Most referrals were made by a third person, such as a school nurse or child minder, rather than by the parents, which may have caused anxiety in some cases. This is the price to be paid for greater public awareness and vigilance over child abuse, which makes it essential to have easy, rapid access to a specialist with experience and training in managing such children. More research and training are needed so that non-accidental injury can be diagnosed with more precision.

We thank Dr J Wynne and Dr M F G Buchanan for allowing us access to their patients' records and for extensive advice on this paper.

References

- 1 Anh NT. "Pseudobattered child" syndrome. *JAMA* 1976;236:2288.
- 2 Kirschner RH, Stein RJ. The mistaken diagnosis of child abuse. *Am J Dis Child* 1985;139:873-5.
- 3 Pascoe JM, Hildebrandt HM, Tarrier A, Murphy M. Patterns of skin injury in non-accidental and accidental injury. *Pediatrics* 1979;64:245-7.
- 4 Robertson DM, Barbor P, Hull D. Unusual injury? Recent injury in normal children and children with suspected non-accidental injury. *Br Med J* 1982;285:1399-401.

- 5 Worlock P, Stower M, Barbor P. Patterns of fractures in accidental and non-accidental injury in children: a comparative study. *Br Med J* 1986;293:100-2.
- 6 Hobbs CJ. When are burns not accidental? *Arch Dis Child* 1986;61:357-61.
- 7 Adams PC, Strand RD, Bresnan MJ, et al. Kinky hair syndrome: serial study of radiological findings with emphasis on the similarity to the battered child syndrome. *Radiology* 1974;112:401-7.
- 8 Horodniceanu C, Gruenebaum M, Volovitz B, Nitzan M. Unusual bone involvement in congenital syphilis mimicking the battered child syndrome. *Pediatr Radiol* 1978;7:232-4.
- 9 Roberts DLL, Pope FM, Nicholls AC, Narcisi P. Ehlers-Danlos syndrome type iv mimicking non-accidental injury in a child. *Br J Dermatol* 1984;111:341-5.
- 10 Yeatman GW, Shaw C, Barlow MJ, et al. Pseudobattering in Vietnamese children. *Pediatrics* 1976;58:616-8.
- 11 Feldman KW. Pseudo-abusive burns in Asian refugees. *Am J Dis Child* 1984;138:768-9.
- 12 Asnes RS, Wisotsky DH. Cupping lesions simulating child abuse. *J Pediatr* 1981;99:267-8.
- 13 Asnes RS. Buttock bruises=Mongolian spot. *Pediatrics* 1984;74:321.
- 14 Adler R, Kane-Nussen B. Erythema multiforme: confusion with child battering syndrome. *Pediatrics* 1983;72:718-20.
- 15 Brown JB, Melinkovich P. Schonlein-Henoch purpura misdiagnosed as suspected child abuse. A case report and literature review. *JAMA* 1986;256:617-8.
- 16 O'Hare AE, Eden OB. Bleeding disorders and non-accidental injury. *Arch Dis Child* 1984;59:860-4.
- 17 Waskerwitz S, Christoffel KK, Hauger S. Hypersensitivity vasculitis presenting as suspected child abuse: case report and literature review. *Pediatrics* 1981;67:283-4.
- 18 Smith R, Francis MJO, Houghton G. *The brittle bone syndrome*. London: Butterworths, 1983.
- 19 Cameron JM, Rae LJ. *Atlas of the battered child syndrome*. London: Churchill Livingstone, 1975.
- 20 Chapman S. Child abuse or copper deficiency? A radiological view. *Br Med J* 1987;294:1370.

(Accepted 8 December 1987)

Lesson of the Week

Gas gangrene: a cautionary tale

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The principles of preventing and treating gas gangrene are well known but are often forgotten because the disease is uncommon in civilians.¹ As the incidence, morbidity, and mortality of gas gangrene after injury may be reduced by appropriate management² awareness of this life threatening disease is important.

Case report

A previously well 6 year old boy presented with a laceration to his right knee after a fall. On examination he had a deep wound over the anterolateral portion of the knee, through which the joint capsule was visible. Radiographic examination showed air within the joint (figure). Exploration of the wound showed considerable soiling with a small laceration of the capsule and a haemarthrosis. The haematoma was evacuated, the capsule repaired, and the wound cleaned extensively. The skin was sutured and the leg placed into a split cylinder of plaster of Paris. The boy had previously developed a rash and facial swelling when given amoxycillin, which had subsided after the drug was withdrawn, and erythromycin was therefore given prophylactically.

Three days later he developed a fever and his right leg became oedematous. The white cell count was raised ($32 \times 10^9/l$ with a predominance of neutrophils), but cultures of blood did not yield any growth. When the wound was re-explored pus was found, from which *Clostridium perfringens*

Penicillin should be given to patients with infection with *Clostridium perfringens* unless an allergy to the drug is proved, and primary closure of soiled or penetrating wounds should be delayed

and *Citrobacter freundii* were subsequently cultured. After the sensitivities of these organisms had been tested cefuroxime, trimethoprim, and metronidazole were given intravenously; equine gas gangrene antitoxin was also given.

The boy's condition deteriorated over the next three days and the oedema progressed to the other leg, the abdominal wall, and the lower chest. The skin of the right thigh and lower abdomen became mottled and indurated and blisters developed over the thigh and the dorsum of the foot. He retained sensation in his right leg and movement of his toes and ankle. Hyponatraemia and hypoproteinaemia developed, and he had a small haematemesis.

Because of the progression of the infection he was given eight two hour sessions of treatment with hyperbaric oxygen but his condition continued to deteriorate and he began to have convulsions, requiring intravenous diazepam, ventilation, and cardiovascular support. A test dose of amoxycillin trihydrate and clavulanic acid (Augmentin), to which both *C. perfringens* and *C. freundii* were sensitive, was given with no adverse effects. This subsequently continued at high dose and the other antibiotics were stopped.

After 24 hours his general condition was much improved and he was weaned from the ventilator. His oedema was slightly reduced and the erythematous appearance of the skin was diminished. Ten days after amoxycillin and clavulanic acid were started the oedema had resolved and the white cell count and serum concentrations of electrolytes and proteins were normal. The original wound healed by secondary intention, but a split

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skin graft was required to repair full thickness skin loss over the thigh where blistering had occurred. The boy was finally discharged three months after the initial fall.

Radiograph showing gas within joint cavity and bursas.

Discussion

Gas gangrene is usually associated with wartime injuries. Its incidence, however, was low in the American and British forces during the wars in Vietnam and the Falkland Islands because soiled or penetrating wounds were managed with debridement, prophylactic antibiotics, and delayed primary closure.¹ Experience of gas gangrene is limited in civilian hospitals; the condition usually

occurs after operations (intestinal operations and, particularly, amputations because of peripheral vascular disease) and trauma.³ Unfortunately, the immediate closure of the wound in this case probably predisposed the boy to develop gas gangrene.

Penicillin is the drug of choice for gas gangrene not only because the causative organism is sensitive to it and it can penetrate oedematous and relatively avascular tissues but also because it has been used successfully to treat septic arthritis caused by *C. perfringens*.^{4,7} Although the organism was sensitive to the alternative antibiotics that we used, they were ineffective, probably because they penetrate tissue poorly. The boy made a dramatic recovery when penicillin was eventually used. A history of sensitivity to penicillin should never be lightly dismissed because administering the drug to someone who is truly allergic can be catastrophic. A history of allergy is, however, often erroneous as many infections are associated with a fine, erythematous macular rash, which may be misinterpreted as an allergy to antibiotics being taken concurrently. Thus in life threatening infections in which penicillin is the drug of choice the claim of allergy should be verified by giving a test dose of penicillin and taking the necessary precautions.⁸

Hyperbaric oxygen failed to halt the progression of the disease in this case and this emphasises the importance of combined treatment in gas gangrene.

This case emphasises that primary closure of soiled or penetrating wounds should be delayed to reduce the risk of gas gangrene and also that penicillin should be given in clostridial infections unless a test dose confirms allergy.

References

- 1 Anonymous. Remembering gas gangrene [Editorial]. *Lancet* 1984;ii:851-2.
- 2 Hart GB, Lamb RC, Strauss MB. Gas gangrene. *J Trauma* 1983;23:991-1000.
- 3 Darke SG, King AM, Slack WK. Gas gangrene and related infection: classification, clinical features and aetiology, management and mortality. A report of 88 cases. *Br J Surg* 1977;64:104-12.
- 4 Torg JS, Lammot TR. Septic arthritis of the knee due to *Clostridium welchii*. Report of two cases. *J Bone Joint Surg* 1968;50:1233-6.
- 5 Schiller M, Donnelly PJ, Melo JC, Raff MJ. *Clostridium perfringens* septic arthritis. Report of a case and review of the literature. *Clin Orthop* 1979;139:92-6.
- 6 Harrington TM, Torretti D, Viozzi FJ, Davis DE. *Clostridium perfringens*: an unusual case of septic arthritis. *Ann Emerg Med* 1981;10:315-7.
- 7 Barton LL, Jacob S, Chinnadural S. Septic arthritis caused by *Clostridium perfringens*. *Am Fam Physician* 1985;31:135-7.
- 8 Goodman A, Goodman LS, Gilman A, eds. Antimicrobial agents. *Goodman and Gilman's The pharmacological basis of therapeutics*. 6th ed. New York: Macmillan Publishing Co, 1980:1149-50. (Accepted 17 November 1987)

WORDS THYM- is incorporated in several words of medical interest. THYME (*L. thymum*; *Gk thumon*) is an aromatic plant, found chiefly in countries bordering the Mediterranean. *Thymus vulgaris* (garden thyme) is cultivated as a culinary herb; its leaves and stalks are a valued ingredient of stuffings and bouquets garnis. Various species yield a corresponding variety of aromas and flavours. The word derives from *Gk thuein*, to burn a sacrifice, and thence to *Gk thumiaō*, to burn incense, of which thyme was doubtless an ingredient. "Thyme" must surely be the only word in the English language in which "th" is pronounced "t." The ancient spelling was in accord with pronunciation; thus, "tyme" in Middle English (ca 1150-1500), while Shakespeare (1590) has:

"I know a banke where the wilde time blows"—*Midsummer Night's Dream*, II,i,249.

When oil of thyme is distilled it yields THYMOL, a powerful phenolic antiseptic, formerly used in the treatment of hookworm infestation. With glycerin and other ingredients it is used in mouthwashes and gargles, and in dental practice it is used, with camphor and phenol, to line prepared carious cavities. THYMOXAMINE (1953) is an α adrenergic blocking agent. It is used for its vasodilator activity in the treatment of chilblains, acrocyanosis, and Raynaud's disease, and as an aid to vascular surgery. It is also used in eye drops to shrink the pupil by reversing the effect of phenylephrine and similar mydriatics. When the benzol ring in the chemical structure of a sympathomimetic agent is separated from the nitrogen containing side chain, a sympatholytic agent is formed. Increased sympatholytic potency is achieved by substituting the benzol ring with a THYMOL ring, as in thymoxamine.

The THYMUS, situated in the upper anterior thorax, plays a major part in the body's immune mechanisms, being a mediator of the maturation of

marrow stem cells into T lymphocytes. The thymus takes its name from the Greek *thymos*, which means, according to context, soul, heart (metaphorically), spirit, or breath (in the sense of *L anima*). I have no doubt that it acquired this meaning from its intimate anatomical relation to the heart, whose palpitation under emotional stress has in all ages been taken as evidence for its being the prime seat of the emotions. The proximity of the diaphragm (*Gk phren*, seat of the soul and mind), has likewise given us "frenzy" and "frantic." The *Oxford English Dictionary* has surely gone astray in offering an alternative etymology, *Gk thumos*, a warty excrescence.

Two separate etymological pathways stem from "thymus." The ancient belief in the influence of the thymus on the emotions has given us CYCLOTHYMIA, a condition characterised by recurrent swings of mood between elation and depression; THYMERGASIA, a somewhat arcane term for undue excitement or depression; and THYMOLEPTIC, defined as a "psychic energiser," and now superseded by the term "antidepressant." The other pathway branches from the densely cellular content of the thymus and its consequentially large content of nuclear material. The pyrimidine base THYMINE (1894) was originally obtained from the thymus, and is now known to be one of the four bases in the molecular structure of DNA, whence THYMIDINE is the nucleoside in which thymine is linked to the sugar deoxyribose.

There is thus no apparent connection between the plant and the thoracic viscus, and between their respective etymological derivatives. Yet Eric Partridge,¹ who digs more deeply than most, contrives to link the two to a common origin, thus: (a) thyme—incense—smoke = *L fumus*; (b) thymus—courage—"akin to Sanskrit *dhūmas*, smoke."—B J FREEDMAN.

Partridge E. *Origins: a short etymological dictionary of modern English*. 4th ed. London: Routledge and Kegan Paul, 1966:719.