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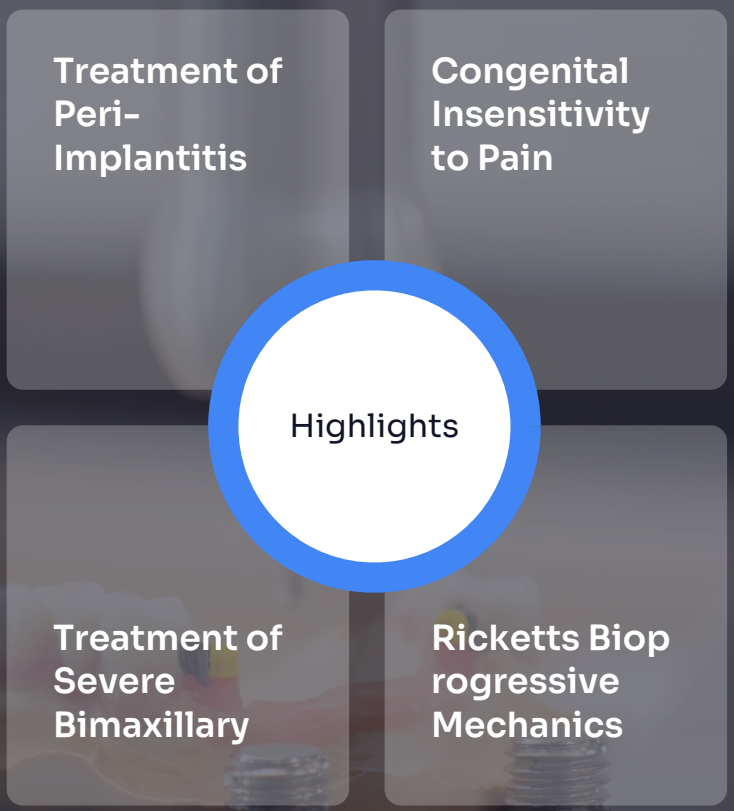

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Extraction Treatment of Severe Bimaxillary Incisor Protrusion in a High-Angle Class II Patient: Three-Dimensional Torque Control using ART and Ricketts Bioprogressive Mechanics

By Dao Quang Huy

Introduction- Bimaxillary incisor protrusion is one of the most common conditions affecting facial esthetics in adolescent patients, particularly when associated with lip protrusion, mentalis muscle strain, and a convex facial profile [1,2]. In many cases, extraction-based orthodontic treatment is indicated to reduce incisor protrusion and improve the soft tissue profile. However, in patients with a vertical growth pattern (high-angle pattern), space closure following extractions is often more challenging due to an increased risk of anterior tooth extrusion, clockwise mandibular rotation, reduced occlusal stability, and difficulty in controlling the soft tissue profile [3–5].

From a biomechanical perspective, in the majority of extraction cases, the space-closing force is applied below the center of resistance of the anterior segment, thereby generating unfavorable moments, particularly negative torque. Consequently, the crowns tend to tip posteriorly while the roots are displaced anteriorly and labially, increasing the risk of labial cortical bone contact or periodontal complications such as fenestration and dehiscence, especially in the mandibular incisor region [6–9].

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Dao Quang Huy

I. Introduction

Bimaxillary incisor protrusion is one of the most common conditions affecting facial esthetics in adolescent patients, particularly when associated with lip protrusion, mentalis muscle strain, and a convex facial profile [1,2]. In many cases, extraction-based orthodontic treatment is indicated to reduce incisor protrusion and improve the soft tissue profile. However, in patients with a vertical growth pattern (high-angle pattern), space closure following extractions is often more challenging due to an increased risk of anterior tooth extrusion, clockwise mandibular rotation, reduced occlusal stability, and difficulty in controlling the soft tissue profile [3–5].

From a biomechanical perspective, in the majority of extraction cases, the space-closing force is applied below the center of resistance of the anterior segment, thereby generating unfavorable moments, particularly negative torque. Consequently, the crowns tend to tip posteriorly while the roots are displaced anteriorly and labially, increasing the risk of labial cortical bone contact or periodontal complications such as fenestration and dehiscence, especially in the mandibular incisor region [6–9]. This risk is further exacerbated when the mandibular incisor roots are initially positioned close to the labial cortical plate, significantly narrowing the biological envelope available for lingual tooth movement [10–12].

Based on these considerations, this clinical case was designed with the following objectives: (i) reduction of incisor protrusion and improvement of soft tissue esthetics; (ii) vertical control in a high-angle patient; and (iii) three-dimensional torque control to protect the mandibular incisor roots from the risk of cortical bone perforation during prolonged space closure, through the combined use of an ART torque spring and segmented mechanics following the Ricketts–Bioprogressive philosophy.

II. Patient Information and Chief Complaint

A 16-year-old male patient presented with the chief complaint of “protrusive upper and lower incisors, resulting in a protrusive facial appearance and poor esthetics.” The patient’s primary concern was to improve facial esthetics and reduce lip protrusion [1,2].

III. Clinical Examination

a) Extraoral Examination

Extraoral examination revealed a convex facial profile, with both the upper and lower lips positioned markedly anterior to the esthetic E-line [1,3]. Increased mentalis muscle activity was observed during lip closure, reflecting compensatory muscular function associated with mandibular incisor proclination. Overall, facial soft tissue esthetics were significantly compromised by incisor protrusion.

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Figure 1: Pre-Treatment Extraoral Photographs

b) Intraoral Examination

Intraoral examination revealed severe proclination and protrusion of both the maxillary and mandibular incisors [6]. The occlusal relationship was Class I at the canine (tooth 3) and first molar (tooth 6) levels bilaterally. A critical unfavorable biological factor was the proximity of the mandibular incisor roots to the labial cortical plate, representing a high-risk condition when planning extraction-based anterior retraction mechanics [10–12]. All four third molars were present.

Figure 2: Pre-Treatment Intraoral Photographs

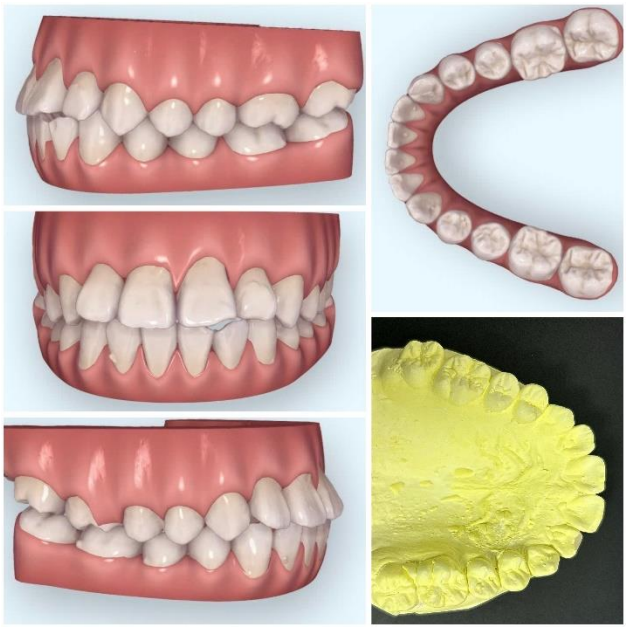

Figure 3: Pre-Treatment Intraoral 3D Digital Models

IV. Cephalometric Analysis According to the Ricketts Analysis System

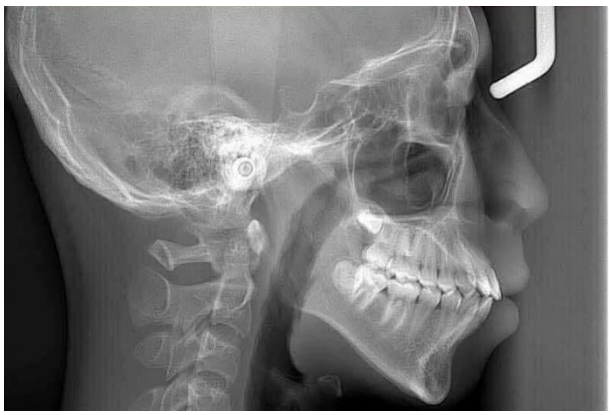

Figure 4: Pre-Treatment Lateral Cephalometric Radiograph

Cephalometric analysis according to the Ricketts system revealed a mild skeletal Class II relationship, with a facial convexity of 3.4 mm [15]. The mandible was mildly retrusive relative to the cranial base, as indicated by a facial depth of 85.8°, while the maxilla demonstrated a relatively neutral position with a maxillary depth of 88.9° [15,16].

Vertical analysis demonstrated a pronounced vertical growth pattern, with an increased FMA of 36.7°, an increased lower facial height (LFH) of 48° (compared with the normal range of 45–46°), and a reduced facial taper of 57.5° relative to the average value of approximately 68° [3,15]. These findings reflect a tendency toward clockwise mandibular rotation and vertical facial imbalance.

Dentally, both maxillary and mandibular incisors exhibited markedly increased proclination and protrusion compared with physiological norms (maxillary incisors: protrusion 13.3 mm, inclination 41.6°; mandibular incisors: protrusion 10.7 mm, inclination 36.1°) [6,15]. Overall, this case represents severe bimaxillary incisor protrusion on a background of mild skeletal Class II malocclusion with a high-angle growth pattern, accompanied by an unfavorable biological risk factor characterized by the close proximity of the mandibular incisor roots to the labial cortical plate [10–12].

Cephalometric Analysis (Ricketts Analysis)			
Cranial Base Characteristics		**Normal**	**Patient**
Cranial base angle (FH–NBa)	°	27.0°	**32.1**
Anterior cranial base length (CC-N)	mm	64.0 mm	**55.5** mm
Posterior cranial base length (Po-Ptv)	◦	43.5 mm	**37.7** mm
Facial Typology			
Total facial height (NBa-XiPm)	°	60.0°	**69.0°**
Facial taper (Npg-GoMe)	°	68.0°	**57.5**
Mandibular Growth Direction			
Facial axis angle (NBa–PtGn)	°	90.0°	**78.5°**
Lower facial height (ANS-Xi-Pm)	°	46.0°	**48.1**
Mandibular Morphology			
Mandibular arc angle (DC–Xi–Pm)	°	27.2°	**33.8°**
FMA	°	21.5°	**36.7**
Mandibular body length (Xi–Pm)	mm	77.4 mm	**66.8** mm
Posterior facial height (CF–Go)	mm	64.0 mm	**61.0** mm
Skeletal Relationships			
Facial convexity (A-Npg)	◦ mm	0.0 mm	**3.4** mm
Upper facial height (N–CF–A)	°	62.5°	**56.7°**
Maxillary depth (FH–NA)	°	90.0°	**88.9°**
Facial depth (FH–NPg)	°	91.7°	**85.8°**
Dental Relationships			
Upper first molar to PTV	mm	21.0 mm	**15.8** mm
Upper incisor protrusion (U1-APg)	mm	6.5 mm	**13.3** mm
Upper incisor inclination	°	30.0°	**41.6°**
Interincisal angle	°	126.0°	**126.0°**
Lower incisor extrusion (Occ–L1)	mm	1.2 mm	22.0 mm
Lower incisor inclination (L1-APg)	mm	22.0°	**36.1** mm
Mandibular plane angle (Facial axis closure)		92.0 mm	**79.1** mm

Figure 5: Pre-Treatment Cephalometric Analysis

V. Diagnosis

- *Skeletal Malocclusion:* Mild skeletal Class II.
- *Growth Pattern:* High-angle / vertical growth pattern.
- *Dental Findings:* Severe bimaxillary incisor protrusion and proclination.
- *Occlusion:* Bilateral Class I molar and Class I canine relationships.
- *Risk Factor:* Mandibular incisor roots positioned close to the labial cortical plate.

VI. Treatment Objectives

1. To reduce protrusion and proclination of the maxillary and mandibular incisors and improve soft tissue esthetics (reduction of lip protrusion and mentalis strain).
2. To maintain and refine a Class I occlusal relationship with optimal interdigitation.
3. To achieve vertical control during extraction-based treatment in a high-angle patient, minimizing anterior tooth extrusion and further clockwise mandibular rotation.
4. To protect the biological limits of the anterior dentition, particularly the mandibular incisors, through active torque control.
5. To obtain well-aligned dental arches with a stable arch form, facilitating long-term retention.

VII. Reatment Plan

The selected treatment plan consisted of extraction of the four first premolars in both arches, combined with a moderate anchorage strategy. During the initial phase, maxillary anchorage was reinforced using mini-screws during canine retraction; subsequently, the mini-screws were removed during the anterior retraction phase to maintain overall anchorage at a moderate level, which was appropriate given the more cancellous nature of maxillary bone. An MBT 0.022 bracket system was used in combination with continuous archwire mechanics, an ART torque spring for mandibular incisor torque control, and segmented mechanics according to the Ricketts Bioprogressive philosophy to achieve three-dimensional control of tooth movement [6,15,18].

VIII. Treatment Progress

a) Alignment and Leveling

MBT 0.022 slot brackets were bonded in both arches. The archwire sequence consisted of 0.014, 0.016, 0.016×0.022, 0.017×0.025, and 0.019×0.025 nickel–titanium wires, followed by a 0.019×0.025 stainless steel archwire to complete alignment and leveling. Each archwire was maintained for approximately 1–1.5 months. Extraction of the four first premolars was performed once stable alignment had been achieved, prior to initiating space closure.

b) Anchorage Setup and Canine Retraction

After progression to a 0.019×0.025 stainless steel archwire, two interradicular mini-screws measuring 1.6 × 10 mm were placed in the maxillary arch between the first and second premolars to reinforce posterior anchorage. Elastomeric chains delivering approximately 150 g of force were applied from the mini-screws to the maxillary canines to perform canine retraction using

sliding mechanics [6,8]. In the mandibular arch, moderate anchorage was established using elastomeric chains delivering approximately 150 g of force from the first molars to the canines.

Figure 6: Canine retraction on a 0.019 × 0.025-inch stainless steel archwire using sliding mechanics

During the canine retraction phase, the patient wore intermaxillary elastics (3/16-inch, 3.5 oz) from the maxillary first molars to the mandibular first and second premolars to stabilize posterior occlusal interdigitation, as canine retraction using sliding mechanics tends to generate rotational moments and increases the risk of posterior occlusal disclusion [6,7].

From the rigid archwire stage onward, an ART torque spring was placed in the mandibular four-incisor region and maintained continuously throughout the canine retraction phase. The ART appliance functioned as an auxiliary torque spring, generating active positive torque to direct the incisor roots into cancellous bone and counteract the negative torque moments produced during space closure with force application below the center of resistance [6,9]. Studies on periodontal tissue response have demonstrated that light and continuous torque forces facilitate safe alveolar bone remodeling, particularly in regions where the incisor roots are positioned close to the labial cortical plate [22,23].

Figure 7: Torque control of the mandibular incisor roots using an ART torque spring during space closure

During canine space closure, a commonly observed side effect is an increased tendency for the roots to approach the cortical bone. At the mandibular canine region (tooth 33), due to the close proximity of

the root to the labial cortical plate, tooth movement was slowed when sliding mechanics were applied [10–12]. Under these circumstances, a single-loop was fabricated on a 0.019×0.025-inch TMA archwire to generate a root-directing moment, guiding the root into cancellous bone and thereby "reopening" the biological envelope available for tooth movement. The loop was activated at a rate of approximately 1.5 mm per month to complete the remaining space closure [19–21].

Following completion of canine space closure, a tendency for maxillary canine extrusion was observed. Therefore, two L-shaped loops with elastomeric elements were applied to deliver an intrusive force, reduce extrusion, and re-establish occlusal plane balance.

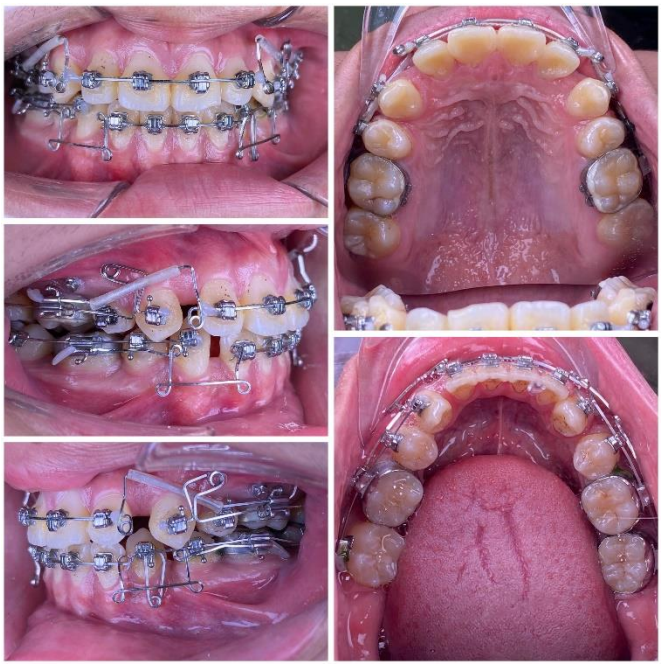

Figure 8: Space closure performed by segmented loop mechanics for canine retraction, followed by anterior space closure using a retraction arch with three-dimensional torque control

c) Incisor Retraction using Segmented Mechanics

After completion of canine retraction, the incisor segment was retracted using segmented mechanics according to the Ricketts Bioprogressive philosophy. Retraction arches in both arches were designed to achieve three objectives simultaneously: (i) controlled incisor retraction; (ii) activation of an intrusive component of approximately 2–3 mm to counteract anterior tooth extrusion, which is particularly critical in high-angle patients; and (iii) generation of strong and stable positive torque to achieve three-dimensional control of incisor root movement, especially in the mandibular arch [19–21]. The retraction arches were activated at a rate of approximately 1.5 mm per month while maintaining torque and vertical control.

During the finishing phase, the ART torque spring was continuously maintained in the mandibular incisor region to reduce secondary negative torque and to assist in directing the incisor roots into cancellous bone, thereby protecting the labial cortical plate during the stage when retraction forces generate the most unfavorable moments [22–24].

After the occlusal objectives were achieved, the patient was progressed through finishing archwires (0.016 NiTi; 0.016×0.022 NiTi; 0.017×0.025 NiTi; and 0.017×0.025 stainless steel), in combination with intermaxillary elastics (3/16-inch, 3.5 oz) for midline correction and occlusal settling. Subsequently, space reopening was observed between the maxillary lateral incisors (tooth 2) and canines (tooth 3) bilaterally. A space-closing archwire with L-shaped loops positioned between teeth 2 and 3 was fabricated, and space closure was activated at approximately 1.5 mm per month over a two-month period, resulting in complete space closure. Thereafter, both arches were placed on 0.017×0.025 stainless steel archwires with full-arch elastomeric chains. Intermaxillary elastics were continued to assist in midline correction and to achieve optimal intercuspation.

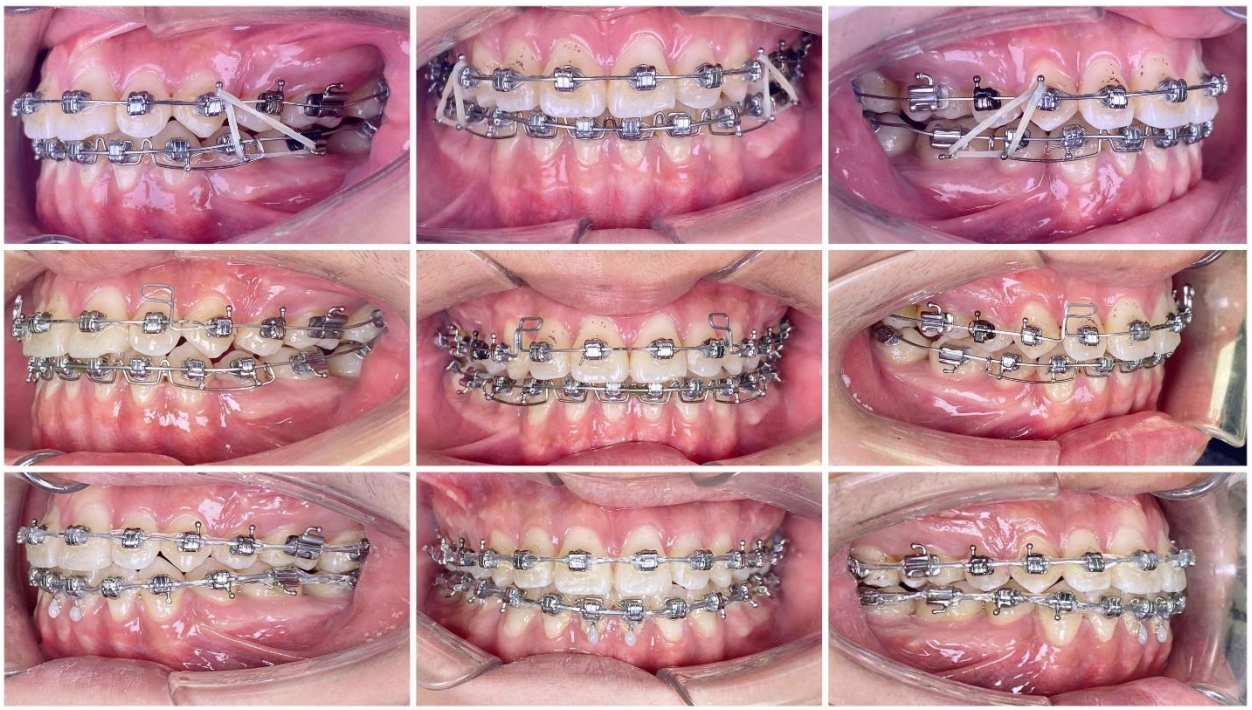

Figure 9: Re-leveling and alignment phase following anterior space closure of the four incisors

The patient was retained for three months prior to appliance removal. The total treatment duration was 33 months.

IX. Treatment Results

After appliance removal, bilateral Class I canine and first molar relationships were achieved, with stable intercuspation. The maxillary and mandibular dental midlines were coincident, and both overjet and overbite were approximately 2 mm. The dental arches in both jaws were well aligned, leveled, and exhibited a standardized arch form.

With respect to soft tissue outcomes, facial esthetics improved markedly, transitioning from a convex facial profile with lip protrusion relative to the E-line to a more harmonious facial profile with an E-line position approaching physiological norms. Mentalis muscle strain was reduced, facial esthetics were significantly enhanced, and the patient expressed satisfaction with the treatment outcome.

Notably, the mandibular incisor roots did not perforate the labial cortical plate and did not exhibit a clinically significant increase in negative torque, despite the prolonged space closure phase. This finding is of particular clinical relevance given the unfavorable biological limitations present at the beginning of treatment.

Figure 10: Post-treatment intraoral photographs

Figure 11: Comparison of incisor root position before and after treatment

Figure 12: Post-treatment extraoral photographs

X. Pre- And Post-Treatment Cephalometric Changes

Post-treatment cephalometric analysis according to the Ricketts system demonstrated marked improvements in incisor inclination and protrusion. Maxillary incisor inclination was reduced to 28.6°, with protrusion decreased to 7.4 mm, while mandibular incisor inclination was reduced to 22°, with protrusion decreased to 3.4 mm. Superimposed pre- and post-treatment tracings showed posterior repositioning and improved axial inclination of the incisors in both arches. The posterior teeth exhibited a slight mesial movement, consistent with the moderate anchorage strategy employed.

Notably, in the mandibular arch, the incisor roots were more favorably oriented within the cancellous bone compared with the pre-treatment condition, reflecting the effectiveness of active torque control during space closure.

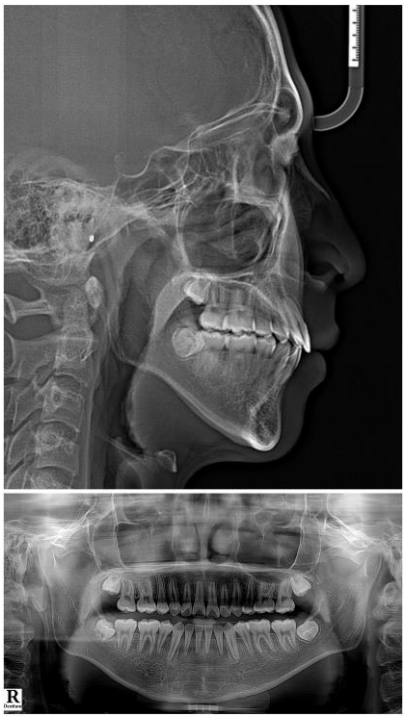

Figure 13: Post-Treatment Lateral Cephalometric and Panoramic Radiographs

Post-treatment Cephalometric Analysis (Ricketts)

Measurement	Normal	Patient
Cranial Base		
FH–NBa (°)	27.0	30.0
CC–N (mm)	64.0	55.8
Po–Ptv (mm)	43.5	35.9
Facial Typology		
NBa–XiPm (°)	60.0	67.8
Facial taper Npg–GoMe (°)	68.0	59.6
Mandibular Growth Direction		
Facial axis NBa–PtGn (°)	90.0	79.6
LFH ANS–Xi–Pm (°)	46.0	46.4
Mandibular Shape		
Mandibular arc DC–Xi–Pm (°)	27.2	35.5
FMA (°)	21.5	35.9
Xi–Pm (mm)	77.4	65.0
CF–Go (mm)	64.0	65.0
Skeletal Relations		
Facial convexity A–Npg (mm)	0.0	3.2
Upper facial height N–CF–A (°)	62.5	57.4
Maxillary depth FH–NA (°)	90.0	87.5
Facial depth FH–NPg (°)	91.7	84.5
Dental Relations		
Upper 6 to PTV (mm)	21.0	18.1
U1–APg (mm)	6.5	7.4
Upper incisor inclination (°)	30.0	28.6
Interincisal angle (°)	126.0	128.9
Occ–L1 (mm)	1.2	-1.6
Lower incisor inclination (°)	22.0	22.5
L1–APg (mm)	1.0	3.4
Facial axis closure (°)	92.0	96.1

Figure 14: Post-treatment Ricketts Cephalometric Analysis

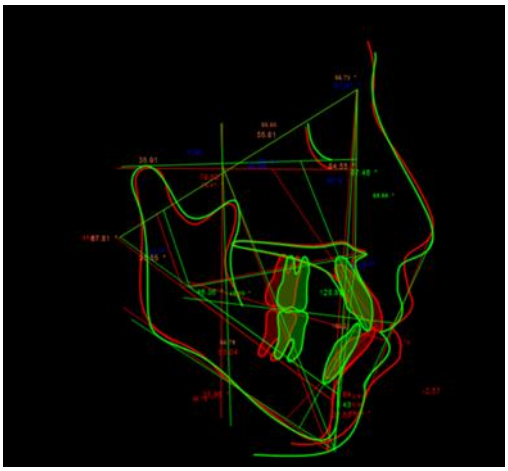

Figure 15: Superimposition on Ba–N at CC after treatment

XI. Discussion

This clinical case was challenging for three main reasons: the patient exhibited a high-angle growth pattern associated with an increased risk of anterior tooth extrusion and clockwise mandibular rotation; severe bimaxillary incisor protrusion required extensive and prolonged retraction; and the mandibular incisor roots were positioned close to the labial cortical plate, which significantly limited the biological envelope available for tooth movement [3–5,10–12].

The application of retraction forces below the center of resistance during space closure generates rotational moments that increase negative torque of the incisors, thereby elevating the risk of root displacement toward the labial cortical bone in the absence of active torque control [6,7].

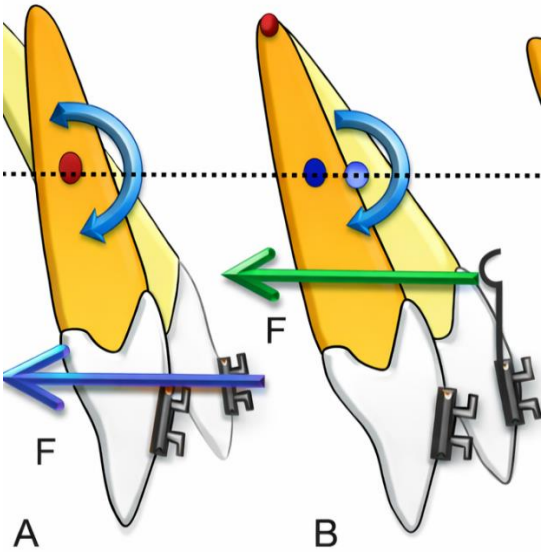

Figure 16: Negative torque moments and tooth extrusion occurring during space closure with force application below the center of resistance

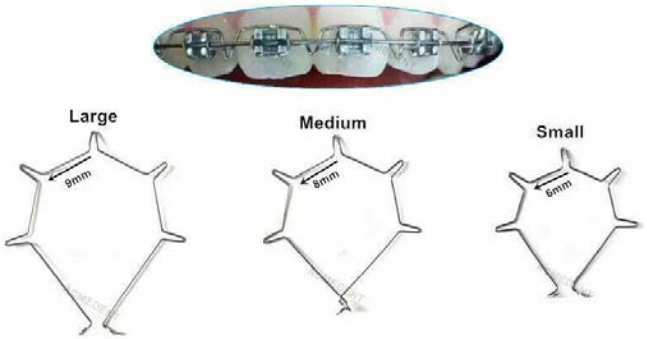

Figure 17: The ART torque spring generates active positive torque to control incisor root position

In this case, an ART torque spring was employed as an auxiliary torque spring to generate additional positive torque moments, based on biomechanical principles of moment control and root movement as described by Burstone, and in accordance with studies on the biological response of periodontal tissues to light and continuous torque forces [9,22,23].

In addition, segmented mechanics using a single-loop on a TMA archwire and retraction arches designed according to the Bioprogressive philosophy allowed three-dimensional control of incisor movement by combining posterior retraction forces, intrusive forces, and strong positive torque. This approach is particularly suitable for high-angle patients, in whom vertical control plays a decisive role in occlusal stability and soft tissue esthetics [19–21].

XII. Retention

After treatment, a Hawley retainer was delivered for the maxillary arch, and a fixed lingual retainer was bonded to the eight mandibular incisors. The Hawley retainer was prescribed for full-time wear (except during eating and oral hygiene) during the first year, followed by nighttime wear in subsequent years. All four third molars were scheduled for extraction after completion of orthodontic treatment.

XIII. Conclusion

Extraction of the four first premolars in a high-angle patient with severe bimaxillary incisor protrusion and mandibular incisor roots positioned close to the labial cortical plate represents a significant biomechanical and biological challenge. In this case, the combination of continuous archwire mechanics with active torque control using an ART torque spring and segmented mechanics based on the Ricketts–Bioprogressive philosophy allowed effective reduction of incisor protrusion, improvement of soft tissue esthetics, maintenance of a Class I occlusal relationship, and, most importantly, preservation of biological safety in the mandibular incisor region throughout the prolonged space closure process.

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Antimicrobial Photodynamic Therapy in the Treatment of Peri-Implantitis

By Fernanda dos Santos Lacerda & Fabiano Luiz Heggendorn

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Abstract- Peri-implantitis is a chronic inflammation that compromises osseointegration and the longevity of dental implants. This study reviewed the literature on the efficacy of antimicrobial photodynamic therapy (aPDT) in the treatment of peri-implantitis, analyzing its mechanisms, protocols, and clinical and microbiological outcomes. This exploratory literature review analyzed articles published between 2020 and 2025 in the SciELO, PubMed, LILACS, and Google Scholar databases, meeting previously defined inclusion and exclusion criteria. aPDT proved effective in reducing biofilm, inflammatory parameters, and probing depth, especially when combined with mechanical debridement. Despite the heterogeneity of protocols, the results suggest that aPDT is a safe and promising approach with no risk of bacterial resistance. Further studies are needed for standardization and clinical validation.

Keywords: *peri-implantitis, dental implants, low-level light therapy, osseointegration.*

GJMR-J Classification: *NLMC Code: WU 640*

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Antimicrobial Photodynamic Therapy in the Treatment of Peri-Implantitis

Terapia Fotodinámica Antimicrobiana en el Tratamiento de la Periimplantitis

Terapia Fotodinâmica Antimicrobiana no Tratamento da Peri-Implantite

Fernanda dos Santos Lacerda [α] & Fabiano Luiz Heggendorn [σ]

Abstract- Peri-implantitis is a chronic inflammation that compromises osseointegration and the longevity of dental implants. This study reviewed the literature on the efficacy of antimicrobial photodynamic therapy (aPDT) in the treatment of peri-implantitis, analyzing its mechanisms, protocols, and clinical and microbiological outcomes. This exploratory literature review analyzed articles published between 2020 and 2025 in the SciELO, PubMed, LILACS, and Google Scholar databases, meeting previously defined inclusion and exclusion criteria. aPDT proved effective in reducing biofilm, inflammatory parameters, and probing depth, especially when combined with mechanical debridement. Despite the heterogeneity of protocols, the results suggest that aPDT is a safe and promising approach with no risk of bacterial resistance. Further studies are needed for standardization and clinical validation.

Keywords: peri-implantitis, dental implants, low-level light therapy, osseointegration.

Resumen- La periimplantitis es una inflamación crónica que compromete la osteointegración y la longevidad de los implantes dentales. Este estudio revisó la literatura sobre la eficacia de la terapia fotodinámica antimicrobiana (TFDPA) en el tratamiento de la periimplantitis, analizando sus mecanismos, protocolos y resultados clínicos y microbiológicos. Esta revisión exploratoria de la literatura analizó artículos publicados entre 2020 y 2025 en las bases de datos SciELO, PubMed, LILACS y Google Scholar, que cumplían con los criterios de inclusión y exclusión previamente definidos. La TFDPA demostró ser eficaz en la reducción del biofilm, los parámetros inflamatorios y la profundidad de sondaje, especialmente al combinarse con el desbridamiento mecánico. A pesar de la heterogeneidad de los protocolos, los resultados sugieren que la TFDPA es un enfoque seguro y prometedor, sin riesgo de resistencia bacteriana. Se necesitan más estudios para su estandarización y validación clínica.

Palabras Clave: periimplantitis, implantes dentales, terapia por luz de baja intensidad, oseointegración.

Resumo- A peri-implantite é uma inflamação crônica que compromete a osseointegração e a longevidade dos implantes dentários. Esta revisão de literatura integrativa objetivou investigar, discutir e analisar a eficácia da aPDT no tratamento da peri-implantite, considerando seus mecanismos de ação, protocolos clínicos utilizados e os desfechos microbiológicos e clínicos observados. A pesquisa bibliográfica de caráter exploratório, incluiu a análise de artigos publicados entre 2020 e 2025 nas bases SciELO, PubMed, LILACS e Google Scholar, obedecendo aos critérios de inclusão e exclusão previamente definidos. A aPDT demonstrou-se eficaz na redução do biofilme, de parâmetros inflamatórios e da profundidade de sondagem, especialmente quando associada ao desbridamento mecânico. Apesar da heterogeneidade nos protocolos, os resultados sugerem que a aPDT é uma abordagem segura, promissora e sem risco de resistência bacteriana. Novos estudos são necessários para padronização e validação clínica.

Palavras-chave: peri-implantite, implantes dentários, terapia com luz de baixa intensidade, osseointegração.

I. Introdução

Após a reabilitação com implantes dentários, espera-se que a osseointegração proporcione estabilidade funcional, longevidade do tratamento e resultados estéticos satisfatórios. Contudo, complicações biológicas como a peri-implantite, uma inflamação dos tecidos peri-implantares associada à perda óssea progressiva, têm se tornado uma das principais causas de falhas tardias em implantes osseointegrados (1) (2) (3) (4) (5) (6) (7). Clinicamente, a peri-implantite compartilha características com a periodontite, como sangramento à sondagem (BOP), supuração, aumento da profundidade de sondagem (PD) e reabsorção óssea em torno do implante (1) (2) (5) (6) (8) (7).

A etiologia dessa condição é multifatorial e inclui aspectos como higiene oral inadequada, tabagismo, histórico de periodontite, sobrecarga oclusal e presença de biofilme bacteriano nas superfícies implantossuportadas (1) (6) (7). Assim, o controle microbiano efetivo torna-se um fator essencial no tratamento da peri-implantite, visando a preservação da estrutura óssea e o prolongamento da vida útil do implante (1) (2) (4) (6) (9).

Nesse contexto, a terapia fotodinâmica antimicrobiana (aPDT) surge como uma alternativa minimamente invasiva e promissora (4) (6) (7) (10) (11) (12). Trata-se de uma técnica que combina a aplicação de um corante fotossensível com a irradiação por luz com comprimento de onda específico, resultando na

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produção de espécies reativas de oxigênio capazes de destruir seletivamente microrganismos patogênicos (1) (3) (6). A aPDT vem sendo estudada como tratamento adjunto ou complementar em casos de peri-implantite, com resultados promissores na redução do biofilme e na inflamação tecidual (13) (12) (3) (9) (1) (4) (5) (8) (14).

A ativação fotodinâmica atua de forma localizada, sem causar efeitos adversos aos tecidos adjacentes, sendo eficaz contra bactérias resistentes e biofilmes maduros (9) (1) (4) (15) (7) (16), além de não induzir resistência microbiana como os antibióticos tradicionais (17) (10) (2) (3) (4) (18) (5) (19) (14). Por esse motivo, a aPDT tem despertado crescente interesse em pesquisas voltadas para a terapêutica peri-implantar (11) (10) (13) (20) (2) (3) (1) (4) (18) (6) (15) (19) (8) (7) (16) (21).

Dessa forma, o objetivo desta revisão de literatura integrativa foi investigar, discutir e analisar a eficácia da aPDT no tratamento da peri-implantite, considerando seus mecanismos de ação, protocolos clínicos utilizados e os desfechos microbiológicos e clínicos observados.

II. Metodologia

Esta pesquisa analisou de forma qualitativa a eficácia da aPDT no tratamento da peri-implantite. A busca foi realizada nas bases de dados PubMed (National Library of Medicine), SciELO (Scientific Eletronic Library Online), LILACS (Literatura Latino-Americana e do Caribe em Ciências da Saúde) e pelo endereço eletrônico scholar.google.com.br, entre os anos de 2020 a 2025, utilizando os seguintes descritores, em inglês e português, associados aos operadores booleanos, resultando nas duas estratégias de busca: (peri-implantite OR inflamação peri-implantar OR doença peri-implantar OR infecção peri-implantar) AND (terapia fotodinâmica antimicrobiana OR aPDT) AND (implante dental OR implantodontia OR implante) e (peri-implantitis OR peri-implant inflammation OR peri-implant disease OR peri-implant infection) AND (antimicrobial photodynamic therapy OR aPDT) AND (dental implant OR implant dentistry OR implant).

Os títulos e os resumos de todos os artigos encontrados nas buscas foram analisados com base nos critérios de inclusão, identificando os artigos que relatavam investigar os efeitos da aPDT sobre os tecidos peri-implantares, abordando seus mecanismo de ação, protocolos utilizados e os principais resultados microbiológicos e clínicos relevantes ao tratamento da peri-implantite. Foram incluídos artigos completos, publicados entre os anos de 2020 a 2025, que abordavam diretamente o uso da aPDT como intervenção terapêutica para peri-implantite. Foram excluídos artigos publicados fora do período delimitado, teses, monografias, dissertações, livros, artigos incompletos ou que não apresentassem relação direta com o objetivo da pesquisa.

III. Resultados e Discussão

Após a aplicação dos descritores nas bases de dados selecionadas, foram encontrados 24 artigos. Destes, foram incluídos na presente análise aqueles que abordavam o uso da aPDT como estratégias adjuvantes para o controle inflamatório e regeneração tecidual em casos de peri-implantite.

A análise dos estudos selecionados nesta revisão evidencia que a aPDT tem se destacado como uma abordagem promissora e complementar ao desbridamento mecânico (DM) no tratamento da peri-implantite. Diversos ensaios clínicos randomizados e revisões sistemáticas reforçam sua eficácia na melhora dos parâmetros clínicos, microbiológicos e imunológicos, especialmente em populações com fatores de risco como diabetes, tabagismo ou uso de narguilé (17) (10) (3) (8) (6).

A associação da aPDT com o DM demonstrou reduções significativas no BOP, PD e índice de placa (PI) em diferentes grupos populacionais, inclusive diabéticos tipo 2 (17) e usuários de produtos à base de nicotina (23) (19) (8). No estudo de Afrasiabi *et al*. (2023) observou-se redução significativa no BOP após 6 meses (SMD = -2.15; $p = 0.01$) e no PI aos 3 meses (SMD = -0.79; $p < 0.001$), embora a redução no PD não tenha alcançado significância estatística (SMD = -3.13; $p = 0.08$). De forma consistente, AlMubarak (2025) relatou que, em usuários habituais de nicotina, a aPDT promoveu reduções significativas no PD, PI e BOP em todos os estudos avaliados.

A metanálise conduzida por Fonseca *et al*. (2024), mostrou melhora clínica significativa com redução do PD quando a aPDT foi utilizada como adjuvante (3), resultado semelhante ao encontrado por Bahrami *et al*. (2024) (2) e Patil *et al*. (2023) (5), que também destacaram a diminuição dos níveis inflamatórios, como IL-6 e TNF-α.

No tocante aos desfechos microbiológicos, a aPDT mostrou-se eficaz na redução de patógenos como *Porphyromonas gingivalis*, *Aggregatibacter actinomycetemcomitans* e *Prevotella intermedia*, tanto em estudos clínicos quanto laboratoriais (9) (21) (24) (6). (15). Segundo Fraga *et al.* (2018), observou-se uma diminuição estatisticamente significativa na contagem de *Porphyromonas gingivalis* (OR = 4,08), *Aggregatibacter actinomycetemcomitans* (OR = 1,31) e *Prevotella intermedia* (OR = 1,66), reforçando o potencial da terapia como adjuvante no controle da infecção peri-implantar. Adicionalmente, estudos demonstraram redução da colonização subgengival por leveduras em pacientes com mucosite peri-implantar após uma única sessão de aPDT (16).

Apesar dos resultados positivos, algumas limitações devem ser consideradas. A heterogeneidade metodológica, principalmente no número de sessões, entre uma e quatro aplicações, nos fotossensibilizadores utilizados, como azul de metileno e toluidina azul, e nos comprimentos de onda variando entre 635 e 810 nm, torna difícil a padronização de um protocolo terapêutico ideal (4) (24) (14) (20). Enquanto Lähteenmäki *et al*. (2022) utilizaram duas sessões com intervalo semanal, Ali *et al*. (2024) optaram por quatro sessões semanais consecutivas, evidenciando a falta de consenso quanto à frequência ideal de aplicação da aPDT. Ainda assim, as evidências sugerem que sessões únicas ou repetidas podem reduzir de forma significativa a inflamação e a carga microbiana sem efeitos colaterais relevantes (18) (1) (12) (13) (11).

Estudos anteriores que analisaram os efeitos do laser na osseointegração também sugeriram benefícios significativos na modulação inflamatória, estimulação celular e deposição de matriz mineralizada (25), reforçando o potencial terapêutico complementar da aPDT na regeneração tecidual peri-implantar.

Zhao et al. (2022) realizaram uma metanálise com fumantes, observando redução estatisticamente significativa em PD (MD = -1,26 mm) e PI (MD = -10,6%) com o uso da aPDT combinada ao DM, confirmando sua superioridade ao tratamento convencional isolado(19). De forma similar, Al-Hamoudi (2023) relatou melhora clínica e redução dos níveis de RANK-L em usuários de narguilé, sugerindo benefício adicional da aPDT também sobre biomarcadores de reabsorção óssea(8).

Alguns estudos avaliaram a aplicação domiciliar da aPDT com uso de dispositivos de luz dupla, observando melhorias no controle do biofilme e marcadores inflamatórios (24), o que abre perspectivas para sua incorporação como ferramenta auxiliar na manutenção da saúde peri-implantar.

Adicionalmente, a aPDT demonstrou benefícios comparáveis ou superiores aos antibióticos locais, com a vantagem de não induzir resistência bacteriana (14). Este achado reforça seu potencial como alternativa segura em um cenário de crescente preocupação com resistência antimicrobiana.

Embora mais estudos clínicos bem delineados e de longo prazo sejam necessários para consolidar protocolos e ampliar a aplicabilidade da técnica, os achados da presente revisão sustentam o uso da aPDT como terapia adjuvante eficaz, segura e promissora no manejo da peri-implantite.

IV. Conclusão

O estudo demonstrou que a utilização da aPDT apresenta um impacto positivo no controle inflamatório e microbiológico da peri-implantite, além de contribuir para a preservação dos tecidos peri-implantares e o sucesso clínico dos implantes dentários. No entanto, deve ser considerado um viés devido ao número limitado de estudos clínicos e à ausência de um protocolo terapêutico padronizado. Mais pesquisas devem ser realizadas para confirmar a eficácia da aPDT em termos de estabilidade dos tecidos peri-implantares e manutenção longitudinal da osseointegração, consolidando sua aplicação segura e reprodutível na implantodontia.

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The Silent Sufferers: Congenital Insensitivity to Pain with Anhidrosis (CIPA): A Case Report

By Dr. Kalpna Chaudhry, Dr. Diganta Rava, Dr. Deepshikha Singh & Dr. Pooja Panwar

Abstract- Congenital Insensitivity to Pain with Anhidrosis (CIPA) is a rare hereditary condition that affects the nervous system, leading to an absence of pain sensation and impaired thermal regulation. This case report highlights the diagnostic process of a 9-year-old patient suspected to be suffering with CIPA in a dental setting where early recognition of the condition plays a critical role in preventing complications. The report discusses the implications of CIPA for pediatric dental care, emphasising the need for increased awareness and modified management approaches.

Keywords: *anhidrosis, congenital, insensitivity, pain, pediatric dentistry.*

GJMR-J Classification: *NLMC Code: WL140, WU480*

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Keywords: anhidrosis, congenital, insensitivity, pain, pediatric dentistry.

I. Introduction

Congenital Insensitivity to Pain with Anhidrosis (CIPA) is classified under Hereditary Sensory and Autonomic Neuropathies (HSAN Type IV). Due to a mutation in the NTRK1 gene, affected individuals are unable to feel pain or temperature, leading to frequent self-injuries, delayed wound healing and other complications.

While CIPA has been widely studied in medical literature, its impact in pediatric dentistry is not well documented. In dentistry, the absence of pain can mask serious oral conditions, posing a significant challenge for diagnosis and management. CIPA is an exceedingly rare disorder, with a reported incidence of one in 125 million[1]. The disease shows geographic variability, which may be attributed to founder mutations and consanguineous marriages[2]. The condition exhibits an autosomal recessive inheritance pattern, necessitating the presence of two mutated alleles for phenotypic expression[3]. The majority of affected individuals originate from consanguineous unions, emphasizing the importance of genetic counseling in at-risk populations. There is no reported study about the gender predilection of this disease particularly.

CIPA is characterized mainly by 3 symptoms: pain, anhidrosis and temperature. Notably, lacrimation, salivation, and touch perception are unaffected. Due to their lack of pain perception, affected persons are more vulnerable to infections and self-inflicted injuries, such as intraoral injuries. The inability to sweat is a contributing factor to anhidrosis, which raises the risk of hyperthermia. A nerve biopsy, genetic testing, and clinical assessment all contribute to the diagnosis. To detect the precise mutation and validate the diagnosis, NTRK1 gene genetic analysis is required.[4] This case report focuses on the identification of CIPA in a 9-year-old patient and its implications for pediatric dental practice.

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II. Case Report

a) Patient Information

A 9-year-old male was brought to the Department of Pediatric and Preventive Dentistry in Seema Dental college & Hospital, Rishikesh, for a routine dental check-up. The patient's medical history revealed no significant dental complaints, but the parents reported frequent self-injuries and an inability to perceive pain since birth. According to his mother the patient would inflict self-injuries using hot iron rods or would sit on top of the fire and get burns but won't feel any pain. Based on clinical history, the patient was suspected to be suffering from a very rare condition known as congenital insensitivity to pain with anhidrosis (Table 1). The patient belonged to low socio economic background therefore his parents never bothered to undergo any kind of investigation for his medical condition.

b) Clinical Presentation

Upon extraoral examination, the patient displayed several healed scars on the extremities and head, likely resulting from repeated self-inflicted injuries as shown in Figure 1(a). Despite the presence of noticeable injuries, the patient exhibited no signs of discomfort.

Intraoral examination revealed generalized attrition of teeth, early carious lesions in the posterior teeth with no complaints of sensitivity or pain, multiple areas of soft tissue scarring on the inner lips and buccal mucosa, no other visible pathologies or acute dental issues were noted as shown in Figure 2.

The patient did not respond to any pain stimuli during the examination, confirming the clinical signs of CIPA. Radiographic imaging was performed, which showed deep carious lesions with periapical radiolucency as shown in Figure 3. The diagnosis made was deep carious lesion with periapical abscess w.r.t 46.

c) Diagnostic Process

The diagnostic process is based on clinical evaluation, genetic testing, and a nerve biopsy. Genetic analysis of the NTRK1 gene is essential for confirming

the diagnosis and identifying the specific mutation.[5] The mother used to work at AIIMS Rishikesh as a cleaning staff and she mentioned that she had consulted a neurologist about the condition once and she was told that it might be due to neurological problems. No further investigation of any kind was done. Given the patient's unique presentation and the reported medical history and comparing it with other similar neuropathies, CIPA was suspected as the underlying condition. While the patient did not present with any immediate dental concerns, the absence of pain posed challenges in evaluating the true extent of oral damage. Routine dental tests, such as percussion or sensitivity testing, were not applicable, necessitating a more cautious approach in future monitoring.

d) Management

No immediate treatment was provided during this visit. The focus remained on educating the parents regarding the long-term implications of CIPA on oral health. Preventive dental care, regular check-ups, and close monitoring were strongly recommended. Customized preventive strategies, including the use of mouthguards and improved oral hygiene practices, were discussed to minimize the risk of self-inflicted injuries in the future. Since the mother was a labor moving from place to place in search for work, the patient didn't turn up for further treatment.

III. Discussion

CIPA presents a unique diagnostic challenge in pediatric dentistry due to the patient's inability to experience pain. In a typical dental scenario, pain acts as a key indicator for diagnosing conditions such as caries, pulpitis, or infections.[6] However, in patients with CIPA, dental practitioners must rely on visual and radiographic cues rather than patient-reported symptoms, potentially delaying the diagnosis of critical conditions. Although this syndrome can be diagnosed by clinical and paraclinical tests together, but a confirmatory genetic test is better to fully understand the disease. [3] In this case the child was first suspected to be victim of child abuse and neglect asit can be easily confused for child abuse as described by Yagev et al.[8] After thorough conversation with the child and his mother as well his sister individually it was found out that the child has masochistic habits. Upon further conversation it was found out that the child doesn't feel any pain.

Pediatric dentists should be aware of the increased risk of oral trauma, caries progression, and periodontal disease in these patients, as they often go unnoticed without the protective mechanism of pain. In a case presented by Kouvelas N et al. parents gave a history of self-extraction of the teeth as the child did not feel any pain.[1]. Additionally, these patients may develop severe infections or complications if oral conditions are left untreated. Caregivers should be informed about maintaining meticulous oral hygiene, frequent dental visits, and injury prevention techniques.

The case also highlights the need for a multidisciplinary approach, involving pediatricians, neurologists, and dentists, to ensure comprehensive care. We suggest psychological interventions for CIPA primarily focusing on patient education, coping mechanisms development and emotional support to help individuals understand their condition, learn strategies to prevent injuries and manage psychological impact of not experiencing pain, including anxiety related to potential harm and social challenges arising from their unique situation. In a similar case presented by Neves BG et al, they reported that it is important to include a dentist in the multidisciplinary team to reduce the frequency and severity of the self-inflicted lesions in these patients.[9] Early diagnosis of CIPA in a dental setting can prevent severe complications, contributing to better long-term outcomes for the patient. At an early age and with parent's cooperation, the use of a night-guard, grinding sharp edges of the teeth, or the addition of a composite are helpful; rather than the performance of a full mouth extraction which is an extremely radical treatment that causes bone loss.[10]

The management of these individuals is quite challenging, and there is little information in dentistry literature about this problem. Unrecognizing of the clinical pictures of CIPA and minimal literature references in the past, misleads to late diagnosis and management.[11]

a) Significance in Pediatric Dentistry

CIPA significantly alters the approach to pediatric dental care. Key considerations include:

- *Preventive Focus:* Regular dental visits should be scheduled to monitor oral health since patients will not report symptoms of pain.
- *Education:* Educating caregivers about injury prevention and the importance of maintaining oral health is crucial in preventing self-inflicted damage and infections.
- *Modified Treatment:* Treatment approaches must be adjusted, focusing on visual diagnostics rather than patient-reported symptoms. Pain management strategies should be carefully considered due to the patient's lack of pain perception.

A rubber dam should always be used to avoid any serious iatrogenic injuries since the patient is unable to feel any pain and wouldnot be able to report about the same.

- *Team Approach:* A collaborative approach between dental and medical professionals is essential to ensure the patient's overall well-being.

IV. Conclusion

CIPA is a rare condition with profound implications for pediatric dental care. Although no immediate dental treatment was required for the 9-year-old patient in this case, the diagnosis emphasizes the need for a specialized approach to oral care. Pediatric dentists must be vigilant and proactive in identifying and managing such cases to prevent complications and maintain oral health in the absence of pain as a diagnostic tool.

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Table 1: Characteristics in Similar Sensory Neuropathies[4]

	Hereditary sensory Neuropathy type I	Hereditary sensory Neuropathy type II	Congenital Insensitivity to pain	Familial Dysautonomia or HSN III	Congenital Insensitivity to pain with anhidrosis
Onset	Childhood-Adulthood	Birth	Birth	Birth	Birth
Hereditary	Dominant	Recessive	Recessive	Recessive	Recessive
Intelligence	Normal	Normal	Dull	Retarded	Retarded
Sweating	Normal	Normal	Normal	Increased	Absent
Unknown fever	?	?	?	Present	Present
Pain	Absent	Absent	Absent	Absent	Absent

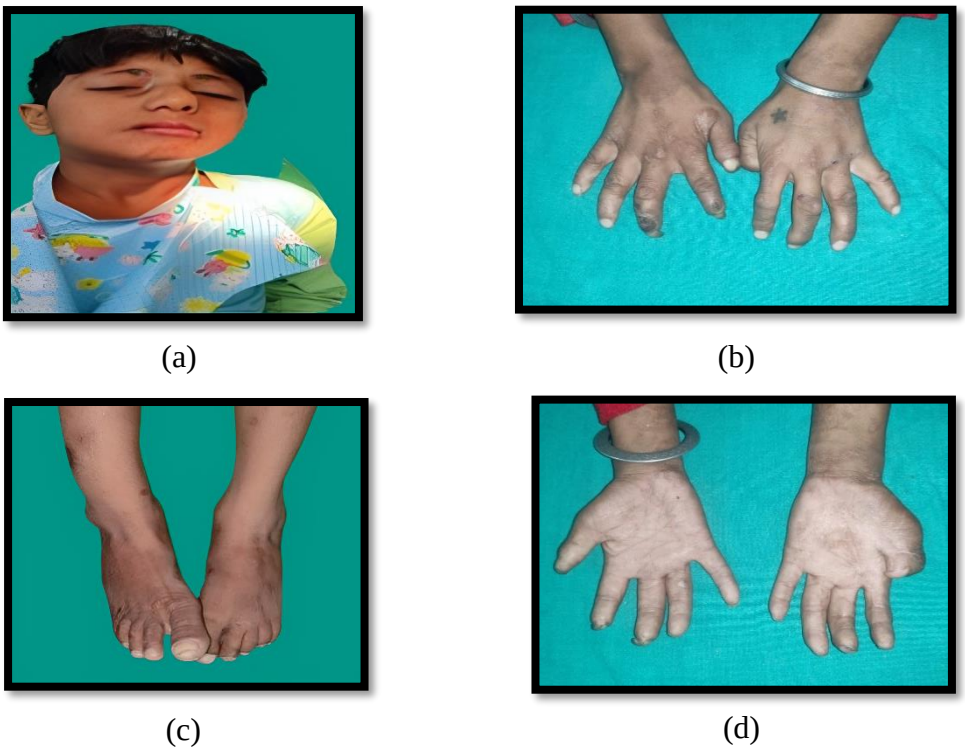

Figure 1: (a) Healing scars on face, (b&c) Foreshortening of distal phalanges of hand (d) Multiple burn scars on leg

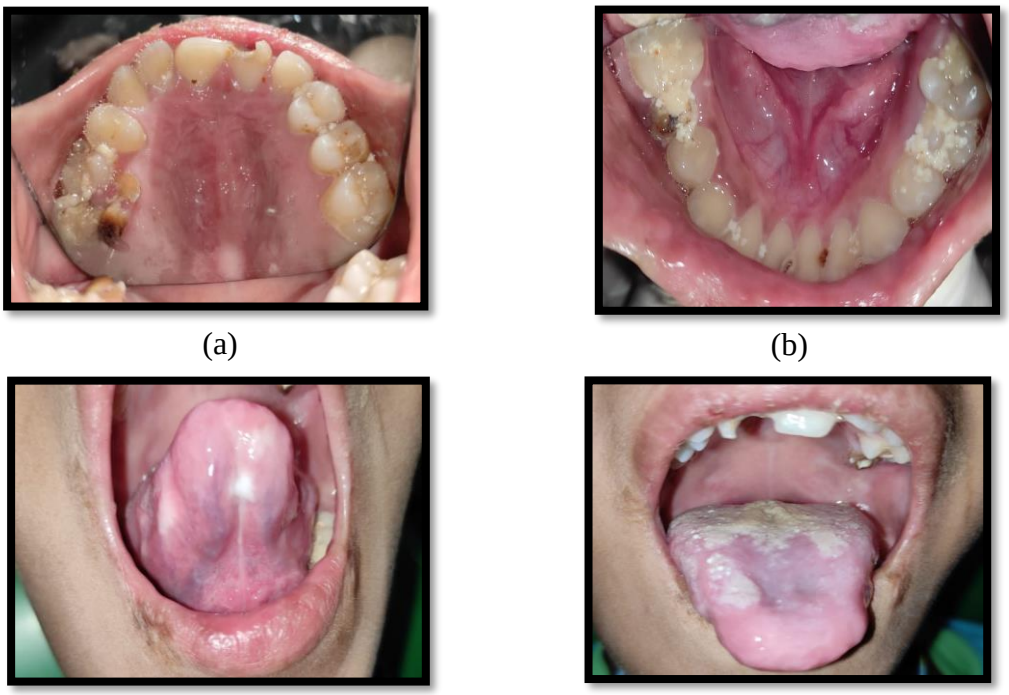

Figure 2: Intraoral examination (a&b) Multiple carious teeth, poor oral hygiene, (c&d) Diffused whitish mucosal lesions seen on the dorsal and ventral aspect of tongue, Labial soft tissue deformity of the patient due to biting

Figure 3: Radiolucency involving enamel, dentin and pulp, loss of lamina dura in mesial and distal root, diffused periapical radiolucency with mesial and distal root i.r.t 46

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A major lynchpin of research work for the writing of research papers is the keyword search, which one will employ to find both library and internet resources. Up to eleven keywords or very brief phrases have to be given to help data retrieval, mining, and indexing.

One must be persistent and creative in using keywords. An effective keyword search requires a strategy: planning of a list of possible keywords and phrases to try.

Choice of the main keywords is the first tool of writing a research paper. Research paper writing is an art. Keyword search should be as strategic as possible.

One should start brainstorming lists of potential keywords before even beginning searching. Think about the most important concepts related to research work. Ask, “What words would a source have to include to be truly valuable in a research paper?” Then consider synonyms for the important words.

It may take the discovery of only one important paper to steer in the right keyword direction because, in most databases, the keywords under which a research paper is abstracted are listed with the paper.

Numerical Methods

Numerical methods used should be transparent and, where appropriate, supported by references.

Abbreviations

Authors must list all the abbreviations used in the paper at the end of the paper or in a separate table before using them.

Formulas and equations

Authors are advised to submit any mathematical equation using either MathJax, KaTeX, or LaTeX, or in a very high-quality image.

Tables, Figures, and Figure Legends

Tables: Tables should be cautiously designed, uncrowned, and include only essential data. Each must have an Arabic number, e.g., Table 4, a self-explanatory caption, and be on a separate sheet. Authors must submit tables in an editable format and not as images. References to these tables (if any) must be mentioned accurately.

Figures

Figures are supposed to be submitted as separate files. Always include a citation in the text for each figure using Arabic numbers, e.g., Fig. 4. Artwork must be submitted online in vector electronic form or by emailing it.

Preparation of Eletronic Figures for Publication

Although low-quality images are sufficient for review purposes, print publication requires high-quality images to prevent the final product being blurred or fuzzy. Submit (possibly by e-mail) EPS (line art) or TIFF (halftone/ photographs) files only. MS PowerPoint and Word Graphics are unsuitable for printed pictures. Avoid using pixel-oriented software. Scans (TIFF only) should have a resolution of at least 350 dpi (halftone) or 700 to 1100 dpi (line drawings). Please give the data for figures in black and white or submit a Color Work Agreement form. EPS files must be saved with fonts embedded (and with a TIFF preview, if possible).

For scanned images, the scanning resolution at final image size ought to be as follows to ensure good reproduction: line art: >650 dpi; halftones (including gel photographs): >350 dpi; figures containing both halftone and line images: >650 dpi.

Color charges: Authors are advised to pay the full cost for the reproduction of their color artwork. Hence, please note that if there is color artwork in your manuscript when it is accepted for publication, we would require you to complete and return a Color Work Agreement form before your paper can be published. Also, you can email your editor to remove the color fee after acceptance of the paper.

Tips for writing a good quality Medical Research Paper

1. Choosing the topic: In most cases, the topic is selected by the interests of the author, but it can also be suggested by the guides. You can have several topics, and then judge which you are most comfortable with. This may be done by asking several questions of yourself, like "Will I be able to carry out a search in this area? Will I find all necessary resources to accomplish the search? Will I be able to find all information in this field area?" If the answer to this type of question is "yes," then you ought to choose that topic. In most cases, you may have to conduct surveys and visit several places. Also, you might have to do a lot of work to find all the rises and falls of the various data on that subject. Sometimes, detailed information plays a vital role, instead of short information. Evaluators are human: The first thing to remember is that evaluators are also human beings. They are not only meant for rejecting a paper. They are here to evaluate your paper. So present your best aspect.

2. Think like evaluators: If you are in confusion or getting demotivated because your paper may not be accepted by the evaluators, then think, and try to evaluate your paper like an evaluator. Try to understand what an evaluator wants in your research paper, and you will automatically have your answer. Make blueprints of paper: The outline is the plan or framework that will help you to arrange your thoughts. It will make your paper logical. But remember that all points of your outline must be related to the topic you have chosen.

3. Ask your guides: If you are having any difficulty with your research, then do not hesitate to share your difficulty with your guide (if you have one). They will surely help you out and resolve your doubts. If you can't clarify what exactly you require for your work, then ask your supervisor to help you with an alternative. He or she might also provide you with a list of essential readings.

4. Use of computer is recommended: As you are doing research in the field of medical research then this point is quite obvious. Use right software: Always use good quality software packages. If you are not capable of judging good software, then you can lose the quality of your paper unknowingly. There are various programs available to help you which you can get through the internet.

5. Use the internet for help: An excellent start for your paper is using Google. It is a wondrous search engine, where you can have your doubts resolved. You may also read some answers for the frequent question of how to write your research paper or find a model research paper. You can download books from the internet. If you have all the required books, place importance on reading, selecting, and analyzing the specified information. Then sketch out your research paper. Use big pictures: You may use encyclopedias like Wikipedia to get pictures with the best resolution. At Global Journals, you should strictly follow here.

6. Bookmarks are useful: When you read any book or magazine, you generally use bookmarks, right? It is a good habit which helps to not lose your continuity. You should always use bookmarks while searching on the internet also, which will make your search easier.

7. Revise what you wrote: When you write anything, always read it, summarize it, and then finalize it.

8. Make every effort: Make every effort to mention what you are going to write in your paper. That means always have a good start. Try to mention everything in the introduction—what is the need for a particular research paper. Polish your work with good writing skills and always give an evaluator what he wants. Make backups: When you are going to do any important thing like making a research paper, you should always have backup copies of it either on your computer or on paper. This protects you from losing any portion of your important data.

9. Produce good diagrams of your own: Always try to include good charts or diagrams in your paper to improve quality. Using several unnecessary diagrams will degrade the quality of your paper by creating a hodgepodge. So always try to include diagrams which were made by you to improve the readability of your paper. Use of direct quotes: When you do research relevant to literature, history, or current affairs, then use of quotes becomes essential, but if the study is relevant to science, use of quotes is not preferable.

10. Use proper verb tense: Use proper verb tenses in your paper. Use past tense to present those events that have happened. Use present tense to indicate events that are going on. Use future tense to indicate events that will happen in the future. Use of wrong tenses will confuse the evaluator. Avoid sentences that are incomplete.

11. Pick a good study spot: Always try to pick a spot for your research which is quiet. Not every spot is good for studying.

12. Know what you know: Always try to know what you know by making objectives, otherwise you will be confused and unable to achieve your target.

13. Use good grammar: Always use good grammar and words that will have a positive impact on the evaluator; use of good vocabulary does not mean using tough words which the evaluator has to find in a dictionary. Do not fragment sentences. Eliminate one-word sentences. Do not ever use a big word when a smaller one would suffice.

Verbs have to be in agreement with their subjects. In a research paper, do not start sentences with conjunctions or finish them with prepositions. When writing formally, it is advisable to never split an infinitive because someone will (wrongly) complain. Avoid clichés like a disease. Always shun irritating alliteration. Use language which is simple and straightforward. Put together a neat summary.

14. Arrangement of information: Each section of the main body should start with an opening sentence, and there should be a changeover at the end of the section. Give only valid and powerful arguments for your topic. You may also maintain your arguments with records.

15. Never start at the last minute: Always allow enough time for research work. Leaving everything to the last minute will degrade your paper and spoil your work.

16. Multitasking in research is not good: Doing several things at the same time is a bad habit in the case of research activity. Research is an area where everything has a particular time slot. Divide your research work into parts, and do a particular part in a particular time slot.

17. Never copy others' work: Never copy others' work and give it your name because if the evaluator has seen it anywhere, you will be in trouble. Take proper rest and food: No matter how many hours you spend on your research activity, if you are not taking care of your health, then all your efforts will have been in vain. For quality research, take proper rest and food.

18. Go to seminars: Attend seminars if the topic is relevant to your research area. Utilize all your resources.

19. Refresh your mind after intervals: Try to give your mind a rest by listening to soft music or sleeping in intervals. This will also improve your memory. Acquire colleagues: Always try to acquire colleagues. No matter how sharp you are, if you acquire colleagues, they can give you ideas which will be helpful to your research.

20. Think technically: Always think technically. If anything happens, search for its reasons, benefits, and demerits. Think and then print: When you go to print your paper, check that tables are not split, headings are not detached from their descriptions, and page sequence is maintained.

21. Adding unnecessary information: Do not add unnecessary information like "I have used MS Excel to draw graphs." Irrelevant and inappropriate material is superfluous. Foreign terminology and phrases are not apropos. One should never take a broad view. Analogy is like feathers on a snake. Use words properly, regardless of how others use them. Remove quotations. Puns are for kids, not grunt readers. Never oversimplify: When adding material to your research paper, never go for oversimplification; this will definitely irritate the evaluator. Be specific. Never use rhythmic redundancies. Contractions shouldn't be used in a research paper. Comparisons are as terrible as clichés. Give up ampersands, abbreviations, and so on. Remove commas that are not necessary. Parenthetical words should be between brackets or commas. Understatement is always the best way to put forward earth-shaking thoughts. Give a detailed literary review.

22. Report concluded results: Use concluded results. From raw data, filter the results, and then conclude your studies based on measurements and observations taken. An appropriate number of decimal places should be used. Parenthetical remarks are prohibited here. Proofread carefully at the final stage. At the end, give an outline to your arguments. Spot perspectives of further study of the subject. Justify your conclusion at the bottom sufficiently, which will probably include examples.

23. Upon conclusion: Once you have concluded your research, the next most important step is to present your findings. Presentation is extremely important as it is the definite medium though which your research is going to be in print for the rest of the crowd. Care should be taken to categorize your thoughts well and present them in a logical and neat manner. A good quality research paper format is essential because it serves to highlight your research paper and bring to light all necessary aspects of your research.

Informal Guidelines of Research Paper Writing

Key points to remember:

- Submit all work in its final form.
- Write your paper in the form which is presented in the guidelines using the template.
- Please note the criteria peer reviewers will use for grading the final paper.

Final points:

One purpose of organizing a research paper is to let people interpret your efforts selectively. The journal requires the following sections, submitted in the order listed, with each section starting on a new page:

The introduction: This will be compiled from reference matter and reflect the design processes or outline of basis that directed you to make a study. As you carry out the process of study, the method and process section will be constructed like that. The results segment will show related statistics in nearly sequential order and direct reviewers to similar intellectual paths throughout the data that you gathered to carry out your study.

The discussion section:

This will provide understanding of the data and projections as to the implications of the results. The use of good quality references throughout the paper will give the effort trustworthiness by representing an alertness to prior workings.

Writing a research paper is not an easy job, no matter how trouble-free the actual research or concept. Practice, excellent preparation, and controlled record-keeping are the only means to make straightforward progression.

General style:

Specific editorial column necessities for compliance of a manuscript will always take over from directions in these general guidelines.

To make a paper clear: Adhere to recommended page limits.

Mistakes to avoid:

- Insertion of a title at the foot of a page with subsequent text on the next page.
- Separating a table, chart, or figure—confine each to a single page.
- Submitting a manuscript with pages out of sequence.
- In every section of your document, use standard writing style, including articles ("a" and "the").
- Keep paying attention to the topic of the paper.
- Use paragraphs to split each significant point (excluding the abstract).
- Align the primary line of each section.
- Present your points in sound order.
- Use present tense to report well-accepted matters.
- Use past tense to describe specific results.
- Do not use familiar wording; don't address the reviewer directly. Don't use slang or superlatives.
- Avoid use of extra pictures—include only those figures essential to presenting results.

Title page:

Choose a revealing title. It should be short and include the name(s) and address(es) of all authors. It should not have acronyms or abbreviations or exceed two printed lines.

Abstract: This summary should be two hundred words or less. It should clearly and briefly explain the key findings reported in the manuscript and must have precise statistics. It should not have acronyms or abbreviations. It should be logical in itself. Do not cite references at this point.

An abstract is a brief, distinct paragraph summary of finished work or work in development. In a minute or less, a reviewer can be taught the foundation behind the study, common approaches to the problem, relevant results, and significant conclusions or new questions.

Write your summary when your paper is completed because how can you write the summary of anything which is not yet written? Wealth of terminology is very essential in abstract. Use comprehensive sentences, and do not sacrifice readability for brevity; you can maintain it succinctly by phrasing sentences so that they provide more than a lone rationale. The author can at this moment go straight to shortening the outcome. Sum up the study with the subsequent elements in any summary. Try to limit the initial two items to no more than one line each.

Reason for writing the article—theory, overall issue, purpose.

- Fundamental goal.
- To-the-point depiction of the research.
- Consequences, including definite statistics—if the consequences are quantitative in nature, account for this; results of any numerical analysis should be reported. Significant conclusions or questions that emerge from the research.

Approach:

- Single section and succinct.
- An outline of the job done is always written in past tense.
- Concentrate on shortening results—limit background information to a verdict or two.
- Exact spelling, clarity of sentences and phrases, and appropriate reporting of quantities (proper units, important statistics) are just as significant in an abstract as they are anywhere else.

Introduction:

The introduction should "introduce" the manuscript. The reviewer should be presented with sufficient background information to be capable of comprehending and calculating the purpose of your study without having to refer to other works. The basis for the study should be offered. Give the most important references, but avoid making a comprehensive appraisal of the topic. Describe the problem visibly. If the problem is not acknowledged in a logical, reasonable way, the reviewer will give no attention to your results. Speak in common terms about techniques used to explain the problem, if needed, but do not present any particulars about the protocols here.

The following approach can create a valuable beginning:

- Explain the value (significance) of the study.
- Defend the model—why did you employ this particular system or method? What is its compensation? Remark upon its appropriateness from an abstract point of view as well as pointing out sensible reasons for using it.
- Present a justification. State your particular theory(-ies) or aim(s), and describe the logic that led you to choose them.
- Briefly explain the study's tentative purpose and how it meets the declared objectives.

Approach:

Use past tense except for when referring to recognized facts. After all, the manuscript will be submitted after the entire job is done. Sort out your thoughts; manufacture one key point for every section. If you make the four points listed above, you will need at least four paragraphs. Present surrounding information only when it is necessary to support a situation. The reviewer does not desire to read everything you know about a topic. Shape the theory specifically—do not take a broad view.

As always, give awareness to spelling, simplicity, and correctness of sentences and phrases.

Procedures (methods and materials):

This part is supposed to be the easiest to carve if you have good skills. A soundly written procedures segment allows a capable scientist to replicate your results. Present precise information about your supplies. The suppliers and clarity of reagents can be helpful bits of information. Present methods in sequential order, but linked methodologies can be grouped as a segment. Be concise when relating the protocols. Attempt to give the least amount of information that would permit another capable scientist to replicate your outcome, but be cautious that vital information is integrated. The use of subheadings is suggested and ought to be synchronized with the results section.

When a technique is used that has been well-described in another section, mention the specific item describing the way, but draw the basic principle while stating the situation. The purpose is to show all particular resources and broad procedures so that another person may use some or all of the methods in one more study or referee the scientific value of your work. It is not to be a step-by-step report of the whole thing you did, nor is a methods section a set of orders.

Materials:

Materials may be reported in part of a section or else they may be recognized along with your measures.

Methods:

- Report the method and not the particulars of each process that engaged the same methodology.
- Describe the method entirely.
- To be succinct, present methods under headings dedicated to specific dealings or groups of measures.
- Simplify—detail how procedures were completed, not how they were performed on a particular day.
- If well-known procedures were used, account for the procedure by name, possibly with a reference, and that's all.

Approach:

It is embarrassing to use vigorous voice when documenting methods without using first person, which would focus the reviewer's interest on the researcher rather than the job. As a result, when writing up the methods, most authors use third person passive voice.

Use standard style in this and every other part of the paper—avoid familiar lists, and use full sentences.

What to keep away from:

- Resources and methods are not a set of information.
- Skip all descriptive information and surroundings—save it for the argument.
- Leave out information that is immaterial to a third party.

Results:

The principle of a results segment is to present and demonstrate your conclusion. Create this part as entirely objective details of the outcome, and save all understanding for the discussion.

The page length of this segment is set by the sum and types of data to be reported. Use statistics and tables, if suitable, to present consequences most efficiently.

You must clearly differentiate material which would usually be incorporated in a study editorial from any unprocessed data or additional appendix matter that would not be available. In fact, such matters should not be submitted at all except if requested by the instructor.

Content:

- Sum up your conclusions in text and demonstrate them, if suitable, with figures and tables.
- In the manuscript, explain each of your consequences, and point the reader to remarks that are most appropriate.
- Present a background, such as by describing the question that was addressed by creation of an exacting study.
- Explain results of control experiments and give remarks that are not accessible in a prescribed figure or table, if appropriate.
- Examine your data, then prepare the analyzed (transformed) data in the form of a figure (graph), table, or manuscript.

What to stay away from:

- Do not discuss or infer your outcome, report surrounding information, or try to explain anything.
- Do not include raw data or intermediate calculations in a research manuscript.
- Do not present similar data more than once.
- A manuscript should complement any figures or tables, not duplicate information.
- Never confuse figures with tables—there is a difference.

Approach:

As always, use past tense when you submit your results, and put the whole thing in a reasonable order.

Put figures and tables, appropriately numbered, in order at the end of the report.

If you desire, you may place your figures and tables properly within the text of your results section.

Figures and tables:

If you put figures and tables at the end of some details, make certain that they are visibly distinguished from any attached appendix materials, such as raw facts. Whatever the position, each table must be titled, numbered one after the other, and include a heading. All figures and tables must be divided from the text.

Discussion:

The discussion is expected to be the trickiest segment to write. A lot of papers submitted to the journal are discarded based on problems with the discussion. There is no rule for how long an argument should be.

Position your understanding of the outcome visibly to lead the reviewer through your conclusions, and then finish the paper with a summing up of the implications of the study. The purpose here is to offer an understanding of your results and support all of your conclusions, using facts from your research and generally accepted information, if suitable. The implication of results should be fully described.

Infer your data in the conversation in suitable depth. This means that when you clarify an observable fact, you must explain mechanisms that may account for the observation. If your results vary from your prospect, make clear why that may have happened. If your results agree, then explain the theory that the proof supported. It is never suitable to just state that the data approved the prospect, and let it drop at that. Make a decision as to whether each premise is supported or discarded or if you cannot make a conclusion with assurance. Do not just dismiss a study or part of a study as "uncertain."

Research papers are not acknowledged if the work is imperfect. Draw what conclusions you can based upon the results that you have, and take care of the study as a finished work.

- You may propose future guidelines, such as how an experiment might be personalized to accomplish a new idea.
- Give details of all of your remarks as much as possible, focusing on mechanisms.
- Make a decision as to whether the tentative design sufficiently addressed the theory and whether or not it was correctly restricted. Try to present substitute explanations if they are sensible alternatives.
- One piece of research will not counter an overall question, so maintain the large picture in mind. Where do you go next? The best studies unlock new avenues of study. What questions remain?
- Recommendations for detailed papers will offer supplementary suggestions.

Approach:

When you refer to information, differentiate data generated by your own studies from other available information. Present work done by specific persons (including you) in past tense.

Describe generally acknowledged facts and main beliefs in present tense.

The Administration Rules

Administration Rules to Be Strictly Followed before Submitting Your Research Paper to Global Journals Inc.

Please read the following rules and regulations carefully before submitting your research paper to Global Journals Inc. to avoid rejection.

Segment draft and final research paper: You have to strictly follow the template of a research paper, failing which your paper may get rejected. You are expected to write each part of the paper wholly on your own. The peer reviewers need to identify your own perspective of the concepts in your own terms. Please do not extract straight from any other source, and do not rephrase someone else's analysis. Do not allow anyone else to proofread your manuscript.

Written material: You may discuss this with your guides and key sources. Do not copy anyone else's paper, even if this is only imitation, otherwise it will be rejected on the grounds of plagiarism, which is illegal. Various methods to avoid plagiarism are strictly applied by us to every paper, and, if found guilty, you may be blacklisted, which could affect your career adversely. To guard yourself and others from possible illegal use, please do not permit anyone to use or even read your paper and file.

Criterion for Grading a Research Paper (Compilation) by Global Journals

Please note that following table is only a Grading of "Paper Compilation" and not on "Performed/Stated Research" whose grading solely depends on Individual Assigned Peer Reviewer and Editorial Board Member. These can be available only on request and after decision of Paper. This report will be the property of Global Journals.

Topics	Grades		
	A-B	**C-D**	**E-F**
Abstract	Clear and concise with appropriate content, Correct format. 200 words or below	Unclear summary and no specific data, Incorrect form Above 200 words	No specific data with ambiguous information Above 250 words
Introduction	Containing all background details with clear goal and appropriate details, flow specification, no grammar and spelling mistake, well organized sentence and paragraph, reference cited	Unclear and confusing data, appropriate format, grammar and spelling errors with unorganized matter	Out of place depth and content, hazy format
Methods and Procedures	Clear and to the point with well arranged paragraph, precision and accuracy of facts and figures, well organized subheads	Difficult to comprehend with embarrassed text, too much explanation but completed	Incorrect and unorganized structure with hazy meaning
Result	Well organized, Clear and specific, Correct units with precision, correct data, well structuring of paragraph, no grammar and spelling mistake	Complete and embarrassed text, difficult to comprehend	Irregular format with wrong facts and figures
Discussion	Well organized, meaningful specification, sound conclusion, logical and concise explanation, highly structured paragraph reference cited	Wordy, unclear conclusion, spurious	Conclusion is not cited, unorganized, difficult to comprehend
References	Complete and correct format, well organized	Beside the point, Incomplete	Wrong format and structuring

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