



Research Article

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Comparative clinical evaluation of conventional nance appliance and modified aesthetic nance appliance (MANA) in maxillary premolar extraction cases: A prospective study

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Abstract:

Visible extraction spaces and aesthetic concerns during orthodontic treatment remain inadequately addressed by conventional anchorage appliances. Therefore, it is of interest to compare the Conventional Nance Appliance and Modified Aesthetic Nance Appliance (MANA) in 30 patients undergoing bilateral maxillary premolar extraction. Patients were allocated into two groups (n=15 each) and anchorage loss, space maintenance, soft tissue response, oral hygiene and patient satisfaction were assessed. MANA showed comparable anchorage control with significantly higher patient satisfaction and superior aesthetics. Thus, data show an aesthetic modification maintains clinical efficiency while improving patient-centered outcomes in orthodontic care.

Keywords: Orthodontic anchorage, nance appliance, aesthetics, premolar extraction, pontics

Background:

Premolar extraction is a commonly employed orthodontic approach for managing crowding and dentoalveolar protrusion, particularly in cases where space creation is essential for achieving functional occlusion and facial harmony [1]. It remains a widely accepted treatment modality due to its effectiveness in alleviating dental irregularities and improving overall alignment. However, the success of extraction-based orthodontic therapy is highly dependent on precise anchorage control, which is critical to prevent undesirable mesial movement of posterior teeth and to ensure that the intended tooth movements are achieved without compromising treatment objectives [2]. Inadequate anchorage can lead to compromised outcomes, prolonged treatment duration and suboptimal esthetic and functional results [3]. The Nance appliance has traditionally been used as a reliable method of anchorage reinforcement in the maxillary arch. It consists of bands on the molars connected by a palatal arch with an acrylic button resting on the palatal mucosa, allowing distribution of reactive forces and minimizing molar movement [4]. Despite its clinical effectiveness, the conventional Nance appliance does not address one of the most significant concerns faced by patients undergoing extraction therapy the presence of visible extraction spaces during treatment [5]. These spaces, particularly in the anterior region, can be aesthetically unpleasing and may lead to reduced patient confidence, social discomfort and decreased overall satisfaction with the orthodontic experience. In contemporary orthodontic practice, where patient-centered care and aesthetics are increasingly prioritized, such limitations become clinically relevant [6]. Various alternative strategies have been explored to overcome these aesthetic challenges. Removable appliances with pontics have been suggested as a means of temporarily replacing extracted teeth; however, these are highly dependent on patient compliance and may interfere with active orthodontic mechanics [7]. Additionally, the need for frequent removal can compromise

hygiene and consistency of use. On the other hand, skeletal anchorage systems such as mini-implants and temporary anchorage devices provide excellent anchorage control, but they are invasive, require surgical placement and still fail to address the aesthetic concerns related to missing teeth during treatment [8]. In response to these clinical challenges, the Modified Aesthetic Nance Appliance (MANA) was developed as an innovative approach that integrates anchorage reinforcement with aesthetic space maintenance [9]. By incorporating fixed bilateral pontics into the design, MANA not only preserves anchorage but also restores the visual appearance of missing teeth during treatment. This dual functionality has the potential to enhance patient comfort, confidence and overall satisfaction while maintaining the biomechanical advantages of the conventional Nance appliance [10]. Therefore, it is of interest to assess the clinical efficiency and aesthetic benefits of the Modified Aesthetic Nance Appliance in comparison to the conventional Nance appliance.

Methodology:

This prospective comparative clinical study was conducted to evaluate the efficiency of two anchorage systems in patients undergoing orthodontic treatment with bilateral maxillary premolar extraction. A total of 30 patients were selected based on predefined eligibility criteria and were equally divided into two groups of 15 each. Patients aged between 16 and 30 years who required bilateral maxillary premolar extraction as part of their orthodontic treatment plan and were in good general health were included in the study. Patients with poor oral hygiene, periodontal disease, or any craniofacial anomalies were excluded to ensure standardization and minimize confounding factors. The selected patients were allocated into two groups according to the type of appliance used. Group A consisted of 15 patients treated with the Conventional Nance Appliance, while Group B included 15 patients treated with the Modified

Aesthetic Nance Appliance (MANA). The conventional Nance appliance was fabricated using a 0.9 mm stainless steel wire adapted to the palatal contours and incorporated an acrylic button resting on the palatal mucosa to reinforce anchorage. In contrast, the Modified Aesthetic Nance Appliance (MANA) was designed with a stainless steel framework combined with a palatal acrylic button, along with bilateral anterior extensions carrying tooth-colored pontics positioned in the extraction spaces to enhance aesthetics during treatment. All patients underwent bilateral maxillary premolar extraction as part of their orthodontic treatment protocol. Following extraction, the respective appliances were cemented onto the maxillary first molars. Standard orthodontic procedures, including levelling and alignment, were initiated thereafter. Patients were monitored through regular monthly follow-up visits to assess treatment progress and appliance performance. In the MANA group, a specific protocol was followed in which the pontics were gradually trimmed during the process of space closure to maintain aesthetic continuity without interfering with orthodontic tooth movement. The evaluation of treatment outcomes was based on several clinical parameters. Anchorage loss was measured in millimeters to determine the effectiveness of posterior anchorage preservation. Space maintenance was assessed to evaluate the ability of the appliance to preserve extraction space during treatment. Soft tissue response was observed to identify any irritation or adverse reactions associated with the appliance. Patient satisfaction was recorded using a Visual Analog Scale (VAS) ranging from 0 to 10, reflecting the subjective perception of comfort and aesthetics. Oral hygiene status was also monitored throughout the study period. The collected data were subjected to statistical analysis using mean and standard deviation for descriptive evaluation. Intergroup comparisons between the two appliances were performed using Student's t-test to determine the significance of differences observed. A p-value of less than 0.05 was considered statistically significant, ensuring the reliability and validity of the study findings.

Results:

A total of 30 patients were included in the study, with 15 patients in each group. Both the Conventional Nance Appliance (Group A) and the Modified Aesthetic Nance Appliance (MANA) (Group B) demonstrated effective anchorage control throughout the treatment period, indicating that both appliances were clinically reliable in preventing undesirable molar movement. With respect to anchorage loss, Group A exhibited a mean loss of 1.8 ± 0.4 mm, while Group B showed a slightly lower mean anchorage loss of 1.6 ± 0.3 mm. Although the MANA group demonstrated better numerical control, the difference between the two groups was not statistically significant ($p>0.05$), suggesting comparable anchorage efficiency. These findings are presented in **Table 1**. Patient satisfaction showed a marked difference between the two groups. Group A reported a mean satisfaction score of 4.2 ± 1.1 on the Visual Analog Scale (VAS), reflecting low to moderate satisfaction levels. In contrast, Group B reported a significantly

higher mean score of 8.6 ± 0.8 , indicating a high level of satisfaction. This difference was statistically significant ($p<0.05$), highlighting the superior aesthetic acceptance of the MANA appliance. These results are summarized in **Table 2**. Space maintenance was found to be more effective in the MANA group as compared to the conventional group. While Group A demonstrated moderate ability to maintain extraction spaces, Group B consistently maintained space more efficiently, likely due to the presence of fixed pontics that preserved both function and appearance during treatment. This comparison is illustrated in **Table 3**. Evaluation of soft tissue response revealed minimal complications in both groups. Only one mild case of palatal irritation was reported in Group A, whereas no cases of irritation were observed in Group B. This indicates that both appliances were well tolerated by patients, with MANA showing a slightly better biological response. Oral hygiene status was observed to be moderate in Group A and relatively better (mild plaque accumulation) in Group B, possibly due to improved patient motivation associated with aesthetics. Overall, appliance stability was found to be good in both groups, with no significant dislodgement or mechanical failures reported during the study period. A comprehensive comparison of all evaluated parameters, including sample size, anchorage loss, space maintenance, aesthetic score, soft tissue response, oral hygiene, patient satisfaction and appliance stability, is presented in **Table 4**.

Table 1: Comparison of anchorage loss between groups

Parameter	Group A (Conventional Nance)	Group B (MANA)	p-value
Anchorage Loss (mm)	1.8 ± 0.4	1.6 ± 0.3	>0.05

Table 2: Comparison of patient satisfaction (VAS Score)

Parameter	Group A (Conventional Nance)	Group B (MANA)	p-value
Patient Satisfaction (VAS)	4.2 ± 1.1	8.6 ± 0.8	<0.05

Table 3: Comparison of space maintenance

Parameter	Group A (Conventional Nance)	Group B (MANA)
Space Maintenance	Moderate	Excellent

Table 4: Master comparative chart of clinical parameters

Parameter	Group A (Conventional)	Group B (MANA)
Sample Size	15	15
Anchorage Loss (mm)	1.8 ± 0.4	1.6 ± 0.3
Space Maintenance	Moderate	Excellent
Aesthetic Score (VAS)	4.2 ± 1.1	8.6 ± 0.8
Soft Tissue Irritation	1 mild case	None
Oral Hygiene	Moderate	Mild
Patient Satisfaction	Low-Moderate	High
Appliance Stability	Good	Good

Discussion:

The present study showed that both the Conventional Nance Appliance and the Modified Aesthetic Nance Appliance (MANA) provided effective anchorage control, with mean anchorage loss of 1.8 ± 0.4 mm in Group A and 1.6 ± 0.3 mm in Group B. The difference was not statistically significant, indicating that the aesthetic modification in MANA did not

compromise anchorage reinforcement. This finding is consistent with Jamwal *et al.* (2012) [11], who reported that the Nance appliance reduced anchorage loss compared with controls, although it did not provide absolute anchorage. In comparison, the present study supports the clinical reliability of the Nance concept but adds that aesthetic pontics can be incorporated without reducing anchorage efficiency. The slightly lower anchorage loss observed in the MANA group may be clinically relevant, although statistically insignificant. Verma *et al.* (2025) [12] compared mini-screws with the Nance palatal arch during canine retraction and reported that skeletal anchorage offered stronger anchorage control. However, mini-screws are invasive and do not solve the problem of visible extraction spaces. In contrast, MANA provides acceptable anchorage while simultaneously improving aesthetics, making it more patient-friendly in routine extraction cases. Patient satisfaction was significantly higher in the MANA group, with a VAS score of 8.6 ± 0.8 compared with 4.2 ± 1.1 in the conventional group. This agrees with Fareed *et al.* (2025) [13], who emphasized that extraction spaces remaining visible for several months are a common aesthetic concern among orthodontic patients and described composite pontics as a useful aesthetic solution. The present study extends this concept by integrating pontics into a fixed anchorage appliance rather than using them only as separate aesthetic additions. Similarly, Raj *et al.* (2016) [14] described temporary pontics as a simple method for aesthetic tooth replacement during orthodontic treatment. Their findings support the rationale behind MANA, as both approaches aim to preserve smile aesthetics during active treatment. However, the advantage of MANA is that it combines pontic-based space masking with anchorage reinforcement, reducing the need for additional removable or auxiliary appliances. The soft tissue response in the present study was favorable, with only one mild irritation case in the conventional group and none in the MANA group. This is important because Li and Chung (2022) [15] reported that conventional anchorage appliances such as the Nance appliance may be associated with palatal discomfort and inflammation. The absence of significant irritation in the MANA group suggests that careful appliance design and gradual pontic

trimming can maintain tissue compatibility while improving aesthetics.

Conclusion:

We show that MANA performs comparably to the conventional Nance appliance in anchorage control while offering superior space maintenance, aesthetics and patient satisfaction. Thus, MANA may be considered a clinically useful modification for extraction-based orthodontic treatment where both anchorage preservation and patient-centered aesthetic outcomes are important.

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