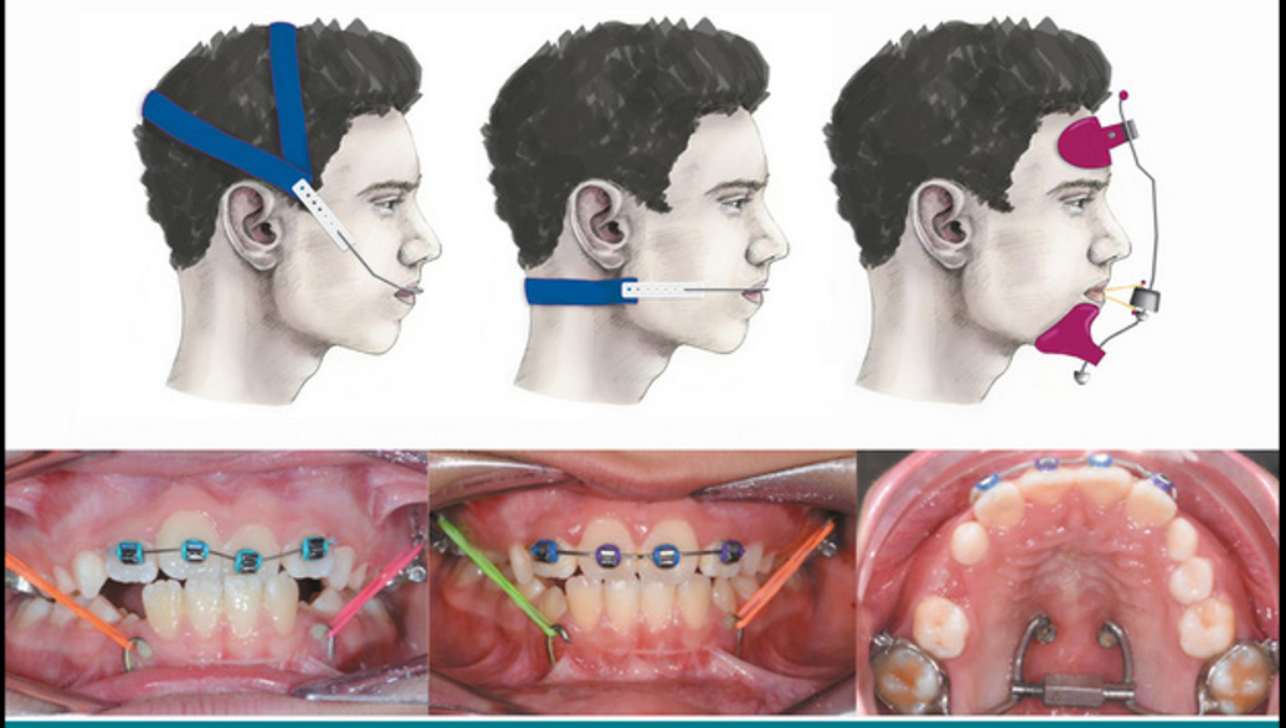
# Orthodontics for Dental Hygienists and Dental Therapists

TINA RAKED



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*Tina Raked*

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*To my parents and my family for their love, encouragement and endless support.*

# Contents

# Preface

As an oral health therapist, I am grateful to have this opportunity to help oral health and dental hygiene students to gain a better understanding of the fundamentals of orthodontic theories and gain elementary clinical guidance. My aim is to provide a textbook that breaks down the orthodontic mechanics and delivers explanations of the basic orthodontic theories in a simple approach. This book is intended for all undergraduate dental hygiene, dental therapy and oral health students.

Among various countries the role and scope of practice of oral health therapists, dental hygienists and dental therapists greatly varies. Nevertheless, it is best to have validations on scopes of practice with the dental associations within each state or country to confirm the clinical limitations prior to any clinical practice.

To become valuable team members in an orthodontic practice, it is crucial to understand the orthodontic mechanics and fundamentals regardless of the clinical limitations. This allows therapists to communicate better with patients and other colleagues. Hence, it is important that all oral health therapists, dental hygienists and dental therapists have the essential theoretical knowledge of the field to be able to understand the clinical outcomes and treatments carried out by orthodontists.

Tina Raked
Sydney, Australia
2017

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## About the Companion Website

Remember to visit the companion website for this book:

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# 1

# Scope of Practice and Competency

Dental care services may require a team of dental professionals to carry out the necessary treatments. There are several divisions for registered dental practitioners in different types of healthcare settings with diverse scopes of practice based on their training, education and competence. These divisions in the dental industry vary greatly between countries.

## Dentists

Dentists are independent practitioners with a range of responsibilities associated with assessment, prevention, diagnosis, treatment and management of dental lesions, deformities, traumas and diseases of human teeth and associated structures. Care is provided to patients of all ages. Dentists can practise all aspects of dentistry that is within their education, training and competency and can further pursue a specialist training to become dental specialists in various fields of dentistry. Examples of these specialties include:

- orthodontics
- endodontics
- oral and maxillofacial surgery
- oral pathology
- oral surgery
- periodontics
- paediatric dentistry
- prosthodontics
- special needs dentistry.

## Oral Health Therapists

This dual-qualified programme provides graduates with sufficient knowledge of all aspects of dental hygiene and dental therapy. In a general dental setting, the scope is to provide assessment, diagnosis and treatment for children and adolescents, working closely with dentists. Depending on the national board approved programme, the

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treatment can be carried out for patients of all ages. The scope is regulated to preventative services, restorative work and fillings, extraction of deciduous teeth, treatment of periodontal diseases, oral health education and promotion. Oral health therapists work closely with specialists in an orthodontic setting to carry out the treatment plan designed by the orthodontist. Based on the training and education provided in the programme, the level of competency greatly varies.

## Dental Hygienists

Assessment, diagnosis, treatment and management of mild to moderate periodontal diseases are the primary roles of dental hygienists. Treating severe periodontal cases with a surgical approach is beyond the scope of dental hygienists. In these instances, dental hygienists work closely with periodontists to manage the condition. The main role is oral health education and prevention of oral diseases in patients of all ages, by promoting better oral health and hygiene. In a general dental setting, dental hygienists only work within a structured professional relationship with dentists. In the orthodontic setting, dental hygienists work under the guidance and supervision of an orthodontist.

## Dental Therapists

The primary role of the dental therapist is assessment, diagnosis and management of dental caries. This is achieved by providing preventative care services, pulpotomies and extraction of deciduous teeth, restorative procedures for children and adolescents. Depending on the national board approved programmes, the age limits vary and some scopes allow treatment for patients of all ages. One of the key roles of dental therapists is enhancing better oral health with oral health promotion and education for patients of all ages. Dental therapists are only permitted to work within a structured professional relationship established with dentists.

## Orthodontic Treatment

The scope of orthodontics is not narrowed solely to straightening teeth. The field of orthodontics is about treatment of irregularities in growth and development of the orofacial complex, enhancing function and aesthetics. Orthodontic treatment contributes to improving the physical and mental wellbeing of the patient. A team approach by dental professionals is needed to achieve successful outcomes and to provide the patient with a pleasant experience. Some cases may require a team of specialists cooperating together to guide the patient towards their orthodontic goal and providing them with a balanced facial appearance, healthy periodontium and a functional occlusion with an aesthetically pleasing smile.

In an orthodontic practice, oral health therapists, dental therapists and dental hygienists work closely with orthodontists to carry out the treatment plan under the supervision of the specialist. The level of training of dental practitioners varies greatly

worldwide. Thus, for efficient and quality dental treatment, it is critical to confirm the limitations and scope of practice within each state or country before any form of clinical practice. Oral health therapists, dental hygienists and dental therapists can be valuable team members in an orthodontic setting, but they also play an important role in general dental clinics. A greater knowledge of orthodontics is therefore essential for these practitioners to help to monitor dental growth and development closely during regular dental visits and to make appropriate referrals as required.

Every orthodontist will manage their patients differently based on their education and training. Over the years, there have been well-known specialists who have contributed to the evolution of orthodontics by introducing advanced and contemporary techniques and appliances. There can be numerous ways to reach a common goal using various treatment options and appliances. These goals may not always be what the specialist considers as the norm or ideal. The treatment objective is to address the chief complaint and to respect the goals and objectives requested by the patient.

There is sufficient knowledge and understanding of the ideal occlusion. One scheme that is well known and used as guidance by many specialists is Andrews' six keys (Andrews, 1972). An ideal occlusion is shown in Figure 1.1. The six keys are as follows:

1) Correct molar relationship
2) Correct crown angulation
3) Correct crown inclination
4) No rotations
5) No spaces
6) Flat occlusal plane.

A variety of treatment options can be outlined to reach the desired goals. These goals and procedures must be discussed in depth and approved by the patient. A treatment plan may indicate the need or combination of the following:

- extractions
- functional appliances (influences dentoalveolar and muscular changes)


**Figure 1.1** Normal occlusion. *Source*: Courtesy of Professor Ali Darendeliler.

- orthopaedic appliances (stimulate bone growth and position)
- removable appliances
- full/partial upper and lower fixed appliances
- single arch fixed appliances
- orthognathic surgery
- acceptance of the malocclusion.

Typically, treatment in deciduous dentition is not indicated and is delayed until early mixed dentition, with an exception for significant facial asymmetry and craniofacial deformities. Early treatment aids in minimising the severity of the orthodontic problem and reduces the need for complex treatment once the permanent dentition is established. Adults of all ages can undergo treatment, depending on the health of the underlying periodontium. In severe cases, orthodontic therapy alone may not suffice and a combination of orthognathic surgery and restorative dental procedures may be needed, particularly if growth has ceased. In some instances, patients may choose to accept their orthodontic problem and may not seek treatment. Acceptance of the malocclusion or skeletal disharmony is always an option if the patient disagrees with all the treatment options provided by the specialist. Growth and development, orthodontic assessment, treatment planning and various appliances are discussed in the remaining chapters in this book.

## Orthodontic Indices

Several orthodontic indices have been developed to create a better understanding of the severity of the orthodontic problem and the need for treatment. Some of the commonly used indices include the Index of Orthodontics Treatment Need (1987), the Peer Assessment Rating and the Index of Complexity Outcome and Need.

The Index of Orthodontic Treatment Need (Daniels and Richmond, 2000) is designed for children under the age of 18 years. There are two components to this index. The first is the dental health element and the second is aesthetics. The British Orthodontic Society provides five grades that allow clinicians to evaluate the rationale for treatment. The aesthetic aspect of this index employs a series of ten photographs. The index only assesses the incisors and does not consider all possible malocclusions, such as class III and open bites.

The Peer Assessment Rating (Richmond et al., 1992) was developed to assess the effectiveness and success of the orthodontic treatment outcome based on various occlusal traits. The traits assessed include crowding, buccal segment relationships, overjet, overbite and midlines. Each trait is given a score and the diagnosis of severity is made based on the total of the scores.

The Index of complexity Outcome and Need is the combination of scores from the Index of Orthodontic Treatment Need and the Peer Assessment Rating. The final scores indicate the severity of the orthodontic issue and the need for treatment. Score of more than 43 indicates a need for treatment. Other commonly used indices include the Treatment Priority Index (Grainger, 1967) and Dental Aesthetic Index (Cons et al., 1987).

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# 2

# Growth and Development

## Craniofacial Growth and Development

A better understanding of growth and development can create an easy path in gaining superior knowledge of diseases and abnormal developmental processes. In some cases, early detection of abnormalities can prevent complex treatments. This chapter provides a brief summary of craniofacial growth and tooth development.

### What is Growth?

Over the years, there have been several definitions and justifications of growth. Some refer to growth as an increase in the size or number or changes in the amount of living substance occurring in a process of development.

Human growth refers to numerous sequential, developmental stages involving tissue and cell differentiations for formation of various organs and systems. Development is an evolutionary process from initiation to maturation. However, growth and development are not always about an increase in size or multiplication of cells. In some cases, certain cells and tissues must differentiate, change or decrease in size or number for other cells to form completely without abnormalities; for example, if remnant cells (remaining cells) persist during development and differentiation, they may result in cysts and complicate the growth process.

### What Factors Affect Growth?

Several factors can influence growth. These factors can be categorised into two major groups of genetics and environmental. Hereditary factors or genetics play a significant role in regulating growth patterns. Thus, people are distinct because of their unique genetic make-up and individualised growth and development. Environmental dynamics can modify the outcomes of normal growth patterns depending on the time and type of environmental influence. Human growth consists of two phases of prenatal (before birth) and postnatal (after birth).

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## Prenatal Developmental Phases

The normal human prenatal development consists of three phases, beginning with fertilisation and proceeding to formation of the three germ layers (ectoderm, mesoderm and endoderm). The first three weeks are considered to be the first prenatal phase. From the fourth prenatal week, the second phase initiates and extends to the eighth week. Any disturbances during the second prenatal phase may lead to various abnormalities and defects, depending on the type and timing of the disruption. This period is vital, as the three germ cells differentiate into several tissues and gives rise to the organs and systems. The prenatal development ends with the fetal phase, from the ninth to the fortieth week. The focus of this chapter is on the first two stages of prenatal development and provides a summary of postnatal craniofacial growth.

### First Prenatal Phase (Weeks 1–3)

Embryogenesis is the term given to the process of embryo formation and development (Figure 2.1). An embryo development begins with a zygote formation in a process called fertilisation. Sperm swim through the fallopian tube until they reach the ovum (egg) that has been released from one of the ovaries. Sperm attack the ovum to break through the physical barriers and membranes for its nuclei to fuse with the egg nuclei to form a zygote (Figure 2.2). The zygote travels towards the uterus, down the fallopian tube.

The zygote undergoes several mitotic cell divisions during a process called cleavage and develops into a ball of cells known as the morula. Three days after fertilisation, the morula enters the uterus. The outer cells of the morula undergo compaction within a week and the morula becomes a blastocyst. It consists of a single outer layer called the trophoblast and a fluid-filled space, the blastocoel (also known as the blastocyst cavity). There are groups of cells inside the trophoblast, called the inner cell mass or embryoblast.

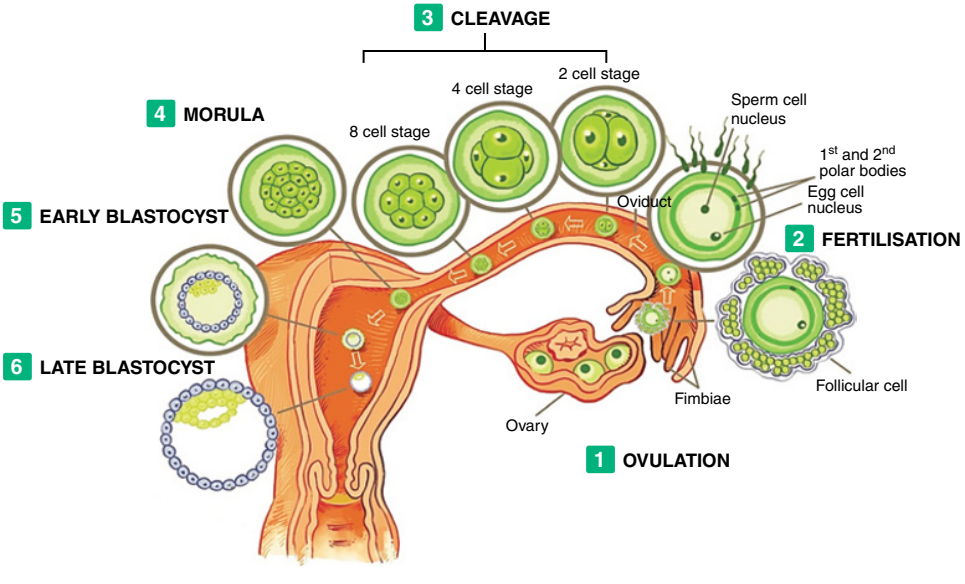


**Figure 2.1** The first prenatal phase (weeks 1–3).