

THE ABUSED CHILD COMPLEX AND ITS CHARACTERISTIC X-RAY FINDINGS

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Maltreatment of infants has up to the present time not been considered an important enough subject to include in the curricula of medical schools, and the study of this condition is given scant attention in most paediatric textbooks. This is mainly attributable to the ignorance of this so-called 'battered child' syndrome; an ignorance which is largely due to society's disbelief that such inhuman cruelties can be inflicted on children.¹ But parents can be their infants' worst enemy and such lack of awareness by the medical profession, with postponement of investigation, often leads to future tragedy.

The general practitioner is usually the first person who will obtain knowledge of a situation involving the abuse of

children, but the distaste of legal entanglements and the fear of court action lead to hesitation in reporting these cases to some recognized law enforcement agency in his community.

The importance of early and correct diagnosis of injuries suffered by the infant is of more than academic interest. Later, costly medical expenses can be avoided and musculoskeletal disease as well as permanent brain damage can be prevented.

Brailsford² maintains that deformities such as bowed legs, knock-knees and other bony changes resulting in arthritic changes are now more frequently recognized than

previously as the result of inflicted injuries suffered earlier by the child.

GENERAL OBSERVATIONS

The interpretation of traumatic experiences in the infant must always present a difficult problem since no relative or causative history can be obtained as is the rule in the more mature individual. The parents will evade any questions and resent any enquiries relating to the abuse of their child.

To distinguish between trauma and other pathological processes under these conditions can often become a serious problem. When the physical signs show a picture similar to that of the characteristic manifestations of adult injury, the practitioner should always bear in mind the possibility of inflicted trauma.³

Local swellings, tenderness with discolouration and signs of brain injury should be sought. Several members of a family may be injured by an irresponsible parent and the necessity of recognizing the social and familial environment of the infant becomes a matter of prime importance.

The 'child maltreatment' syndrome deserves the professional interest of the medical, social, as well as the legal minds concerned with the problem of child abuse. Only through the cooperative diagnostic efforts on the part of the medical fraternity can the incidence of this syndrome be ascertained and steps be taken to limit its occurrence and aid in its prevention.

General practitioners treat over 75% of injuries received by children and they are therefore put in the responsible position of identifying the presenting signs of unexplained multiple associated injuries. The medical student should consequently be made aware that investigations have shown that over 50% of these infants are liable to secondary injuries or death if appropriate steps are not taken to remove the child from its immediate environment. The educational process of bringing this syndrome to the attention of the student should be stimulated by this reluctance on the part of the doctor to interpret parental neglect as the cause of the inflicted trauma.

Multiple injuries in varying stages of resolution, subdural haematoma and malnutrition should all be reasons for suspicion on the parts of physicians.

Index of Suspicion

The 'child maltreatment' syndrome is characterized by findings such as:

1. The general health of the child which may be indicative of neglect.
2. The distribution of injuries which are usually both multiple and extensive.
3. The infant is often under 1, and generally under 3 years of age.
4. Evidence that the injuries have occurred at different times and are in different stages of resolution—this sign of *repeated injury* is perhaps the most characteristic feature of the syndrome.
5. A family history of previous maltreatment.
6. No new lesions recorded during the child's hospitalization.

Social Aspects

Emotional immaturity probably remains the greatest single cause for antisocial activities and destructive paren-

tal behaviour. Irritated by intimate questionings, parents do not volunteer information to the doctor, social workers or law enforcement agencies.

In London and New York statistics have shown that in 1 year over 5,000 cases of child neglect come to the attention of the children's court but of these only about 1% are officially reported.

In a large number of cases the infant's condition is attributed to some rare mysterious disease and it is felt that such misinterpretations can be prevented by medical education.

The maltreatment trend is not confined to one particular race or sex, nor is it limited to one socio-economic or geographic group. The problem exists throughout the world and higher social class apparently is not a deterrent to child abuse.

Prevention of recurrence involves the cooperation of the social services, and the child protection agencies should be prepared to eliminate many of the conditions and factors in the environment that motivate this type of parental delinquency.

CASE REPORT

An infant, 12 months old and of White parentage, was brought into the Karl Bremer Hospital with signs of numerous body injuries and ecchymotic skin areas. There were peculiar deformities and swellings of both the upper and the lower limbs. The child looked dehydrated and appeared pale and neglected.

Fluctuant erythematous swellings were present over the soft tissues around the right hip and multiple contusions extended over both the shoulder and elbow regions.

Crying was provoked by pain when palpating the extremities and particularly when handling the right leg. Some inguinal adenopathy was found to be present and there was a tendency towards bowed legs.

The diagnosis of unsuspected multiple traumata was not initially entertained. The mother evaded answering any questions relating to maltreatment or to any unhealthy social environment of the child, who showed all the appearances of abuse and neglect.

In view of the inadequacy of the parent's explanation of the patient's physical condition, further enquiries were made. These revealed the fact that the infant had been badly neglected and generally deprived of its needs for normal maternal attention.

The mother had already been warned by the Child Welfare Society and had on more than one occasion been cautioned for wilfully inflicting injuries and abusing her infant. The father was an unreliable and emotional person and a man of impulsive disturbances of behaviour.

This parental immaturity was responsible for the marital instability and the creation of family problems which were apparent in all avenues of their marital life.

The casualty officer admitted the infant with a provisional diagnosis of scurvy and a suspected fracture of the right leg. Radiographic examination was requested.

Radiological Findings

Irregular hyperostosis of the shafts of the long bones in the upper limbs was present. The left humerus was affected mainly in its proximal half and the right humerus showed the changes mostly in its distal third. The periosteum had in various degrees been separated from the bony surfaces. In both humeri ectopic bone islands were shown and translucent bands were clearly visible in the juxta-epiphyseal regions of the metaphyses (Fig. 1).

In the femora, sclerosis of the shafts with narrowing of their medullary canals was shown. The hyperostosis was mainly present over the middle third of the right femur and a healing fracture of the lower end of this bone could be detected (Fig. 2). A peculiar squaring of the ends of the long bones, particularly of the upper and lower metaphyseal ends of the left humerus was present and lipping was a feature in these regions (Fig. 3). These changes are quite unlike those seen in cases of



Fig. 1

Fig. 2

Fig. 3

Fig. 1. Hyperostosis of shafts of humeri with periosteal elevations and lamellations indicating repeated traumata. Ectopic bone islands around proximal left humerus. Fig. 2. Sclerosis with narrowing of medullary cavities in bones of legs. Reparative changes apparent and healing of fracture in right lower femur. Fig. 3. Squaring of lower metaphyseal ends of humeri with separation of generative cartilage layer and translucent bands. Lipping is a feature.

active rickets where cupping of the metaphyseal surfaces is a characteristic feature and is always accompanied by a generalized decalcification of the bones.

The skull showed no abnormalities and both the texture and the density of the cranial bones appeared normal.

The chest radiographs showed no abnormality of the lung fields and no fractured ribs could be seen. No marked exaggeration of the bronchovascular shadows, which is so frequently seen in cases of rickets, was present (Fig. 4).

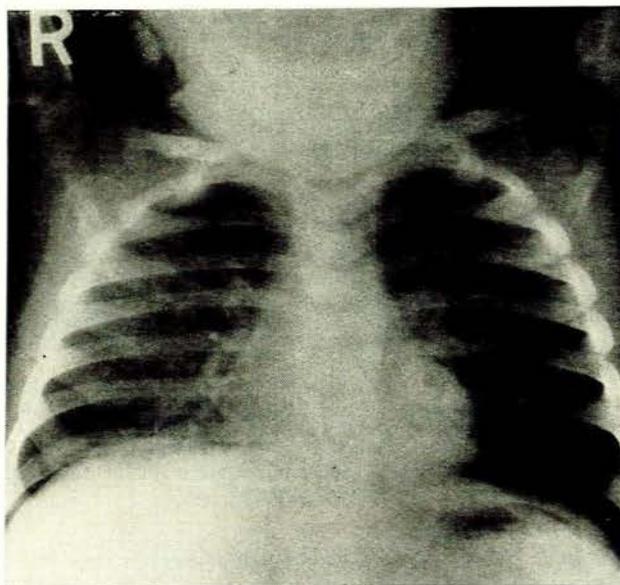


Fig. 4. Chest clear with some irregularity, but no splaying at costochondral junctions or exaggerated lung striations, as seen in rickets.

A diagnosis of inflicted traumatic lesions in the growing bones, known as the 'abused child complex' (or 'battered child' syndrome), was made.

DIFFERENTIAL DIAGNOSIS

When infants with local swellings, ecchymotic patches and tenderness over the limbs or body are seen, the attending doctor must always bear in mind the possibility of brain injury. The presence of conditions such as syphilis, rickets

and scurvy, osteogenesis imperfecta, infective bony invasions, infantile cortical hyperostosis and early osteogenic tumours should be excluded. The correct diagnosis in several of these pathological disturbances remains a difficult problem for the general practitioner.⁴

In the first publication of this syndrome by West,⁵ in 1888, the swelling and deformities in infants were assumed to be of a rachitic nature and the possible presence of trauma was completely ignored. In scurvy the ossified subperiosteal haemorrhages are always accompanied by a ground-glass osteoporosis and the characteristic epiphyseal ringing is a diagnostic feature. Scurvy also never occurs during the first few months of life, during which period inflicted traumatic changes are most commonly encountered.

In infantile hyperostosis or Caffey's disease cortical thickenings are present throughout the skeleton and these changes characteristically involve the mandible. Syphilis and infective conditions of bone can be excluded, by the history of infection and by recognized bacteriological studies and skin tests.

DISCUSSION

The radiologist today has a distinct advantage in recognizing from the films changes pathognomonic of inflicted bone injuries. Multiple lesions may be present and these usually appear in different phases of development. If fractures of the long bones are present these can be detected.

Besides such fractures, which heal rapidly in 4-6 weeks, subluxations may be seen and terminal irregularities in the metaphyses are present with a thickening of the cortical bone. Fragments may be torn off the metaphyseal ends of these bones, but although visible at the time of injury they soon fuse with the shaft, resulting in the later distinctive squaring of the ends of the bone. This characteristic change was first pointed out by Caffey.^{6,7}

Fissures through the metaphysis occur with separation of the original zone of calcification, and when absorption of the exudate takes place, a translucent band is shown. Slight lengthening of the shaft may take place in cases where the proliferating cartilage escapes injury, and this condition, sometimes seen in adults, possibly resulted from

trauma in early life. The cortical thickenings are due to the lifting of the periosteum from the bony surfaces as the result of the exudate or haemorrhage caused by the injuries to the affected regions. These bony thickenings may last for years and later observations make the diagnosis very difficult if the history of trauma is not known.

In young bones the attachment of the periosteum by the fibres of Sharpey is weak and the generative layer of osteoblasts is comparatively thick. The periosteal blood-vessels are abundant and the proliferative layer is easily separated from the surface of the compact bone by exudation or bleeding.

Over the metaphyseal ends the periosteum is more firmly attached and the fragments, which may be separated, continue their osteoblastic activities resulting in the distinctive lipping here. The shell of the compact bone thickens and later, after absorption of the effusion has taken place, a widened shaft remains.^{6,7} Leakage through the periosteum frequently occurs and ectopic bone islands in the adjacent soft tissues are developed. Lamellations in the cortical thickenings indicate that successive traumata have taken place.⁸ The shaft may therefore present irregular outlines, the degree of hyperostosis depending on the time of injury.

It may be of interest to record that in routine X-ray examinations the radiologist not infrequently observes slight periosteal thickenings along the shafts of the long bones in children and there is reason to believe that these changes are often attributable to some previously sustained injury. Dangling an infant by the arms or legs—sometimes in pride and not infrequently in prejudice—is a practice which should obviously be discouraged.

CONCLUSION

Children represent the future of society, and if such society is to survive, it is necessary that all means and measures be taken to preserve and protect them. The American Academy of Pediatrics in 1961 brought to the attention of the medical profession a new significance of the problem of infant abuse and the term 'battered child syndrome' was coined for cases of inflicted child injuries.

As practitioners, most of us can recall cases of trauma in infants where the cause of the injury was never fully ex-

plained to our satisfaction. Even our hospitals, up to the present day, have no recognized diagnostic symbol through which such records can be reviewed.

Trauma remains a frequent cause of both acute and chronic skeletal disturbances, but as the modern tendency in medicine is to hunt for the more exotic diseases, the overwhelming incidence of simple direct injury is ignored. With the increase of the population, its rapid growth and subsequent economic problems, the incidence of inflicted trauma in early childhood would possibly increase.

In an age where it has become possible to break up atoms and to make assaults on distant targets in outer space it should not prove impossible to devise ways of solving the less costly and more approachable human problem—the prevention of the tragedy of infant abuse.

SUMMARY

1. A case of an infant with bony changes and deformities of the limbs as a result of inflicted trauma, is described.
2. The interpretation of traumatic lesions in young children will always remain a difficult problem.
3. With the increasing knowledge of the aetiology of diseases, the incidence of the more frequently encountered simple direct trauma is often sadly ignored.
4. A missed diagnosis is the commonest cause of failure in the treatment of a child with the 'battered' syndrome.
5. The social and familial environment of the usually unwanted infant may require careful investigation and thereby later expensive medical treatment for resultant musculo-skeletal disorders can be avoided.
6. The predominant findings are radiologic and the doctor is often astounded by the severity and extent of the pathology revealed.

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REFERENCES

1. Kempe, C. H. (1962): *J. Amer. Med. Assoc.*, **181**, 17.
2. Brailsford, J. F. (1948): *Brit. J. Radiol.*, **21**, 157.
3. Woolley, P. V. (1955): *J. Amer. Med. Assoc.*, **158**, 539.
4. Silverman, F. N. (1953): *Amer. J. Roentgenol.*, **69**, 413.
5. West, S. (1888): *Brit. Med. J.*, **1**, 856.
6. Caffey, J. (1946): *Amer. J. Roentgenol.*, **56**, 163.
7. *Idem* (1956): Paper presented at Annual Congress of British Institute of Radiologists, London, December.
8. Clark, W. E. L. (1945): *The Tissues of the Body*, pp. 66 and 67. London: Oxford University Press.