

CHURCHILL LIVINGSTONE

The Management of Traumatized Anterior Teeth of Children

J.A. Hargreaves J.W. Craig H.L. Needleman

Foreword by James Lorraine Trainer

SECOND EDITION

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Edited by

John Anthony Hargreaves

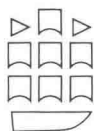
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**The Management of Traumatized
Anterior Teeth of Children**

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Foreword

As anticipated the first edition of this book met with resounding success. Its popularity, and recent advances in conservative techniques, have called for a second edition.

This has resulted in some alterations to the original text, particularly involving the use of composite materials and in the intermediate treatment of injured incisor teeth.

By keeping up-to-date this book retains its right to be regarded as one of the leading textbooks in this field of dentistry and should be included in the bookcase of everyone concerned with the care of children's teeth.

Edinburgh, 1981

J. L. Trainer

Preface

During the past ten years, since the publication of the first edition of this text, a considerable amount of new research and clinical technique has been developed concerning the treatment of injuries to the teeth.

Scandinavian researchers, particularly, have produced basic information related to the biological principles of healing and treatment of injuries to the teeth. Epidemiological studies in different regions of the world have highlighted the problems of trauma to teeth and in North America specifically, preventive methods have been developed to reduce the frequency of injury.

The development of acid etch techniques with composite resin materials has played a major part in both splinting and restorative treatments.

The new edition of this book is produced now in 1981, with the same aim as the 1970 edition; to provide a companion to undergraduate and pre-doctoral teaching and also to give a clear current and practical manual as a ready reference for the many dentists who routinely have to treat injuries to the teeth of children.

The initial authors, J. A. Hargreaves and J. W. Craig, welcome the collaboration of Howard Needleman as a joint editor of the new text. We have carefully reviewed the changes in treatment over the past ten years and have added more information on the biological principles of treatment, expanding the list of references in this area for those who would like to read the original reports of these investigations.

The chapter on Permanent Restorations has been prepared by Robert E. Burr, Associate in Prosthodontics at Children's Hospital Medical Centre, Staff Maxillofacial Prosthodontist at the Peter Bent Brigham Hospital. Boston and Clinical Instructor in Pediatric Dentistry at Harvard University.

Chapter 12 has been prepared by Bryan Tompson, Assistant Professor of Pedodontics and Orthodontics at Toronto

University. We extend our gratitude to him, to A. R. Bradshaw, Lecturer in Oral Medicine at Edinburgh University, for the revision of his chapter on Radiographs as an Aid to Diagnosis and to J. S. Clyde, Senior Lecturer in Operative Dental Surgery at Edinburgh University, for the revision of his chapter on Pulp Therapy.

Additional artwork was completed by Dr David Meadow, and Mr Bob Sheehan prepared the new photographic material. We thank them for their artistic contribution.

Our thanks are also given to Vera Hargreaves for her patience in reading and correcting drafts and proofs and to Gordon Bolas for compiling the index. We acknowledge the willing help given by Miss Beth Rioux, Gloria Barzey and Patricia Kennedy for the typing of the interim and final manuscripts.

Finally, as with the first edition of this book, we wish to acknowledge the kindness, understanding and help we have received from the publishers.

1981

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The problem, prevalence, etiology and classification

Trauma to the teeth of both permanent and deciduous dentitions is a very real problem met by all dental practitioners who deal with children. The treatment of injuries should always be commenced as early as possible following the accident. For this reason the initial treatment should be simple and rapid, so that a busy practitioner or school dental officer can deal with the emergency in his practice without having to delay drastically his daily appointments; it is of utmost importance that a quick method is used to arrive at an immediate and accurate diagnosis.

During childhood the development of the occlusion both functionally and esthetically is dependent on the satisfactory presence of teeth. Unfortunate and disastrous results can occur when



Fig. 1.1 Mesial drift and tilting of maxillary central incisors, following fracture of the right incisor which received no treatment



Fig. 1.2 Palatal eruption of permanent maxillary central incisors in a 7-year-old child following injury to the deciduous central incisors at two years of age. Development of apical abscess and failure of normal root resorption

a traumatized region is inadequately treated, causing such conditions as malformed or malpositioned teeth, premature tooth loss and pulpal death with abscess formation (Figs 1.1 & 1.2).

PREVALENCE STUDIES

Ellis (1960) completed a survey of 4251 secondary school children in Canada and found 4.2 per cent of children had fractured teeth. Craig in a similar study in Edinburgh, Scotland during 1966–67, found that of 17 831 children examined between the ages of four and 18 years, 5.9 per cent had traumatized anterior teeth. Treatment of these injured teeth was minimal; 8.1 per cent had received adequate treatment, 2.8 per cent had received treatment considered unsatisfactory and 88.6 per cent had received no treatment.

In a review of literature, O'Mullane (1972) presented results from several studies investigating the prevalence and incidence of injuries to permanent anterior teeth. He also undertook a survey of 2792 school children in Cork City, Ireland. In this sample of children between the ages of six and 19 years, almost 13 per cent were found to have suffered injuries. The prevalence increased

from 0.4 per cent in six-year-olds to approximately 20 per cent in 12-year-olds.

Other recent studies include those by Zadik et al (1972) who examined 10 903 children between six and 14 years living in Jerusalem, Israel. They found 8.7 per cent of injuries and, like the study of Craig, a low percentage were receiving treatment. Andreassen & Ravn (1972) in a Danish population sample consisting of 487 children found that 46 per cent had a history of injury to either primary and/or permanent teeth with 30 per cent having sustained injuries to primary teeth. Ravn (1974) in a study of children from Copenhagen, Denmark, stated that 34.9 per cent of boys and 23.1 per cent of girls may be assumed to have sustained tooth trauma before leaving school in the 9th grade. The ratio of boys to girls showing that boys receive more injuries than girls has been documented in other studies. Ellis (1960) showed this to be 2.5:1. O'Mullane (1971) in his literature review showed similar findings and in his own study in Ireland a ratio of 1.5:1, the majority of injuries occurring in males between seven and 11 years, and in girls between six and 10 years of age. Hedegård & Stålhane (1973) and Stålhane & Hedegård (1975) who treated 3752 children between seven and 15 years of age attending the Eastman Institute in Stockholm, Sweden, because of injury to their teeth, also found the boys to have more than twice as many injuries to teeth as girls. Zadik et al (1980) studied 252 children in Jerusalem who attended the Hadassah hospital clinic with dental injuries. Their findings were similar to other surveys; the largest number of injuries occurred at age nine years and 25 per cent of the children had had previous injury.

Several studies have shown that the same child may receive several injuries. Accident proneness must also be considered and studies by the World Health Organization (1956) suggest that children who are careless or come from broken homes are more prone to accidents than others. O'Mullane (1973) investigated factors predisposing to injuries of permanent incisor teeth in school children. In his Irish sample, the prevalence of injured permanent incisors was significantly higher in subjects with protruding incisors and inadequate lip coverage and also in those who were accident prone. Only a small percentage of this sample was shown to have been injured during organized contact sports.

In North America, ice hockey, football, and basketball are major contact sports for boys. Reeves & Mendryk (1970) in a hockey injury study showed that in Alberta, Canada, of 6890 players from 461 teams, 446 injuries were reported from 345 players. The

overall injury rate was 5 per cent. The mouth received 16 per cent of the total injuries which was the highest of any single body region. Wood (1972), discussing head protection in contact sports, emphasizes the health profession's responsibility in injury prevention.

Of those investigators who looked at injuries to individual anterior teeth, a clear pattern has been shown. Ellis (1960) found that 73 per cent of fractured teeth were upper central incisors, 18 per cent were lower central incisors, 3 per cent upper laterals and 6 per cent lower laterals. Zadik et al (1972) showed 89.5 per cent to be upper central incisor teeth and O'Mullane (1972) found that 87.1 per cent of injured teeth were upper central incisors in girls, and 74 per cent upper central incisors in boys. Trauma to primary teeth has been reported by Schreiber (1959) who undertook a study of 118 young children who had attended the Manchester Dental Hospital, England. He found that the primary anterior teeth were the most commonly injured mainly between one and two years of age. Injuries to the deciduous dentition are discussed in Chapter 10.

CEREBRAL PALSY

A special group within the pediatric population with a high proclivity to dental trauma are the patients with cerebral palsy. Their susceptibility stems from two factors. Many of these children are subject to abnormal muscle tones and function in the oral area producing protrusion of the maxillary anterior teeth. Secondly, because of their poor skeletal muscle cooperation, they are subject to frequent falls. Prevention is therefore the wisest course of action. Health workers treating cerebral palsied patients should make every effort to inform parents and professionals involved with these children of the high risk of dental injury and actively promote the general wearing of protective extra-oral athletic type mouthguard protection as described later.

IMMEDIATE RESULTS OF TRAUMA

A blow to the face may not cause permanent damage but can result in displacement, fracture, or both displacement and fracture of teeth, with or without damage to the supporting and surrounding tissues (Table 1.1). The direction and force of the blow can cause either direct or indirect injury to the teeth. Direct trauma occurs when a tooth is hit directly by an object such as a stone or hockey

Table 1.1

Injury	
Subluxation (Loosening without displacement)	Displacement
	<div> <div>Partial Displacement</div> <div>Total Displacement</div> </div>
	<div> <div> <div>By Direct Trauma</div> <ol style="list-style-type: none"> 1 Palatal or lingual movement with fracture of the palatal or lingual alveolar bone. 2 Palatal or lingual movement with fracture of the labial alveolar bone and compression of the palatal or lingual alveolar bone. 3 Displacement of the tooth from its socket. </div> <div> <div>By Indirect Trauma</div> <ol style="list-style-type: none"> 1 Labial movement with fracture of the palatal or lingual alveolar bone and compression of the labial alveolar bone. 2 Labial movement with fracture of the labial alveolar bone. 3 Intrusion of the tooth into its socket compressing bone in the periapical region. </div> </div>
	<div> <div> <div>Enamel fracture, not involving dentine.</div> <div>Enamel and dentine fracture but no pulpal exposure.</div> <div>Extensive crown fracture exposing the pulp.</div> <div>Fracture of the root with or without coronal fracture.</div> </div> <div>Tooth fracture</div> </div>

ball. Indirect trauma occurs when the mandibular teeth are forcibly closed against the maxillary teeth, usually as a result of a blow on the chin.

If the teeth are loosened or partially displaced, one of several conditions can occur.

Subluxation

Any injury to the teeth which causes loosening but no observed displacement is referred to as subluxation. This is damage to the tooth supporting structure and is normally the result of mild trauma. Severe trauma more commonly will result in tooth displacement or fracture.

Partial displacement by direct trauma

In this case the teeth are usually displaced towards the tongue or palate and will appear either elongated or retroclined compared with the unaffected teeth.

The teeth displaced are generally maxillary central incisors of a young child where the roots are incompletely formed and the cancellous bone of the maxilla is less dense than in the adult. The tooth, therefore, with less support against a sudden blow, displaces with relative ease.

The displacement normally follows one of three movements:

1. A palatal or lingual movement with fracture of the palatal or lingual alveolar bone (Fig. 1.3A).
2. A palatal or lingual movement with fracture of the labial alveolar bone and compression of the palatal or lingual alveolar bone (Fig. 1.3B).

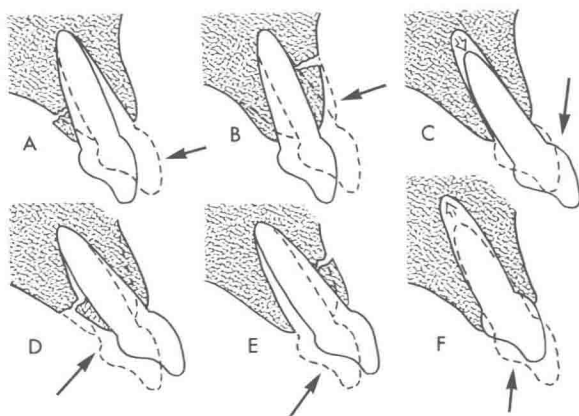


Fig. 1.3 Types of tooth displacement following direct and indirect trauma

3. Displacement of the tooth from its socket, the tooth appearing elongated on clinical examination (Fig. 1.3C).

Partial displacement by indirect trauma

Indirect trauma, in contrast to the direct trauma described above, usually results in the teeth being displaced labially or intruded into the alveolar bone, compared with the unaffected standing teeth.

The displacement again commonly follows one of three movements:

1. A labial movement with fracture of the palatal or lingual alveolar bone and compression of the labial alveolar bone (Fig. 1.3D).

2. A labial movement with fracture of the labial alveolar bone (Fig. 1.3E).

3. Intrusion of the tooth into its socket compressing bone in the periapical region, the tooth appearing short on clinical examination (Fig. 1.3F).

Total displacement due to trauma

Total displacement of anterior teeth can also occur. Nearly always the cause of such displacement is the consequence of direct trauma (Fig. 1.4).

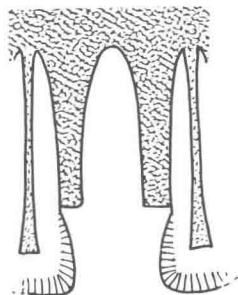


Fig. 1.4 Total tooth displacement following trauma

Fracture due to trauma

Fracture of anterior teeth is a common sequela of a blow to the face. The teeth may be fractured and also show one of the partial displacements listed above. The varieties of fracture fall into four basic types which are the same for both permanent and deciduous dentitions (Fig. 1.5).

Type I Simple fracture of the crown not involving dentin.