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CLEFT LATERALITY- A REVIEW

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ABSTRACT

Laterality in unilateral facial cleftshas been shown to follow non-random patterns and to influence morphology, surgical complexity, functional outcomes, and psychosocial adjustment. This review surveys existing literature to describe the existing knowledge about laterality- epidemiology, developmental and genetic underpinnings, morphological and functional consequences, implications for surgery and long-term outcomes. We conclude that though the leftsided unilateral clefts are more frequent, the side of cleft has meaningful, though often subtle, impact on outcomes. Recognizing laterality in clinical reporting, surgical planning, and research design is important, and future studies should more consistently stratify by side.

INTRODUCTION

Unilateral orofacial clefts are among the most common congenital malformations. While cleft type, severity, presence/ absence of a syndrome have been well studied, the laterality concept has received growing attention as a phenotypic variable with potential implications. Studies have observed that left-sided clefts are more common than right-sided clefts, and that side may correlate with differences in morphology, functional outcome, aesthetics, psychosocial adjustment, and academic performance.

Epidemiology and Incidence of Laterality

- In a large anthropometric preoperative study, patients with complete unilateral cleft lip (with or without palate) showed about twice as many left sided clefts compared to right sided ones.[1]
- The same study found significant differences in preoperative lip morphology depending on side: right sided clefts showed greater deficits in lateral lip element vertical height and vermillion height compared with left-sided clefts. [1]
- In a population based data, children with isolated unilateral oral clefts on the left side had lower academic performance compared both to children with right-sided clefts and unaffected classmates. Right-sided clefts had academic profiles more similar to peers without clefts. [2]

Developmental and Genetic Bases

- An anthropometric study suggests that tissue on the lateral lip element is more hypoplastic in right-sided clefts[1], implying inherent morphogenetic differences in tissue growth or fusion on that side.
- Genetic and epidemiological investigations suggest that cleft laterality may cluster within families and may involve genes that influence left-right patterning, though no single gene has been definitively shown to govern laterality. [3]
- Associated traits like tooth agenesis often are more likely on the same side as the cleft, providing evidence of asymmetric developmental disruption. [3]

Morphological Differences and Imaging Findings

- The preoperative anthropometric study found that right-sided unilateral cleft lip patients have greater lateral lip element hypoplasia, specifically deficiency in vertical lip height and vermillion height when compared to left-sided cleft patients. [1]
- Studies of facial morphology show that individuals with clefts differ from non-cleft controls in facial

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width, interorbital distance, nasal width, etc. A few of these facial shape variations have been explored with 3D imaging. [4]

Functional Outcomes: Speech, Hearing, Academic Performance

- Children with left-sided unilateral clefts had lower standardized reading scores, by nearly 7 percentile points, than those with right-sided clefts. [2]
- The same children (left-sided clefts) also had lower scores in other academic domains (about 4-6 percentiles lower) and greater use of special education services than peers without clefts. [2]
- The study did not find that right-sided clefts had significantly worse academic performance compared with unaffected classmates. [2]

Surgical Implications

- The anthropometric study [1] suggests that right sided clefts, due to greater deficiency in certain lip elements, may require more planning or tissue release during reconstruction.
- Another recent study found that although right-sided clefts are less prevalent, in many surgeons' perceptions right-sided clefts are thought to be more morphologically severe, though evidence for consistent long term worse outcomes is mixed. [5]

Psychosocial, Developmental, and Co-occurring Anomalies

- In studies of academic outcomes, left-sided clefts are associated with educational disadvantage compared to both right-sided clefts and unaffected peers. [2]
- Studies assessing facial aesthetics/perception suggest that right-sided clefts are sometimes judged more disfigured than left-sided ones, possibly due to more pronounced tissue deficits. [6]
- Associations also exist between cleft side and dental anomalies- tooth agenesis on the cleft side is more likely, however, the pattern differs by cleft subtype and side. [3]

Should Laterality Be Explicitly Reported and Used in Clinical Practice?

- Because anthropometric differences are demonstrated preoperatively between left- and right-sided clefts [1], and academic and possibly psychosocial outcome differences appear by side [2][6], it is advisable for outcome studies to stratify by side.
- Surgical planning may benefit from anticipating more tissue deficiency (for instance, in the lateral lip element) in right-sided clefts, as shown in morphometric measures. [1]

Gaps, Limitations, and Future Directions

- The genetic signals related specifically to laterality remain unclear, hence more large scale genetic studies focused on the side of cleft are needed.
- Many studies are limited by small numbers of right side clefts, which reduces statistical power to detect side related differences.
- Variation in definitions (complete vs incomplete cleft, involvement of palate), measurement methods, and follow-up durations complicates cross study comparison.
- Cultural perceptions of facial asymmetry and side may also modify psychosocial outcomes but are under-studied.

DISCUSSION & CONCLUSION

Laterality in unilateral orofacial cleft lip with or without palate is a meaningful phenotypic variable. Left-sided clefts are more common, but right-sided clefts often have greater structural deficits, especially in lateral lip and vermillion height. Some functional and academic outcomes are worse for left-sided clefts compared to right or unaffected peers. While differences are often subtle and influenced by many other factors, the accumulated evidence suggests that side should be considered in research, patient counseling, and surgical planning to optimize outcomes.

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