—Ollier. Substitution of various gases for air: Demarquay and Leconte. Open Method: Bartscher and Vezin: Burow: Humphrey. Healing by scabbing: John Hunter: Neudörfer: Bennion: Lister: Bouisson: Bonnet, etc. Irrigation and the water-bath: early history: Jossé: Bérard: Mayor: Amussat: Langenbeck: Valette.

We must now trace the different modes of treatment to which the ideas as to the cause of the bad effects which often follow wounds have given rise.

*Incubation.*

As has been already mentioned, the view for a long time was that it was the cooling and drying effect of the air on the wound which had to be guarded against. Since Priestley's discovery this idea has been more or less abandoned; but in 1835 and later, M. JULES GUYOT<sup>1</sup> studied the effects of cold, and attempted to found a method of treatment on his views. Guyot adduces evidence from Paré and Larrey to shew that wounds cicatrise most rapidly in warm air. Larrey, in his 'Campagne d'Égypte,' states that the wounds in that hot climate cicatrise with astonishing rapidity; and in his 'Campagne d'Allemagne' he makes the opposite remark as to the deleterious effects of cold. Guyot accordingly made a series of experiments on animals, and found that when wounds were kept at a temperature

<sup>1</sup> *Archives Générales de Médecine*, Vol. VIII. 1835. See also *De l'Incubation et de son Influence thérapeutique*, Paris, 1840; and *De la Chaleur dans le Traitement des Plaies*, 1842.

of about 35° C., they healed with great facility, and much more rapidly than similar wounds left exposed to the ordinary temperature.

He applied this method to wounds in man. His object was to surround the part with a uniform and sufficiently elevated temperature (about 36° C., and not below 28°–30° C.) He enclosed the wounded part, without any dressing, in a box, into which a current of warmed air was constantly introduced through a pipe. The box had glass sides, so that the wound could be always seen. This treatment was continued for from ten to twenty days. At first there was a very abundant serous discharge and by-and-by pus. The pus dried up, forming crusts, which were removed every two or three days. Guyot says that wounds thus treated heal more rapidly than by any other method, and also that wounds, such as some forms of ulcers, which refused to heal at the ordinary temperature, healed readily at a temperature of 36° C.

This method only merits the term antiseptic to a limited extent. No doubt the heat made the discharge more concentrated, and possibly unfit for the growth of organisms, while at the same time mechanical rest was obtained. Nevertheless, the method did not fulfil the expectations of its introducer, and, partly for that reason, and partly also because it was so unwieldy, it has been completely abandoned.

#### *Subcutaneous Surgery.*

A much more important outcome of the idea of the bad effects of the gases of the air was, however, the introduction of the SUBCUTANEOUS method—a method which has maintained its place up to the present time and will probably always continue to do so to a certain extent.

Already in the last century, and indeed earlier, the foundation of this method had been laid. DELACROIX and ANEL, by their methods of aspirating cavities containing blood or pus, and more especially ABERNETHY, by his valvular incisions into abscesses and into joints, had carried out the principle more or less completely. Nevertheless it is to the introduction and practice of subcutaneous tenotomy that we owe the spread of the subcutaneous method.

In 1807, Sir CHARLES BELI advised the subcutaneous division of the ligaments by means of a cataract needle in cases of irreducible dislocation of the thumb. There seems to be no evidence, however, that he ever put his suggestion into practice.

The first real attempt at conducting an operation under the skin was made by DELPECH in 1816.<sup>1</sup> Delpech, in spite of what has been thought and said to the contrary, performed the operation of tenotomy in this way in order to avoid the contact of the air with the divided tendon. Of the air he says: 'Cet agent était au moins un stimulant de plus qu'il paraissait prudent d'éviter; c'est dans ce dessein que nous avons pratiqué notre opération, de manière à ne point intéresser la peau qui recouvre le tendon.' The old method of dividing tendons was to make a longitudinal incision over the tendon, expose and divide it. Delpech made a small incision on each side, introduced a narrow knife, and divided the tendon without exposing it. Unfortunately suppuration occurred in his first case.

Probably in this same year BRANSBY COOPER divided the tendo Achillis subcutaneously.

In 1817, BENJAMIN BRODIE applied the same principle to a case of varicose veins, which he divided subcutaneously. This operation was at a later period revived by RICORD.

ASTLEY COOPER, probably looking at division of tendons from the old point of view, objected to subcutaneous tenotomy, but he recommended subcutaneous division of contracted palmar or plantar fascia, and in 1822 BRANSBY COOPER performed such an operation. Neither surgeon makes any remark about the principle on which these operations ought to be performed.

In the same year (1822) DUPUYTREN performed the first subcutaneous myotomy. The muscle operated on was the sterno-mastoid. The account of the operation is not published, so far as I can find, by himself, and the accounts given in various works differ much. It seems, however, to have been a case of contracted sterno-mastoid in a female, and Dupuytren divided the muscle subcutaneously, not from any idea of excluding the air, but simply with the view of avoiding a large scar. Indeed his incision seems to have been more than an inch long, so that only part of the operation was done

<sup>1</sup> *De l'Orthomorphie, &c.*, 1828–29.

subcutaneously, and it was not at all performed on the subcutaneous principle.

In 1830 DIEFFENBACH<sup>1</sup> speaks of Dupuytren's operation as having been frequently performed with success, and SYME, among others, repeated it in 1832 strictly subcutaneously.

The various attempts at subcutaneous surgery which I have mentioned remained, however, in the main fruitless, till STROMEYER, and after him DIEFFENBACH, took up the subject.

STROMEYER seems to have performed his first operation in 1831, and his first publication was made in 1833.<sup>2</sup> He only operated on tendons. The object of his operation is distinctly stated to be the exclusion of the air by making as small an incision in the skin as possible. He looked on suppuration and sloughing of the tendon as the consequences were air admitted. He improved Delpech's operation by omitting one of the incisions, simply making a single incision of sufficient size to permit the introduction of a narrow-bladed knife. In his 'Beiträge zur operativen Orthopädie,' published in 1838, he narrates a great number of cases of division of various tendons throughout the body.

DIEFFENBACH, who had been performing Dupuytren's operation pretty extensively, no sooner heard of Stromeier's results, than he at once adopted the practice, and his publication in the 'Archives générales de Médecine,' in 1835, narrating numerous cases, excited the greatest interest, and along with Stromeier's results firmly established the method.

The most important writer on the subject, though in no way possessing any claim as its originator, was undoubtedly JULES GUÉRIN. Though, as I have said, not possessing any claim as originator of the method, he was the first to study, and describe accurately, so far as the state of science at that time permitted, the principles on which subcutaneous surgery was based, and thus he paved the way for the more general application of these principles. In his 'Méthode souscutanée,' published in 1841, he describes his views in detail, and gives a number of results. His first operations were performed in 1836, and in these he remarked the constant absence of in-

<sup>1</sup> See also *Ueber die Durchschneidung der Sehnen und Muskeln*, 1841.

<sup>2</sup> *Ueber Durchschneidung der Achilles Sehne*. *Rust's Magazin*, Bd. 39.

flammation, and the rapid organisation of the wound. Comparing his results in this respect with the details given by Dieffenbach, Lisfranc and others, in which the frequent occurrence of inflammation and abscess is mentioned, he came to recognise the principles of subcutaneous surgery to the full, or at least so far as they could be recognised in the then state of science. He was thus led to establish the following law: 'That all wounds made subcutaneously, whatever be their seat and the nature of the tissues divided, possess the property of subcutaneous injuries of tendons, that is to say, do not inflame nor suppurate, but undergo immediate organisation.' Both on man and animals he found that the most extensive wounds, such as division of the great mass of the dorsal muscles, were not followed by any trace of inflammatory symptoms.

He indicates some of the applications to which this principle of making the wound under the skin may be applied. Of these the following are the most important: Incisions into serous pouches; subcutaneous incision of commencing inflammatory swellings; subcutaneous removal of exostoses, leaving the detached portion to be absorbed, or to be removed after healing of the bone; opening chronic abscesses; numerous myotomies and tenotomies of all kinds.

About this time various operations other than tenotomy were performed subcutaneously. Thus BARTHÉLEMY, MALGAIGNE and VELPEAU (the two former with success) opened ganglia subcutaneously. M. RICORD, as we have mentioned, operated subcutaneously on the veins in varicocele. He preferred to ligature them.

DUPRESNE CHASSAIGNE, and about the same time, or somewhat later, GOYRAUD and SYME, proposed and carried into effect a subcutaneous method of removing loose cartilages from the knee-joint, by dividing the capsule subcutaneously, expelling the cartilage, and leaving it in a bed in the cellular tissue, from which it could be extracted at a later period.

In England, WILLIAM ADAMS<sup>1</sup> published a pamphlet on subcutaneous surgery in 1857, in which he shews himself a strong advocate of the subcutaneous method. In support of the generally accepted views as to the principles of subcutaneous

<sup>1</sup> *Subcutaneous Surgery*, 1857.

surgery, he quotes the following passage from PAGET: 'For of the two injuries inflicted on a wound, the mechanical disturbance of the parts, and the exposure to the air of those that were covered, the exposure, if continued, is the worst. Both are apt to excite inflammation; but the exposure excites it most certainly, and in the worst form, i.e., in the form which most delays the process of repair, and which is most apt to endanger life.'

As pointed out by Dr. Henry Dick,<sup>1</sup> Jules Guérin, by his operation for removing exostoses, must be looked on as the first to operate subcutaneously on bones. LANGENBECK, however, is the man who has popularised subcutaneous osteotomy. The idea first occurred to him during the Schleswig-Holstein war, in 1848, where he had introduced small straight pointed saws for section of bones. His first operations were not strictly subcutaneous, but in 1852 he practised subcutaneous operations for ankylosis of the knee, and he soon extended his method to the division of rickety bones. MEYER seems to have operated more perfectly for rickety deformities. GROSS, in 1859, performed osteotomy for deformity of the femur. This operation was followed by abscess at the seat of fracture, but the patient made a good recovery.

In 1869 ADAMS<sup>2</sup> extended this principle to division of the neck of the femur for ankylosis of the hip-joint.

Quite recently OGSTON has divided the internal condyle of the femur subcutaneously in cases of genu valgum. Ogston however always operates with strict Listerian precautions, but other surgeons still practise the operation subcutaneously, without bad result.

#### Occlusion.

Attempts have been made at various times to apply the supposed subcutaneous principle of the exclusion of gases in the treatment of wounds, not in the first instance subcutaneous. Thus have been produced the various methods of treatment by *occlusion*. We have already become acquainted with the at-

<sup>1</sup> Adams' *Subcutaneous Surgery*.

<sup>2</sup> *A New Operation for Bony Ankylosis of the Hip-joint*, 1871

tempts of the ancients to exclude the air, by applying masses of dressings. I do not refer to these, but to the more recent attempts which have been made since the principles of subcutaneous surgery have been discussed.

In 1839, in a memoir communicated to the Academy on the subject of subcutaneous surgery, JULES GUÉRIN ascribed its good results to the exclusion of the air from the wound. He further enunciates as a proposition: 'Que les applications du phénomène de l'organisation immédiate des plaies souscutanées sont de ramener toutes les plaies avec libre communication à l'air aux conditions des plaies souscutanées.'

From that time he tried various means for the purpose of converting open wounds into subcutaneous ones, such as the application of goldbeater's skin, caoutchouc, &c.; of these he considers, in 1844,<sup>1</sup> that goldbeater's skin gave the best results. In 1844 LAUGIER also described a similar method of treatment in a paper entitled 'Sur l'heureux emploi du mucilage de gomme arabique et de la baudruche dans le traitement des plaies suppurantes.'

CHASSAIGNAC<sup>2</sup> also brought forward an identical method, and claimed priority over Jules Guérin. Chassaignac used the method in abscesses, as well as in wounds. He held that the walls of abscesses, whether acute or chronic, resembled the surface of a recent wound, and by opening them by a small puncture he hoped to get adhesion of the walls. He covered his puncture with diachylon plaster. (There is here nothing essentially different from Abernethy's method.) Five years later Chassaignac said that this method had been so successful that he had never observed a single case of erysipelas, of phlegmon, or of hospital gangrene, even in the most unhealthy hospitals, under this method. Nevertheless, when he began to work at drainage he readily abandoned occlusion.

Rochard's<sup>3</sup> remarks on Chassaignac's statement are very much to the point, and well worth quoting: 'Ce n'est pas sans quelque étonnement qu'on voit se produire de pareilles assertions à chaque nouvelle méthode qui apparaît. En les prenant au pied de la lettre, on serait forcé d'en conclure que

<sup>1</sup> *Gazette Médicale*, 1844.

<sup>2</sup> *Annales de Thérapeutique*, 1844.

<sup>3</sup> *Histoire de la Chirurgie Française*, 1875.

les accidents consécutifs des plaies doivent être à peu près inconnus dans les hôpitaux de Paris, puisque tous les chirurgiens qui y pratiquent se flattent de les éviter sûrement par la méthode qu'ils ont adoptée; mais on ne sait que trop bien à quoi s'en tenir sur ce point, et quant à ce qui concerne les cuirasses de diachylon, Broca rappela qu'il avait vu mourir d'érysipèle à Lariboisière, et dans le service même de l'inventeur, une femme qui avait été pansée de cette manière, à la suite d'une ablation du sein. Chassaignac, du reste, ne tarda pas à modifier son traitement en y introduisant un élément nouveau, qui absorbe bientôt tout le reste: on comprend que nous voulons parler du drainage chirurgical.'

Collodion was introduced in America in 1848, as an application to the surface of the line of incision.

In 1866,<sup>1</sup> Jules Guérin developed his ideas further, and described a complicated apparatus for the purpose, not only of excluding the air, but also of removing the discharge. He, unlike Chassaignac, had failed in obtaining any very satisfactory results from the methods formerly described, and he thought that this was because, though the impermeable material was closely applied in the first instance, it soon became lifted up by the discharges from the wound, and thus air got in. Then he also feared that by that method there would be accumulations of discharge, and that if these became putrid, their presence would be worse than that of air. I need not enter into a description of his method, which consisted essentially in applying an apparatus fitting the limb closely, and from which the air was pumped out. In this way none of the gases of the air were in contact with the wound, while the discharges flowed freely out. He stated that in cases so treated there had been no inflammation, or the inflammation had been shortened and reduced in severity.

An absolutely identical method was brought forward in 1867<sup>2</sup> by MAISONNEUVE, as something quite new. The only difference was, however, that, instead of pumping out the air once for all, he was continually pumping it out, and he called this 'L'aspiration continue.'

<sup>1</sup> *Gazette Médicale.*

<sup>2</sup> *Comptes-rendus*, Vol. LXV. 1867.

LANNELONGUE also published a method, in which he used a double-walled india-rubber covering, and pumped air into the space between its walls. The inner sac, applying itself closely to the limb and the wound, prevented any air from coming in contact with the latter.

There seems to be no doubt that whatever credit accrues to any one for the introduction of these methods is due to Jules Guérin; and as the logical development of the view that the noxious agents in the air are the gases of the air, these attempts, with their failures, are of great interest and importance.

In spite of the glowing terms in which Jules Guérin spoke of his method, it was not found to be of any use in the hands of others, while, what is of more importance, it broke down in the hands of Guérin himself during the siege of Paris. In a discussion at the Academy of Medicine of Paris, in 1875, on Alphonse Guérin's cotton-wool dressing, Jules Guérin was asked about his results during the siege. He stated that at an ambulance (l'ambulance des ponts et chaussées), to which he was attached, he had treated only wounds by his method, but wounds which would otherwise have led to amputation. He said that his success was great, and that Nélaton, hearing of it, asked him to apply his method to his (Nélaton's) amputation cases. He tried it in three cases, all of which died, just as the amputation cases treated otherwise did. Jules Guérin then says: 'Cette effrayante mortalité avait sa raison dans l'infection générale de l'hôtel, qu'il était impossible d'aborder sans en être averti par une odeur nauséabonde. . . . Je me borne à dire qu'en présence de telles conditions j'ai refusé d'étendre au-delà de ces trois sujets l'application de mes appareils au traitement des amputations pratiquées dans un milieu aussi profondément infecté.' These remarks are very interesting, as showing how useless this method was to protect against such accidents in situations favourable to their development, and also as showing how very little confidence M. Jules Guérin himself had in it when employed under unfavourable conditions.

A more important method of occlusion, and one which yields much better results, is the '*Pansement ouaté*,' introduced by ALPHONSE GUÉRIN in 1871. We have already seen (p. 280

that this is really a method of occlusion, and not an aseptic method, as asserted by its author.

The first publication was made by HERVEY<sup>1</sup> in December, 1871, and several details of the method and results are there given. I shall, however, refer to this paper later, and in the meantime take some facts from BLANCHARD'S 'Thesis,'<sup>2</sup> published in May, 1872.

The mortality during the siege of Paris was excessively great; indeed, Hervey says that from September, 1870, till February, 1871, A. Guérin only saved one case of amputation. Guérin, who had for some time held the view that the cause of pyæmia was a miasm carried by the air to the wound, came to look on this miasm as particulate, though in 1869 he seems to have regarded it as gaseous. Acting on the view that the miasm was particulate, he applied large masses of cotton-wool in the hope of excluding it by filtration. There are two other principles on which this dressing acts, which are mentioned by Blanchard, viz., elastic compression and constant temperature.

In using this dressing, ordinary rolls of cotton-wool are employed, and cotton bandages. The cotton-wool is applied in such mass as to allow the most energetic compression without pain, say from a half to two kilogrammes of the wool. A region more extensive than the wound must be enveloped in it. The two precautions to which I have referred before must be attended to rigorously, viz. (1) the dressing must not be applied or renewed in the ward, but in an amphitheatre or room at some distance from the wards; (2) the cotton-wool ought not to be opened in the wards, because there the air is always more or less contaminated. Let us suppose that we have to deal with an amputation wound. The ligatures having been applied, are cut short; the wound is then washed with tepid water, in order to see the bleeding points, and afterwards with some antiseptic liquid such as carbolic or alcoholic water; the limb is then dried and the cotton-wool is laid over all the surface of the wound, new layers being applied till the stump is completely filled. The limb is now enveloped with rolls of cotton-wool as far as the upper part of the thigh. Then the

<sup>1</sup> *Pansement à l'Ouate. Archives Générales de Médecine*, 1871.

<sup>2</sup> *Etude sur le Pansement ouaté*, 1872.

bandage is applied, at first lightly, but afterwards more and more firmly. When it is sufficiently tight, the cotton-wool will not yield any more, and the note on percussion is tympanitic. If the bandage gets loose, apply a new one. If the discharge comes through, apply more cotton-wool outside the dressing. If the smell is very bad, wash the dressing with camphorated alcohol, or with carbolic acid, or place pieces of camphor in the bed. As a rule the first dressing is changed twenty to twenty-five days after the operation. After removing the external layers, the deeper parts are moistened with water; the wound is then washed with an antiseptic lotion, and a fresh dressing is applied.

The advantages which are claimed for this method are—suppression of pain, absence of traumatic fever, diminution of suppuration, and ease in moving the patient.

Blanchard states that during the first period, i.e. from April to the end of June, 1871, forty-one cases of amputation and resection were treated in this way, and of these seventeen died.

	Deaths
12 amputations of the thigh . . . . .	6
11     "     leg . . . . .	6
6     "     upper-arm . . . . .	1
4     "     fore-arm . . . . .	1
3 disarticulations at the shoulder-joint . . . . .	0
5 resections . . . . .	3
41	17
3 of these cases died of pyæmia.	
2     "     tetanus.	
1 amputation of the thigh, from secondary hæmorrhage after twenty-seven days.	
1     "     septicæmia? no metastatic abscesses;	
1     "     shock.	
1     "     an infant of two months: could not be fed.	

Of the remaining eight fatal cases some were not under A. Guérin's care, and, according to Blanchard, were not well attended to. Others died of pyæmia, even after they left the hospital.

In the following period there were:—

1 amputation of the thigh . . . . .	Healed.
1     "     great toe . . . . .	" "