

is always alleviated by oils. Hence, oils alleviate heat or heat-born fever. (p. 1127.)

The meaning of a somewhat obscure passage in the Susruta-Samhita is made clear by the following aphorism, illuminated by the translator's note:—

Women that are beautiful and of full-grown limbs, and that are endued with youth, speedily alleviate by the heat that is in their bodies in consequence of their youthfulness, cold fever, if only they embrace the person that is afflicted therewith.

Says the translator:—

The reading I adopt is *Charupachitagatrah*. Some editions read *Pavitra Charugatrah*. '*Upachitagatra*' means full-grown, that is, of deep bosoms and symmetrical proportions. (p. 1140.)

That measures other than drugging should also be employed is evident from the following remarks:—

The wearing of such gems as are auspicious or such herbs as are so, or of poisons, as also the use of such medicines as have been classed as 'Agadas' (destructive of poisons), checks intermittent fevers. By worshipping, with devotion, the supreme deity, Mahadeva, with (his spouse) Uma and his attendants (*viz.*, Nandi and others) as also the class of female deities called the *Matris* (or mothers) *viz.*, Brahmi, Maheswari, Vaishnavi, Aindri, Varahi, Kaumari, Kauveri, and Charchika, one is speedily freed from intermittent fever. By chanting for his praise the thousand names of Vishnu who is possessed of a thousand heads, who is lord of all creatures mobile and immobile, and who is endued with omnipotence, all kinds of fever become alleviated. By worshipping Brahman (the Grandsire of the Universe) the twin Aswins, Indra, the eater of sacrificial libations (*viz.*, Agni), the mountain Himavat, Ganga, the Maruts, and one's tutelary deities, one succeeds in subjugating all kinds of fever. Through devotion (reverence) to parents, worship of seniors and preceptors, the practice of 'Brahmacharyya', austerities, truthfulness of speech, observance of vows and religious rites involving self-denial, silent recitation of sacred texts, etc., performances of homa, making of gifts, listening to the recital of Vedic mantras, and the sight of righteous persons, one becomes quickly freed from (intermittent) fever. (p. 1145.)

XXIV.—Few of our readers will understand clearly what the condition known as Rakta-pitta (blood-bile) is, and we confess that we share this want of enlightenment, which is a pity for the condition is said to be so serious that:—

If checked at the outset, the following diseases may manifest themselves, *viz.*, suppression of the voice, ozaena, swoons, disgust for food, fever, abdominal and other tumours, enlargement of the spleen, epistaxis, leucoderma, strangury, various kinds of leprosy, piles, erysipelas, loss of complexion, fistula-in-ano, and dulness of understanding and the senses. (p. 1153.)

There are seven holes in the head (*viz.*, the two ears, the two eyes, the two nostrils, and one mouth), and there are two holes in the lower part of the body. That blood-bile which has its course upwards is curable; that which has its course downwards is suppressible; while that which has its course both upwards and downwards is incurable. (p. 1152.)

That hæmorrhage may be meant has occurred to us, but this suggestion, although it is backed

up by the Ayurvedic literature, seems to be invalidated by the description of the condition, to which we would advise the eager reader to turn, as it is too long to quote. At any rate, whatever the condition described as blood-bile may be, its treatment has been laid down by the Sage *in extenso*. We quote only these passages:—

If the bowels are constipated of persons afflicted with blood-bile, the flesh of hares or rabbits, cooked with the potherb called *Vastuka* (*Chenopodium album*), proves beneficial. (p. 1156.)

Prapaundarika (the root-stock of *Nymphaea lotus*), liquorice and honey, dissolved in the expressed juice of horse-dung, or the roots of *Yavasa* (*Hedysarum alhagi*) and those of *Bhringaraja* (*Verbesina calendulacea*) reduced to paste and dissolved in the expressed juice of cow-dung, form good 'peyas' (drinks) that are alleviative of blood-bile. Each of these should be mixed with water in which (sundried) rice has been washed. Or, the expressed juice of cow-dung or horse-dung, mixed with honey and sugar, may be licked. (p. 1159.) The flesh of fowl and animals, having their habitat in the wilderness, mixed with honey, should be licked. When the blood of the patient becomes collected in ducts, he should then lick the dung of doves, mixed with honey. (*Ibid.*)

Here ends our study of the Charaka Samhita. It is abundantly clear from the extracts given that Charaka was not of the height of Susruta, although in the following anonymous verse his superexcellence in therapeutics has been immortalised:—

In the causes of disease, Madhava; in general principles, Bagbhata; in anatomy, Susruta; in treatment, Charaka.

We hope in another article to discuss the Ayurvedic system of medicine as taught and practised in this twentieth century.

A NEW TECHNIQUE OF HEART MASSAGE WITH A CASE OF RESUSCITATION.

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AND REMARKS BY

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In reviewing the literature of heart massage we find that this procedure has repeatedly been done, and in many instances with complete success; but in the career of any one surgeon, however long it may be, the opportunity will present itself but once or twice, if at all.

The first reported case was not until 1898 and the first reported complete success was as late as 1902, by "Starling and Lane," so that even now from a clinical point of view heart massage may be considered of fairly recent origin and application. Green (1) in 1906 reviewed the literature and gave an abstract of forty published cases. Many cases have since been reported, but from

the leading Medical Journals (2) of many countries it would be difficult to collect more than ten successful cases in the last ten years.

Early operation.—Judging by the reported cases complete success depends upon prompt operation, only 6 to 8 minutes after heart stoppage. Mollison's case (3) made a good recovery after an interval of 13 minutes, but showed profound mental symptoms for several days. In view of modern physiological science and surgical skill, all will agree that heart massage should be done in cases of suspended heart action following an anæsthetic, which have failed to respond to the ordinary methods of resuscitation, and as these methods are in many cases of doubtful value they should not be relied upon. Schiff, as early as 1874, demonstrated by chloroforming dogs until the heart ceased to beat, that artificial respiration and stimulation by electricity were of no avail in restoring cardiac action, but that massage, directly applied, restored it after an interval as long as 11½ minutes; furthermore that the shorter the interval of time that elapses before applying massage the higher the percentage of success.

The methods employed.—There has been a gradual evolution of methods of heart massage.

1. *The thoracic method.*—In this a flap consisting of the thoracic wall over the cardiac area is cut and turned back, the base being either inwards or outwards. The costal cartilages are cut through, the pericardium exposed and sometimes opened. The proceeding is forcible, and must accentuate shock. Many intercostal vessels and nerves are involved. Pneumothorax has occurred in several of the published cases, and it is not surprising that the successes were almost *nil*, and that the method has been abandoned.

2. *The abdominal route, subdiaphragmatic.*—It is a familiar fact that some pressure upon the heart can be effected from the abdominal side of the diaphragm, so it was a natural thought to apply such pressure, when the heart's action was arrested during the progress of a laparotomy operation. When promptly applied the conditions were favourable to resuscitation.

This method has probably been used at an early stage in many unpublished cases, and the promptitude has won success.

It is also possible that some of these cases might have recovered without massage. It has been demonstrated that in a child whose thorax is small and tissues elastic, compression is possible though difficult; but in the adult it would rarely be effective, as only the cardiac apex can be reached, and it slips away upward. Hence the need for the trans-diaphragmatic method to reach the base of the heart where the auriculo-ventricular nerve ganglia are situated.

Heart massage is a complex performance. In its lightest rhythmical form it may undoubtedly

stimulate the cardiac nerves, but a gentle squeeze of the organ does more; it empties the blood from the flaccid, perhaps distended, auricles into the ventricles, the blood current acts as the physiological stimulus to these, and then the coronary arteries supply fresh blood to the cardiac muscle; thus a healthy circle is re-established, and is reinforced by the artificial respiration, which should be carried on the whole time.

3. *The trans-diaphragmatic abdominal route* has been several times adopted, probably only unsuccessfully because too late. It need not be condemned on the statistics hitherto available. As above pointed out, the successful cases of sub-diaphragmatic massage were those in which an abdominal operation was being performed at the time of the heart failure. It was the facility and the promptitude which secured the success. The diaphragm was only incised in the late stages of the worst cases, as for example Green's second case, in which an hour after apparent death from diphtheritic syncope, he incised the pericardium through the diaphragm, and by massage started a few contractions. What more could have been expected? or Maucclair's cases after tracheotomy and other measures carried out for thirty minutes?

The trans-diaphragmatic incision seems in these cases to have been approximately antero-posterior, splitting the muscle fibres and gaining direct access to the pericardium. There is some difficulty in executing this manœuvre on account of the left lobe of the liver and the stomach; there is also some risk of injuring the musculophrenic artery and having concealed hæmorrhage; and the suturing of the opening in the pericardium and diaphragm is as difficult as it is also necessary.

Hence the advantage of the horizontal incision behind the left costal margin which we here describe.

Description of the new technique.—The abdominal incision is made four inches long in the median line extending from above the umbilicus well up into the xipho-sternal notch. The left costal cartilages are well retracted, bringing the anterior diaphragmatic insertion well into view. There should be a pillow under the waist. A two-inch incision beginning one inch to the left of the median line carried outwards behind the costal margin cuts the fibres of the diaphragm near their insertion. A blunt instrument pushed in opens the pleural cavity, and the opening is rapidly dilated with two or three fingers of the right hand, so that the whole hand can then be passed into the thoracic cavity anterior to the pericardium. The hand is passed upward, the thumb behind the sternum and the fingers embracing the entire organ in the pericardium. The thumb compresses the right auricle and ventricle, and the base of the heart is effectively

massaged. No vessels are injured in this incision as the superior epigastric artery is internal to the incision and passes into the rectus muscle, and the musculo-phrenic branch enters the diaphragm through the cellular tissue behind the 8th or 9th costal cartilages and passes backwards, deeper than the incision. The liver and stomach even if prominent offer no obstruction to this route, nor is the pericardium in risk of being opened. During the massage the parts can be pressed round the wrist of the operator so that air is not sucked in, and there is no tendency to collapse of the lung.

Closure.—The incision is easily closed and made air-tight. The costal margin is retracted and the cut diaphragm pressed up while a continuous catgut suture is inserted by means of a strong curved needle and holder. While this is being done the assistant can make rhythmic pressure during inspiration, relaxed during expiration, so that any contained air may be expelled and no more be allowed to enter. The abdominal wound is then closed in the usual way.

Abstract of a case.—Pte. M. P., aged 37, was severely wounded on October 26, 1917, both knee-joints being involved. There was prolonged treatment and several operations. By March 1918, both knees were healed, the left knee ankylosed, and he was allowed up. A week later some vague shifting abdominal pains began to appear, with tenderness and some rigidity, first on the right flank then on the left, and an irregular temperature. He also had a cough. Diarrhoea alternated with constipation. A week later he had retention of urine, and the Orderly Officer passed a catheter; there was some pyuria and diminished quantity of urine. No casts were found. He was thin and losing ground; with a blood-pressure of 155 mm. and leucocyte count 12,000. In consultation it was decided to perform laparotomy to determine the presence of any abdominal abscess, and the condition of the kidneys; some metastatic sepsis being suspected.

Operation.—On March 30, after a preliminary hypodermic of atropine $\frac{1}{100}$ and morphia $\frac{1}{4}$ th, chloroform was slowly and carefully administered by the open method, by an experienced anaesthetist.

TIME TABLE.

11-45 A.M.—Began anaesthetic.

11-55 A.M.—Almost under: Anaesthetist asked the surgeons to wait a minute as the patient was not yet fully relaxed.

11-58 A.M.—Respiration ceased, pupils dilated, and colour changed to waxy. No pulse could be felt.

Artificial respiration at once begun, with rhythmical traction of his tongue, and head of table lowered.

12-0 A.M.—Strychnine and ether hypodermically. Auscultated, no heart sounds.

12-10 P.M.—Artificial respiration pumps air well into chest, but nothing spontaneous, eyes staring open, pupils dilated and insensitive.

Capt. Bost made a four-inch epigastric incision, passed his gloved hand in, and pressed on the heart through the diaphragm. The heart felt quite flaccid and slipped upwards so that only the apex could be pressed, and there was no response.

12-15 P.M.—Artificial respiration continued, and some rhythmical heart pressure first by Capt. Bost then by Major Neve.

12-20 P.M.—The case appeared hopeless, but Capt. Bost proposed to insert his hand into the thorax, and did so incising the diaphragm as described above; he passed his hand up under the sternum, outside the pericardium to the base of the heart, which he could then completely grasp, and began slow pressure.

12-25 P.M.—At first the organ was completely flaccid; after perhaps 12 seconds a sort of muscular twitch was felt, followed by a very feeble contraction which in a few more seconds became strong and regular.

12-30 P.M.—Pulse felt, colour returned, and massage stopped, injected pituitin: artificial respiration continued. The diaphragm was sutured.

A rapid exploration of the abdomen was made by Major A. Neve. There was some free clear fluid, and no pus, nor any inflammatory adhesions. The kidneys felt large. The wound was sutured and dressings applied.

12-45 P.M.—Bandaging completed. Breathing slowly. Strong visible cardiac pulsation.

1-15 P.M.—Back in ward. Blood pressure 145 mm.

1-30 P.M.—Continuous proctoclysis was begun. He lay comatose.

March 31st.—Still in same state, pupils medium size, sluggish.

April 1st.—Still same state, has had no convulsions. Has slight emphysema over left chest. Takes only one or two ounces of peptonized milk at the time as he swallows badly. Pulse still strong and rapid.

April 2nd.—Emphysema has disappeared. He is more comatose. Died at 5-30 P.M., 77 hours after the operation.

Post mortem on April 3rd.—The laparotomy wound was well closed and quite clean, also the incision in the diaphragm, which was quite airtight. There was no pneumothorax, and the chest looked healthy, except some septic metastatic foci at the base of both lungs. The pericardium and heart looked healthy. Both kidneys showed small calculi and pyelo-nephrosis. The left ureter was partly blocked by the pus and gravel at the bladder orifice.

Remarks by Major Neve.—The striking success of Capt. Bost's procedure in this case as regards the resuscitation of the heart's action after 25 minutes' absolute cessation proves the value of efficient heart massage. Without that the man was already dead. It was clear to all the five surgeons who were present, that we were dealing with a case of primary heart failure under chloroform narcosis, due to the toxæmia of the patient's disease.

We could carry on the respiration without his muscles, but not the circulation. Sub-diaphragmatic massage was inefficient, because it did not stimulate the cardiac nerve ganglia at the base; but after incising the diaphragm and grasping the base of the heart, ten or twelve gentle squeezes started regular contractions, and the strong apex beat became visible to all onlookers. We have discussed the technique elsewhere. The incision was one which Capt. Bost had previously planned on a cadaver.

It is unfortunate that this method was not adopted a few minutes earlier.

CONCLUSIONS.

1. We consider that this case illustrates the unique value of heart massage, and that the human heart can be resuscitated after a variable length of time, in this instance after 25 minutes.

Nothing else could have re-started the cardiac action in this case.

2. *Type of cases for massage.*—All cases of suspended heart action following an anæsthetic, regardless of theoretical, etiological factors after a certain interval. Cases of asphyxia should also fall within this group.

3. *Length of interval.*—This should probably vary with individual cases, but should rarely be done under 5 minutes (unless the abdomen be already open) and certainly after 8 minutes, though a longer interval need not bar the operation.

The simpler methods of resuscitation, such as artificial respiration, tongue traction, sharp percussion over the cardiac region, and inversion of the patient, should begin in the first minute, but not be uselessly persevered in to the neglect of more efficient measures.

4. Sub-diaphragmatic massage may suffice, especially in children, and if very promptly undertaken. But if only the apex is reached and the

heart remains unresponsive, the diaphragm should be incised and the base of the heart be massaged without further delay.

5. That no surgeon, even if relatively unskilled, should be content to abandon a case without giving his patient the benefit of direct cardiac massage.

6. We claim that this new technique offers a simpler method of approach and is a decided improvement upon all other ways of doing direct heart massage, as it involves less risk of hæmorrhage, trauma and shock, and can subsequently be more quickly and satisfactorily closed.

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CARDIAC MASSAGE IN CHLOROFORM POISONING.

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As these cases are not very common, a short account of the following may be of some interest. The patient, Private Rarshid Saleh, aged 24, was admitted into No. 34 General Hospital on the 4th May, 1918, convalescent from dysentery.

He was feeble and emaciated and had slight attacks of diarrhœa off and on. His pulse and temperature were practically normal. On the 26th May, 1918, the patient developed signs of early ascites.

On the 13th June, 1918, the abdomen was sufficiently tense to cause considerable respiratory difficulty. At this time we had in the hospital a series of cases of ascites of obscure origin, and as the ascites had rapidly recurred after tapping or simple laparotomy in some of the other cases, I decided to perform lymphangioplasty on this case.

At 10 A.M. on the 13th June, 1918, the patient was anæsthetised with chloroform.

After I had applied the sterilised towels to the abdomen, the anæsthetist informed me that the patient had stopped breathing. It was evident, from the colour of the mucous membranes and the absence of a pulse at the wrist, that the heart had stopped. This was confirmed by means of the stethoscope. Artificial respiration was tried for two to three minutes with no result.

As the operation proposed, namely lymphangioplasty, involved a laparotomy in any case, I decided at this stage to open the abdomen and try the effect of cardiac massage, while Captain