CLEFT PALATE
Speech Intervention Across the Lifespan

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PREFACE

This book is the culmination of many phone calls and Zoom discussions related to the care of individuals born with cleft palate by Speech-Language Pathologists (SLPs). There were two abiding issues that became obvious during our initial discussions. First, assessment and treatment for communication disorders are often provided across the lifespan but the range and scope of treatment services depend on the needs of the individual. For instance, initial surgical repair is carried out in the infant/toddler stages and SLPs assist the child and caregivers with early feeding strategies and follow the communication development of the child along with monitoring hearing status. If intervention is needed, treatment will be provided by either the hospital-based SLP or a community-based SLP. For many of our clients, it is a lifelong journey that requires different services at different times through adulthood. The second abiding issue is that there are exceptional therapies that have been developed within the international community and practitioners need a single resource that allows them access to these cutting-edge treatments. For example, using parents as intervention agents may be needed for some individuals, but the hospital-based SLP or community-based SLP may not be familiar with the methods and procedures requisite to instituting such a program. One must also keep in perspective that individuals with cleft palate are managed by an interdisciplinary team and that collaboration among team members and between SLPs is very important. The primary purpose of this publication is to provide a source for treatment across the lifespan that addresses primarily the communication disorders of those born with cleft palate. Not all clients will need speech and language services, but there is a subset who will and that is the impetus for this book.

The book is divided into five sections and the first is entitled Foundations of Treatment. It is preliminary to the other parts of this resource, because it covers relevant background information. For instance, information regarding normal communication processes and delayed development is discussed as it is important to understand normal speech and language development and what constitutes delayed or disordered communication. A clear understanding of normal development provides the practitioner with a foundation to interpret the communicative behaviors of an individual and determine if intervention services are needed. The determination or rendering of a diagnosis needs to be established through an assessment process that examines communication in a systematic way and considers all speech production systems and the individual's cognitive-linguistic functioning. Finally, individuals born with cleft palate are a diverse group with respect to linguistic, cultural, and ethnic factors, and these differences need to be taken into consideration

during both assessment and treatment. The SLP needs to be cognizant of these variables because they are factors that impact treatment decisions for the client and caregivers.

The second section, Treatment: The Early Years, deals with treatment strategies for infants, toddlers, and preschoolers. Even before the cleft palate is repaired, the SLP is in direct contact with the child and caregivers, continuing to assess communication development after surgery and routinely thereafter. The acquisition and expansion of the child's consonant inventory, the detection of cleft-related speech errors, and receptive/expressive language development are some of the key variables that are monitored. For some children with cleft palate, treatment for speech and/or language disorders is necessary during their early years of development; consequently, early intervention services and teaching parents to act as intervention agents are very important in the provision of treatment. Each chapter presents very important information that can be utilized in the consultation and treatment of children in the preschool years.

Treatment: School-Age Years is the third section of the book and deals with a number of diverse topics. The first two chapters present different theoretical approaches for the treatment of cleft-related speech sound errors that have been proposed in the literature. Although there is evidence to support each theoretical treatment approach, readers are advised to conduct a careful analysis of an individual's speech sound errors to determine which treatment will be most effective and efficient. The third chapter in this section discusses the use of Telepractice, which is an innovative way to deliver services. It is a technology that holds real promise for persons who are geographically distant from services or other factors that prevent face to face treatment. It is currently employed by some SLPs who have individuals with cleft-related speech errors on their caseloads. Finally, different instrumental treatments that utilize biofeedback techniques for the correction of speech sound errors or the modification of velopharyngeal closure for speech are presented for the reader. The advantages and disadvantages of instrumental treatments are summarized, along with the limited efficacy of each.

The final two sections entitled Treatment: Teens and Adults and Emerging Directions address a variety of topics that remain centered on treatment. The first is a unique chapter that details treatment services for teens and adults. Some older clients may seek services for speech, while still being seen by a team or when they are no longer being seen. There are different reasons for seeking services, and SLPs need to be prepared to deal with this emerging group. The final section contains diverse topics such as treatment models that are being employed in countries with limited financial, medical, and speech-language pathology resources. Despite significant challenges, different models have been created to deliver services that can be used with local populations and build capacity for future expansion. Collaboration among SLPs is extremely important in contexts of educating SLPs who are not familiar with cleft-related speech errors or in cases where SLPs are working on different aspects of assessment/treatment. In these contexts, collaboration is important, and there are specialized models that facilitate efforts among and between SLPs and other entities to ensure quality services. Finally, evidence-based practice is an important part of the treatment process. The final chapter is an in-depth discussion of evidence-based practice emphasizing the importance of evaluating different intervention strategies prior to implementation. Additionally, it outlines a systematic and evidence-based approach for practitioners to assess the available evidence related to specific interventions.

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1 Introduction to Cleft Palate Speech Disorders

Linda Vallino-Napoli and Dennis Ruscello

General Introduction to Cleft Palate

This is an introductory chapter to the book and provides basic background information cogent to the treatment material that will be presented in the following chapters. The first section provides an overview of cleft lip and palate detailing its causes, types, and management which involves interdisciplinary team care. It also highlights the significance of the International Classification of Functioning (ICF, WHO, 2001) in addressing the holistic and comprehensive assessment and treatment needs of individuals with cleft lip and palate.

The second section of this chapter is devoted to a general discussion of issues related to children who are born with palatal clefts. This information may appear redundant to some speech-language pathologists (SLPs), but review is critical to keep a practitioner current and serve as a resource to SLPs who do not provide services to children with cleft palate on a regular basis. It is important to have the necessary knowledge and skills in this area as it is a low incidence population for community-based clinicians who feel unprepared to provide services (Mason et al., 2020; Mills & Hardin-Jones, 2019).

The third section of the chapter deals with developmental and non-developmental variables related to children with speech sound disorders and is germane to children with cleft palate (Bernthal et al., 2017). Initially, there is a discussion of the communication systems that form the speech production system. We feel that this is important information, because the SLP needs to examine the child's speech and determine which systems are affected. Is there a problem with resonance only or are multiple systems involved such as articulation, resonance, and phonation? The clinician must identify the system problems and provide the appropriate intervention(s). Similarly, it is important to understand normal speech sound production and the knowledge that has been generated through studies of perception, acoustics, and physiology. For example, one needs to understand nasality and its effect on speech production because many of our patients present with resonance disorders. It is also important that the practitioner have an awareness of current models of speech motor control and phonological knowledge considering the different theoretical interpretations and research data, which

implicitly and explicitly influence our assessment and treatment practices (Schwartz, 1992). Developmental data regarding speech perception, speech production, and variations present in the cleft palate population are also reviewed. Finally, the narrative shifts to defining speech sound disorders and specifically the speech sound disorders present in some children born with cleft palate with or without cleft lip.

Section 1. Overview of Cleft Lip and Palate

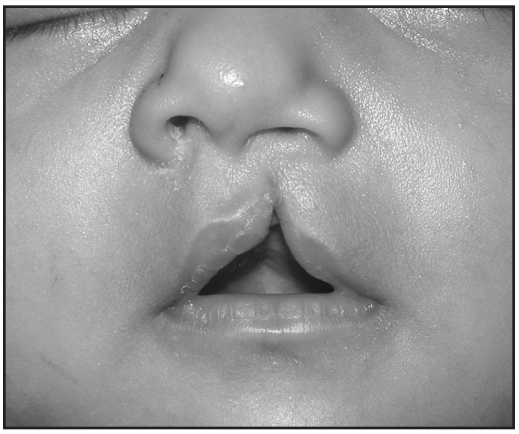
Cleft lip and palate represent one of the most prevalent craniofacial anomalies and the fourth most common birth defect (Parker et al., 2010; Mai et al, 2019; Phalke & Goldman, 2023; Tanaka, et al., 2013). A cleft occurs when the lip, hard palate, and soft palate fail to fuse at the midline during the 6th to 12th weeks of pregnancy. Clefts of the lip and palate are generally divided into two categories: cleft lip with or without cleft palate (CL±P) and cleft palate only (CP). Cleft palate is embryologically different from cleft lip and palate. A cleft can occur in isolation (isolated or nonsyndromic cleft) or as part of a syndrome (syndromic cleft). Around two-thirds of infants born with a cleft present with an isolated CL±P, while the remaining one third of these infants also have other birth defects (Vallino-Napoli et al., 2006). Cleft palate is more often associated with syndromes and other congenital anomalies than with CL±P (Stoll et al., 2022; Tanaka et al, 2013). Cleft lip and/or palate are listed as features of over 400 syndromes or conditions.

The severity of a cleft can vary, ranging from a small notch indentation in the lip to a cleft that involves the lip, alveolus, hard palate, and soft palate. A cleft may be incomplete or complete and affect one side (unilateral) or both sides (bilateral). A cleft is described based on location (unilateral or bilateral), severity (complete or incomplete), and the structures involved (i.e., lip only, lip and palate). Several classifications systems have been devised to describe and classify clefts such as those by Kernahan and Stark (1958), Veau (1931), Kriens (1990) and Kernahan (1971). Figure 1–1 shows the range of severity of cleft lip and palate.

Another variation of a cleft is the submucous cleft palate. This condition is marked by the incomplete fusion of the underlying velar muscles along the midline, while the mucosal layers of the oral and nasal cavities remain intact. The classic triad of a submucous cleft palate is a bifid uvula, notching at the junction of the hard and soft palate, and a bluish coloring in the midline of the soft palate (zona pellucida; Figure 1–2). An occult submucous cleft palate lacks the external anatomical landmarks of a submucous cleft palate while still lacking muscular fusion, making a diagnosis of an occult submucous cleft palate more difficult.

The primary etiology of CL±P is the complex interaction of genetic and environmental risk factors. For some families, the cleft may be a new occurrence in that no other family member has been affected, and for others, there may be a family history of cleft palate. Clefts can be caused by environmental agents, known as teratogens, in the developing embryo during pregnancy. Examples of teratogenic exposures are maternal smoking, maternal alcohol consumption, and overuse or misuse of medications and uncontrolled substances (i.e., fentanyl; Leslie & Marazita, 2013; Wadman et al., 2023).

The estimated prevalence of CP±L is approximately 1 in 700 live births (Mai et al., 2019; Mossey & Castilla, 2003). The



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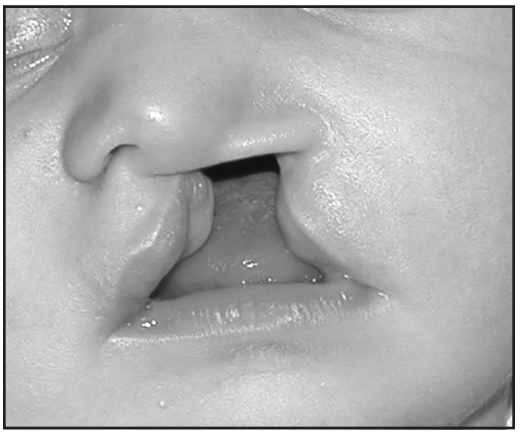

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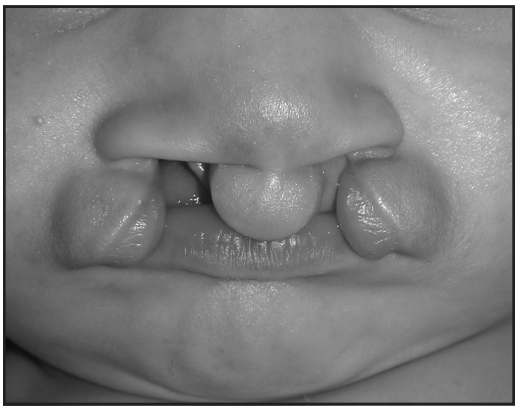
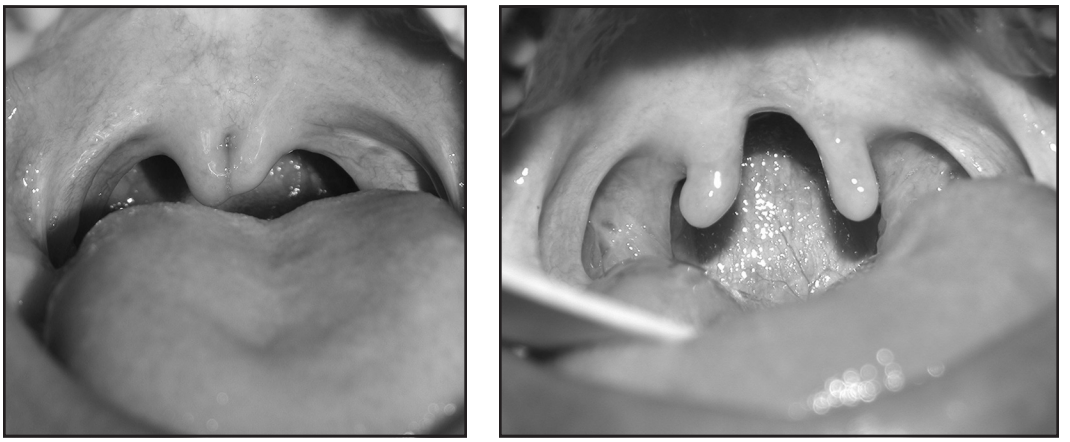


C

Figure 1–1. Range of severity of cleft lip and palate. **A.** Incomplete cleft lip. **B.** Unilateral cleft lip and palate. **C.** Bilateral cleft lip and palate. *Source:* Courtesy of Joseph A. Napoli, MD, DDS, Children's Hospital of Philadelphia, Philadelphia, PA.

occurrence of clefts varies according to the type of cleft, gender, and racial or ethnic background. Generally, CP±L is observed approximately twice as frequently as either cleft lip (CL) or CP alone. Males are affected at a rate that is twice that of females. Cleft lip and palate occur more frequently in males than females whereas CP occurs more frequently in females than males (Calzolari et al., 1988; Donahue, 1965). In terms of racial demographics, the highest prevalence of clefts is found among Asians, followed by Caucasians, and then individuals of sub-Saharan African descent (Murray, 2002; Vanderas, 1987).

Prenatal detection of cleft lip and palate can often be made using 2D or 3D ultrasound conducted between 18- and 20-weeks' gestation (Johnson, 2019). The overall accuracy for prenatal diagnosis varies and is dependent on the experience of the sonographer and cleft type (Smith et al., 2004). The rate of detection of a cleft lip and palate varies from 16% to 93% (Maarse et al., 2010; Cash et al., 2001). Cleft lip is generally easier to detect than an isolated cleft palate. The palate's location, shadowing of the surrounding bones, and limitations of the ultrasound technology, make it challenging to detect a cleft of the alveolus and isolated cleft palate



A B

Figure 1–2. Range of severity of submucous cleft palate. **A.** Narrow. **B.** Wide. *Source:* Courtesy of Joseph A. Napoli, MD, DDS, Children's Hospital of Philadelphia, Philadelphia, PA.

(Smarius et al., 2017). Figure 1–3 shows a high-resolution 3-D ultrasound image of a fetus at 26 weeks of gestation.

Fetal MRI is increasingly being used as an adjunct to ultrasound to identify a cleft. Because the images are more detailed, it is possible that a cleft of the lip and palate can be more readily detected (Yan et al., 2022).

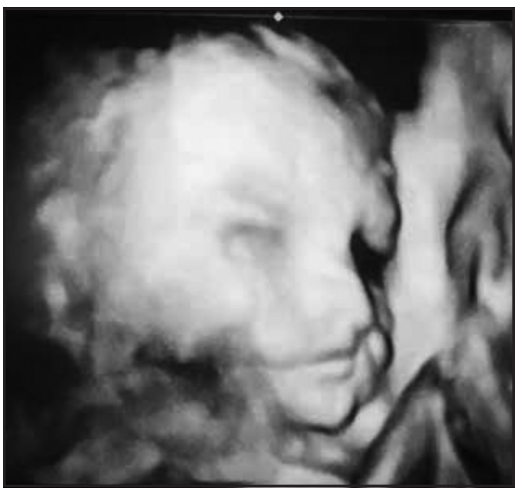


Figure 1–3. Transabdominal 3-D ultrasound image of fetus with left cleft lip and palate. *Source:* From *Evaluation and Management of Cleft Lip and Palate: A Developmental Approach, Second Edition* (pp. 1–450) by Zajac, D. J., & Vallino-Napoli, L. Copyright © 2026 Plural Publishing, Inc. All rights reserved.

General Course of Treatment

The management of cleft lip and palate is a lifelong process, starting at birth and continuing through childhood, adolescence, and into adulthood (Figure 1–4). Initial intervention may take place before birth, when a cleft is identified via ultrasound or fetal MRI. When a cleft is identified prenatally, the emphasis is placed on providing family support, guidance, and information regarding the condition, overall care, and intervention timelines. Following birth, the focus shifts to addressing the cleft lip and palate deformity and other conditions such as otitis media. During this time, families receive ongoing counseling about feeding, speech and language, and hearing. As the child nears school age and adolescence, additional surgical procedures, such as alveolar bone grafting and, if necessary, speech

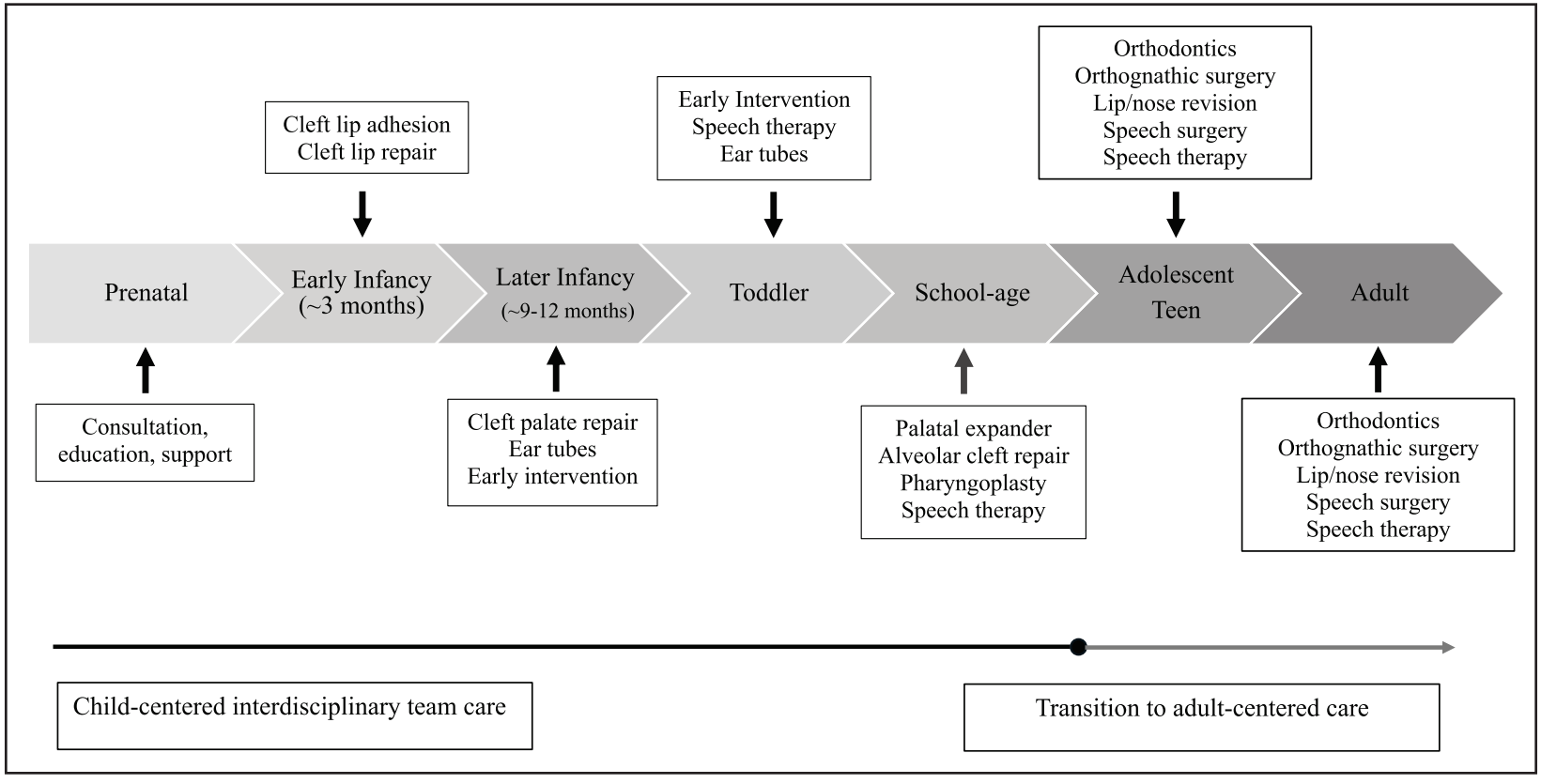


Figure 1–4. Management of cleft lip and palate across the lifespan.

surgery to correct hypernasal speech, are undertaken. During the teenage years and adulthood, treatment typically focuses on surgical interventions aimed at correcting malocclusion, addressing deformities of the lips and nose, and, in some cases, performing additional surgeries related to speech. General guidelines for surgical interventions related to cleft conditions are outlined in Table 1–1.

Speech intervention plays an important role in the comprehensive care of individuals with cleft lip and palate. While not every child with a cleft palate will require intervention, there are those who do. This intervention can occur at any stage of life. Early intervention can address early speech and language delays that are present before and after palate repair (see Chapters 4 and 5). As the child grows older, speech therapy addresses the modification of cleft related speech disorders as well as other noncleft speech disorders (see Chapters 6 and 7).

Upon reaching adulthood, individuals have considerably more autonomy in deciding to seek speech therapy. Some might choose

Table 1–1. General Guidelines for Surgical Treatment of Cleft Lip/Palate Across the Lifespan*

Typical Age*	Intervention
<3 months	†Prior to definitive cleft lip repair, presurgical management options include: Nonsurgical Lip taping Nasoalveolar molding (NAM) Presurgical Lip, Alveolus, and Nose Approximation (PLANA) Surgical Lip adhesion
3 to 6 months	Cleft lip repair
9 to 14 months	Cleft palate repair
7 to 9 years	Alveolar bone graft
16 years+	Orthognathic surgery Lip/nose revision
4+ years, including adulthood	Speech surgery (if needed)

*Each child is unique so that the age at time of surgery may vary depending on factors such as health status of child, medical/team protocol, and caregiver values and preferences.

†Infants who have a wide or severe cleft lip and palate may require presurgical orthopedics to narrow the width of the cleft and align the maxillary segments prior to definitive cleft lip repair.