Short communication

Parametric sparse representation-Three dimensional recording for maxillo-mandibular malformations

ABSTRACT

Complex malformations manifest in jaws which pose a challenge to diagnose the malocclusion for its management. A thorough three-dimensional assessment of the dentofacial skeleton is necessary to identify the underlying malocclusion. Although there are numerous methods to investigate the same, recording in a way to easily register, communicate and replicate is not much worked upon. This article tries to introduce a simple tool to record maxillamandibular malformations.

Keywords: Classification, malformations, malocclusion

INTRODUCTION

The growth of dentofacial skeleton depends on various environmental and genetic factors. The dentofacial malocclusion is a result of a complex interplay of size, position, and rotation of jaws in all three dimensions of space as well as the position of teeth in respective jaws.

Proper identification of malocclusion is a very important part of orthodontic diagnosis and treatment planning. Orthodontic works of literature already have many classifications for various skeletal and dental malformations. Most of the classifications give more emphasis to the sagittal dimension which leads to less scope of observation for other dimensions while recording the malocclusion.[1]

Many initial classifications of malocclusion considered only the sagittal plane for classifying dental or skeletal malformations. The most widely used Angle's classification of malocclusion also considers the sagittal plane.[2] Simons was the first one to consider the malocclusion in all the three planes of face the observations were limited to dental malformation.[3]

The purpose of this tool is to record the maxillomandibular skeletal malformation in all three dimensions and is also very simple to write and communicate the same.

MATERIALS AND METHODS

Parametric sparse representation (PSR)-three-dimensional (3D) tool has specific code for both jaws, each dimension, and each malformation, this makes it easy to remember to note the malformation in every dimension. This tool uses alphanumeric codes to denominate the malformation, its dimension, and the jaw involved, as shown in Table 1. The coding procedure for various malformations is as follows:
- The three dimensions and their codes are sagittal (1), vertical (2), and transverse (3)
- The malformations can be of three types, i.e., abnormalities

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Table 1: PSR-3D recording for maxilla-mandibular skeletal malformations

Dimension	Malocclusion					
	Maxilla (U)			Mandible (L)		
	Position (P/p)	Size (S/s)	Rotation (R/r)	Position (P/p)	Size (S/s)	Rotation (R/r)
Sagittal (1)	Proganthic (P)	Macrognathic (S)	Clockwise (R)	Proganthic (P)	Macrognathic (S)	Clockwise (R)
	Retrognathic (p)	Micrognathic (s)	Anticlockwise (r)	Retrognathic (p)	Micrognathic (s)	Anticlockwise (r)
Vertical (2)	Upward (P)	Excess (S)	Clockwise (R)	Upward (P)	Excess (S)	Clockwise (R)
	Downward (p)	Deficit (s)	Anticlockwise (r)	Downward (p)	Deficit (s)	Anticlockwise (r)
Transverse (3)	Right (P)	Wide (S)	Clockwise (R)	Right (P)	Wide (S)	Clockwise (R)
	Left (p)	Narrow (s)	Anticlockwise (r)	Left (p)	Narrow (s)	Anticlockwise (r)

PSR-3D: Parametric sparse representation-three-dimensional

in position of jaws (prognathic [P]/retrognathic [p]), abnormalities of size (macrognathic [S]/micrognathic [s]), and abnormal rotation of jaws (Clockwise rotation ®/ anticlockwise rotation ®)

- The jaws are also coded as (U) for maxilla and (L) for the mandible
- A hyphen (-) should be used between the maxillary and mandibular code
- A "0" should be added after the jaw to indicate no abnormality detected
- Any asymmetry can be denoted as "X" at the end of the code for the respective jaw.

Example for coding the malformation

1. Maxillary prognathism with mandibular retrognathism and a forward rotation of jaws can be coded as (U1PR-L1pR)
2. Maxillary macroganthia with prognathic and downward placed transversely wide maxilla and mandibular deficiency and backward rotation of mandible (U1PS2p3S-L1sR)
3. The absence of any malformation in any plane will be omitted from the code like if the maxilla has no abnormality in any plane and the only mandible is short in size then (U0-L1s)
4. Similarly (U1r-L0) means anticlockwise rotation in the sagittal plane of the upper jaw and normal mandibular arch in all planes
5. If any additional rare malformation is present other than the mentioned in the table, then they should be mentioned outside the box bracket, for example, if a cleft palate is present in addition to retrognathia, micrognathia, and constricted maxilla which is anticlockwise rotated in the sagittal plane and placed upward with normal mandible: ([U1psr2p3s-L0] cleft palate)

DISCUSSION

Over the years, many classifications have been developed to classify malocclusion, mostly covering the position of teeth in relation to jaws with less emphasis on underlying skeletal malformations in all the three dimensions of space. Currently, there is no single method to record and communicate the dentofacial skeletal malformation in all three dimensions. Salzman 1950 was the first to address underlying skeletal malocclusion in classes I, II, and III. Mageet AO in 2016 also designed revisited various classifications and designed a morphometric classification to aid in treatment planning.[3] International Classification of Diseases 10 data also uses a coding system for recording and categorizations of malocclusion.[4]

This tool has provision to record all the basic malformations of jaws which are alterations in size, position, and rotation along the sagittal, vertical, and transverse plane of space. Such a method also makes it convenient for coding the malformation and uses the same for epidemiological purposes and fabrication of population statistics. The tabular format aids as a reminder to verify the malocclusion in all planes and types, with minimal chance to overlook the underlying subtle issues. Recording the maxillary and mandibular malformation is also helpful to diagnose and plan for orthognathic surgical procedures. With upcoming dental insurance, specifics codes are usually assigned to various malocclusion making it convenient for assignment among different categories of reimbursement. This tool is only for recording and communicating the malformation and works as a template. It is not a classification of skeletal malformations. It does not record the magnitude of malocclusion. There is no incorporation of dental defects in the tool as many simple classifications are established over the years for dental malocclusion, which is easy to record and communicate. The authors suggest supplementing this tool with Angle's classification to include the dental abnormalities in the tool.

This tool can be routinely used during the diagnosis as a checklist, for maintaining the records, and for collecting the population statistics for surveys and research purposes. It can be digitized and communicated across any media. It is difficult to memorize the codes initially but with the use of a template

the system can be adapted and implemented on a larger scale. This is a prototype tool with further scope for refinement.

CONCLUSION

PSR3D is a skeletal dentofacial malformation recording tool with emphasis on registering the maxillary and mandibular size, position, and rotational abnormalities in the vertical, horizontal, and transverse plane. It is simple and easy to use. There is further scope for refinement of the same and studies to verify its usefulness statistically to make it more clinically acceptable.

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Conflicts of interest
There are no conflicts of interest.

REFERENCES

1. Katz MI. Angle classification revisited. 1: Is current use reliable? Am J Orthod Dentofacial Orthop 1992;102:173-9.
2. Villada-Castro M, Rueda ZV, Botero-Mariaca PM. Level of knowledge on classification systems of malocclusions among dentists and orthodontists. J Educ Ethics Dent 2017;7:37.
3. Mageet AO. Classification of skeletal and dental malocclusion: Revisited. Stomatol Edu J 2016;3:205-11.
4. 2022 ICD-10-CM Diagnosis Code M26.212: Malocclusion, Angle's Class II. Available from: https://www.icd10data.com/ICD10CM/Codes/M00-M99/M26-M27/M26-/M26.212. [Last accessed on 2021 Oct 05].