as it stands to-day is to institute voluntary classes on venereal disease while awaiting the considered action of the General Medical Council, and certainly no divergence of opinion exists as to the desirability of conducting post-graduate classes on venereal diseases at all suitable centres.

In these circumstances it may be of service to give a short sketch of a venereal disease clinic and its course of teaching, based on the experience gained at Glasgow, where a university lectureship was established some years ago.

The lecturer has charge of a venereal department at the Royal Infirmary and also of the Lock Hospital for Women, and the instruction is given at these institutions. In each there is both an outdoor and an indoor department; in the indoor a treatment room is attached to each ward and there is a central operating theatre. The outdoor department (which should have an evening hour of attendance) consists of a waiting room, an examination room, a treatment room, and a bacteriology room, all in series.

The examination room is divided into compartments by screens or otherwise, each containing an examining table; the work is thus expedited without sacrificing privacy. An instrument cabinet, dressing tables, wash-hand basins, and a sink complete the furnishing of the room. In addition to the usual surgical instruments and sterilizer, the special instruments include cystoscope, urethroscopes, storage battery; urethral probes, knives and cauteries; catheters, Watson's sounds, flexible bougies (filiform, acorn-tipped, and olivary), hot sounds, syringes, irrigating stand, urological basins, and salvarsan apparatus.

The bacteriology room should be supplied with a good microscope, having an oil immersion lens and dark-ground illumination, an incubator at 37° C., and also stains and apparatus. Tubed media can be obtained from the regular bacteriological department as required. Wassermann tests are performed only in the regular pathology department.

The treatment room in the department for male patients should have a number of cubicles each containing a urinal, and, at a height of 4½ ft. above the urinal, a two quart glass reservoir with attached rubber tubing for the irrigating solution. The most efficient means of treating gonorrhoea we have at present at our command is the *grand lavage* method of Janet. This can quite well be carried out by the patients themselves in a standing posture, but a trained attendant must be in attendance at treatment hours. He supplies each patient with a sterilized cannula, explains the details of the procedure, sees that the whole process is properly completed, and keeps a record of attendance. With this provision, a patient suffering from acute gonorrhoea can, during the first week, attend twice daily for treatment and with decreasing frequency thereafter, at hours to suit his own convenience, and he is only required to see the medical practitioner in charge at stated intervals.

The course of instruction includes at least twelve lecture-demonstrations. By a selection of cases systematic teaching and clinical instruction can be combined. In addition each student is given the opportunity of practising the technique of the various methods of diagnosis and treatment, the class being divided into sections of not more than six for this purpose. Prominence is given to the clinical and practical features of the course.

Syllabus of Course: Twelve Meetings.

1. Historical and general survey. Acute gonorrhoea in the male: anatomical and physiological data: bacteriology and pathology. Each student collects specimens for bacteriological examination.
2. Diagnosis of anterior and posterior urethritis: treatment of gonorrhoea, practice of *grand lavage*, etc.
3. The complications of gonorrhoea and their treatment: the preparation of vaccines, etc.
4. Chronic gonorrhoea, its diagnosis and treatment: use of bougies, sounds, urethroscopes, etc.
5. Gonorrhoea in women and children.
6. Urethritis simplex: venereal sores: balanitis: technique of examination to prove patient free from infectivity: prophylaxis.
7. Syphilis. Pathology: primary syphilis: classification of chancres: demonstration of the *Spirochaeta pallida*. Each student secures and examines specimens.
8. Systemic invasion: skin and mucous membrane manifestations: Wassermann reaction: methods of taking blood and serum specimens practised.
9. Late appearances of syphilis: syphilis of internal organs.

10. Syphilis of the nervous system: withdrawal of cerebro-spinal fluid for examination.

11. Congenital syphilis: syphilis of eye and ear.

12. Treatment of syphilis. Each student during the course administers kharsivan intravenously, and also practises intramuscular mercurial injections, etc.

It will be noticed that in the above synopsis almost half of the course is devoted to gonorrhoea. This, I believe, is not an undue proportion. In no other class is there more than a passing reference to gonorrhoea, while this does not hold good of syphilis. A considerable knowledge of technique is required, particularly for the treatment of chronic gonococcal infections, and a corresponding amount of time must be assigned to its teaching. Gonorrhoea is a much more common disease than syphilis, and its after-effects are hardly less important.

In so limited a course the teaching on syphilis has to be concentrated mainly on practical points in diagnosis and treatment, and on subject matter either neglected or not fully considered by the teachers in other classes. While syphilis has to be portrayed as a complete whole, and all its manifestations displayed in perspective, the lecturers on medicine are not relieved of their responsibility for giving detailed instruction on syphilitic disease of the circulatory and nervous systems, nor the ophthalmologist with reference to syphilitic disease of the eye. Patients with nerve and eye symptoms are examined, discussed, and treated, and the knowledge of the students on these cases tested, and, when necessary, reinforced; but little more than a summary is attempted. The relative value of the Wassermann reaction in the diagnosis, and the proper place of kharsivan in the treatment, of such cases can well be demonstrated in this class.

SUGGESTIONS TOWARDS A SYSTEMATIC OPERATIVE TREATMENT OF GUNSHOT WOUNDS OF THE MANDIBLE.

BY

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THE problems connected with gunshot fractures of the jaw, in spite of the attention they have received and the special provision that is now made for dealing with them, do not seem to have been carried so far towards solution that we can yet regard the treatment of these injuries as wholly satisfactory. Their clinical course is still long, painful and uncertain; in the earlier stages it is not without danger, in its intermediate stages it is apt to be distressing and disgusting to the patient and chequered by recurrent abscesses and operations, and ultimately it is still apt to leave a residue of more or less permanent deformity and disability. Doubtless much is being done for the improvement of treatment in the special institutions set apart for such cases, and it is common knowledge that notable advances in technique have been made.

One does not, however, altogether escape the impression that fractures of the mandible have perhaps been regarded somewhat too exclusively as essentially problems of dental surgery, though the skill and ingenuity of dental surgeons in attacking them undoubtedly support such a view. The very success of the specialist in securing by ingeniously contrived apparatus fixation of the fragments in the most unpromising cases tends to overshadow the difficulties still remaining in dealing with sepsis and the plastic reconstruction of the jaw.

These very problems, however, are those with which the general surgeon will necessarily have been forced to contend in treating in civil practice diseases implicating the mandible. As far as can be judged from the considerable number of gunshot wounds of the jaw that reach the London general hospitals, the difficulties both as to asepsis and plastic work met with in these cases are closely similar to the difficulties in the same departments that are met with in the treatment of malignant disease in this region. The infective processes seem in the traumatic cases to be almost exclusively of buccal origin and to display clinical and pathological characters closely similar to those that are so familiar and so comparatively easily controllable by adequate measures as incidents in the

treatment of malignant disease. It is possible, therefore, that it may be of some interest to discuss the difficulties presented by war injuries of the mandible in the light of experience gained in dealing with tumours implicating this bone.

The surgical problems met with in serious wounds involving the lower jaw may be arranged in three groups in the order of their appearance.

1. Complications Following Soon After the Wound.

Haemorrhage—especially from the soft tissues of the floor of the mouth and tongue. It may be seriously persistent or recurrent, and is notoriously difficult to control.

Acute sepsis, having the characters peculiar to infections originating from the upper alimentary tract—namely, an acute course of about a week, an invariable tendency to cause sloughing, and a liability to spread as a deep cellulitis if there is the least restraint of drainage. These infections bear some direct relation to the amount of oral sepsis, but the mere presence of teeth, however healthy, makes it possible that a considerable wound will be seriously attacked.

Secondary haemorrhage—peculiarly liable to appear from about the seventh to the tenth day on account of the limited acute course of oral infections and the tendency for sloughs to begin freely separating about that time. The fact that infections from the mouth *always* cause sloughing makes secondary haemorrhage an appreciable risk.

2. Complications during Healing (Chronic Suppuration, Recurrent Abscesses, and Necrosis of the Jaw).

These complications are apt to drag out the case for an indefinite period, and are doubtless to a large extent due to the special density of the bone that renders the separation of sequestra a peculiarly tedious process.

3. Difficulties of Plastic Reconstitution of the Jaw.

Relapses of sepsis after bone grafting. These may be due to the impossibility of exposing the bone on either side of the gap without opening the buccal cavity, or to the implantation of the graft in the septic scar which has resulted from prolonged suppuration. Such septic scars, as is well known, are particularly prone to cause failure of bone-grafting operations.

The opinion has already been ventured that attention has perhaps tended too exclusively to be concentrated on the fixation of the fractured ends of the bone. Now it is perfectly clear that when—as is lamentably common—there has been a large loss of bone substance, no amount of fixation can lead to reconstitution of the bone, and that it is towards the latter purpose that all treatment must be directed. If, by fixation, displacement of the fragments can be prevented until reconstitution can be undertaken so much the better, but the reconstitution must be regarded as the essential purpose and nothing be allowed to prejudice it. The prevention of displacement is certainly less important than the attainment of sound union of the reformed jaw, and there can be no doubt that if there is any clash of interests between the two objects, a strong and solid bone, even if somewhat deformed, is worth a good deal more to the patient than an insecurely united but shapely one.

For considerations of treatment, cases may be conveniently divided into three classes: (1) Fractures without considerable loss of substance, actual or probable; (2) fractures with considerable loss of substance, either actual from immediate destruction or probable from necrosis, but with the superficial soft parts more or less intact; (3) fractures with considerable destruction of bone and of the overlying soft parts—cases where the bone and lower part of the face are “blown away.”

The first class obviously lends itself to treatment by intrabuccal fixation, and may be expected to give results almost as good as those of the ordinary fractured jaw of civil practice. The third class would lead us into too detailed a discussion of technique for the purposes of this paper, and so will not be entered upon. It is the second class which particularly interests us here; it seems to be an especially common and troublesome type, and perhaps to lend itself to a more radical and systematic treatment than it usually receives.

In a case of this class, with, for example, considerable destruction of the bone in the incisor or premolar region, and extensive wounding of the floor of the mouth and tongue, while the lower lip and cheek remain intact, one of the outstanding features of the early treatment is the extreme inaccessibility of the wounded soft parts. Should serious haemorrhage occur, the ordinary methods of control are almost helpless, and the surgeon may even be tempted

by the desperate—and here more than ever valueless—expedient of distant ligature. The same inaccessibility is apt to baffle him in attempting to deal radically with sepsis either by way of prevention or cure.

Now in the treatment of malignant disease in this region there is one measure which has thoroughly justified itself when it is practicable, as means of preventing both haemorrhage and sepsis, and that is the complete closure of wounds. By this is meant not the mere bringing edge to edge of mucous membrane, but the complete obliteration of cavities by bringing raw surfaces into contact by means of large mattress sutures. To do this properly, of course, full access to the parts is essential, and this will always have been obtained by the preliminary exposure of the tumour, which is indispensable before the proper removal of it can be begun.

There appears to be no valid reason why the treatment of gunshot wounds of the jaw and mouth should not have the benefit of the same free access, and there certainly is no other means of preventing haemorrhage and sepsis with the same precision that is attainable in the treatment of malignant disease.

Free access to the whole wound by uncompromising division of the overlying soft parts in order to allow of such excision of the wound surfaces as seems necessary and subsequent suture is the first suggestion, then, which a consideration of general surgical principles provides.

When a segment of the mandible has been removed for a growth the only method of securing the ends of the bone from infection and necrosis—unless the mouth has long been edentulous and is therefore comparatively aseptic—is to seal off the raw surfaces of bone by stitching the soft parts over them. To do this effectually it is necessary to bring the soft parts on the inner side of the jaw into firm contact with those on the outer side by large mattress sutures passing deeply into the floor of the mouth and tongue and tied externally on the cheek. If part of the tongue has already been removed, an adequate raw surface will be ready. Otherwise the mucous membrane is stripped off the side of the tongue to make a surface to meet the inner surface of the cheek. The soft tissues are thus brought into and completely close the gap in the jaw. In order to get the jaw thoroughly covered by soft parts it is usually necessary to bevel off the alveolar margin on each side of the gap so that no sharp angle of bone projects upwards here and is difficult to cover in. By these means haemorrhage is arrested, sepsis in the soft parts and bone is controlled and rapid union is secured, so that the resulting scar shall be comparatively aseptic and olerant of a bone graft. No attempt is made to close the gap in the bone at the primary operation, and the surgeon concentrates his attention on getting the quickest possible healing of the wound.

The Primary Operation.

It seems probable that the same technique could be applied to certain gunshot wounds. This would involve radical operative treatment at the earliest possible moment. If it were established by x-ray examination that considerable destruction of bone had occurred and possibly that further loss by necrosis was probable, it would be clear that no attempt to secure union by ordinary methods was possible, and that everything must be done to favour the success of the necessary plastic operation.

A preliminary puncture laryngotomy should be done—a matter of a few seconds—and the pharynx plugged, or an intratracheal anaesthetic given. The fracture should be exposed either by a free incision over it or by turning back the soft parts in a flap from the middle line, and thus avoiding paralysis of the lower lip, loose fragments of bone should be removed, the wound in the soft parts excised, a clean surface given to the fractured ends by a saw cut, and the alveolar border cut back at an angle. The cheek and the floor of the mouth and side of the tongue should then be brought together with numerous large mattress sutures so as completely to obliterate any cavity between the ends of the bones. A large opening should be left for drainage below the jaw. If intrabuccal fixation of the fragments is possible now, it should, of course, be used, and will doubtless favour healing and the comfort of the patient. If such treatment were successfully carried out and healing were reasonably rapid, the necessary plastic operation should be possible within a few weeks.

The Plastic Operation.

Plastic operations on the mandible are rendered especially difficult by irregular scars in which it is impossible to bury a graft without opening the cavity of the mouth, and by septic scars in which operative interference precipitates a relapse of infection. We have considered the possible means by which these difficulties may, perhaps, be combated.

Aseptic union will, however, probably always be exceptionally difficult to attain, and it thus seems a reasonable precaution to make special efforts to maintain the vitality of a graft implanted in the jaw. To attain this object an obvious method is the use of pedunculated grafts. Such grafts can be provided by excising a piece of bone to which a muscle is attached and using the muscle as a pedicle. Parts adapted for such a purpose within reach of the mandible are the attachment of the sterno-mastoid, splenius or trachelo-mastoid to the skull, the trapezius and the levator anguli to the clavicle or scapula, but especially the attachment of the sterno-mastoid to the inner end of the clavicle. The bone here closely resembles the mandible in texture, the upper half of it with the broad attachment of the muscle lends itself to detachment and to displacement without undue difficulty into the gap in the jaw. It is unnecessary to indicate the technical steps of such an operation; the graft should obviously be measured exactly and drilled for screws before detachment. In a presumably aseptic scar there would clearly be no objection to the use of a Lane's plate if thought desirable. In a suitable case where the anterior part of the jaw had been destroyed I should not hesitate to make use of a graft from each clavicle, joined in the middle line by a suitably bent plate.

Conclusion.

In this very summary sketch it has been attempted merely to apply principles gathered in a prolonged experience and study of operations upon the jaw undertaken in civil practice in cases where large parts of the bone have had to be removed. In such cases the plastic reconstruction of the jaw has not proved to present insurmountable difficulties as a rule, and grafts, taken almost invariably from unaffected parts of the jaw itself, have been found an easy and satisfactory method of re-establishing the continuity and stability of the bone. It should be added that as in these cases some part of the thickness of the bone usually is available for use as a graft, even in the affected region, the two-stage operation is not often necessary; it is, in fact, only quite recently that one has become interested in its possibilities and in the development of its technique.

One cannot, of course, do more than suggest the technique that might be found applicable by those who have opportunities of dealing with gunshot wounds on a large scale. It seems certain, however, that the primary and immediate operation giving full access to the fracture with the purpose of limiting haemorrhage, sepsis and necrosis and attaining a limited and relatively aseptic scar, is an indispensable preliminary to a systematic application of plastic bone surgery to large destructive lesions of the mandible. It would obviously be irrelevant in a more or less speculative paper such as this to attempt to embody all the many minor details of practice one has found useful in what I have called the primary operation as carried out for tumours. If the surgeon keeps clearly in mind the principle that protection of raw surfaces in order to secure rapid union must be the first consideration, the minor procedures that facilitate this will suggest themselves readily.

SOLVENTS FOR DICHLORAMINE-T.

BY

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AND

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(Report to the Medical Research Committee.)

DICHLORAMINE-T is a slightly yellowish solid, readily soluble in most organic solvents with the exception of the paraffin hydrocarbons. It is a powerful antiseptic, and when dissolved in oily media has found useful application in the treatment of infected wounds¹ and for nasopharyngeal disinfection.² Although, as first stated,

dichloramine-T readily dissolves in most organic solvents, the majority of these solutions are of no value for practical purposes, since the dichloramine-T contained in them is rapidly decomposed. Among the few solvents which give reasonably stable solutions many had to be rejected on account of their proving too irritating, so that it will be realized that the selection of a suitable solvent for dichloramine-T is a somewhat difficult problem.

In our earlier experiments we made use of eucalyptol which had been previously lightly chlorinated to reduce its avidity for chlorine. The solution thus prepared was diluted with paraffin oil which had been chlorinated in similar fashion.³ Eucalyptol prepared as described is a good solvent for dichloramine-T, and the solution is reasonably stable if protected from light. Thus an 11 per cent. solution after standing in a corked amber bottle for six months still contained 6 per cent. of unchanged dichloramine-T. The addition of paraffin oil to the mixture is apt to reduce its stability, especially if care is not taken to select a suitable oil. It appears worth noting that liquid paraffin oils vary greatly in their suitability as diluents for dichloramine-T solutions. The Russian oils containing much naphthenes are unsuited for this purpose, while some grades of American oils contain considerable quantities of olefines as well as naphthenes.

The best oils with which we are acquainted are Pennsylvanian oils which have been well purified by agitation with fuming sulphuric acid and then washed and dried. Such oils are readily obtained in the open market, and on light chlorination, as previously described in this JOURNAL, furnish a very satisfactory diluent.

The use of eucalyptol has two disadvantages. In the first place, it is not as bland and innocuous a substance as might be desired, and its use is occasionally followed by a rash. Secondly, pure eucalyptol is not available in indefinitely large amounts, and at the present time its high price is a definite consideration. The same disadvantages apply to a more highly chlorinated eucalyptol, which was introduced by Lewis and Kraus, obtained by chlorinating eucalyptol with chlorine gas until the oil has a specific gravity of about 1.2. This oil, moreover, occasionally liberates traces of hydrochloric acid on standing, which causes a rapid deterioration of the dichloramine-T solution.

We therefore undertook a systematic survey of other possible solvents for dichloramine-T with the object of finding a cheaper and blander substitute for eucalyptol. This we believe we have accomplished, at least in part, and a description of the new solvent is appended. Early in our quest it became clear that most compounds containing oxygen gave unstable solutions of dichloramine-T unless the oxygen were in an ether-like combination, as in eucalyptol. Many esters, chlorinated aldehydes, acetals, alcohols, and glycerides were tried and abandoned. Chlorinated phenolic ethers, such as dichloranisole, were tried and found too irritating. It appeared improbable that compounds containing oxygen were likely to prove successful, since they usually abstracted chlorine from the dichloramine-T too readily. The choice then practically resolved itself into halogen derivatives of other hydrocarbons of the aromatic, aliphatic, and other series. The chlorine derivatives of aromatic hydrocarbons in most cases were found too irritating for practical use, and the same is, of course, true of some of the lowest members of the aliphatic series, such as chloroform. We therefore turned to the chlorine derivatives of the higher aliphatic hydrocarbons. Heptyl chloride, obtained by the chlorination of purified heptane from petroleum ether, gave encouraging results, and the same was true of many of its homologues; but it soon became clear that the stability of the dichloramine-T solution depended to a considerable extent on the purity of the solvents, and the preparation of these substances in an approximately pure condition is a difficult and costly matter. On attempting to chlorinate higher hydrocarbons, such as those in gasoline, kerosene, vaseline, and purified liquid paraffin oil, we found that with restricted chlorination poor solvents were obtained, while on more extensive chlorination deep-seated decomposition occurred with the formation of thick oils which were unusable. This latter decomposition we believe to be largely due to the presence of cyclic hydrocarbons, so-called naphthenes, in these oils, for these substances do not give simple stable derivatives on chlorination, but undergo far-reaching decomposition.

We therefore experimented with the chlorination of paraffin wax, since this substance is free from naphthenes