FROM THE ORTHOPAEDIC DEPARTMENT, ÖREBRO HOSPITAL.
HEAD: DR. HELGE SJÖVALL, M.D.

TETANUS PROPHYLAXIS FOR ORTHOPAEDIC OPERATIONS

BY

IVAR BORG

Most of the postoperative cases of tetanus described in the literature have followed: gynaecological operations, such as criminal and legal abortions, operations for salpingitis and hysterectomies; intestinal operations, such as appendicectomies; and tooth extractions and other operations in the oral cavity and pharynx. A large number of single cases of tetanus have also been reported after almost every kind of operation. At the beginning of the twentieth century tetanus neonatorum was a common, and rightly feared, disease; in Hungary as many as 10,000 deaths from this disease have been reported during one year (1904). At one period "the eight days sickness" on the island of St. Kilda carried off two-thirds of all newborn infants. That the mortality was heavy is evident from the name, which indicates the short period of incubation. This form of tetanus has now practically disappeared, and is scarcely ever seen in our hospitals.

Orthopaedic operations may also be followed by tetanus, especially operations on the lower limbs, more particularly the feet.

Satta (1924) reported three cases of tetanus occurring after operations on the foot. In the first two, tetanus followed resection of the calcaneus, and contamination of the skin was considered to be the probable source of infection. *Strebel* (1927) described a case which developed tetanus 5 days after an aseptic operation for pes cavus, and died within 14 hours. He considered skin infection to be the cause, and prophylactic serum treatment was afterwards introduced at similar operations. *Königswieser* (1929) published three cases of tetanus following aseptic operations on

the foot, occurring in a period of 5 years at the Orthophaedic Hospital of Vienna. Two of these followed arthrodesis of the ankle for sequelae of poliomyelitis. In both cases there was secondary infection, and tetanus developed on the 8th and 12th days, leading to death within 4 days and 12 hours respectively. The third case developed tetanus on the 6th day after an operation for talipes cavus by Spitzy's technique, and died within 24 hours. Autopsy showed "discoloration of the wound", which otherwise had a normal appearance. As these cases were published, efforts to perfect asepsis were increased: sterile plaster, no insertion of osteosynthetic material direct through the plantar surface, a separate knife for skin incisions, and, finally, prophylactic serum treatment were introduced for all bigger foot operations, especially those in which the incision was made on the plantar surface. *Edelman* (1931) reported a case of tetanus 10 days after the application of a calcaneus extension for fractured leg. Since then, he has used serum prophylaxis with all foot operations or foot tractions, and considers this well advised, in spite of complications of serum treatment. *Karl Schnaberth* (1941) described two cases of tetanus in the Orthopaedic Hospital of Vienna. In one, tetanus developed on the 12th day after a Chopart's amputation for deformity from a traumatic paresis; 6 days later the patient had recovered. In this case the splint had also caused a bad pressure sore on the foot, whose skin was susceptible as a result of the nerve injury. The second case followed a club-foot operation on a foot with pronounced cavus formation from the use of an orthopaedic splint. Secondary infection arose, and on the 12th day tetanus developed. The patient recovered. Schnaberth stresses the importance of changes in the skin caused by splints in these cases. *Gordh* (1945) described a fatal case of tetanus developing 5 days after an operation for hallux valgus on a patient with a coarse and rough skin. Other cases of tetanus after aseptic surgical measures on the foot are reported. *Mauclaire* (1932) had 3 cases of tetanus after operations for club-foot, *Kaufman* (1932) a similar case, *Waterman* (1933) a case after operation for talipes cavus, and *Clarenz* (1935) 2 cases following operations on the foot.

Probably some of the cases published in the literature as "Spättetanus" can be explained on the same basis. By "Spättetanus" is meant the development of tetanus from material which was introduced at an earlier injury but remained latent and was able to develop in the favourable conditions after a later operation. *Lange* (1942) describes as "Spättetanus" one case which exhibits a certain amount of parallelism with those described above. The patient received at the same time as a foot injury with fracture-luxation, also a "small wound" over the medial malleolus which healed without complication. After a later operation to correct the deformity, tetanus developed on the 16th day; splitting the plaster revealed a reddened, partly moist area in the field of operation.

The patient was discharged healthy. It would seem most probable that the infection had arisen at the operation, and that only in the favourable soil afforded them later on were the bacteria able to emit their toxin. The "small wound" connected with the primary injury need not be invoked as the port of entry, and the term "Spättetanus" does not appear to be appropriate in this case.

At the Orthopaedic Department of the Central Hospital, Örebro, we have recently had a case of tetanus following a foot operation:

A 52-year old workshop turner, Jnl. No. 48/48; A subtalus arthrodesis was made on his right foot for pes varus paralyticus post poliomyelitidem. After the operation a foot plaster was applied. During the next few days penicillin was given prophylactically, and the patient was allowed up on the 8th day, and to leave the hospital 11 days after the operation without signs of infection.

23 days after the operation the patient had cramp in his neck and difficulty in opening his mouth. These increased, and after 3 days he had to stay in bed. On the 4th day he was sent in to the hospital with the diagnosis of tetanus. After discharge he had not had any accident, and had not injured himself, been bitten, or had any wounds or sores. On admission, 27 days after operation, he complained of pain in the nape of his neck so that he could hardly move his head. He could only open his mouth to give 1 cm between his front teeth, and then there was a painful spasm of the masseters.

When the plaster was split, necrosis of the wound, such as is often seen after these operations, was found; the wound was re-excised. Later, episthotonus and contraction of the abdominal muscles developed. He was treated with large serum doses, sedatives, and penicillin and, without any definite spasms, the condition gradually subsided, and on the 17th day he was discharged free from tetanus. The only complication was a moderate serum urticaria, which appeared on the 9th day after admission, and quickly vanished under treatment with calcium, ephedrine and Antasthen.

There was no reason to suspect defective sterility of the surgical instruments, catgut, towels or bandages, as neither before nor since has any other case of postoperative tetanus occurred in this theatre, which has been used by the surgeons of the hospital for many years.

Most probably the wound was infected by tetanus bacteria

or spores on, or in, the skin; these can never be entirely eliminated by skin-disinfecting measures. Tetanus spores may remain in sweat and sebaceous glands, and in fissures, particularly those present in thick skin, they may "heal into" the horny layer and remain latent for a long time. The skin on the sole of the foot is often a half centimetre or more thick, and frequently cracks, especially if there is a deformity of the foot and cutaneous changes have developed from mechanical conditions such as pressure from shoes or splints. In these cases it is impossible to enure perfect sterility of the skin. In addition, the lower limbs, and particularly the feet, are also most exposed to contamination.

Case histories from the literature show that tetanus is more common after wounds on the feet and legs than after wounds on other parts of the body. *Vinnard* states that of 269 cases of traumatic tetanus, 205 were caused by injuries of the lower limbs. *v. Bakay* and *v. Klimko* attribute 76 % of the cases to lesions on the lower extremities, and 71 % of these to wounds confined to the feet. The predominance of the foot as infective focus is still more notable when it is recalled that the feet (and toes) constitute only 3,6 % of the whole body.

In our case, both the long time between the operation and the tetanus, 23 days, and the benign course favour the view that the tetanus bacteria or spores from the skin had been deposited in the wound at the operation and that they were only able to develop gradually when the necrotic tissue and secondary infection were established. Certainly, a later contamination should have produced a more serious form of the disease.

A further factor of importance in the occurrence of tetanus in our case is that skin-necroses and secondary infections in the field of operation frequently occur after subtalar arthrodesis, and, as a result, conditions are often favourable to the development of anaerobic bacteria. In addition, relatively short decubitus is part of the treatment, and tetanus material can enter secondarily through the plaster dressing which is opened in front when the patients are about on their feet.

The cases of postoperative tetanus described in the literature often had a very severe course, with a short latent period and high mortality, as has been shown by the case histories already described. The average mortality for all tetanus cases ranges from 45 to 70 % in the larger series, though it was lower—30 %—in recent smaller series. Among *Vinnard's* 352 cases of tetanus, 11 followed surgery. The operations were: 5 tooth extractions, an appendicectomy, a herniotomy, a hysterectomy, a jaw operation, a ganglion operation and a subcutaneous injection. 6 of the patients died. *Bunch* and *Quattlebaum* reported 8 cases, 6 following gynecological operations, with 7 deaths. *Schmid* reports 9 cases following intestinal operations, with 9 deaths; 25 following gynecological operations, with 17 deaths; 11 following hydrocele-hernia operations, with 8 deaths. This high mortality may have been due to a more massive infection, or to the patients' lowered resistance due either to the primary disease or to the operation, and also to the difficulty of diagnosing mild cases. It is not possible to obtain a true figure for the frequency of tetanus following operation in modern hospitals, since milder cases will often escape diagnosis. When tetanus appears late, its symptoms are usually slight, and are probably not always recorded. Further, the surgeon's disinclination to report its occurrence may also make it difficult to assess the frequency. However, tetanus is probably not a common complication of operation, though when it occurs it is an extremely unpleasant one.

The present case stresses the need to try in every way to avoid tetanus as a postoperative complication. It is impossible to set up rules for the general preoperative prophylaxis of tetanus, but within orthopaedics there is a group of patients, represented by our own case, which is well suited to such treatment. Corrective treatment of deformities of the feet and legs (either for deformities or posttraumatic conditions) frequently cause more or less extensive skin necroses, with secondary infections which have developed during prolonged plaster treatment, and afford favourable conditions for the tetanus bacteria introduced into the operation wound from the skin to exercise their toxic action. These typical chronic cases have the advantage that they need not be operated immediately, so that the tetanus prophylaxis which is most effective and has fewest complications, viz. immunisation with tetanus anatoxin, can be given pre-operatively. The papers quoted above show that, in the past, orthopaedic surgeons have not withheld serum

treatment from cases requiring operations on the feet, in spite of its great disadvantages (inadequacy, serum sickness and anaphylaxis, with, not rarely, death). Now that a vaccine is available there is still less reason for withholding tetanus prophylaxis. Experience has shown that vaccine gives a safe and very effective prophylaxis.

At the Orthopaedic Department in Örebro we now give tetanus vaccine to those of our patients who have operations on the feet or legs. At their first visit they receive 1 ml. of vaccine, after 4 weeks 2 ml., and after 8 days another 2 ml., and we consider that these precautions give a satisfactory degree of increased safety.

SUMMARY

A case of tetanus following an operation on the foot is reported, and routine prophylactic vaccination before operations on the lower limbs, particularly the feet, is recommended.

RESUME

Il est rapporté un cas tétanos dans le pied, suivi d'une opération. La vaccination prophylactique ordinaire de l'extrémité inférieure et particulièrement du pied est recommandée avant l'opération.

ZUSAMMENFASSUNG

Ein fall von Tetanus im Gefolge einer Operation am Fusse wird berichtet und rutinemæssige prophylaktische Vakzination vor Operationen an den unteren Extremiteten, besonders an den Füssen, wird empfohlen.

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