CEYLON J. MED. SCI., Vol. XV No. 1, (June 1966)

Injury to Teeth

by

L. TILAKARATNE
Department of Dental Surgery

and

C. H. S. JAYEWARDENE
Department of Forensic Medicine,
University of Ceylon, Peradeniya

Thought at one time to produce only a mechanical impediment to the process of mastication, injuries to teeth were usually left to look after themselves. When, however, it was found that the transient discomfiture of the injury itself was sooner or later replaced by the more permanent discomfiture of complications which result in the loss of teeth, these injuries have been given a little more thought. The discovery that the alteration in the appearance of the individual caused by injury to teeth can cause profound psychological disturbances and behavioural disorders so as to totally incapacitate the individual (Finn, 1957), has pushed these injuries into a position of relative importance and work on the subject has been carried out with a view to minimising the damage by the restoration of the injured tooth to normality or near normality. The study of injury to teeth, undertaken in occidental countries, has resulted first, in the classification of these injuries and secondly, in recommendations of therapeutic action (Finn, 1957; Boyle, 1955; Ellis, 1952). Therapeutically orientated, these studies, which are of considerable value to the dental surgeon, are of little more than academic interest to the medical practitioner, who in Ceylon, is frequently the first clinician to see the injured tooth. In most cases, the interest in the injury centres in the legal implications rather than in the later complications so that the assessment of the gravity of the injury tends to be often in legal rather than therapeutic terms. Unable to deal effectively with the case himself, and in most instances, without any specialised help close at hand, the medical practitioner is wont to allow the injured tooth to take care of itself, little realising the untold damage that such a course of action can result in.

Injured teeth present two types of problems. A fracture or dislocation of a tooth is defined by law to constitute grievous hurt (Ceylon Penal Code). The gravity of the charge that an assailant consequently faces enjoins the medical practitioner to exercise care in the examination of the injured tooth to determine, first, whether such a fracture or dislocation does exist, secondly, whether such a fracture or dislocation is a recent or old injury and thirdly, whether the injury could have been caused in the way it is alleged to have been caused. Instances where persons have attempted to aggravate their injuries by including among them an injury to a tooth not caused in the course of the assault are not unknown. These are medico-legal problems. The clinical problems which constitute the second set

are entirely different. They involve first, an assessment of the extent of damage not in terms of fracture and dislocation but in terms of the type and quantity of dental tissue damaged, secondly, an anticipation of complications and thirdly, an evaluation of the situation and the action that should be taken with a view to saving the tooth or minimising the damage.

This paper is the result of two independent studies both of which have been undertaken to determine the pattern of injury to teeth, one dealing with accident and assault cases examined during the five year period ending 30th September 1965. Some of the cases in this series were from Colombo where one of the authors examined assault and accident cases from the Wellampitiya, Aturugiriya, Kolonnawa, Welikada and Bomiriya Police areas every Tuesday, and some were from Kandy where the same author examined, in a subsequent period, accident and assault cases from the judicial district of Kandy, four days a month. This series contained a total of 56 cases where there was a complaint of injury to teeth whether or not palpable or visible injuries were present. The other dealt with injured teeth found on persons attending the Clinic of the Dental School of the University of Ceylon, Peradeniya, during the year ending 30th September 1965. This series contained 61 cases of which 41 were old injuries and 20 recent ones. The two series have been analysed together. Yet, the identity of the two has not been completely destroyed as the one dealt mainly with persons in the older age groups who had sustained injuries recently in the course of an assault and the other dealt predominantly with persons in the younger age groups who had sustained injuries in the past in an accident. It is perhaps pertinent to mention that the clinic series (the latter) was obtained by questioning every individual who came to the clinic for treatment about any injury to teeth, whether his or her complaint was associated with the injury or not.

Injuries to teeth have been classified in a variety of ways. Some of these classifications have had their basis in the underlying lesion while other classifications are according to the subsequent line of treatment to be followed (Brauer, 1950; Malone and Massler, 1952; Dunn and Eichenbaum, 1952; Ellis, 1952; Wilmur, 1952; Boyle, 1955; Finn, 1957). These classifications have not been used in this study not because they were considered inadequate but because it was thought that a classification based on the manner in which a tooth presented itself would be more meaningful from the point of view of the clinician who first sees the case. On this basis, injured teeth could be classified very simply as :

(1) Broken Teeth: where a part of the tooth is missing and a part, usually firm with a rugged and sharp edge, remains ;
(2) Displaced Teeth: where the alignment of the tooth has been altered ;
(3) Loose Teeth: where the tooth is present but not firm in the socket ;
(4) Missing Teeth: where there is no tooth but only a raw socket to mutely remind one that a tooth had very recently been there ;
and (5) Normal Teeth: where there are no palpable or visible signs of injury.

Combinations of any two or more of these could also occur. Of the 117 cases that are included in this study, 51 had broken teeth, 22 loose teeth, 7 missing teeth, 29 normal teeth, 4 broken and loose teeth, 1 broken and missing teeth, and 3 loose and missing teeth. 50

had sustained their injuries in the course of an assault and 67 during an accident (Table 1). Though the sample does not lend itself to conclusions regarding the frequency of the type of injuries and the their cause it may be noted that assaults and accidental falls are the commonest ways in which teeth are injured and that in the former instance the injury tends to be a loose or missing tooth while in the latter instance the tendency is for the injury to be a broken tooth. Athletic accidents do not appear to be a common cause of broken teeth in Ceylon. In occidental countries, it is a relatively frequent method of sustaining injury to teeth so much so that the National Alliance Football Rules Committee of the United States of America has ruled that an intra-oral mouth and tooth protector should be worn by players as a preventive measure.

In this study there has been no case of displaced teeth. There was, however, one case of a female who presented herself with loose teeth and a history of a fall who claimed that her teeth had been lingually displaced and that she had manually manipulated them into position. Teeth that are displaced by buccal, lingual or lateral displacement or by extrusion may also be loose and manipulation by the patient may have corrected the displacelment in cases included in this study so that the category of displaced teeth would be left to have included in it only cases of displacement by intrusion, of which no case has been encountered.

Broken, loose and missing teeth were found in 88 individuals. A total of 154 teeth were involved and of these 112 were in the upper jaw and 42 in the lower (Table 2). The incisors were the teeth that were most commonly involved and here it was the central rather than the lateral incisors. Upper and lower sets were involved equally frequently when the injury was a loose or missing tooth but when the injury was a broken tooth there appears to have been a definite predilection for the uppers. Canine, premolar and molar teeth also do get injured, but injuries to these teeth are rare. Only three cases with injury to canine teeth were encountered in this study. All these cases were ones of assault where a weapon had been used and in each case there was considerable damage to the soft tissues of the face. In one case the weapon was a sword. The injured had an incised wound extending from the middle of his upper lip to his ear. The force of the blow had broken the canine tooth. The two cases where there was damage to premolar and/or molar teeth were also assault cases, both being assaults with weapons. In one case the weapon was a club. In this case the 1st molar tooth was missing, there was injury to the soft tissues of the face and the maxillary bone was also fractured. In the other case, a stab with a pointed rod had pierced the cheek and injured the 1st molar nd 2nd premolar teeth.

Broken or loose teeth were the original injury in 36 of the 41 cases of old injury examined in the clinic series. The time lapse between the injury and the time of examination varied from a minimum of 1 month to a maximum of 20 years. During this period 16 persons have had no complaints. Only in the case of 7 of them were the teeth viable. All these teeth (the viable teeth) were broken and the time lapse between the injury and the time of examination varied from a minimum of 2 months to a maximum of 5 years. Loss of viability had occurred in the case of broken teeth after periods varying from a minimum of 1 month to a maximum of 20 years. The pathological lesion in the case of a broken tooth is a fracture crownward of the epithelial attachment. In some cases it involved only the enamel.

In some the enamel and dentine were involved and in some of these there was pulp exposure while in others there was no such exposure. In some cases the fracture was of the entire crown. The importance of realising that four types of crownward fractures could occur lies in prognosis. In the untreated case, loss of viability is unlikely if only the enamel is involved, is possible when the enamel and dentine are involved without pulp exposure and is certain when there is pulp exposure whether the fracture involves the entire crown or only a part. Artificial replacement of the broken part of the tooth protects the pulp and helps retain viability.

Old injuries had resulted in loose teeth in 5 cases—in one case there was in addition a broken tooth and in another a missing tooth. In all these cases the teeth had produced complaints at a later date and all were found to be non-viable at the clinic examination. The sequence of events in all these cases was a loose tooth immediately after the accident, a restoration of the firmness after some days, pain after a period of time followed by discolouration of the tooth. The loss of viability in all the cases of old injuries resulting in loose teeth encountered in this study suggests that a loose tooth is not one that should be treated lightly though people are apt to consider a loose tooth less serious than a broken one. Even the law in Ceylon concurs with this popular view for it does not recognise a tooth loose but in its socket as constituting grievous hurt (Julihamy vs Fernando, 1932). The levity with which a loose tooth is treated is due partly to the fact that firmness is frequently soon restored and partly to inadequate appreciation of the underlying lesion. X'ray examination of the new injuries resulting in loose teeth encountered in this study indicate that a loose tooth could be the manifestation of one of three basic lesions. Most frequently the lesion is a fracture rootward of the epithelial attachment. How loose a tooth is depends on the position of the fracture. The nearer the fracture is to the apex the firmer is the tooth. Experience in occidental countries indicate that viability in cases of rootward fractures is retained for considerably long periods (Austin, 1930). Reports of viability after 30 to 40 years after the injury are not uncommon (Claus and Orban, 1953; Boulger, 1928). Less frequently the lesion is one of incomplete subluxation. There is no fracture in these cases but the tooth is loose because it has been partly jacked out of its sockets. As far as viability is concerned these teeth are in more or less the same position as apparently normal teeth. The third lesion that has been found in this study to give rise to loose teeth is a fracture of the alveolar margin which releases the firm hold that the bone has on the tooth. This lesion is very infrequently met with in cases where the injury is due to a fall or blow but common in cases of vehicular accidents where there is in addition considerable damage to the face.

Injury does not always result in a broken, missing or loose tooth. Quite frequently there is no apparent damage to the tooth although the person may be in pain. In a number of cases where positive evidence of a blow existed in the form of injury to the lips and other surrounding soft tissue, there were no palpable or visible signs of any injury to teeth. Five cases where such had been the situation at the time of injury turned up in the clinic series and in all these cases the viability of the tooth had been lost. Such injured, yet apparently normal, teeth are concussed and have been found to be more prone to complications than those where fractures have occurred (Anderson, 1944). There is nothing that could be done at the time of the injury. Observation at repeated intervals will help to identify loss

of viability at an early date when the dead pulp could be removed before complications such as apical abscesses and granulomata which inevitably follow set in (Dumalie and Landwerlin, 1949). These normal teeth are more frequently encountered in assault rather than in accident cases. As the law stands they do not constitute any form of hurt even though the blow may result in the ultimate loss of a tooth. Consequently, the necessity to differentiate between a true concussion and a faked one exists only as far as prognosis is concerned. It has to be based on the intuition of the clinician who elicits the only sign—pain on percussion.

Faked injuries especially in the case of missing teeth are not uncommon in assault cases. *In one case, not included in this study, an individual presented himself for examination with* a history of assault with fists and an incissor tooth in his hand. A raw socket indicated the position this tooth had occupied earlier. As the only other injury on the individual was a superficial incised wound on the left forearm strongly suggestive of self infliction and as the injured was a hospital attendant, surgical extraction was suspected. The suspicion was confirmed by a confession from the injured when the Police started canvassing dental surgeons for evidence. Having but little to go on, medical practitioners have placed much reliance on injury to the lips to establish the genuineness of an alleged assault on the assumption that a blow hard enough to damage a tooth would invariably damage the lips. Cases of broken, missing and loose teeth sustained in the course of an accident are numerous enough to demonstrate the unreliability of reliance on such injuries. Injury to lips occur only when the lips are interposed between the teeth and the injuring agent. Such interposition of the lips do not occur in cases where the teeth are injured while using them to crack a nut or unscrew a bolt. The lips are also only rarely injured when the injured teeth are protruding teeth. Here the force can be transmitted directly to the teeth without the involvement of the lips. Even when the mouth is fully closed, the lips fail to cover the teeth fully. In the case of non-protruding teeth the same result can be produced if the mouth is opened and the surface of contact of the injuring agent is small. Such is apparently the position when the injury is caused in an accidental fall when the real injuring agent is usually a projection or an edge. When, however, the injury is caused by a weapon with a large area of contact the lips are bound to be injured. This difference accounts for the greater frequency of injury to lips in assault cases. It also accounts for the greater frequency of apparently normal teeth in assault cases. As the lips act as a sort of cushion over the teeth, part of the force of injuring agent is expended in the injury to the lips so that the force transmitted to the teeth is insufficient to fracture them.

A question that needs consideration is whether the difference in the type of injuries encountered in assault and accident cases is also a function of the nature of the injuring agent. It has already been pointed out that broken teeth are more common in accident cases and missing and loose teeth in assault cases. In the case of accidents the likelihood is that the force is transmitted on to the incisal edge of the teeth and in the case of assaults on to the entire labial surface. It is probable that when the former is the situation a crownward fracture is more likely to occur and when the latter is the situation a rootward fracture, a fracture of the alveolar margin or a subluxation to result. Supporting this thesis is the case of an individual who had his upper incisors broken as a result of the impact of the lower incisors on them following an upper cut on his lower jaw. The experience of occidental

dentists, however, is different. As the root is the weakest part of the tooth even blows on the incisal edge of the crown have been thought to cause rootward fractures rather than crownward fractures (Boyle, 1955). There is a possibility that the differences in injuries noted in this study are due to the nature of the sample. In the case of the younger age group the root is yet growing and consequently vascular so that injuries tend to heal rapidly. These cases may not fall into the sample. Without any complaint to act as a constant reminder the fact that an injury ever occurred may be easily forgotten. In consequence old injuries will show a bias towards broken teeth because even if the patient has forgotten the injury the examiner could readily recognise it and remind the patient of it. Table I shows that broken teeth were more frequently encountered in the case of old injuries. Of the 41 old injuries 31 were cases of broken teeth while only 20 of the 76 recent injuries were such. The table also shows that broken teeth are more commonly caused in accidents. The age distribution of the sample according to the cause of injury (Table 4) shows that it is the younger age groups that meet with accidents, giving further support to the thesis of forgotten injuries.

In conclusion it may be stressed that an injury to a tooth can result in its loss. If the tooth does not fall off immediately, it may remain as a broken or loose or even normal tooth which, after a varying interval of time, will be found to be non-viable and this only after it has caused pain and discomfort to the patient. Broken and loose teeth often involve a fracture, the gravity of which has to be assessed in both legal and clinical terms. The viability of these teeth is lost with certainty in the untreated case. Concussed teeth—apparently normal teeth—frequently present the biggest problem. More certain than any other form of injury to produce complications they demand repeated examinations to ensure that complications are recognised early enough to minimise possible damage. Much reliance has been placed on injury to the lips to establish assault. While such injuries do occur frequently in assault cases they are not inevitably found. Indiscriminate dependence on them for proof of assault is fraught with danger.

TABLE 1

Type of injury and cause.

Injury	Assault with Fists	Assault with Weapons	Accidental Fall	Athletic Accident	Vehicular Accident	Other Accident	Total
Broken Teeth	6	3	28(20)	3(3)	5(2)	6(6)	51(31)
Displaced Teeth	—	—	—	—	—	—	—
Loose Teeth	10	4	4(2)	2(1)	2	—	22(3)
Missing Teeth	5	1	—	—	1	—	7
Normal Teeth	10	7	5(2)	2(2)	3(1)	2	29(5)
Broken and Loose Teeth	2	—	1	—	1(1)	—	4(1)
Broken and Missing Teeth	—	—	—	—	1	—	1
Loose and Missing Teeth	2	—	1(1)	—	—	—	3(1)
Total	35	15	39(25)	7(6)	13(4)	8(6)	117(41)

Note : 1. Figures refer to the number of cases.
2. Figures in parentheses refer to old injuries.

TABLE 2

Type of Injury and Tooth Injured.

Tooth Injured	Broken Teeth	Loose Teeth	Missing Teeth	Total
Maxilla				
Right Side				
3rd Molar	—	—	—	—
2nd Molar	—	—	—	—
1st Molar	—	—	1	1
2nd Premolar	—	—	—	—
1st Premolar	—	—	—	—
Canine	—	—	—	—
Lateral Incisor	7	8	1	16
Central Incisor	32	12	5	49
Left Side				
Central Incisor	27	5	2	34
Lateral Incisor	5	4	1	10
Canine	1	—	—	1
1st Premolar	—	—	—	—
2nd Premolar	—	—	—	—
1st Molar	—	1	—	1
2nd Molar	—	—	—	—
3rd Molar	—	—	—	—
Mandible				
Right Side				
3rd Molar	—	—	—	—
2nd Molar	—	—	—	—
1st Molar	—	—	—	—
2nd Premolar	—	—	—	—
1st Premolar	—	—	—	—
Canine	—	1	—	1
Lateral Incisor	2	7	2	11
Central Incisor	2	7	3	12
Left Side				
Central Incisor	1	7	3	11
Lateral Incisor	2	4	—	6
Canine	—	—	1	1
1st Premolar	—	—	—	—
2nd Premolar	—	—	—	—
1st Molar	—	—	—	—
2nd Molar	—	—	—	—
3rd Molar	—	—	—	—
Total	—	—	—	—
Maxilla	72	30	10	112
Mandible	7	26	9	42

Note : Figures indicate the number of teeth.

TABLE 3

Injury to lips in cases of injured teeth

	Broken Teeth	Loose Teeth	Missing Teeth	Normal Teeth	Broken and Loose Teeth	Broken and Missing Teeth	Loose and Missing Teeth
Accident Cases							
No injury to lips	25	5	1	6	1	1	—
Contusion of lips	8	—	—	2	—	—	1
Contusion and Laceration of lips	9	3	—	4	1	—	—
Assault Cases							
No injury to lips	1	4	1	—	1	—	1
Contusion of lips	1	2	—	5	1	—	—
Contusion and Laceration of lips	7	8	5	12	—	—	1
All Cases							
No injury to lips	26	9	2	6	2	1	1
Contusion of lips	9	2	—	7	1	—	1
Contusion and Laceration of lips	16	11	5	16	1	—	1

TABLE 4

Age at which injury occurred

Age in Years	Assault with Fists		Assault with Weapons		Accidental Fall		Athletic Accident		Vehicular Accident		Other Accident		Total	
	M	F	M	F	M	F	M	F	M	F	M	F	M	F
0— 4	—	—	—	—	1	—	—	—	—	—	—	—	1	—
5— 9	—	—	—	—	4	1	—	1	—	—	—	—	4	2
10—14	—	1	—	—	13	3	—	—	4	1	1	2	18	7
15—19	2	—	3	—	6	3	4	—	—	1	1	1	16	5
20—24	7	2	2	—	5	1	1	—	1	—	1	1	17	4
25—29	4	1	1	—	1	—	1	—	—	—	1	—	8	1
30—34	2	2	4	—	—	—	—	—	2	—	—	—	8	2
35—39	4	1	1	—	1	—	—	—	—	—	—	—	6	1
40—44	1	1	—	1	—	—	—	—	2	—	—	—	3	2
45—49	2	1	—	—	—	—	—	—	—	—	—	—	2	1
50—54	2	1	—	—	—	—	—	—	—	1	—	—	2	2
55—59	—	—	2	1	—	—	—	—	—	—	—	—	2	1
60—64	1	—	—	—	—	—	—	—	—	—	—	—	1	—
65—69	—	—	—	—	—	—	—	—	—	1	—	—	—	1
Total	25	10	13	2	31	8	6	1	9	4	4	4	88	29

ANDERSON, B. G. (1944). Injuries to Teeth. *J. Amer. dent. Ass.*, **31,** 195—199.

AUSTIN, L. T. (1930). A Review of Forty Cases of Retained Fractured Roots of Anterior Teeth. *ibid.*, **17,** 1930—1942.

BOULGER, E. P. (1928). Histologic Studies of Fractured Roots. *ibid.*, **15,** 1778—1785.

BOYLE, P. E. (1955). *Kronfield's Histopathology of the Teeth and their Surrounding Structures.* Philadelphia: Lea and Febiger.

BRAUER, J. C. (1950). The Treatment of Children's Fractured Anterior Teeth. *J. Amer. dent. Ass.*, **41,** 192—199.

Ceylon Penal Code

CLAUS, E. C. AND ORBAN, B. (1953). Fractured Vital Teeth. *Oral Surg.*, **6,** 605—612.

DUMALIE, A. AND LANDERWERLIN, F. (1949). Considerations sur les traumatismes Dentaires. *Ann. odonto-stomat.*, **6,** 245—262.

DUNN, N. W. AND EICHENBAUM, I. W. (1952). Diagnosis and Treatment of Fractured Anterior Teeth. *J. Amer. dent. Ass.*, **44,** 632—643.

ELLIS, G. G. (1952). *The Classification and Treatment of Injuries of the Teeth of Children.* Chicago: Yearbook Publications Inc.

FINN, S. B. (1957). in *The Care of Fractured and Displaced Teeth in Children.* FINN, S. B., CHERASKIN, E., VOLKER, J. F., HITCHCOCK, H. P., LAZANSKY, J. P., PARFITT, G. J., THOMAS, A. E. AND SHARRY, J. J. (Ed.) *Clinical Pedodontics.* Philadelphia: W. B. Saunders Co., pp. 303—329.

JULIHAMY VS FERNANDO. (1932). *Ceylon Law Weekly*, **2,** 96.

MALONE, A. J. AND MASSLER, M. (1952). Fractured Anterior Teeth. *Dent. Dig.*, **58,** 85—94.

WILMUR, H. M. (1952). Management of Injured Teeth. *J. Amer. dent. Ass.*, **44,** 529—542.