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ELECTROCAUTERY-ASSISTED GINGIVECTOMY FOR THE MANAGEMENT OF PLAQUE-INDUCED GENERALIZED GINGIVAL ENLARGEMENT IN A 9-YEAR-OLD CHILD: A CASE REPORT

Pedodontics

Dr. Simran Minhas Final-Year Post Graduate Student, Department of Pediatric and Preventive Dentistry, Himachal Dental College and Hospital, Sundernagar, Himachal Pradesh, India

Dr. Muskan* Second-Year Post Graduate Student , Department of Periodontology and Oral Implantology, Himachal Dental College and Hospital, Sundernagar, Himachal Pradesh, India *Corresponding Author

Dr. Ankita Gaur Professor, Department of Pediatric and Preventive Dentistry, Himachal Dental College and Hospital, Sundernagar, Himachal Pradesh, India

Dr. Vasundhara Pathania Professor, Department of Pediatric and Preventive Dentistry, Himachal Dental College and Hospital, Sundernagar, Himachal Pradesh, India

Dr. Shiva Chauhan Reader, Department of Periodontology and Oral Implantology, Himachal Dental College and Hospital, Sundernagar, Himachal Pradesh, India

Dr. Aman Singla Final Year Post Graduate Student, Department of Periodontics, Desh Bhagat Dental College and Hospital, Mandi Gobindgarh, Punjab, India

ABSTRACT

Background Gingival enlargement is a common periodontal condition characterized by an increase in the size of the gingival tissues resulting from inflammatory, drug-induced, hereditary, neoplastic, or systemic factors. In pediatric patients, chronic plaque accumulation remains the predominant etiological factor, leading to inflammatory gingival enlargement that may interfere with oral hygiene, mastication, speech, tooth eruption, and facial esthetics. Although nonsurgical periodontal therapy effectively resolves inflammatory enlargement in many patients, persistent fibrotic gingival overgrowth frequently requires surgical intervention. Electrocautery-assisted gingivectomy has emerged as an effective alternative to conventional scalpel surgery because it allows simultaneous tissue incision and coagulation, providing superior hemostasis, improved visualization of the operative field, and reduced surgical time. **Case Presentation** A 9-year-old male child presented to the Department of Periodontology with a one-year history of progressive gingival enlargement involving the anterior regions of the maxillary and mandibular arches. The patient complained of difficulty in maintaining oral hygiene, bleeding during tooth brushing, and compromised esthetics. Medical and family histories were non-contributory. Following comprehensive clinical examination, a diagnosis of plaque-induced generalized inflammatory gingival enlargement with secondary fibrotic changes was established. Initial management consisted of oral hygiene reinforcement, full-mouth scaling, and curettage/root planing. Despite significant reduction in inflammation, residual fibrotic gingival enlargement persisted. Electrocautery-assisted gingivectomy was subsequently performed using a radiofrequency electrosurgical unit equipped with a loop electrode. Healing was evaluated at one week, two weeks, and one month postoperatively. **Results** Postoperative healing progressed uneventfully without evidence of infection or excessive discomfort. Progressive restoration of physiological gingival contours, reduction in inflammation, and marked improvement in oral hygiene maintenance were observed during follow-up. At the one-month review, the gingival tissues exhibited healthy color, contour, and consistency with no clinical evidence of recurrence. The patient and parents expressed complete satisfaction with both the functional and esthetic outcomes. **Conclusion** Electrocautery-assisted gingivectomy proved to be a safe, predictable, and effective treatment modality for persistent plaque-induced gingival enlargement in this pediatric patient. The technique provided excellent intraoperative hemostasis, facilitated precise tissue contouring, and resulted in favorable postoperative healing. Successful long-term outcomes depend on meticulous plaque control, regular periodontal maintenance, and continued patient and parental motivation.

KEYWORDS

Gingival Enlargement; Electrocautery; Gingivectomy; Pediatric Periodontology; Plaque-induced Gingival Overgrowth.

INTRODUCTION

Gingival enlargement, also referred to as gingival overgrowth or gingival hyperplasia, represents an abnormal increase in the size of the gingival tissues caused by a variety of local and systemic factors. Depending on the underlying etiology, gingival enlargement may be inflammatory, drug-induced, hereditary, conditioned, neoplastic, or associated with systemic diseases.[1] Among pediatric patients, plaque-induced inflammatory enlargement remains the most frequently encountered form and is primarily attributed to persistent microbial biofilm accumulation resulting from inadequate oral hygiene practices.[2] The chronic inflammatory response initiated by dental plaque promotes vascular proliferation, inflammatory cell infiltration, connective tissue edema, and, in long-standing lesions, excessive collagen deposition leading to fibrotic enlargement.[3]

Inflammatory gingival enlargement is more than a cosmetic concern. Excessive gingival tissue compromises oral hygiene by creating plaque-retentive areas that are difficult to clean, thereby perpetuating the inflammatory process. As the enlargement progresses, it may interfere with mastication, speech, and normal tooth eruption, while also adversely affecting facial esthetics and the psychological well-being of young patients.[4] In children, poor plaque control associated with gingival enlargement may establish a vicious cycle in which inflammation promotes further tissue enlargement, resulting in progressive deterioration of periodontal health if appropriate intervention is not instituted.[5]

The diagnosis of gingival enlargement requires careful evaluation of the patient's medical history, drug history, family history, and clinical presentation to identify the underlying cause. Inflammatory enlargement is typically characterized by generalized or localized swelling, erythema, bleeding on probing, and plaque accumulation.[6] Chronic lesions frequently exhibit varying degrees of fibrosis, producing firm gingival tissues that respond poorly to nonsurgical therapy alone. Differentiating inflammatory enlargement from hereditary gingival fibromatosis, drug-induced gingival overgrowth, leukemic enlargement, and other gingival lesions is essential for appropriate treatment planning.[7]

The primary objective in the management of inflammatory gingival enlargement is elimination of the etiological factors responsible for the disease. Consequently, Phase I periodontal therapy, including comprehensive oral hygiene instruction, patient motivation, supragingival and subgingival scaling, and root planing, represents the first line of treatment. Improvement in plaque control frequently results in substantial reduction of inflammatory edema.[8] However, when significant fibrotic enlargement persists despite adequate nonsurgical therapy, surgical intervention becomes necessary to restore physiological gingival architecture and facilitate effective plaque control.

Conventional external bevel gingivectomy performed with a scalpel

has historically been regarded as the standard surgical approach for gingival enlargement. Although the procedure is effective, it may be associated with considerable intraoperative bleeding, reduced visibility of the operative field, and increased surgical time, particularly in pediatric patients.[9] In recent years, alternative modalities including electrocautery, radiosurgery, diode lasers, CO_2 lasers, and other soft tissue technologies have gained popularity owing to their ability to improve surgical precision and patient comfort.

Electrocautery utilizes high-frequency electrical current to generate thermal energy capable of simultaneously incising soft tissues and coagulating blood vessels. This dual action produces excellent hemostasis, enhances visibility during surgery, shortens operative time, and minimizes the need for repeated pressure application to control bleeding. These advantages are particularly beneficial in pediatric dentistry and periodontology, where maintaining patient cooperation and reducing treatment duration are important determinants of successful clinical outcomes.[10] Nevertheless, careful technique is essential to minimize collateral thermal injury and ensure favorable wound healing.

The present case report describes the successful management of persistent plaque-induced generalized inflammatory gingival enlargement in a 9-year-old male child using electrocautery-assisted gingivectomy following completion of Phase I periodontal therapy. The report highlights the clinical effectiveness of electrosurgical management, documents the sequential healing process through clinical photographs, and discusses the advantages of this technique in the periodontal management of pediatric patients.

CASE REPORT

Patient Information

A 9-year-old male child was referred to the Department of Periodontology by the Department of Pediatric and Preventive Dentistry with the chief complaint of progressively swollen gums involving the upper and lower front teeth for approximately one year. The patient's parents reported that the gingival enlargement had gradually increased in size over time and was associated with bleeding during tooth brushing, difficulty in maintaining oral hygiene, and compromised esthetics. The child denied any history of spontaneous pain, pus discharge, or difficulty in mastication.

The medical history was non-contributory. There was no history of systemic illness, hospitalization, allergies, haematological disorders, or long-term medication use that could contribute to gingival enlargement. The family history was negative for hereditary gingival fibromatosis or similar gingival conditions among first-degree relatives. The patient had not undergone any previous periodontal or surgical treatment. Oral hygiene practices were inadequate, with irregular tooth brushing and visible plaque accumulation.

Clinical Examination

General physical examination revealed a healthy child with no facial asymmetry, cervical lymphadenopathy, or other extraoral abnormalities.

Intraoral examination demonstrated generalized gingival enlargement affecting both the maxillary and mandibular anterior regions, with greater severity in the maxillary arch. The enlargement predominantly involved the marginal and interdental gingiva, resulting in bulbous gingival contours and partial coverage of the clinical crowns of several anterior teeth.

The gingiva appeared erythematous in certain areas with generalized edema superimposed on firm fibrotic tissue. The consistency of the enlarged gingiva varied from soft and edematous in inflamed regions to firm and fibrotic in long-standing areas. Generalized plaque deposits and bleeding on gentle probing were present. Pseudo pocket formation was evident around the affected teeth owing to coronal displacement of the gingival margin without clinical attachment loss.

The excessive gingival tissue created plaque-retentive niches, making routine oral hygiene difficult and contributing to persistent inflammation. No tooth mobility, pathological migration, or suppuration was observed. The remaining oral mucosa, tongue, floor of the mouth, and palate appeared clinically normal.

Figure 1. Preoperative frontal intraoral view demonstrating generalized plaque-induced inflammatory gingival enlargement involving the maxillary anterior region.

Diagnosis

Based on the patient's history, clinical examination, and absence of systemic or hereditary factors, a diagnosis of generalized plaque-induced inflammatory gingival enlargement with secondary fibrotic changes was established.

Differential Diagnosis

The following conditions were considered during diagnosis:

1. Hereditary gingival fibromatosis – excluded because of the absence of a positive family history and the presence of marked inflammatory changes.

2. Drug-induced gingival enlargement – ruled out as the patient had no history of medications such as phenytoin, cyclosporine, or calcium channel blockers.

3. Leukemic gingival enlargement – excluded due to the absence of systemic manifestations such as fever, pallor, bruising, or lymphadenopathy.

4. Inflammatory gingival enlargement – considered the most likely diagnosis because of abundant plaque accumulation, bleeding on probing, and clinical improvement following Phase I periodontal therapy.

Treatment Planning

The treatment objectives were to eliminate local etiological factors, reduce gingival inflammation, restore physiological gingival contours, improve esthetics, and facilitate effective plaque control.

The planned treatment sequence included:

- Comprehensive oral hygiene instructions and motivation.
- Full-mouth supragingival and subgingival scaling.
- Curettage and root planing where indicated.
- Reinforcement of plaque-control measures.
- Re-evaluation after four weeks.
- Electrocautery-assisted gingivectomy for persistent fibrotic enlargement.
- Supportive periodontal maintenance.

Phase I Periodontal Therapy

The patient initially underwent nonsurgical periodontal therapy. Oral hygiene instructions were demonstrated to both the patient and his parents, emphasizing twice-daily tooth brushing using Fones brushing technique and improved plaque-control measures. Full-mouth scaling and curettage/root planing were performed to eliminate plaque, calculus, and local irritants.

At the four-week re-evaluation appointment, a marked reduction in gingival inflammation was observed. However, residual fibrotic enlargement persisted, particularly in the maxillary anterior region, preventing adequate plaque control and compromising gingival morphology. Consequently, surgical intervention was planned.

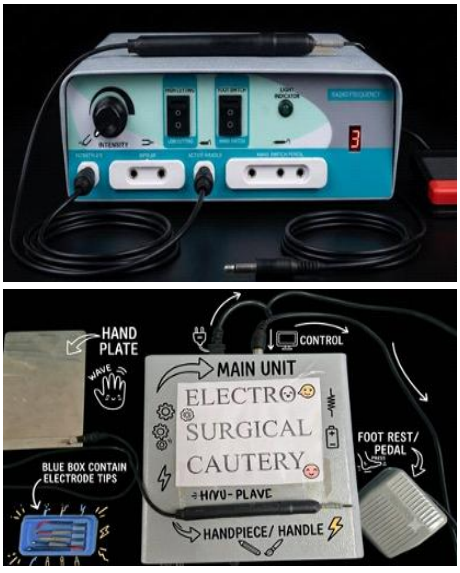
Surgical Procedure

Written informed consent was obtained from the patient's parents before commencement of the surgical procedure. Following administration of local anesthesia, periodontal pocket depths were assessed and bleeding points were marked using a periodontal pocket marker to outline the planned external bevel incision (Figure 2). This served as a guide for accurate removal of the enlarged gingival tissue while preserving normal gingival architecture.

Figure 2. Pocket marking performed before gingivectomy to delineate the planned incision line.

Gingivectomy was performed using a radiofrequency electrosurgical unit (TSW RF Radiofrequency Electrocautery machine 3.5 MHz) available in the Department of Periodontology. The electrosurgical setup consisted of a control unit, active handpiece, loop electrode, patient plate, and foot-operated switch (Figure 3).

Figure 3. Radiofrequency electrosurgical unit and accessories used during the surgical procedure.



A loop electrode was selected for tissue excision because it allowed controlled removal of the enlarged gingiva while simultaneously coagulating blood vessels. The electrode was activated intermittently and moved in a sweeping motion along the predetermined incision line to minimize thermal damage to adjacent tissues. Simultaneous tissue incision and coagulation provided excellent hemostasis and maintained a clear operative field throughout the procedure (Figure 4). The enlarged gingival tissue was excised systematically, and the remaining gingival margins were carefully recontoured to recreate normal physiological architecture. Following complete excision, the surgical field was irrigated thoroughly with sterile normal saline to remove tissue debris and residual coagulum. The excised tissue specimen was collected and discarded according to institutional biomedical waste management protocols, as histopathological examination was not performed due to the characteristic clinical presentation.

Figure 4. Intraoperative view demonstrating electrocautery-assisted gingivectomy using a loop electrode.

Figure 5. Excised gingival tissue following electrocautery-assisted gingivectomy.

A periodontal dressing was placed over the surgical site to protect the wound during the initial healing phase and improve patient comfort.

Postoperative Care

The patient and his parents received detailed postoperative instructions. They were advised to avoid hot, spicy, and hard foods for the first 24–48 hours and to maintain meticulous oral hygiene while avoiding trauma to the operated area. A 0.12% chlorhexidine gluconate mouth rinse was prescribed twice daily for one week. The patient was prescribed ibuprofen at a dose of 10 mg/kg body weight orally every 8 hours after meals for 3 days for postoperative pain control. The patient's parents were instructed to administer the medication only as required if pain was experienced and to avoid exceeding the recommended pediatric dosage. The patient was scheduled for postoperative evaluations after one week, two weeks, and one month.

Follow-up and Outcome

At the one-week postoperative visit, healing was satisfactory with no evidence of excessive bleeding, infection, or wound dehiscence. Mild fibrin slough was present over the surgical site, representing normal healing. The patient reported only minimal postoperative discomfort.

Figure 6. One-week postoperative photograph showing satisfactory healing with healthy granulation tissue.

At the two-week follow-up, gingival inflammation had reduced considerably, and the gingival contours appeared well defined. Plaque control had improved significantly owing to the restoration of normal gingival morphology.

At the one-month review, complete healing of the surgical site was observed. The gingival tissues exhibited healthy color, firm consistency, and physiological contour. Oral hygiene maintenance had improved substantially, and no clinical signs of recurrence were evident (Figure 7). Both the patient and his parents expressed satisfaction with the esthetic and functional outcome of the treatment.

The timeline of the clinical management, including initial assessment, Phase I periodontal therapy, surgical intervention, and postoperative follow-up, is summarized in Table 1.

The differential diagnosis considered for generalized gingival enlargement and the rationale for excluding other possible conditions are presented in Table 2.

Figure 7. One-month postoperative clinical photograph

demonstrating healthy gingival architecture and satisfactory healing.

TABLE 1. Timeline of Clinical Management

Clinical Stage	Findings / Treatment
Initial Visit	Nine-year-old male presented with generalized gingival enlargement, bleeding during brushing, and difficulty maintaining oral hygiene.
Clinical Examination	Plaque accumulation, bleeding on probing, pseudo pocket formation, generalized inflammatory enlargement with secondary fibrotic changes.
Phase I Therapy	Oral hygiene instruction, scaling, curettage, and reinforcement of plaque-control measures.
Four-week Re-evaluation	Significant reduction in inflammation; persistent fibrotic enlargement remained.
Surgical Procedure	Electrocautery-assisted gingivectomy performed under local anesthesia using a radiofrequency electrosurgical unit with a loop electrode.
One-week Follow-up	Uneventful healing with minimal postoperative discomfort.
Two-week Follow-up	Reduction in inflammation and improved gingival contour.
One-month Follow-up	Complete healing, healthy gingival architecture, satisfactory esthetic outcome, and no evidence of recurrence.

TABLE 2. Differential Diagnosis of Gingival Enlargement

Condition	Characteristic Features	Reason for Exclusion
Plaque-induced inflammatory gingival enlargement	Plaque accumulation, bleeding on probing, inflammatory enlargement	Confirmed diagnosis based on clinical findings and response to Phase I therapy
Drug-induced gingival enlargement	Associated with phenytoin, cyclosporine, or calcium channel blockers	No relevant medication history
Hereditary gingival fibromatosis	Generalized fibrotic enlargement with positive family history	Family history was negative
Leukemic gingival enlargement	Diffuse enlargement associated with systemic symptoms and haematological abnormalities	No systemic manifestations or relevant medical history
Hormonal gingival enlargement	Associated with puberty or endocrine changes	Clinical presentation and age favored plaque-induced inflammatory enlargement

DISCUSSION

Gingival enlargement is a relatively common clinical finding encountered in periodontal practice and represents an increase in the size of the gingival tissues resulting from inflammatory, drug-induced, hereditary, neoplastic, or systemic causes.[1] In children and adolescents, plaque-induced inflammatory enlargement is the most prevalent form because oral hygiene practices are often inconsistent and plaque control is frequently inadequate.[11] Chronic accumulation of dental plaque initiates a host-mediated inflammatory response characterized by vascular dilatation, migration of inflammatory cells, and release of cytokines and matrix-degrading enzymes, ultimately leading to enlargement of the gingival tissues.[2] If inflammation persists for a prolonged period, repeated cycles of tissue destruction and repair stimulate excessive collagen deposition and fibrosis, resulting in firm, fibrotic gingival enlargement that responds poorly to nonsurgical therapy alone.[2]

The present case illustrates this clinical progression. The patient initially presented with generalized plaque accumulation, bleeding on probing, pseudo pocket formation, and marked enlargement of the marginal and interdental gingiva. Although Phase I periodontal therapy produced a noticeable reduction in inflammatory changes, a considerable amount of fibrotic enlargement remained, particularly in the anterior region. This clinical response highlights the importance of distinguishing inflammatory edema from fibrotic tissue when determining the need for surgical intervention. While inflammatory enlargement may resolve following meticulous plaque control, longstanding fibrotic tissue frequently requires gingivectomy to restore normal gingival architecture.[3]

The management of gingival enlargement should always begin with identification and elimination of the underlying etiological factors. Comprehensive oral hygiene instruction, professional scaling, root planing, and reinforcement of plaque-control measures constitute the cornerstone of treatment.[1] In the present case, nonsurgical periodontal therapy was performed before surgery, ensuring that the inflammatory component was minimized and allowing more predictable surgical outcomes.[2]

Selection of the appropriate surgical technique depends on the extent of enlargement, tissue characteristics, operator experience, and patient-related factors. Conventional external bevel gingivectomy using a scalpel has historically been regarded as the standard surgical procedure for suprabony gingival enlargement because it effectively removes excess tissue and re-establishes physiological gingival contours.[3] However, scalpel surgery is often associated with significant intraoperative bleeding, which may compromise visibility and increase operative time. These challenges become particularly relevant in pediatric patients, where prolonged procedures and repeated bleeding control may reduce patient cooperation and increase operator difficulty.[12]

Electrosurgery has become an increasingly accepted alternative for soft tissue management in dentistry because it combines simultaneous tissue incision and coagulation. High-frequency electrical current passing through the active electrode generates localized heat, allowing controlled cutting of soft tissue while sealing small blood vessels.[1] The resulting hemostasis produces a clean operative field, improves visualization of anatomical landmarks, and facilitates precise tissue contouring.[2] In pediatric patients, where cooperation is often limited by anxiety and reduced tolerance for lengthy procedures, these advantages may significantly improve the overall surgical experience.[11]

In the present case, the use of a radiofrequency electrosurgical unit equipped with a loop electrode enabled controlled excision of the enlarged gingival tissue with minimal intraoperative bleeding. Excellent hemostasis allowed continuous visualization of the surgical field and facilitated accurate re-establishment of physiological gingival architecture.[11] The reduced bleeding also minimized the need for repeated suctioning and gauze compression, thereby shortening the overall treatment time. These findings are consistent with previous reports describing electrocautery as a practical and efficient technique for soft tissue surgery in pediatric dentistry.[13]

Several authors have reported favorable clinical outcomes following electrosurgical management of gingival enlargement. Pedron and colleagues emphasized that electrosurgery provides excellent haemorrhage control and improved patient management during pediatric soft tissue procedures.[13] Similarly, previous periodontal literature has demonstrated that electrosurgical gingivectomy allows predictable removal of enlarged gingival tissue with satisfactory postoperative healing when proper technique is employed.[1] The present case corroborates these observations, as healing progressed uneventfully without postoperative infection, excessive discomfort, or clinically detectable recurrence during the one-month follow-up period.[2]

One of the principal advantages of electrocautery lies in its ability to

simultaneously incise and coagulate tissues. This reduces intraoperative blood loss and improves access to the operative site, particularly in regions where bleeding may obscure anatomical landmarks. Furthermore, because electrocautery seals small lymphatic vessels during tissue incision, postoperative edema may be reduced in comparison with conventional scalpel surgery.[2] The technique also provides improved operator control during gingival recontouring, allowing more precise recreation of physiological gingival margins.[12]

Despite these advantages, electrosurgery should be performed with careful attention to technique. Excessive activation time, prolonged contact between the electrode and tissue, or inappropriate power settings may generate unnecessary thermal injury to adjacent structures. Such thermal damage may delay wound healing, increase postoperative discomfort, and compromise the quality of the surgical outcome.[1] Intermittent activation of the electrode, continuous movement during tissue excision, and avoidance of prolonged contact with bone or tooth surfaces are therefore recommended to minimize collateral tissue injury.[2] In the present case, meticulous surgical technique and controlled use of the loop electrode contributed to favorable healing without evidence of thermal complications.

Laser-assisted gingivectomy has also gained popularity in recent years because of its excellent soft tissue cutting ability, bactericidal effects, and patient comfort. Diode, CO_2, Nd: YAG, and erbium lasers have all been used successfully for gingival recontouring.[12] However, widespread implementation of laser technology remains limited by equipment cost, maintenance requirements, and operator training. In many teaching institutions and public healthcare settings, electrosurgery remains a more accessible and cost-effective alternative while still providing excellent clinical outcomes.[14]The availability of a radiofrequency electrosurgical unit within the department allowed successful completion of the procedure without the need for additional specialized equipment.

Long-term success following gingivectomy depends not only on the surgical procedure itself but also on continued control of the etiological factors responsible for disease initiation. Plaque accumulation remains the primary determinant of recurrence in inflammatory gingival enlargement.[2] Accordingly, postoperative maintenance should include regular professional periodontal evaluation, reinforcement of oral hygiene instructions, periodic scaling when required, and active parental supervision of oral hygiene practices. In pediatric patients, parental motivation plays an especially important role in ensuring long-term compliance with plaque-control measures.[15]

A limitation of the present case is that histopathological examination of the excised tissue was not performed. Although the clinical presentation and response to therapy were highly suggestive of plaque-induced inflammatory gingival enlargement, histopathological evaluation would have provided microscopic confirmation of the diagnosis and excluded uncommon pathological conditions presenting with similar clinical features.[2] Future case reports should consider routine submission of excised tissue for histopathological analysis whenever feasible.

Another limitation is the relatively short follow-up period of one month. Although complete healing and absence of recurrence were observed during this period, longer clinical follow-up would provide more robust evidence regarding the long-term stability of the treatment outcome.[1] Nevertheless, the present case demonstrates that electrocautery-assisted gingivectomy can successfully restore physiological gingival contours, improve oral hygiene maintenance, and achieve satisfactory esthetic and functional outcomes in pediatric patients when combined with meticulous plaque control and regular periodontal maintenance.[15]

Overall, this case reinforces the concept that successful management of inflammatory gingival enlargement requires a comprehensive treatment approach beginning with elimination of local etiological factors, followed by carefully selected surgical intervention when indicated.[1] Electrocautery-assisted gingivectomy represents a valuable treatment modality because it combines excellent intraoperative hemostasis with predictable clinical outcomes, making it particularly advantageous in young patients where efficient treatment and patient cooperation are essential for successful periodontal therapy.[13]

CONCLUSION

Plaque-induced inflammatory gingival enlargement can adversely affect oral hygiene, function, and esthetics in children if left untreated. This case demonstrates that comprehensive periodontal therapy followed by electrocautery-assisted gingivectomy effectively restored normal gingival architecture and achieved favorable postoperative healing. The excellent haemostasis, improved surgical visibility, and reduced treatment time associated with electrocautery make it a valuable treatment option in pediatric patients. Although histopathological examination was not performed, the clinical presentation and favorable therapeutic outcome supported the diagnosis. Further studies with larger sample sizes and longer follow-up are required to validate these findings.

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