ECRONICON OPEN ACCESS

EC DENTAL SCIENCE
Case Report

Need for Optimizing the Dental Treatment in Patients of Morquio Syndrome (Mucopolysaccharidosis IVA)

Bindiya Kumari Pahuja[1]* and Yasser Khaled[2]

[1]*All India Institute of Medical Sciences (AIIMS), New Delhi, India*

[2]*Assistant Professor, Oral Medicine, TMD/Orofacial Pain School of Dentistry, Marquette University, USA*

***Corresponding Author:** Bindiya Kumari Pahuja, All India Institute of Medical Sciences (AIIMS), New Delhi, India.

Received: September 19, 2023; **Published:** December 04, 2023

Abstract

Mucopolysaccharidosis type IV (MPS IV), also known as Morquio syndrome, is a rare inherited metabolic disorder that affects the body and ability to break down certain types of complex sugars. It leads to the buildup of these substances in various tissues and organs, resulting in skeletal abnormalities, joint problems, heart and breathing difficulties, vision and hearing impairment, and other health issues. Symptoms and severity can vary widely among affected individuals. Treatment typically focuses on managing symptoms and providing supportive care. Dental treatment for individuals with Morquio syndrome requires careful consideration due to the unique challenges presented by the condition, such as skeletal abnormalities, dental abnormalities, and potential airway complications. A thorough evaluation of the patient and dental and skeletal issues is essential before any dental procedures. This assessment helps in understanding the extent of dental abnormalities, potential airway obstruction risks, and the patient and ability to tolerate treatment. Patients with Morquio syndrome might have anatomical abnormalities that affect their airway. Dental treatment should be planned to ensure that the patient and airway is maintained during procedures. Consultation with an anesthesiologist might be necessary for certain cases. Due to dental abnormalities common in Morquio syndrome (such as malocclusion, overcrowding, and dental caries), specialized dental care by professionals experienced in managing such cases is crucial. Orthodontic treatment and dental restorations may be needed to address these issues. Dental procedures might require anesthesia, and considering the potential airway complications, selecting the appropriate anesthesia technique is vital. This decision should be made in consultation with an anesthesiologist familiar with the condition. In summary, optimizing dental treatment for Morquio syndrome patients involves a comprehensive understanding of the condition and impact on dental health, careful planning, specialized dental care, consideration of potential airway complications, and ensuring patient comfort throughout the treatment process. Collaboration among various healthcare professionals, including dentists, orthodontists, anesthesiologists, and other specialists, is crucial to provide the best possible care for these individuals.

Keywords: *Mucopolysaccharidoses (MPS); Glycosaminoglycans (GAGs); Morquio Syndrome (Mucopolysaccharidosis IVA)*

Introduction

Mucopolysaccharidoses (MPS) are a group of inherited autosomal recessive metabolic disorders characterized by intra-lysosomal storage of glycosaminoglycans (GAGs) due to the deficiency in 1 of the 11 enzymes responsible for breakdown of GAGs [1]. The progressive accumulation of GAGs results in skeletal deformities, poor joint mobility, severe growth deficit, coarse facial features, and enlarged organs

[1]. The 7 distinct types of MPS (I, II, III, IV, VI, VII, and IX) present an overall prevalence range of 1.9 to 4.5 per 100,000 live births; however, geographic differences in prevalence were noted for specific types [2] patients presented with MPS disorder require special healthcare needs depending on the severity of their disease like those with MPS I, II and III will usually have significant cognitive impairment and behavioural difficulties, whereas those with type IV disease will be within the normal range of intelligence [3].

Syndrome	Eponym	Enzyme deficiency	Stored material
MPS-I H	Hurler syndrome	Alpha-L-iduronidase	Dermatan sulphate Heparan sulphate
MPS-I S	Scheie syndrome	Alpha-L-iduronidase	Dermatan sulphate Heparan sulphate
MPS-II A	Hunter syndrome (severe)	Iduronate sulfatase	Dermatan sulphate Heparan sulphate
MPS-II B	Hunter syndrome (Mild)	Iduronate sulfatase	Dermatan sulphate Heparan sulphate
MPS-III A	Sanfilipo syndrome A	sulphamidase	Heparan sulphate
MPS-III B	Sanfilipo syndrome B	N-Acetyl- alpha -glucosaminidase	Heparan sulphate
MPS-III C	Sanfilipo syndrome C	N acetyl- transferase	Heparan sulphate
MPS-III D	Sanfilipo syndrome D	N-acetyl 6 sulfatase	Heparan sulphate
MPS IV A	Morquio syndrome A	N acetyl galactosamine 6.. sulfatase	keratan sulphate
MPS IV B	Morquio syndrome B	Beta galactosidase	Keratin sulphate
MPS VI A	Maroteaux Lamy syndrome A	Arylsulfatase B	Dermatan sulphate
MPS VI B	Maroteaux Lamy syndrome b	Arylsulfatase B	Dermatan sulphate
MPS VII	Sly syndrome	Beta glucuronidase	Dermatan sulphate Heparan sulphate Chondroitin sulphate
MPS IX		hyaluronidase	
MSD	Multisulphate deficiency	Multiple sulphatase deficiencies	Sulfatides GAG's steroid sulphates, sphingolipids

Table 1: *Classification of MPS diseases.*

Various oral health studies over the world acknowledge that vulnerable populations often have multidisciplinary needs including oral health care professional. Dental defects are often seen in association with generalized syndromes were first observed in 1952 by Garn and Hutme who described dental defects in members of a family with Morquio's disease [4]. Since then, further reports have confirmed this association. All kinds of MPS (I, II, III, IV, VI, VII, and IX) present with dento-facial involvement with varied signs and symptoms [5]. Many studies show a higher prevalence of caries, malocclusions, and poorer periodontal health. While the other suggests alterations in the structure of the enamel and dentine and in particular the enamel/dentine junction in MPS type I [6] and type IV presentations [7] however, the extent and significance of this is unclear [5]. Patients with MPS present a tendency toward vertical growth that results in a dolichocephalic facial pattern. These morphologic and spatial features lead to sagittal and vertical changes in the craniofacial skeleton and dentoalveolar vertical alterations, such as buccal inclination of the lower incisors, which are more prevalent and severe in the mandible, in addition to a decrease of the nasopharyngeal space. These factors might be responsible for the mouth breathing observed in these patients [8].

It's a challenge for dentists to treat such heterogeneous group of patients due to varied clinical picture complicated by medical and physical disabilities. Many, and in particular those with MPS III [3] also exhibit behavioural problems which are progressive with the

disease process. It is noted that there every patient of MPS is different from other in presentation of oral symptoms like MPS I patients do not have an increased dental caries rate but show enamel defects. The group also displayed developmental anomalies of both the permanent and primary dentition. The MPS groups II, III and VI also show a low caries rate though firm conclusions are difficult to justify given the small sample size [5].

The current article will present a case, review the literature and international treatment guidelines for Morquio A syndrome in an attempt to simplify and optimize the dental treatment needs of these group of patients.

Case Report

A 18-years-old known case of Morquio syndrome female patient presented for comprehensive oral examination with a chief complaint of sensitive lower molar teeth. She was born after an uneventful pregnancy and delivery. When she was 6 years old, the clinical diagnosis of Morquio's syndrome was established. Recent examination of the patient revealed height? (short stature) and her weight as kilograms. IQ ------Marked growth retardation was accompanied by a typical deformity of the extremities, a barrel chest with pigeon breast, a short neck, and spinal deformity (gross kyphoscoliosis). Patient's vision and hearing capacity ere not compromised. Oro-facial evaluation revealed flattened nasal bridge and flared alae of the nose with a broad and flat plate. There were no TMJ manifestations like clicks or crackles. During mouth opening no significant facial asymmetry was observed. Head and neck lymph nodes were not enlarged. The teeth were placed widely apart with open interdental spaces and mild gingival inflammation. There was no discrepancy in occlusion and intercuspal relations were all normal. The enamel of all teeth appeared to be thinner than normal. The oral mucosa showed normal color and texture. The tongue was normal in size and showed typical enlarged papillae. Teeth cusps were almost flattened and were poorly formed. There were no signs of dental caries or restoration. Lips were non-competent and flaring of the anterior teeth was a cause for mouth breathing. Oral radiographs including OPD and IOPA were taken and revealed normal tooth anatomy and bone architecture.

The familial pedigree revealed that the parents had no history of the disease, were no consanguineous. The patient has--siblings and the other children are---.

After diagnosis pertaining to the hypersensitivity the patient received both preventive and corrective treatment. Including oral prophylaxis, topical fluoride application and tooth brushing was demonstrated. 1.1% sodium fluoride toothpaste was prescribed to be used twice daily. The patient was asked to follow up every 3 months for oral prophylaxis. After 10 months of the initial therapy the patient reported with improvements in tooth sensitivity. After subsequent follow up visits for years patients was asymptomatic and had maintained a good oral hygiene until recently at the age of 23 years when she has shown some signs of mild to moderate generalized gingival inflammation.

Discussion

The patients of mucopolysaccharidoses (MPS) show a myriad of different clinical signs and symptoms [1-4]. Even group IV (Morquio syndrome has further divisions into group A and group B). The symptoms involve in general almost every hard and soft tissue of the oro-facial region extent of which depends upon the severity of the disease [5].

Our interest is Morquio syndrome A (Mucopolysaccharidosis IV) the condition in general, shows thin enamel layer on the teeth and the teeth are smaller and more opaque than usual. The permanent posterior teeth also show thin, pointed cusps resulting in a concave and saucer shaped occlusal surface with absence of the normal fissure pattern. The buccal surfaces of teethe also shows a concavity in a gingiva occlusal direction leading to the pointed cusp tips. In addition, there is generalized pitting of the enamel on buccal surfaces of the permanent posterior teeth. The permanent maxillary incisors are placed apart with open interdental space. Changes were present in the deciduous dentition as well [7,9,10].

Also, there are differences among patients of Morquio A and Morquio B syndrome. Langer and Carey" found that eight of their ten patients with Morquio syndrome showed a thin enamel layer with sharp pointed cusps in both deciduous and permanent teeth [11]. Levin and coworkers described similar findings in 12 affected patients, and they concluded that these dental abnormalities were specific for the Morquio syndrome and were not seen in the other mucopolysaccharidoses [12]. However, Fujimotov and Horwits [13] and Hecht and coworkers [14] made no mention of tooth abnormalities in their reports of clinically atypical patients with MPS IV A.

The present study confirms that there are mild clinical variants of MPS IV A (Dale variants) and agrees with the suggestion of Beck and coworkers [15] that MPS IV A should be subdivided into severe, intermediate, and mild categories [9]. These results support the hypothesis that all cases of MPS IV A show the above dental changes but that in some clinically mild, atypical variants the changes may be relatively slight and may escape detection unless a detailed dental examination is carried out. It is possible that in some cases the changes may only be demonstrable radiographically. These dental changes are highly specific and are useful in the diagnosis of all cases of Morquio's disease type A, but they are especially useful in clinically mild atypical cases [9].

Patients with MPS IVA can be easily distinguished from patients with other MPSs because their intelligence is preserved unlike other variants of MPS but they have severe skeletal abnormalities [16]. The mean age at death (standard deviation) was 25.30 ± 17.43 years for Morquio A syndrome, with female patients living longer than male patients (26.55 ± 12.28 years versus 22.95 ± 17.63 years, respectively) [19]. Therefore, adequate evaluations and therapy in the early stages of the disease can greatly improve the quality of life of patients suffering from skeletal abnormalities. Moreover, such early detection and intervention can reduce the mortality rate of those with atlantoaxial subluxation [17].

As by the international guidelines for management and treatment of Morquio A syndrome every patients require dental intervention by a specialized oral health care professional. As reported in the guidelines the Morquio A syndrome tend to have small, widely spaced teeth, often with thin, structurally weak enamel and small pointed cusps, spade-shaped incisors, pitted buccal surfaces, caries and other developmental abnormalities of primary and permanent dentition based on the observations of limited literature. Close monitoring of dental development (at least annually) and regular dental care is important to prevent caries and attrition of the teeth and it is suggested that the intervention to prevent caries, and prophylaxis for caries and gingival inflammation should be given. Morquio A patients should receive fluoride supplementation; fissure sealing of dentition may be considered in situations [18].

The detailed oro-facial intervention by maxillofacial and orthodontic surgeons has not been mentioned so far for the treatment of cranio-facial dysostosis and TMJ disorders. Further studies are needed to propose a defined and detailed treatment algorithm for MPS diseases in general and Morquio A in particular, taking in account the disease spectrum from very severe to highly attenuated cases.

The patient is majorly suffering skeletal and non-skeletal issues. So, keeping the skeletal issues together in one group and non-skeletal simple soft tissue issues in another would ease the clinician in making treatment strategies.

Conclusion

Treatment guidelines should be defined for orthodontic need in such group of patients based on the overall treatment gain calculated by cost: benefit ratio, age, mortality and morbidity picture. As with the advancing age the quality of life of the patient declines and patient may become dependent on the caretaker for day-to-day activities due to progressive involvement of the respiratory, cardiac, skeletal and muscular organs. Even with the availability of present treatment options like enzyme replacement therapy the overall quality of life has not shown tremendous improvement in patients sufferings and symptoms. Currently, in the absence of an effective and safe systemic treatment option, patients require extensive management and regular intervention to maximize their quality of life. Although their quality of life will continually decline over their lifetime as the disease progresses, steps can be taken along the way to keep patients active, pain free, and independent for as long as possible. A brief discussion of some of these steps is available online as supplemental material (S4).

Annexure 1

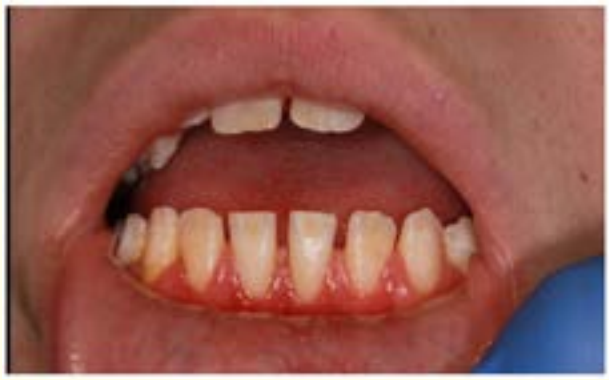

Figure 1

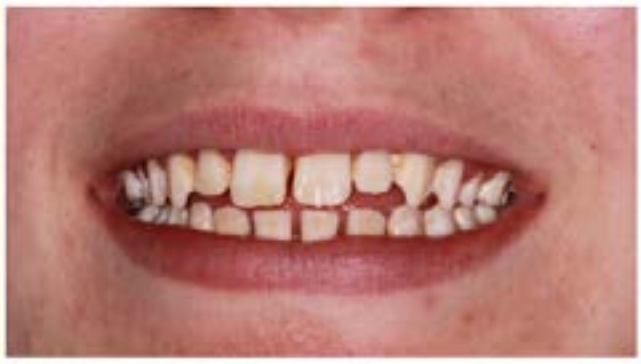

Figure 2

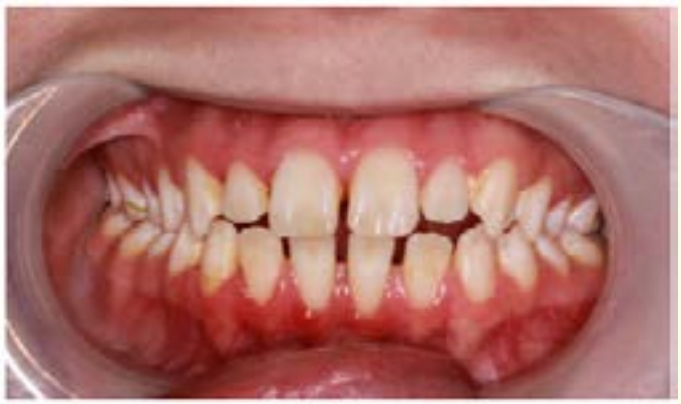

Figure 3

Bibliography

1. Lachman RS., *et al*. "Mucopolysaccharidosis IVA (Morquio A syndrome) and VI (Maroteaux-Lamy syndrome): under-recognized and challenging to diagnose". *Skeletal Radiology* 43.3 (2014): 359-369.

2. de Santana Sarmento DJ., *et al*. "Mucopolysaccharidosis: radiographic findings in a series of 16 cases". *Oral Surgery, Oral Medicine, Oral Pathology Oral Radiology* 120.6 (2015): e240-e246.

3. Kircher S., *et al*. "Mucopolysaccharidoses - a guide for physicians and parents". UNI-MED Verlag AG, International Medical Publishers, London, Boston, Printed in Europe (2007).

4. Garn SM and Hurme VO. "Dental defects in three siblings afflicted with Morquio's disease". *British Dental Journal* 93 (1952): 210-212.

5. James A., *et al*. "The Oral Health Needs of Children, Adolescents and Young Adults Affected by a Mucopolysaccharide Disorder". In: SSIEM, editor. JIMD Reports - Case and Research Reports, 2011/2 [Internet]. Berlin, Heidelberg: Springer Berlin Heidelberg (2011): 51-58.

6. Guven G., *et al*. "Mucopolysaccharidosis type I (Hurler syndrome): oral and radiographic findings and ultrastructural/chemical features of enamel and dentin". *Oral Surgery, Oral Medicine, Oral Pathology, Oral Radiology, and Endodontics* 105.1 (2008): 72-78.

7. Lustmann J. "Dentinoenamel junction area in primary teeth affected by Morquio's syndrome". *Journal of Dental Research* 57.3 (1978): 475-479.

8. Fonseca FRA., *et al*. "Patients with mucopolysaccharidosis have tendencies towards vertical facial growth". *Journal of Oral and Maxillofacial Surgery* 72.12 (2014): 2539-2546.

9. Kinirons MJ and Nelson J. "Dental findings in mucopolysaccharidosis type IV A (Morquio's disease type A)". *Oral Surgery, Oral Medicine, Oral Pathology* 70.2 (1990): 176-179.

10. RéLLING I., *et al*. "Dental findings in three siblings with Morquio's syndrome". *International Journal of Paediatric Dentistry* 9.3 (1999): 219-224.

11. Langer LO and Carey LS. "The roentgenographic features of the KS mucopolysaccharidosis of Morquio (Morquio-Brailsford's disease)". *American Journal of Roentgenology* 97.1 (1966): 1-20.

12. Levin LS., *et al*. "Oral findings in the Morquio syndrome (mucopolysaccharidosis IV)". *Oral Surgery, Oral Medicine, Oral Pathology* 39.3 (1975): 390-395.

13. Fujimoto A and Horwitz AL. "Biochemical defect of non-keratan-sulfate-excreting Morquio syndrome". *American Journal of Medical Genetics* 15.2 (1983): 265-273.

14. Hecht JT., *et al*. "Mild manifestations of the Morquio syndrome". *American Journal of Medical Genetics* 18.2 (1984): 369-371.

15. Beck M., *et al*. "Heterogeneity of Morauio disease". *Clinical Genetics* 29.4 (1986): 325-331.

16. Omatsu S., *et al*. "Enzyme replacement therapy in a murine model of Morquio A syndrome". *Human Molecular Genetics* 17.6 (2008): 815-824.

17. Lee NH., *et al*. "Clinical, radiologic, and genetic features of Korean patients with Mucopolysaccharidosis IVA". *Korean Journal of Pediatrics* 55.11 (2012): 430-437.

18. Hendriksz CJ., *et al*. "International guidelines for the management and treatment of Morquio A syndrome: Morquio A syndrome management guidelines". *American Journal of Medical Genetics Part A* 167.1 (2015): 11-25.

19. Lavery C and Hendriksz C. "Mortality in Patients with Morquio Syndrome A". In Berlin, Heidelberg: Springer Berlin Heidelberg (2014).

Volume 22 Issue 12 December 2023