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## Introduction

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## CHAPTER MENU

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Although each person shares with the rest of the population many characteristics, there are enough differences to make each human being a unique individual. Such limitless variation in the size, shape, and relationship of the dental, skeletal, and soft tissue facial structures are important in providing each individual with their identity (Bishara et al. 2001).

Dorland's Medical Dictionary defines symmetry as "the similar arrangement in form and relationships of parts around a common axis or on each side of a plane of the body" (*Dorland's Illustrated Medical Dictionary* 2000).

The absence of symmetry is asymmetry and is frequently experienced by man in their facial features, both structurally and functionally.

The term symmetry is generally used in two different contexts:

The first meaning is a precise and well-defined concept of balance or "patterned self-similarity" that can be demonstrated or proved according to the rules of a formal system, namely geometry, physics, or otherwise.

The second meaning is an imprecise sense of harmonious or esthetically pleasing proportionality and balance reflecting beauty or perfection. As such, symmetry was demonstrated within art by Leonardo Da Vinci in his Vitruvian Man in 1492 (Figure 1.1) (Baudouin and Tiberghien 2004).

Asymmetry has, on the other hand, been part of the features characterizing the unpleasant and the unharmonious (Edler 2001; Rhodes et al. 2001).

Whereas symmetry in art is used to express harmony, beauty, and peace, asymmetrical layouts are generally more dynamic, and by intentionally ignoring balance, the designer can generate tension, express movement, or convey a mood such as anger, excitement, joy, or casual amusement (Komoro et al. 2009).

Facial asymmetry, being a common phenomenon, was probably first observed by the artists of early Greek statuary who recorded what they had found in nature – normal facial asymmetry (Lundstrom 1961).

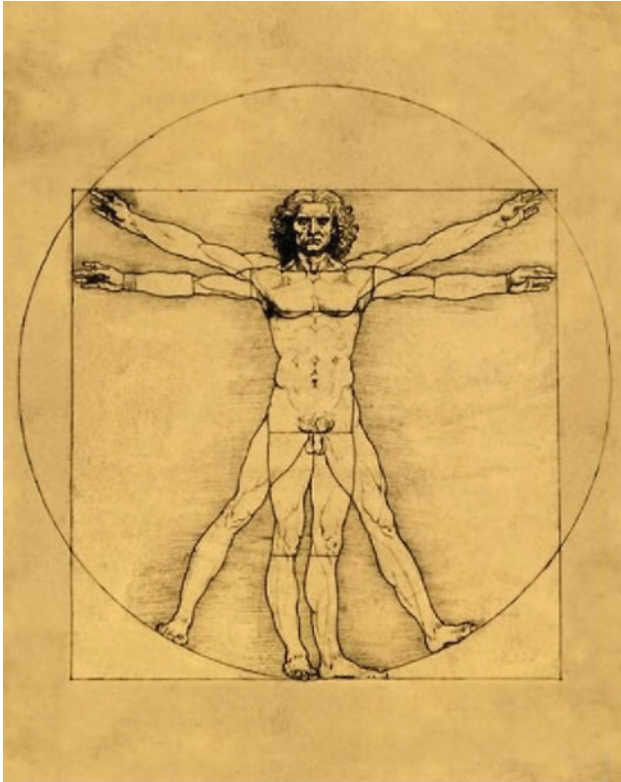
A perfect facial symmetry is extremely rare and practically all normal faces exhibit a degree of asymmetry (Figure 1.2). As in art, where the side has an importance in the interpretation of a movement displayed on a painting, the two sides of the face may express feelings (Schirillo 2000).

The left side of the face is considered more emotionally expressive and more often connotes more negative emotions than the right side. Also interestingly, artists tend to expose more of their models left cheek than their right. This is significant, in that artists also portray more females than males with their left cheek exposed. These psychological findings lead to explanations for the esthetic leftward bias in portraiture (Schirillo 2000; Powell and Schirillo 2009).

The studies of asymmetry of the craniofacial region can be divided into two categories. One is focusing on facial asymmetry in various populations and its impact on perception of the individual's attractiveness and health. The second category is dealing with the influence of asymmetry

on treatment of patients receiving orthodontic treatment or craniofacial surgery.

Studies of various populations belong to the first category, and facial symmetry has been associated with health, physical attractiveness, and beauty of a person. It is also hypothesized as a factor in interpersonal attraction, and relevant research indicates that bilateral symmetry is an important indicator of freedom from disease and worthiness for mating (Edler 2001).



**Figure 1.1** Vitruvian Man drawn by Leonardo Da Vinci in 1492 demonstrating the symmetry of the ideal body.

Most facial asymmetries among nonpatients are, however, fluctuating meaning that they have no significant influence on the attractiveness of the face. The perception of a face as attractive is more influenced by averageness meaning: what do the persons I like in “my tribe” look like. The beauty ideal is clearly changing with time and between various populations (Rhodes et al. 2001). The impact of averageness was studied by Komoro et al. (2009) who let laypeople evaluate the effect of symmetry and averageness on photographs and found that symmetry had a limited if any influence on attractiveness, thus confirming earlier findings by Baudouin and Tiberghien (2004). In a more recent study, it was found that symmetry on one hand reduced attractiveness by decreasing perceived normality, but on the other hand could also increase attractiveness by promoting the perceived symmetry (Zheng et al. 2021). Furthermore, it has been suggested that completely symmetrical faces might appear unemotional and thus less attractive (Swaddle and Cuthill 1995).

The second category of studies deal with asymmetry in relation to treatment. In reference to the need for treatment, it should be noted that the point at which normal asymmetry becomes abnormal cannot be easily defined and is often determined by the clinician’s sense of balance and the patient’s perception of the imbalance (Bishara et al. 2001). Minor asymmetry of the craniofacial skeleton and in the dentoalveolar region is often not easily detected. This can be the reason for which the optimal result of an orthodontic treatment cannot be reached since the asymmetry will often interfere with a satisfactory finishing.

The true prevalence of asymmetries in a population has never been described. Methodological limitations related to etiological factors, timing of appearance, degree of severity, progressing characteristics, and individuals’ age, have enabled relevant studies only in subgroups of patients with facial asymmetry (i.e. hemofacial



**Figure 1.2** Three images where the right face is composed of two right sides, the middle one is the real face, and the left one is composed of two left sides.

microsomia) or dentofacial deformities in university orthodontic clinics.

When studying dentofacial deformity patients at the University of North Carolina, it was found that 34% demonstrated an apparent facial asymmetries. When present, asymmetry affected the upper face in only 5%, the midface (primarily the nose) in 36%, and the chin in 74% (Severt and Proffit 1997).

Recently, Evangelista et al. (2022) performed a review of the prevalence of mandibular asymmetry in different skeletal sagittal patterns and found that there was a significant difference between findings reported from different studies varying from 17.43 to 72.95%, and indicated that the more severe malocclusions exhibited more severe chin deviations than the nonorthodontic population.

Whereas most of the relevant studies have been focusing on facial asymmetry, Sheats et al. (1998) looked into the occlusal status of patients being treated in a graduate clinic and found that in 62% of the patients, the mandibular midline deviated from the facial midline.

An important part of this book will focus on the treatment of patients with various types of facial and dentoalveolar asymmetry focusing on interception, correction, or camouflage. The interception can only be performed for asymmetries related to functional deviations or/and eruption of teeth. Corrections and camouflage in some patients with skeletal asymmetries start at an early age and often continue for the remaining growth period. In adult patients, treatment comprises displacement of teeth and dentoalveolar modeling with goal-oriented biomechanics and orthognathic surgery when needed. For asymmetries with

different localization, their etiology and the possible treatment modalities from a biological, biomechanical, and surgical viewpoints will be discussed. In relation to management, generating symmetry is among the goals of most treatment plans. However, when the outcome of orthodontics is assessed, even minor asymmetries are frequently impossible to generate a result that is compatible with ideal morphology and function.

The challenges in dealing with problems related to facial asymmetry are numerous and, to the knowledge of the editors, many of them have not been dealt with systematically. The purpose of this book is to satisfy the need for a comprehensive text on etiology, localization, and treatment of asymmetries within the craniofacial region. It is our hope that this books will cover all aspects of asymmetry starting with localization followed by etiology, congenital, or acquired through disease or trauma. In addition, it is crucial to verify if what is detected is reflecting a static or a developing deviation. Not only the localization and the morphological characteristics are important when categorizing the different types of asymmetries, but also the etiology should be established before a treatment plan can be worked out.

All contributing authors of this publication are prominent colleagues recognized as experts each within their specialization and the assigned subject within face asymmetries. It is our hope that this book will serve as inspiration for the colleague to approach a goal-oriented therapy based on all-inclusive diagnoses, localization of the asymmetry, and the definition of a comprehensive treatment goal.

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