Current Practice

Prevention of Tetanus in the Wounded

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Active immunization provides the best and safest protection against tetanus. If all wounded patients were known to be actively immune there would be no need for passive protection. Since this ideal situation does not exist in Britain many wounded patients need passive protection. We consider this is best provided by the use of human antitoxin, but unfortunately adequate supplies are not available in this country at present.

In the past horse antitoxin has been widely used, but in recent years the seriousness of hypersensitivity reactions to it and the knowledge that it may fail to protect patients who have had it before have led some doctors to substitute antibiotics for antitoxin in the treatment of non-immune wounded patients.

Additional Prophylaxis

Additional prophylaxis is provided by an antibiotic with or without antitoxin.

An antibiotic should be given for four days ; if the wound then appears clean, is healing well, and there is no suspicion of retained foreign matter the antibiotic may be stopped. Otherwise the antibiotic should be continued until the wound is healed or for at least 10 days in immune category C, and four weeks in immune category D.

Penicillin is preferred, and on general principles a choice may be made between: (1) Oral: phenoxymethylpenicillin capsules

Adrenaline injection (B.P.) should be available during prophylactic procedures for anaphylactic shock. In adults 0.5 to 1 ml., by intramuscular injection.

It is known that both antitoxin and antibiotics can fail, but since serious adverse reactions are believed to be less likely after antibiotics they have gained popularity. However, until a valid comparison of the relative merits of horse antitoxin and of antibiotics has been made it is necessary to adopt a compromise scheme for prophylaxis.

Each of the authors has received frequent requests for advice on procedure in casualty departments. We have therefore formulated the recommendations shown in the above chart in the hope that they may provide a basis for current practice. They may, of course, need to be slightly modified to suit local conditions.

Explanatory comments have been added.

Toxoid

Adsorbed tetanus toxoid—that is, toxoid containing an aluminium adjuvant, such as Tet/Vac/PTAP (B.P.), 0.5 ml., by intramuscular injection (all ages)—is recommended.

A complete course comprises three doses of toxoid with about six weeks between the first and second, and 6 to 12 months between the second and third.

(B.P.), 250 mg., 6-hourly. (2) Intramuscular: fortified procaine penicillin injection (B.P.), 2 ml., daily. (3) Intramuscular, one dose treatment. This is a substitute for daily penicillin to be used if the patient is unlikely to be seen again and/or cannot be relied on to adhere to a daily schedule. It should provide protection for at least four days. A mixture of benzathine penicillin 1 g., procaine penicillin 600 mg., benzylpenicillin 380 mg., such as "Penidural All-purpose," may be used.

Tetracycline may be used if the patient is hypersensitive to penicillin: tetracycline tablets (B.P.), 250 mg., six-hourly.

Tetanus Antitoxin (B.P.), 1,500 i.u. by subcutaneous injection (all ages), should be used in addition to an antibiotic only if the wound is thought to carry a specially high risk of tetanus. In deciding this, consideration should be given to the principal factors affecting toxin production, the extent of contamination, the practicability of full surgical toilet, the possibility of a retained foreign body, and to the age of the wound.

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The antitoxin should *not* be injected into the same limb or with the same syringe as the toxoid. Antitoxin is usually prepared in horses and should *not* be given if the patient is hypersensitive to horse serum, despite the above recommendation. Antitoxin should also be withheld from patients who have had horse serum before if it is at all reasonable to do so.

A test for hypersensitivity should always be made. The patient may be given antitoxin 0.05 ml. by subcutaneous injection, and should be watched for 30 mins. If a general or a local reaction occurs the full dose of antitoxin should be withheld.

In patients with a history of any allergy the above test should be preceded by a similar test using 0.05 ml. of a 1:10 dilution of the antitoxin.

Comments

The emphasis of this scheme is placed on the desirability of establishing and maintaining active immunity and on restricting the use of heterologous serum. In addition, it is important for the doctor who treats wounded patients to explain the significance of active immunization to each patient, so that an increasing proportion of the population will come to realize the importance of being immunized and of knowing their immune status.

Surgical Toilet

Surgical toilet is of prime prophylactic importance, since removal of foreign bodies and of tissues that are dead or likely to die renders the wound unsuitable for the growth of *Clostridium tetani*.

Immune Categories

Immune Category A.—The patient is in a state of adequate active immunity and no further treatment is required.

Immune Category B.—The toxoid acts as a booster which suffices for immediate prophylaxis, and no additional prophylaxis is needed.

Immune Category C.—The toxoid recalls the active immunity, but this may not suffice for immediate prophylaxis and additional prophylaxis may be needed.

Immune Category D.—The toxoid is the first dose of a complete course of active immunization and additional prophylaxis may be needed.

Toxoid

Adsorbed toxoid (such as Tet/Vac/PTAP) is recommended rather than plain toxoid in simple solution (Tet/Vac/FT), since there is evidence that it stimulates a more rapid, higher, and longer-lasting antitoxin response.¹⁻⁴ In addition, adsorbed toxoid is effective when given concurrently with antitoxin.⁵

Although there is some evidence⁶ that plain toxoid when used for booster injections gives a faster response than adsorbed toxoid, we consider this evidence is not strong enough to justify

the inconvenience of using two kinds of toxoid in a prophylactic scheme.

Antibiotics

When additional prophylaxis is required in immune categories C and D it should be provided by an antibiotic. There is support for this use of antibiotics from clinical experience⁷ and from animal experiments.³

Although there is no direct evidence from man regarding the period of antibiotic prophylaxis, animal experiments suggest that four days is an acceptable minimum. Since antibiotics may fail to eliminate *Cl. tetani* from the wound³ it is important that they be continued until there is no likelihood of anaerobic areas remaining, or until active immunity is established. It is probable that in the majority of patients immunity can be produced within ten days of a toxoid injection in the case of immune category C^{2,6} and within four weeks in immune category D.⁸

Penicillin is the drug of choice, although resistant strains have been reported. But if the patient is hypersensitive to penicillin, tetracycline should be used.

Antitoxin

Antitoxin prepared in animals is advised only in immune categories C and D, when the wound carries a high risk of tetanus. This is the case where the wound is such that an adequate concentration of antibiotic may not reach the site of infection, and also where it is possible that a tetanus infection has been active long enough to produce a dangerous amount of toxin. Thus we suggest that where wounds have remained untreated for six hours the use of antitoxin in addition to an antibiotic should be considered. The period of six hours is suggested because experiments indicate that in animals a lethal dose of toxin may be produced within four hours.³ Plainly in this situation antibiotics can be of limited value; neutralization of toxin by antitoxin is also needed. It is recognized that the animal experiments do not truly represent the clinical situation, and it would be possible to argue in favour of any period from 4 to 24 hours. We suggest six hours as the dividing line; the majority of wounds apt to cause tetanus are, in Britain, seen by a doctor within this time.

The recommendations on the use of antitoxin in patients who are hypersensitive to horse serum or who have had horse serum previously may not apply in the treatment of clinical tetanus.

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