Content available at: https://www.ipinnovative.com/open-access-journals

International Journal of Oral Health Dentistry

Journal homepage: www.ijohd.org

Case Report

Prosthodontic rehabilitation of a patient with Neurofibromatosis Type 1 using cross-arch teeth arrangement: A case report

Smita Arun Khalikar[1], Siddhi Dattatraya Bhatawadekar[1]*, Kishor M Mahale[1], Vilas M Rajguru[1], Sonali V Mahajan[1]

[1]Dept. of Prosthodontics and Crown & Bridge, GDCH Chhatrapati Sambhajinagar (Aurangabad), Chhatrapati Sambhajinagar, Maharashtra, India

Abstract

Neurofibromatosis Type 1 (NF1) is a genetic disorder characterized by multisystem involvement, including neurocutaneous manifestations, skeletal deformities, and orofacial abnormalities. This case report presents a 35-year-old male with NF1, exhibiting multiple café-au-lait macules, skeletal abnormalities, and significant radiographic findings affecting the mandible. The patient was completely edentulous with a constricted maxillary arch and a broad mandibular arch, leading to a Class III jaw relation. Prosthodontic rehabilitation was undertaken using a cross-arch teeth arrangement to achieve occlusal stability and functional efficiency. This report underscores the significance of a multidisciplinary approach in the management of patients with Neurofibromatosis Type 1 (NF1), with particular attention to the contribution of prosthodontic interventions in addressing skeletal irregularities. The use of a cross-arch configuration demonstrated success in reestablishing occlusal balance, even in the presence of anatomical complexities. Looking ahead, developments in digital occlusal assessment and the application of implant-supported prosthetics hold promise for improving outcomes in similarly challenging cases.

Keywords: Neurofibromatosis type 1, NF1, Café-au-lait spots, Neurofibromas, Skeletal abnormalities, Bifid mandibular canal, Genetic disorder, Prosthodontic rehabilitation, Cross-arch teeth arrangement.

Received: 21-03-2025; **Accepted:** 12-06-2025; **Available Online**: 31–07-2025

1. Introduction

Neurofibromatosis Type 1 (NF1), also referred to as von Recklinghausen's disease, is a hereditary condition caused by mutations in the NF1 gene located on chromosome 17.[1] These mutations result in decreased production of neurofibromin, a crucial tumor suppressor protein involved in regulating cell proliferation by inhibiting the Ras signaling pathway.[2] When neurofibromin is non-functional or deficient, it can lead to unchecked cell growth, giving rise to neurofibromas and other systemic manifestations.

NF1 is among the most frequently occurring genetic disorders, affecting approximately 1 in every 3,000 live births. It is inherited in an autosomal dominant pattern, although nearly half of all cases arise from spontaneous (de novo) mutations.[3] The disorder displays variable expressivity, meaning that its clinical features can differ greatly between individuals, even within the same family.

Key clinical signs of NF1 include numerous café-au-lait spots, freckling in the axillary and inguinal regions (Crowe's sign), iris Lisch nodules, neurofibromas, and a variety of skeletal anomalies.[4] Additional complications may include optic pathway gliomas, cognitive impairments, and a higher susceptibility to certain malignancies, such as malignant peripheral nerve sheath tumors (MPNSTs).[5] While cutaneous and neurological symptoms are well-characterized in the literature, the orofacial and mandibular manifestations of NF1 are less commonly documented but can significantly impact patient quality of life.

This case report describes a patient exhibiting typical NF1 features, including multiple pigmented skin lesions,

*Corresponding author: Siddhi Dattatraya Bhatawadekar
Email: siddhi2898@gmail.com

https://doi.org/10.18231/j.ijohd.v.11.i.2.12

skeletal irregularities, and notable radiographic abnormalities. These skeletal changes contributed to an altered relationship between the edentulous maxilla and mandible. To address this, a cross-arch arrangement of prosthetic teeth was utilized to restore function and occlusal balance.

2. Case Report

A 35-year-old male presented to the Department of Prosthodontics at GDCH Chhatrapati Sambhajinagar with complaints of impaired mastication. Intraoral examination revealed completely edentulous upper and lower arches (**Figure 1**). The maxillary arch appeared narrow, constricted, and square-shaped, while the mandibular arch was broad and V-shaped.

Figure 1: Pre-operative extraoral and intraoral photograpghs

The patient gave history of tooth loss due to decay and is edentulous since six months

The patient reported progressive hearing disturbance, postural instability, and clawing of the hands. He also had a history of consanguineous marriage in the family and similar cutaneous lesions in his mother.

On clinical examination, multiple pigmented lesions and raised nodules (café-au-lait spots) were observed on the skin over the trunk and face bilaterally, along with axillary and inguinal freckling (Crowe's sign). Musculoskeletal abnormalities included scoliosis, hand deformities (clawing of hands), bowing of the legs, and onychoschisis of the great toe.(**Figure 2**) The patient reported loss of balance while walking (ataxic gait), progressive hearing disturbance, and blurred vision.

Figure 2: Clinical photographs showing pigmented nodules and clawing of hands

A cone beam computed tomographic examination of the face revealed:

1. Enlargement of the left coronoid notch
2. Thinning of the right ramus of the mandible
3. Bifid mandibular canal
4. Enlarged mandibular foramina

All the above findings were strongly suggestive of Neurofibromatosis Type 1.

2.1. Treatment plan

Given the patient's completely edentulous condition, prosthodontic rehabilitation was planned with complete dentures to restore function, aesthetics, and occlusal balance. Due to the wide mandibular arch and constricted maxilla, a conventional prosthetic approach was challenging. With conventional teeth arrangement the mandibular teeth would have been in cross-bite relation to maxillary teeth, which would not follow the ideal intercuspation and hence, reduce chewing efficiency. Thus, a cross-arch teeth arrangement was chosen to achieve a stable occlusal relationship and improve masticatory efficiency.[6]

1. Primary impression: Made with impression compound; diagnostic models fabricated using Type II model plaster.
2. Custom trays: Spacer wax adapted, and trays fabricated using tray material.
3. Border moulding: Done using low-fusing impression compound, followed by final impression with light-body condensation silicone.
4. Master cast: Poured using Type III dental stone; baseplate fabricated using self-cure acrylic resin; occlusal rims made with modeling wax.
5. Jaw Relation:

    a) Occlusal plane assessed using a Fox plane. The incisal edge position was adjusted such that there was around 2mm of visibility during speech.
    b) Labial contour adjusted to form an acute nasolabial angle to improve profile.
    c) Midline marked on the rim using facial midline and maxillary labial frenum as reference,
    d) Lip line assessed at rest and on smiling and marked on the rim.
    e) Appropriate vertical dimension established.
    f) Centric relation guided using Dawson's bimanual palpation technique and stabilized using staple pins.
    g) Jaw relation record transferred to a mean-value articulator.
    h) A Class III jaw relation was noted. (**Figure 3**)

6. Teeth arrangement:

    a) Properly dimensioned teeth selected.
    b) Anterior teeth arranged with adequate overjet and overbite.
    c) Due to the wide mandibular arch, a cross-arch posterior teeth arrangement was chosen. To achieve optimal intercuspation, the posterior teeth of the

maxilla and mandible were reversed, including the right and left sides. This strategic rearrangement allowed the mesiobuccal cusp of the maxillary molar—positioned in the mandibular arch—to align and occlude precisely with the mesiobuccal groove of the mandibular molar, now situated in the maxillary arch.

d) The second premolars were omitted from the maxillary arch for proper occlusal relation. (**Figure 4**)

7. Trial dentures

a) Evaluated intraorally for esthetics, speech, and occlusion.
b) Adjustments made as necessary. (**Figure 5**)

8. Denture processing:

a) Processed using heat-polymerized acrylic resin via compression molding technique.
b) Finished and polished after retrieval. (**Figure 6**)

9. Denture insertion:

a) Inserted and evaluated for esthetics, function and comfort. (**Figure 7**)
b) Post-insertion instructions given. (**Figure 7**)

10. Follow-up

a) Regular follow-ups scheduled to assess occlusion and function.

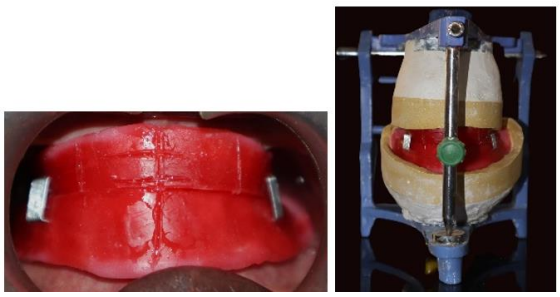

Figure 3: Jaw relation record and transfer

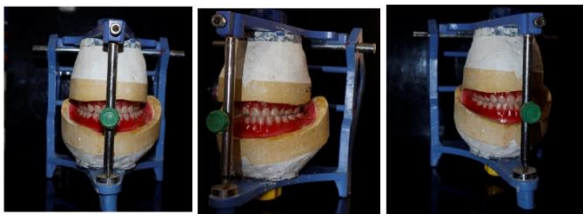

Figure 4: Teeth arrangement

Figure 5: Trial of waxed denture

Figure 6: Final prosthesis

Figure 7: Denture insertion intraoral and extraoral view

3. Discussion

Management of patients with Neurofibromatosis Type 1 (NF1) necessitates a coordinated, multidisciplinary effort that includes prosthodontists, oral and maxillofacial surgeons, neurologists, geneticists, and physical therapists. Due to the complex involvement of both skeletal and neural systems in NF1, patients often present with functional limitations and

aesthetic concerns, requiring a well-integrated and collaborative treatment approach.

Skeletal anomalies, such as maxillary protrusion accompanied by a broad upper arch or mandibular protrusion with an expanded lower arch, present significant challenges in achieving conventional tooth arrangement. These structural differences often necessitate deviations from standard guidelines to establish a functionally and esthetically acceptable prosthetic setup.[7]

Various adaptations have been proposed to accommodate broader mandibular arches, particularly when designing anterior and posterior teeth arrangements. For anterior teeth, configurations such as edge-to-edge or reverse overjet alignments may be employed based on the severity of the discrepancy. Posterior teeth can be arranged buccally relative to the ridge crest, or non-anatomic teeth may be selected to allow flexibility in placement. Additional strategies include cross-arch setups that involve swapping maxillary and mandibular posterior teeth, or using a reverse buccal overlap without exchanging tooth positions.[8]

However, care must be taken, as excessively buccal placement of teeth can predispose dentures to midline fractures.[9] While non-anatomic teeth offer greater freedom in positioning, they may reduce chewing efficiency.[10] Moreover, reverse buccal overlaps—commonly referred to as crossbite arrangements—may not provide reliable intercuspation due to their deviation from natural occlusal relationships.[10]

Among these options, cross-arch tooth arrangement has proven to be an effective method in cases of pronounced skeletal discrepancies between the edentulous jaws. This technique enhances occlusal stability by distributing forces more evenly across the dental arch, reducing tipping forces and improving both prosthesis function and retention.[6] In the present case, the cross-arch setup enabled proper intercuspation despite a markedly wider mandibular arch, resulting in improved chewing efficiency and enhanced patient comfort.

Clinical literature supports the use of unconventional occlusal schemes and prosthetic adaptations in patients with Class III malocclusion stemming from congenital or developmental anomalies. Outcomes may be further optimized through collaboration with orthodontists and maxillofacial surgeons, especially when skeletal corrections are required.[11-13]

For instance, a case reported by Tambe et al. described the prosthetic rehabilitation of a patient with oral submucous fibrosis (OSMF). By recording the neutral zone and adopting a cross-arch configuration for the posterior teeth, the clinicians compensated for abnormal jaw alignment, ultimately achieving a stable and retentive complete denture prosthesis.[13]

Similarly, Loli et al.[11] detailed a case involving mandibular prognathism, in which a cross-arch arrangement was used following the technique introduced by LaVere and Freda.[14] The upper right posterior teeth were placed on the lower left side, and vice versa, which facilitated a satisfactory occlusal relationship with multiple cuspal contacts and improved masticatory performance.

Looking ahead, emerging technologies such as digital occlusion analysis and implant-supported prosthetic solutions may offer even greater precision and long-term success in the prosthodontic management of NF1 patients.

4. Conclusion

This treatment approach effectively restored the patient's masticatory function and esthetics while addressing the anatomical challenges posed by NF1-related skeletal abnormalities.

5. Source of Funding

None.

6. Conflict of Interest

None.

References

1. Ferner RE. Neurofibromatosis 1 and neurofibromatosis 2: a twenty first century perspective. *Lancet Neurol*. 2007 Apr;6(4):340–51.
2. Gutmann DH, Ferner RE, Listernick RH, Korf BR, Wolters PL, Johnson KJ. Neurofibromatosis type 1. *Nat Rev Dis Primers*. 2017;3:17004.
3. Williams VC, Lucas J, Babcock MA, Gutmann DH, Korf B, Maria BL. Neurofibromatosis type 1 revisited. *Pediatrics*. 2009 Jan;123(1):124–33.
4. Friedman JM. Epidemiology of neurofibromatosis type 1. *Am J Med Genet*. 1999 Mar 26;89(1):1–6.
5. Evans DGR, Baser ME, McGaughran J, Sharif S, Howard E, Moran A. Malignant peripheral nerve sheath tumours in neurofibromatosis 1. *J Med Genet*. 2002;39(5):311–4.
6. Zarb GA, editor. *Prosthodontic Treatment for Edentulous Patients: Complete Dentures and Implant-Supported Prostheses*. 13th ed. St. Louis, MO: Elsevier Mosby; 2013.
7. Rangarajan V, Gajapa B. Concepts of occlusion in prosthodontics: A literature review, part I. *J Indian Prosthodont Soc*. 2015;15(3):200–5.
8. Goyal BK, Bhargava K. Arrangement of artificial teeth in abnormal jaw relations: mandibular protrusion and wider lower arch. *J Prosthet Dent*. 1974;32(4):458–61.
9. Kumari R, Bala S. Assessment of Cases of Complete Denture Fracture. *J Pharm Bioallied Sci*. 2021;13(Suppl 2):S1558–S60.
10. Mousa MA, Patil S, Lynch E. Masticatory efficiency and muscular activity in removable partial dental prostheses with different cusp angles. *J Prosthet Dent*. 2017;117(1):55–60.
11. Loli AC, Kumar M, Khullar G. Prosthodontic Rehabilitation of a Completely Edentulous Arch with an Abnormal Jaw Relation: A Case Report. *Dent J Adv Stud*. 2023;11(3):140–4.
12. Alhazmi STF, Abdurahiman VT. Managing class III jaw relations. *Clin Case Rep.* 2023;11(5):e07335.
13. Tambe A, Patil SB, Bhat S, Badadare MM. Cross-arch arrangement in complete denture prosthesis to manage an edentulous patient with oral submucous fibrosis and abnormal jaw relation. *BMJ Case Rep*. 2014 Sep 19;2014:bcr2013203065.

14. LaVere AM, Freda AL. Artificial tooth arrangement for prognathic patients. *J Prosthet Dent*. 1972;28(6):650–4.

Cite this article: Khalikar SA, Bhatawadekar SD, Mahale KM, Rajguru VM, Mahajan SV. Prosthodontic rehabilitation of a patient with Neurofibromatosis Type 1 using cross-arch teeth arrangement: A case report. *Int J Oral Health Dent*. 2025;11(2):136–140.