or silkworm gut may be placed round the anterior teeth, as shown in Fig. 4. This affords the patient much relief, and is much more reliable than a four-tailed bandage.

FIG. 4.—Intermaxillary lacing, showing method in which the principle may be used as a temporary measure to prevent the depression and falling back of the chin.

The method may also be used as an adjunct to the open surgical methods of wiring the fragments, when fixation of the temporo-maxillary joint may be desirable for a time at least. Even if all teeth are present, the patient does not suffer from inability to take sufficient nourishment. There is always sufficient space between the teeth and behind the last molars for liquid food to pass. Patients do not suffer very much from a diet of milk, porridge, arrowroot, soup, etc., for five or six weeks. In a similar way a patient can use an antiseptic mouth-wash and use the tongue as a toothbrush on the lingual surfaces of the teeth.

The vertical wire ligatures may be left on for three weeks, after which in some cases they may be removed and passive movements allowed; they may be replaced by silk ligatures, as being easier to apply. A vertical ligature should be continued until the sixth week, especially during the time or times the patient sleeps, in order to prevent yawning, as the latter does far more harm than even a slight amount of mastication.

Another method of intermaxillary lacing is by means of "Angle's bands." These bands, either made or procured, are clamped to the teeth by means of a thread and nut. There are studs on the buccal surfaces round which ligatures are passed in order to bind the two jaws together.

Absence of teeth is no bar to intermaxillary lacing. When teeth are absent or so carious as to be useless for retention of ligatures I proceed as follows:

1. Holes are drilled through the jaw at the level of the roots of the teeth, and about three-quarters of an inch away from the ends of each fracture line. Stout silver wire is then passed through the holes and the fragments approximated if possible.

2. Further holes are drilled in the region of the lateral incisors of both upper and lower jaws, or other suitable positions, according to the site of the fracture, and a silver wire passed through both. The mandible is brought into the normal or desired position, and the wire tightened by twisting. The upper jaw is thus utilized quite satisfactorily for immobilizing the lower jaw.

3. Submandibular Screws and Wire Splint.

In cases in which none of the other above described methods are available for some reason, such as an extremely septic mouth or the loss of much of the alveolar processes, the following method may be adopted:

1. A very stout piece of German silver (or even iron) wire is obtained and bent to the shape of the lower border of the mandible—as the latter should be normally, and extending from angle to angle.

Four steel screws 1 in. or 1½ in. long, and preferably nickel-plated, are required, and some fine silver or brass wire for ligatures.

2. The skin under the mandible is sterilized, and four small incisions are made directly over the lower border of the bone, two on each side of the fracture line (avoiding, of course, the facial arteries). Holes are bored in the bone for the reception of the screws, and the latter are then screwed in firmly for a depth of about half an inch.

The stout wire splint is then ligatured securely to the four screws with the fine ligature wire, and the mandible is securely clamped (Fig. 5). Every effort should be made to prevent infection reaching the screws, or they may become loose before the fracture has united. It is an advantage to have the wire "splint" nicked each screw to prevent the ligatures from slipping.

FIG. 5.—Submandibular screws and wire splint. The transverse wire is auxiliary to the main curved wire, and may not be necessary. The fine wires ligaturing the wire "splint" to the screws are not shown.

frequently with a file near each screw to prevent the ligatures from slipping.

4. Wiring.

This method is desirable under two conditions:

1. When there is not much loss of tissue, and the fragments can be reasonably approximated.

2. When there is an appreciable loss of bone, and the fracture is so far back in the mandible that it is difficult or impossible to control the posterior fragment.

A wire may then be utilized, not so much absolutely to approximate the two ends, but to prevent the posterior fragment being so much elevated as it otherwise would be. Thus the bar of fibro-cicatricial tissue is considerably shortened, there will be more power in that side of the jaw, and the subsequent fitting of dentures may be done with less difficulty and with more chance of their being efficient and functional. For practically all fractures of the horizontal ramus the operation can be performed wholly from within the mouth. The difficulty, or otherwise, and success of the operation depends entirely upon the amount of swelling and sepsis present. Where this is marked and this method of treatment is deemed most suitable for the case, I prefer to immobilize the jaw by temporary intermaxillary ligatures for some days or a week, whilst antiseptic mouth washes are being used and the wound cleaning up. The method then employed is to drill through the bone between the roots of the teeth about half to three-quarters of an inch away from the fracture on either side, with a suitable drill. (For fractures in the premolar or molar region a "contra angle" bandpiece is used in the engine.) In order to mark the site of the perforation the drill is dipped in pure carbolic acid. Well gilded copper wire is then passed through the holes,* and tightened by twisting the ends, which are cut off and covered with either gutta-percha or fine rubber tubing. It is then advisable, wherever possible, to supplement this single suture by either interdental or inter-maxillary lacing in the neighbourhood of the fracture.

The wire suture should be removed (by being cut) at the end of six weeks. This may require a general anaesthetic, but it can usually be done under cocaine. This method has the advantage of being rapid, simple, and inexpensive.

Precaution.

Care should always be taken to clear out any comminuted fragments of bone from the wound at the time that the injury is treated by splints, or wiring, or lacing, otherwise, of course, union will be prevented, or a sinus will continue discharging long after the soldier might have returned to duty.

Treated by one of the above methods, there is no reason why many men whom one sees at present more or less totally incapacitated (from a military point of view) should not be back in the firing line in six weeks from the date of injury.

REFERENCES.

* See author's *Stomatology*, London, 1912. ² BRITISH MEDICAL JOURNAL, 1909, ii, p. 882

THE TREATMENT OF CHLORINE GAS POISONING BY VENESECTON.

BY

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In the BRITISH MEDICAL JOURNAL for May 27th, 1916, Professor Sir E. A. Schäfer writes that venesection might be tried in acute poisoning by chlorine gas. As the result of the attacks on April 27th and 29th of this year in front of Hulluch, in which chlorine gas was used by the Germans, I had the opportunity of treating a number of cases. As the patients arrived in a condition requiring more drastic treatment than the mere inhalation of ammonia or the injection of atropine, I tried the effect of venesection, and was so struck with its effects that I began to adopt it as a new line of treatment in specially selected cases; only those of the cyanotic type with much distress but with a good pulse were bled.

Selection of Cases.

Venesection is not required for all cases. The two types I called the "cyanotic" and the "cardiac failure." The latter are pallid, collapsed, and require no bleeding. They

* It is sometimes stated that there is considerable difficulty in returning the wire through the holes, but with a few common-sense precautions this is really a very simple matter.

are suffering from cardiac failure, due to a cause other than that of overstrain caused by the increased resistance through the pulmonary system. Cardiac stimulants are required and venesection has no marked result. The congestion found is secondary to cardiac incompetence, and in one case signs of chronic heart disease were present.

The cyanotic type has a different appearance, and is in the majority. The patient is deeply cyanosed, very dyspnoeic, but with a strong pulse, and the immediate trouble is due to the heart becoming increasingly weaker from overstrain in working against an increased pressure through the pulmonary system due to the inflammatory condition of the alveoli.

Result of Venesection.

In theory the two effects of venesection are:

- (a) The resistance of the heart is lowered in ratio to the amount of blood withdrawn.
- (b) The resulting abstraction of fluid from tissues to make up for the loss—and it is not unreasonable to suggest that this abstraction takes place from a place where fluid is in excess—that is, in the waterlogged lungs. This again would lead to a lessened resistance through the pulmonary system.

In practice the following results are obtained:

1. Relief of cyanosis (great).
2. Relief of congestion in the lungs, enabling the patients to breathe more easily.
3. Relief of the acute headache to which patients are subject after twenty-four hours of the gas poisoning.
4. Promotion of sleep by the physical withdrawal of blood from the system; a patient wakes refreshed and less distressed than before.

Time.

The time at which venesection is indicated is important. Early venesection is necessary, as is shown in the following example. Ten cases were cyanosed and equally distressed; 5 were venesected and did well with no further treatment; of the remaining 5, 2 died within twelve hours and 3 became livid and more distressed within twelve hours, and venesection was done then. These three required cardiac stimulants after bleeding. The longer the heart has to work against an increased peripheral resistance the weaker it becomes, and by bleeding early the resistance is lowered and the heart is not put to so great a work.

Method.

Direct incision into median cephalic or median basilic vein—or dissection with ligature of proximal end and then incision into vein. The amount of blood extracted depends upon the patient; from plethoric and alcoholic men 20 to 25 oz., from less robust or elderly men 15 to 20 oz. The time taken to extract 20 oz. is from fifteen to twenty minutes, because symptoms of collapse are produced if the depletion is quicker. The blood in all cases is dark and easily coagulates; in no case was there any odour of chlorine given off from the extracted blood.

Detailed Account of 30 Cases Venesected.

The following is a list of the first 30 cases upon whom venesection was performed and who lived. The result of the bleeding was taken in the patients' own words:

1. Pte. C., aged 22. Admitted very cyanosed and distressed. Oxygen administered. Bled 15 oz. Colour improved. Pulse becomes slower and patient sleeps six hours.
2. Pte. McF., aged 28. Admitted cyanosed, pulse rapid. Bled 20 oz. Says, "Relieved chest, which was fairly choked, and made me sleep well." Colour improved and remained good.
3. Lance-Corpl. McG., aged 32. Admitted cyanosed. Venesection done under oxygen. Bled 20 oz. Says, "Felt chest relieved, and made me sleep." Colour improved slowly and good progress.
4. Pte. C., aged 40. Admitted April 29th. Became cyanosed on May 1st. Bled 20 oz. on account of plethoric and alcoholic type. Says, "Stopped me breathing so quickly and made me sleep." Colour remained good.
5. Pte. D., aged 31. Admitted delirious and restless. Very cyanosed. Bled 20 oz. Says, "Relieved pains in head, eased breathing, and made me sleep." Colour improved.
6. Sergt. F., aged 38. Admitted cyanosed and unconscious. Bled 20 oz. Says, "Felt grand. Relieved headache and eyes, and slept whole afternoon after it." Colour remains good.

7. Sergt. McC., aged 47. Admitted cyanosed, delirious, and collapsed. Bled 15 oz. Says, "It did good to breathing, and relieved pain in head." Colour remains good and pulse slower.

8. Lance-Corpl. L., aged 23. Admitted unconscious and cyanosed. Pulse feeble. Given strychnine. Pulse improved next day, and bled 20 oz. Says, "Helped well; slept well after it, and relieved pains in head."

9. Pte. H., aged 37. Admitted cyanosed, dyspnoeic, and delirious. Bled 20 oz. Says, "Felt improved, lighter in head, and relieved tightening in chest." Colour remains good.

10. Lance-Corpl. G., aged 31. Admitted very cyanosed and dyspnoeic. Bled 25 oz. Says, "Cut did good. Relieved pain in head, made breathing easier, and made me sleep." Colour remains good.

11. Pte. A., aged 22. Admitted slightly cyanosed, and pulse good. At night became worse, and following morning very cyanosed, delirious, and pulse rapid. Bled 20 oz. Slept afterwards. Colour improved, but remains delirious. Following day conscious; colour good and pulse-rate lowered.

12. Corpl. M., aged 29. Admitted very cyanosed and dyspnoeic. Pulse 124. Bled 25 oz. (plethoric). Says, "Relieved my breathing, and I slept well." Colour remained good, and pulse-rate 100 six hours later.

13. Pte. H., aged 21. Admitted very cyanosed. Quick, irregular pulse. Bled 15 oz. Says, "It relieved my head and the tightness of chest and made me sleep." Colour improved, but not good. Oxygen given under pressure at intervals. Twenty-four hours later colour and pulse much improved.

14. Lance-Corpl. K., aged 22. Admitted unconscious, cyanosed, dyspnoeic, and rapid pulse. Bled 20 oz. Says, "Slept for hours after it—did good to my head and chest, and I have felt better ever since." Pulse slower and colour remained good.

15. Pte. C., aged 28. Admitted unconscious, very cyanosed and dyspnoeic. Bled 20 oz. Says, "It made my chest easier, and I could breathe better. My headache was cured." Condition remained good.

16. Lance-Corpl. M., aged 34. Admitted unconscious. Very cyanosed and very dyspnoeic. Bled 20 oz. Says, "Felt a good deal better; cleared my head; chest felt lighter, and made me sleep." Breathing became slower and colour improved.

17. Lance-Corpl. McK., aged 19. Admitted quite livid and unconscious. Pulse feeble. Cardiac stimulants were first given, oxygen, then venesection. Bled 15 oz. Became conscious twelve hours later. Cardiac stimulants repeated. Oxygen given under pressure at intervals, and colour improved. Eight days after admission he was evacuated in good condition.

18. Lance-Corpl. C., aged 38. Admitted very cyanosed and distressed. Brandy given and oxygen. Had been bled at field ambulance, but, on account of cyanosis, venesection was again done. Bled 20 oz. Colour improved and became less distressed. Five days later still unconscious, but less distressed and colour improved.

19. Sergt. L., aged 25. Admitted cyanosed, dyspnoeic, and vomiting. Bled 20 oz. Says, "Slept immediately after it, chest felt lighter." Colour remains good. Gastric distension relieved with sodium bicarbonate.

20. Pte. R., aged 23. Admitted unconscious. Very cyanosed and distressed. Bled 20 oz. Says, "Slept after it and felt easier." Colour improved, but still a little cyanosed. Oxygen given under pressure with benefit. In twenty-four hours colour improved and remained good.

21. Pte. K., aged 26. Admitted semi-conscious and much distressed and cyanosed. Bled 15 oz. Says, "Felt easier; chest and head were much relieved, and my breathing was improved." Colour improved and condition remained good. Four days later developed gangrene (dry) of left leg below knee, due to embolism of popliteal artery. Ten days later amputation at seat of election, with good recovery.

22. Pte. E., aged 47. Admitted semi-conscious, very cyanosed, and very dyspnoeic. Bled 20 oz. Says, "Felt grand; slept; eased chest and head." Colour remained good and breathing improved.

23. Pte. F., aged 19. Admitted very cyanosed and distressed. Previous bleeding at field ambulance, but owing to distress a second venesection was done. Bled 15 oz. Says, "It did good to my chest and head, and I slept after it." Colour improved, pulse became feeble, and cardiac stimulants were required. Evidently his condition was serious at the field ambulance to necessitate bleeding there, and his journey from there would cause his second bout of distress. Later he developed acute bronchitis, but his condition is good.

24. Pte. N., aged 30. Admitted very cyanosed, very dyspnoeic, and vomiting. Bled 20 oz. Says, "Felt better, and relieved breathing and awful pains in head." Colour remains good.

25. Pte. D., aged 26. Admitted unconscious, very cyanosed and distressed, and vomiting. Bled 20 oz. Says, "Helped head and breathing, and felt better." Colour remained good.

26. Pte. H., aged 26. Admitted unconscious, very cyanosed and distressed. Bled 20 oz. Says, "Felt a great deal better, relieved breathing, and slept eight hours after it." Colour remained good.

27. Pte. B., aged 37. Admitted unconscious, very cyanosed and distressed. Bled 20 oz. Colour improved and breathing became less distressed; twenty-four hours later returned to consciousness. Had an uninterrupted recovery.

28. Pte. B., aged 32. Admitted cyanosed and unconscious. Bled 20 oz. Condition improved and colour remained good. Later developed acute bronchitis, but condition is improved.

29. Pte. B., aged 19. Admitted very cyanosed and distressed, and vomiting. Oxygen given under pressure while venesection was done. Bled 15 oz. Says, "Felt chest easier, headache gone, and breathed better. Slept well after it." Colour slowly improved, and remained well.

30. Pte. Q., aged 45. Admitted very cyanosed and dyspnoeic. Alcoholic type. Bled 25 oz. Says, "Relieved me more than anything else, and I slept for hours." Colour improved and remained good.

These are notes on those of the patients who were venesected and lived. They were taken two days after bleeding. All cases were evacuated to the base on the seventh or eighth day after admission with the exception of A., F., and L., who were still in hospital with acute bronchitis.

The effect of venesection on all the cases was the same. The great thing the patients needed was freedom from the heart's embarrassment and rest. Whether the improved condition was due to the rest or the venesection I do not know, but I firmly believe that it was the depletion of blood which caused the sleep, and hence the benefit, and I began to rely upon venesection as a routine line of treatment for the cyanotic group of cases.

DEATH AFTER NITROUS OXIDE-OXYGEN AND LOCAL ANAESTHESIA.

BY

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IN a somewhat large experience of nitrous oxide and oxygen anaesthesia, with and without the addition of ether, I have never seen any other case like that which I here relate. The patient very nearly died during the operation, and succumbed two hours and a half later without recovering consciousness.

I was asked to give an anaesthetic on January 29th, 1915, to a patient of Mr. Gilbert Barling, F.R.C.S. The operation was to be gastro-enterostomy for ulcer of the stomach, which was probably simple. The patient, aged 65, was a thin and anaemic-looking man of earthy complexion, of whom his medical attendant, Dr. Paulin of Malpas, said that he was very nervous. Seven weeks before Mr. Barling saw him he had fainted while conducting a religious service. He had been in bed for six weeks under careful treatment, and had had a very profuse haemorrhage from the bowel twelve days before operation; no rectal haemorrhage nor vomiting of blood had occurred since then. During the haemorrhage morphine, gr. $\frac{1}{2}$, had been injected several times, and he bore it well. He said that he had no cough, and nothing abnormal was found in his lungs. The pulse was soft, the apex beat was a trifle out—about $\frac{1}{2}$ inch outside the usual position—while his heart sounds were rather "flappy," but clear and regular. Nothing abnormal was found in his urine.

Mr. Barling thought the patient was a good subject for nitrous oxide and oxygen anaesthesia, and I fully agreed with him. One and three-quarter hours before operation morphine gr. $\frac{1}{2}$ and scopolamine gr. $\frac{1}{15}$ was injected, and just before operation, as the patient was not drowsy and answered questions promptly and clearly, gr. $\frac{1}{2}$ of morphine was injected intramuscularly before he was carried downstairs to the theatre. On the table gas alone was quietly and easily administered for about ten breaths, then 5 pints of oxygen a minute were added to it, and rebreathing of the gases was allowed. As soon as the patient was unconscious the layers of the abdominal wall were infiltrated with weak novocain solution, and when the abdomen was opened the peritoneum was infiltrated with quinine and urea solution by Crile's method.

The patient's pulse from the very first became very, very weak, but the breathing was good and regular, and when the operation was begun, in spite of much more oxygen, the pulse could hardly be felt at the wrist. Throughout the operation there was no haemorrhage from the wound, and no artery forceps were applied. As operation very rapidly proceeded his pulse vanished, respiration gradually became deeply gasping, although practically no gas was administered and seven or eight pints of oxygen a minute were turned on, which is more than twice as much as is usually given. Air also was allowed at times, and for the latter part of the operation only pure oxygen was given. When the pulse became bad the patient's colour was greyish and pallid, but never blue. Muscular relaxation was absolute throughout the operation. At first the patient's pupils were well but not minutely contracted and fixed; the eye reflexes, brisk at first, were very dull for about twenty minutes, but later on they returned with the administration of pure oxygen. For the last twenty minutes of operation the patient appeared to be dying, the pulse being impalpable and respiration being very prolonged, slow, and gasping, although pure oxygen was administered; therefore, before the abdomen was closed, a vein in the arm was opened and saline solution, to which was added a few drops of pituitary extract and some brandy, was injected. The pulse soon became palpable,

gradually improving in quality, and the eye reflexes became quite active and respiration less gasping; $\frac{1}{2}$ pints of saline were infused; a rectal injection of glucose and sodium bicarbonate in tap water also was given on the table.

When the patient was back in bed the pulse gradually improved further, and became really very good in volume, regular, and steady (120); he groaned during respiration, which was quiet, and we thought that he would recover, but consciousness never returned.

About one hour later collapse occurred. More fluid with brandy was given intravenously, but the pulse became flickering, respiration very gasping, and after about three-quarters of an hour his jaw dropped and he soon died.

Unfortunately no post-mortem examination was allowed.

The anaesthesia lasted thirty-five minutes, during the last fifteen of which hardly any gas was given but a good deal of air, and a large quantity of oxygen with rebreathing. There was no respiratory obstruction at any time.

Why did this man die? As a comparison I may say that five days previously I had administered gas and oxygen by the same method to an old lady of 72, who appeared to be in worse condition than he, for a severe gall stone operation; the difference in the treatment was that she had before operation a trifle less morphine, which made her drowsy beforehand. The anaesthesia and muscular relaxation were perfect, much less oxygen was necessary than in the case I have related, her colour was pink throughout, and respiration and circulation were very good; there was no evidence of shock, although the administration lasted one and a half hours.

Points that occur to me for consideration are:

1. That the circulation failed long before respiration.
2. The failure could not have been due to traumatic shock, because it began before incision.
3. The morphine could not be incriminated, because the patient had had as big or bigger doses before, and was not drowsy before operation.
4. There was no asphyxia from obstruction to respiration, and twice as much oxygen as is usually necessary was inhaled, while very little gas was given.
5. I do not think that death was due to too much gas, because circulatory failure occurred very early, beginning with the administration of the gas.
6. The patient was psychically a very curiously nervous man, and I am inclined to think that psychic shock, together with anaemia, causing heart weakness, were largely responsible for the fatality. This explanation, I admit, is hardly satisfactory.
7. Why did consciousness never return?
8. Would the early addition of a small quantity of ether to the gases have been of value?

Memoranda:

MEDICAL, SURGICAL, OBSTETRICAL.

SYPHILIS: TWO EARLY CASES OF REINFECTION AFTER TREATMENT WITH SALVARSAN AND MERCURIAL INUNCTIONS.

IN July, 1915, Dr. — asked me to see one of his patients whom we had treated for syphilis (acquired twelve months earlier) in February and March of the same year, by giving three injections of salvarsan and using mercurial inunctions for a period of two months. He had a chancre on the glans and enlarged inguinal glands, and admitted the possibility of reinfection. At that time he did not wish to have further salvarsan treatment, and in six weeks developed all the usual secondary signs and symptoms, which immediately cleared up when kharsivan was given.

A prostitute, aged 21, was discharged from this institution in November, 1915, after having been treated for syphilis with kharsivan and mercurial inunctions for a period of a month. She returned on March 28th, 1916, and when I saw her in April had a chancre on the right labium and enlarged inguinal glands. She admitted still earning her living by prostitution.

These two cases I think serve to demonstrate the possibility of effecting a cure by the use of the above method, if the kharsivan or salvarsan is given at suitable intervals, as it seems hardly possible for a person to be reinfected unless the first infection had been eradicated.

Gateshead.

LIONEL L. WESTROPE.