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AN OVERVIEW OF THE CLASSIFICATION OF CLEFT IN THE OROFACIAL REGION

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ABSTRACT

The classification system for orofacial clefts is based upon the cleft lip and palate morphology and embryonic principles. The classification system focuses on providing clinicians with the proper diagnosis, grading the severity of the condition, and planning the treatment. The classifications system of orofacial cleft consists of Tessier type, Veau, and Davis and Ritchie classifications. Davis and Ritchie's classification was fundamental, followed by the symbolic representation of Kernahan and their modifications. The Veau and Davis and Ritchie classification systems were the most popular. The American Cleft Palate Association and Kernahan and Stark classifications probably represent the best variable systems today. This article reviews the past and the most recent classifications to understand better and represent the various types of cleft deformities.

Keywords: Orofacial clefts, cleft lip, cleft lip and palate (CLP), cleft palate (CP)

INTRODUCTION

In humans, orofacial clefts are a common craniofacial birth defect and may be associated with other congenital anomalies. The incidence of the orofacial cleft is approximately 1 in every 500-550 births. It consists of atypical and typical orofacial clefts. The typical orofacial clefts including cleft lip, cleft lip and palate, and cleft palate, and atypical clefts including median, transverse, oblique, and other Tessier types of facial clefts **[1, 2]**. A universally accepted classification scheme that fully encompasses, accurately describes, and integrates all the various types of orofacial and a craniofacial cleft does not exist. Van der Meulen's classification has an embryologic basis and Tessier's classification has an anatomical basis.

The cleft in the lip may be unilateral or bilateral, occurring on one or both sides, respectively. In contrast to clefts of the lateral lip, median lip clefts are relatively rare. An incomplete median cleft (vermilion notch) may occur as an isolated entity or as part of such syndromes as an orofacial-digital syndrome. Clefts of both the lip and palate are also unilateral or bilateral. They may be complete or incomplete. In a complete unilateral cleft of the lip and palate, direct communication exists between the oral and nasal cavities on the side of the palate where the cleft is situated. The nasal septum is attached to the palatal process on the opposite side, thus separating the nasal chamber from the oral cavity. The cleft of the lip can also be associated with alveolus, known as the cleft of lip and alveolus. The alveolar portion is usually distorted outward incomplete lip clefts. When the lip is united, the newly created lip force molds the alveolar section into proper alignment. The purpose of this review is to provide an overview of the Classification systems proposed year-wise based on the morphology of cleft lip and palate and a few on the embryonic principles. This classification system not only helps the clinician to name, grade, remember, plan and discuss the clinical scenario but also describes the condition of cleft, its extension, and severity. The palate has always been included in the various classifications, sometimes with separate specifications of clefts of the hard palate, soft palate, and even uvula.

Classification by Davis And Ritchie Classification (1922)

The following classification was proposed by Davis and Ritchie in 1922 **[3]**. It was one of the first classifications in the literature. This system broadly categorized

the clefts into three groups according to the position of the cleft with the alveolar process.

Group I (Pre alveolar clefts) - Unilateral cleft lip, Bilateral cleft lip, Median cleft lip

Group II (Post alveolar clefts) - Cleft hard palate alone, Cleft soft palate alone, Cleft soft palate and hard palate, submucous cleft

Group III (Alveolar clefts) - Unilateral alveolar cleft, Bilateral alveolar cleft, Median alveolar cleft.

Classification by Veau (1931)

The following classification was proposed by Veau in 1931 **[4]**. **(Figure 1)**

Group I (A)	Defects of the soft palate only
Group II (B)	Defects involving the hard palate and soft palate extending no further than the incisive foramen, thus involving the secondary palate alone.
Group III (C)	Complete unilateral cleft, extending from the soft palate to the alveolus, usually involving the lip
Group IV (D)	Complete bilateral clefts resemble Group III but are bilateral. When cleft is bilateral, pre-maxilla is suspended from the nasal septum.

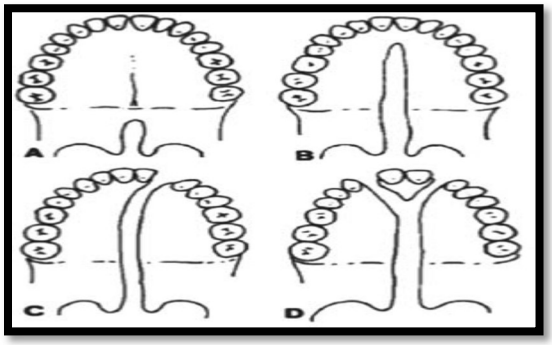

Figure 1: Diagrammatic presentation of Veau's classification

Classification by Fogh Anderson (1942)

Poul Fogh Anderson [5] of Copenhagen described his morphological classification of cleft lip and palate based on embryology and genetics. He divided clefts into three main groups:

- **Harelip (Single or double)** including all degrees from a small notch in the prolabium to a complete cleft of the lip extending "as far as the incisor foramen".
- **Harelip and cleft palate**, which is the largest group. He noted complete clefts from nostril to uvula. This group included single and double clefts.

- **Cleft palate-** This group included isolated cleft palate which he noted may involve the soft and hard palate and is always median and it never reaches further than the incisor foramen. He also included the submucous cleft presenting a cleft in the soft palate but only a bony cleft of the hard palate with intact oral and nasal mucous membrane **(Figure 2)**.

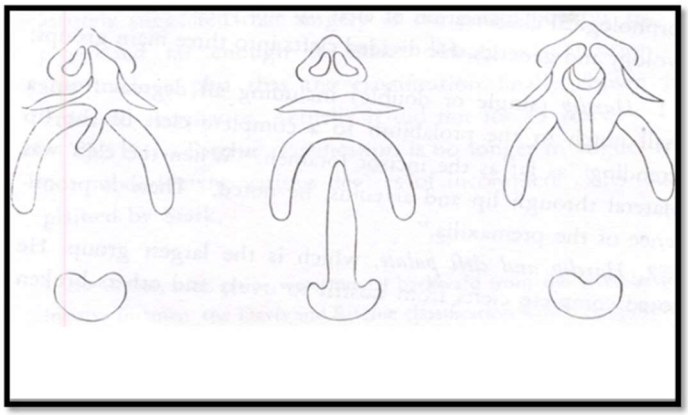

Figure 2: Diagrammatic presentation of Fogh Anderson's classification

Classification by Kernahan And Stark (1958)

Kernahan and Stark [6] recognized the need for a classification based on embryology rather than morphology. The primary palate denotes the lip, alveolar ridge, and premaxilla and the secondary palate refers to the hard and the soft palate which evolves from the maxillary shelves.

Clefts of primary palate only	• Unilateral: Complete and Incomplete. • Median: Complete (premaxilla absent) and incomplete (premaxilla rudimentary) • Bilateral: Complete and Incomplete
Clefts of secondary palate only	• Complete, incomplete, or submucosal
Clefts of the primary and selcondary palate	• Unilateral (right or left) • Complete or incomplete. • Median: Complete or incomplete. • Bilateral

Classification by American Cleft Palate Association (1962) [7]

1. **Clefts of Pre-palate**

Cleft lip

Unilateral-	Right, left, extent in thirds
Bilateral-	Right, left, extent in thirds
Median-	Extent in thirds
Prolabium-	Small, medium, large
Congenital scar-	Right, left, medium Extent in thirds

Clefts of the alveolar process

Unilateral-	Right, left, extent in thirds
Bilateral-	Right, left, extent in thirds
Median-	The extent in thirds, submucous right, left, median

Cleft of pre-palate

• Any combination of the foregoing type
• Pre-palate protrusion Pre-palate rotation
• Pre-palate arrest (median cleft)

2. **Clefts of Palate**

Cleft of the soft palate

• Posteroanterior in thirds width (maximum in mm)	
• Palatal shortness-	None, slight, moderate, marked
• Submucous cleft-	Extent in thirds

Cleft of the hard palate

• Posteroanterior in thirds width (maximum in mm)	
• Vomer attachment-	Right, left, absent
Submucous cleft-	Extent in thirds

Symbolic Classification by Schuchardt And Pfeifer's (1964)

Schuchardt and Pfeifer's **[8]** was the first diagrammatic classification **(Figure 3)**. It makes use of a chart made up of a vertical block of three pairs of rectangles with an inverted triangle at the bottom. The inverted triangle represents the soft palate, while the rectangles represent the lip, alveolus, and hard palate as we go down. Areas affected by clefts are shaded on the chart. Partial clefts and total clefts were shaded in different colors. It is a relatively simple classification and ideal if printed graphs of the proposed chart were available. It was not easy to communicate as writing or typing was not possible.

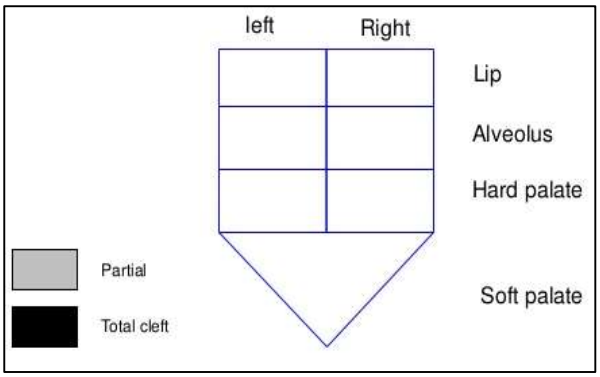

Figure 3: Diagrammatic presentation of Schuchardt and Pfeifer's classification

Classification by International Confederation For Plastic and Reconstructive Surgery (1968) [9]

Group I: Clefts of Anterior (Primary) Palate - Lip: right and/or left, Alveolus: right and/or left.

Group II: Clefts of Anterior and Posterior (Primary and secondary) palate- Lip: right and/or left, Alveolus: right and/or left, Hard palate: right and/or left

Group III: Clefts of Posterior (Secondary) Palate- . Hard palate: right and/or left, Soft palate: medium

For further subdivision the terms 'total' and 'partial' should be used. Rare Facial Clefts Classification based on topographical findings

a. Median clefts of the upper lip with or without hypoplasia or aplasia of premaxilla

b. Oblique clefts (oro-orbita)

c. Transverse clefts (oroauricular)

d. Clefts of the lower lip, nose, and other very rare clefts.

Classification by Arturo Santiago (1969)

The classification was proposed by Santiago in 1969[10]. In this classification, he employed four digits to indicate the presence of the cleft and its location. Each digit is followed by a letter to indicate the condition of the cleft (complete, incomplete, or submucous)**.** The first and second digit represents the lip and the alveolus. The third and fourth digit represents the hard palate and the soft palate.

The numbers in digits represent the condition of the cleft are given as 0= No cleft, 1= Midline cleft, 2= Cleft on right side, 3= Cleft on left side, 4= Bilateral cleft

The letters indicate the types of cleft are given as: A = An incomplete midline cleft, B = An incomplete cleft of right side, C = An incomplete cleft of left side, D = Bilateral incomplete cleft, E = Sub mucous cleft

Points to consider when using the Arturo Santiago Classification System**:**

• When a cleft is not described that is complete or incomplete, it is always assumed as complete cleft.

• When clefts of lip, hard and soft palate are described without giving any information about alveolus, it is assumed that it is completely affected by cleft.

• All cases will be considered midline cleft unless otherwise specified.

Kernahan's Stripped 'Y' Classification (1971)

This symbolic classification was proposed by Kernahan **[11]** in 1971. The classification uses a stripped 'Y' having numbered blocks to represent a specific area of the oral cavity **(Figure 4)**.

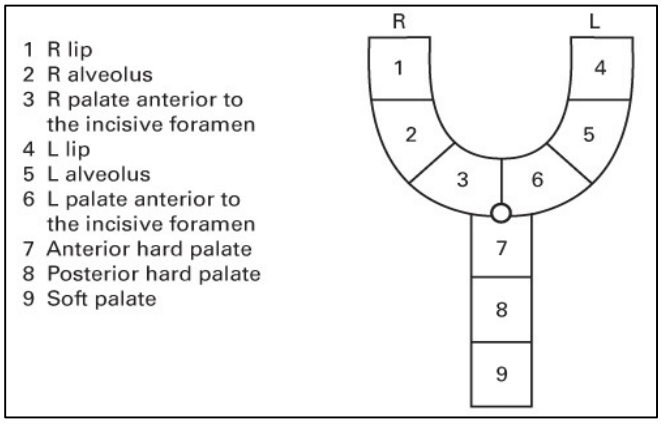

Figure 4: Diagrammatic Presentation of Kernahan's Classification Classification

Elsahy's Modification of the Kernahan's Stripped "Y" Classification (1973)

Elsahy **[12]** modified the Stripped *"Y"* further by double lining the blocks 9 and 10 in the hard palate area and used arrows to indicate the direction of deflection in complete clefts.

Circle 12 under the stem of the *"Y"* represents the pharynx and a dotted line from the y to circle 12 reflecting the velopharyngeal competence. Another circle 13 was also added to represent the premaxilla, and the amount of its protrusion was indicated by the dotted line with an arrow **(Figure 5)**.

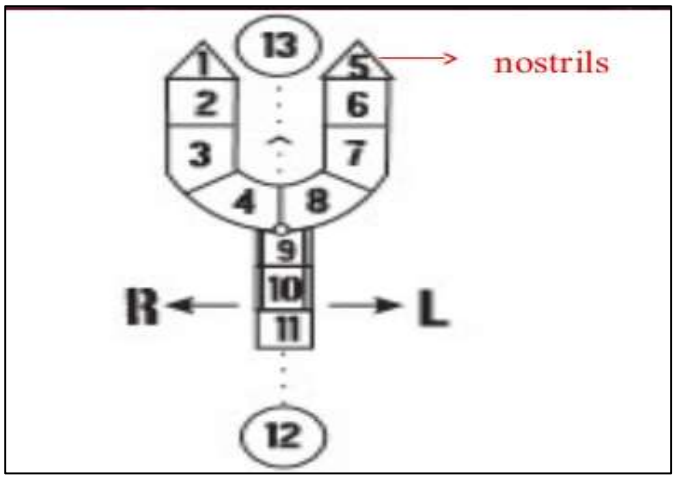

Figure 5: Diagrammatic Presentation of Modified Stripped- Y Elsahy's Classification

Millard's Modification of the Kernahan's Stripped "Y" Classification (1976)

Millard **[13]** added two triangles over the tip of the "Y" to denote the nasal floor. This increased the number of boxes to 11.9 **(Figure 6)**.

Block 1 and 5	Nasal floor
Block 2 and 6	Lip
Block 3 and 7	Alveolus
Block 4 and 8	Hard palate anterior to the incisive foramen
Block 9 and I0	Hard palate posterior to the incisive foramen
Block 11	Soft palate.

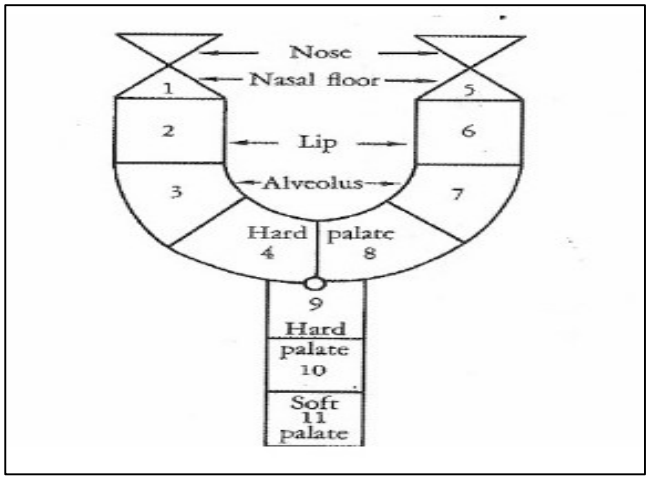

Figure 6: Diagrammatic Presentation of Millard's Modification Classification

Classification by Tessier's (1976)

In 1976, Tessier's **[14]** proposed a classification system for facial clefts in which he described 14 different types of clefts according to their location about eye and orbit. Tessier's classification system is purely descriptive and makes no pretense at causation and developmental relationships. There is also an ease of correlation between the anatomical defect and the required reconstructive surgery.

This system uses the orbit as the frame of reference and the clefts are based around this axis. The point of reference for these clefts continues the orbit with the clefts found in two different hemispheres. Those of the lower lid region are facial, while that of the upper lid is cranial. Clefts 0 through 4 have extensions downward to involve the maxilla and fit into the usual cleft lip and palate classifications. Their superior extensions are the more severe major cranial anomalies **(Figure 7)**.

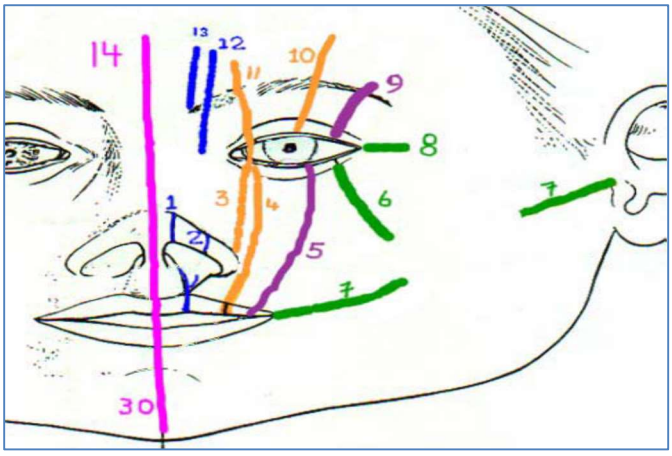

Figure 7: Tessier's classification system for facial clefts

Lahshal Classification of Cleft Lip And Palate (1989)

Kriens **[15]** proposed LAHSHAL, an abbreviated documentation system in 1987. Lahshal is a paraphrase of the anatomic areas affected by the cleft.

L -	Lip
A -	Alveolus
H -	Hard palate
S -	Soft palate
H -	Hard palate
A -	Alveolus
L -	Lip

This classification is based on the premise that clefts of lip, alveolus, and hard palate can be bilateral while clefts involving the soft palate are usually unilateral. The areas involved in the cleft are denoted by the specific alphabet standing for it **(Figure 8)**.

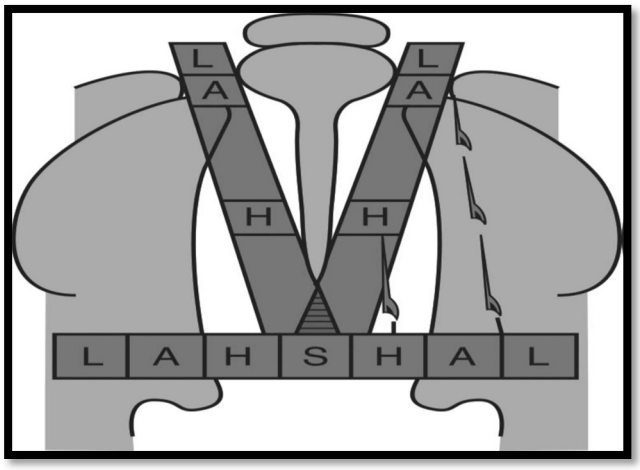

Figure 8: Diagrammatic presentation of LAHSHAL Classification

Classification by Mortier's

Mortier and Martinot **[16]** (1997) developed two-scale that included initial severity score (ISS) and postoperative results score (PRS). Both the scale was calculated for each patient. The initial severity score consisted of a minimum score of 1 to a maximum score of 6 scores [1,2,3,4,5,6] whereas the postoperative score consisted of 0.5 to 3.5 of seven rating scale [0.5, 1, 1.5, 2, 2.5,3,3,5].

This study was carried out on children with partial unilateral clefts, operated on using a derivation on Millard's techniques. A comparison of the ISS and PRS allows for a more objective judgment of the surgical result. The only drawback is that it has been applied only to unilateral incomplete and does not consider the width of the cleft. This work was developed jointly with the cleft lip and palate team at the pediatric Hospital of Tacubaya, which belongs to the Health Institute of the Federal District Department in Mexico City, Mexico.

Classification by Elnassry (2007)

The classification was proposed by Elnassry **[17]** in 2007. He divided cleft lip and palate patients into seven classes.

Class I: Unilateral cleft lip

Class II: Unilateral cleft lip and alveolus

Class III: Bilateral cleft lip and alveolus

Class IV: Unilateral complete cleft lip and palate

Class V: Bilateral complete cleft lip and palate

Class VI: Cleft hard palate

Class VII: Bifed uvula

CONCLUSION

Classification of the orofacial region is important for both clinical research and epidemiological investigation Clefts of the orofacial region are among the most common congenital facial defects. The clinical presentation is usually that of a lateral cleft of the lip through the philtrum with or without extension through the palatal shelves. This review article aims to present a different classification of all the clefts in the orofacial region. These numerous classifications ease the diagnosis, clinical evaluation, and planning of the treatment.

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