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Protraction utility arch: A case series evaluating its efficacy in correcting retroclined upper central incisors

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Abstract
Background: Retroclined upper central incisors are a common orthodontic concern, impacting aesthetics and oral function. Traditional treatment approaches often involve extraoral appliances or complex intraoral mechanics. The protraction utility arch presents a simpler, more patient-friendly alternative for correcting this malocclusion.
Objective: This case series aimed to evaluate the clinical efficacy of the Protraction utility arch in achieving proclination of retroclined upper central incisors.
Methods: The study included four patients presenting with retroclined upper central incisors. All patients were treated with a protraction utility arch appliance, and treatment progress was monitored through serial clinical examinations and radiographs.
Results: The results demonstrated successful proclination of the upper central incisors in all cases. The PUA was found to be effective in achieving significant tooth movement with minimal patient discomfort and good patient compliance. This case series provides preliminary evidence suggesting that the Protraction utility arch is an effective and potentially valuable treatment option for correcting retroclined upper central incisors.

Keywords: Protraction utility arch, retroclined incisors, orthodontics, tooth movement

Introduction
Retroclination of upper central incisors is a common malocclusion that can significantly impact a patient's smile aesthetics and oral function. Various orthodontic appliances, including Protraction utility arches, have been utilized to address this issue. The utility arch, an auxiliary archwire designed based on Burstone's biomechanical principles, finds application in diverse phases of orthodontic treatment [1]. Protraction utility arches are appliances designed to exert gentle forces on the upper incisors, encouraging forward movement and improving their alignment [2].
This case series aims to evaluate the clinical effectiveness of Protraction utility arches in correcting retroclined upper central incisors in a group of patients. The objective is to assess the changes in incisor inclination, overjet, and overbite following Protraction utility arch treatment.

Case Reports
Case 1
A female patient, aged 14 years reported to the department with a chief complaint of irregularly placed upper front teeth. On Intraoral clinical examination, it was observed that the patient's maxillary central incisors were retroclined. This patient had a Class II molar and cuspid relationship. The overjet was significantly reduced and deep overbite was evident.
The 2x2 Protraction utility arch constructed using 0.019 x 0.025 TMA wire, was placed in maxillary arch. Simultaneously, bonding was done in maxillary teeth to level and align the arch using round and rectangular NiTi archwires without including 11,21.
A significant change in incisor inclination was observed 2 months post Protraction utility arch with an increase in overjet and a decrease in overbite. [Figure 1, Figure 2, Table 1]

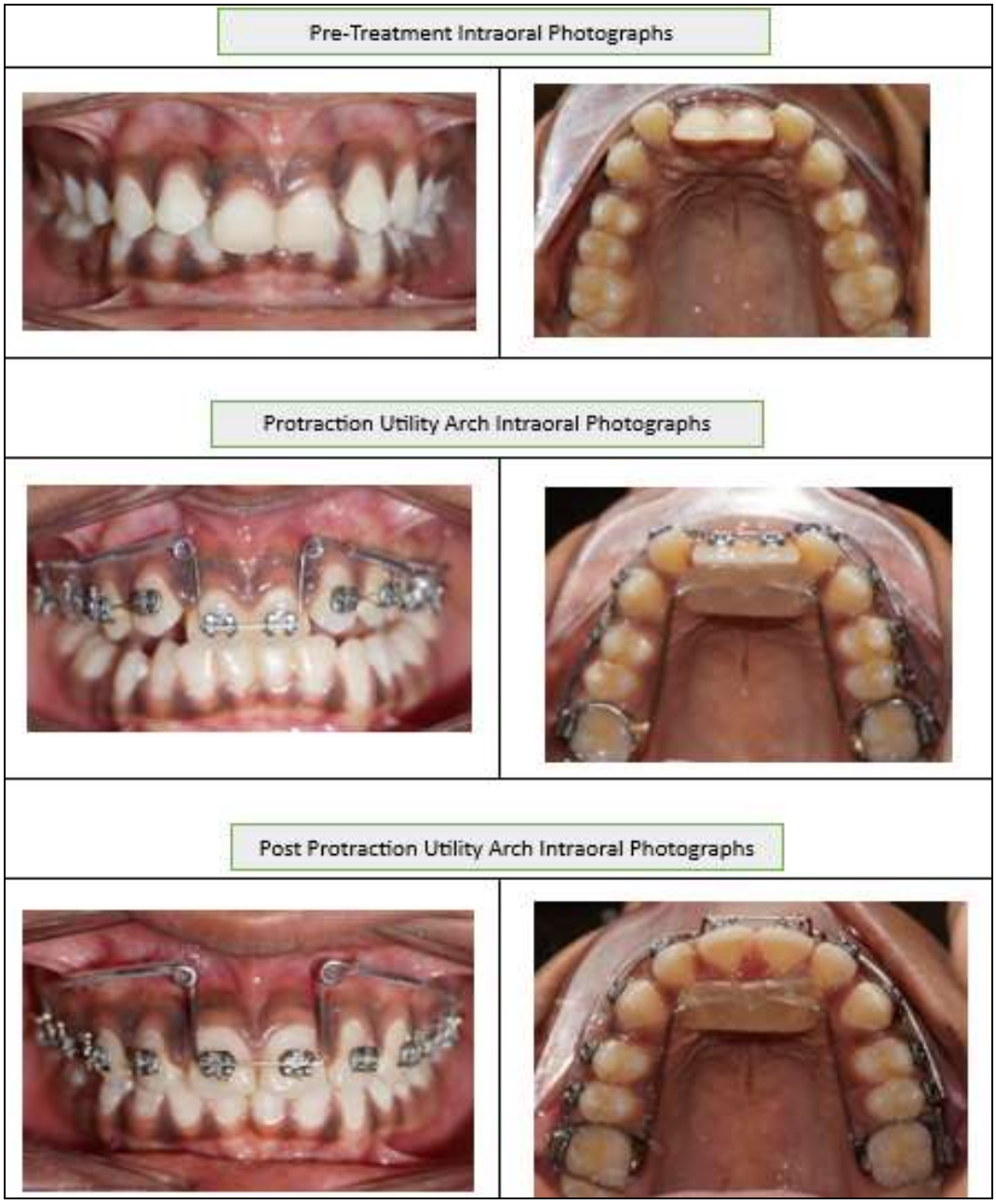

Fig 1: Case 1 Intraoral clinical photographs

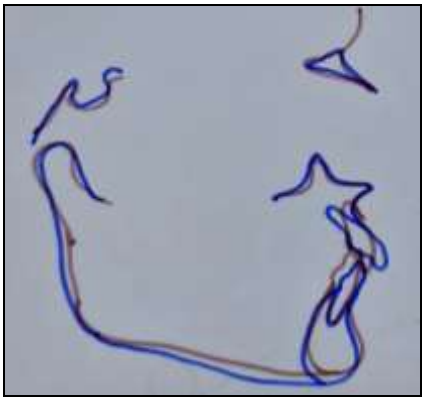

Fig 2: Case 1 Cephalometric superimposition

Table 1: Case 1 Cephalometric values

	Normal value	Pre-treatment	Post Utility arch
U1-SN	102^0	91^0	103^0
U1-NA	22^0	10^0	25^0
U1- NA (linear)	4 mm	2 mm	4 mm
Interincisal angle	131^0	156^0	125^0

Case 2: A patient, 16 years old female reported to the department with a complaint of unesthetic facial appearance on smiling. On Intraoral clinical examination, it was observed that the patient had Class II division 2 malocclusion with crowding in both arches. On occlusion, the patient had a Class II molar and canine relationship. Class II Type 2 incisor relationship was observed. The patient had no overjet and 6 mm of overbite. Severe retroclination was seen with 11, 21

The orthodontic treatment started with placing a 2 x 2 protraction utility arch (0.017x0.025 TMA) in the maxillary arch. Leveling and alignment was started in the maxillary arch using round and rectangular NiTi arch wires by compassing the retroclined central incisors. After 4 months, a rigid stainless steel archwire was placed with the open coil spring between 12 and 22 to make space for protraction of retroclined 11 and 21. A significant change in the degree of inclination of upper central incisors was obtained 6 months post placement of the protraction utility arch. An increase in overjet was seen which significantly reduced the trauma from occlusion on lower anteriors. The overbite was reduced from 6 mm to 4 mm. [Figure 3, Figure 4, Table 2]

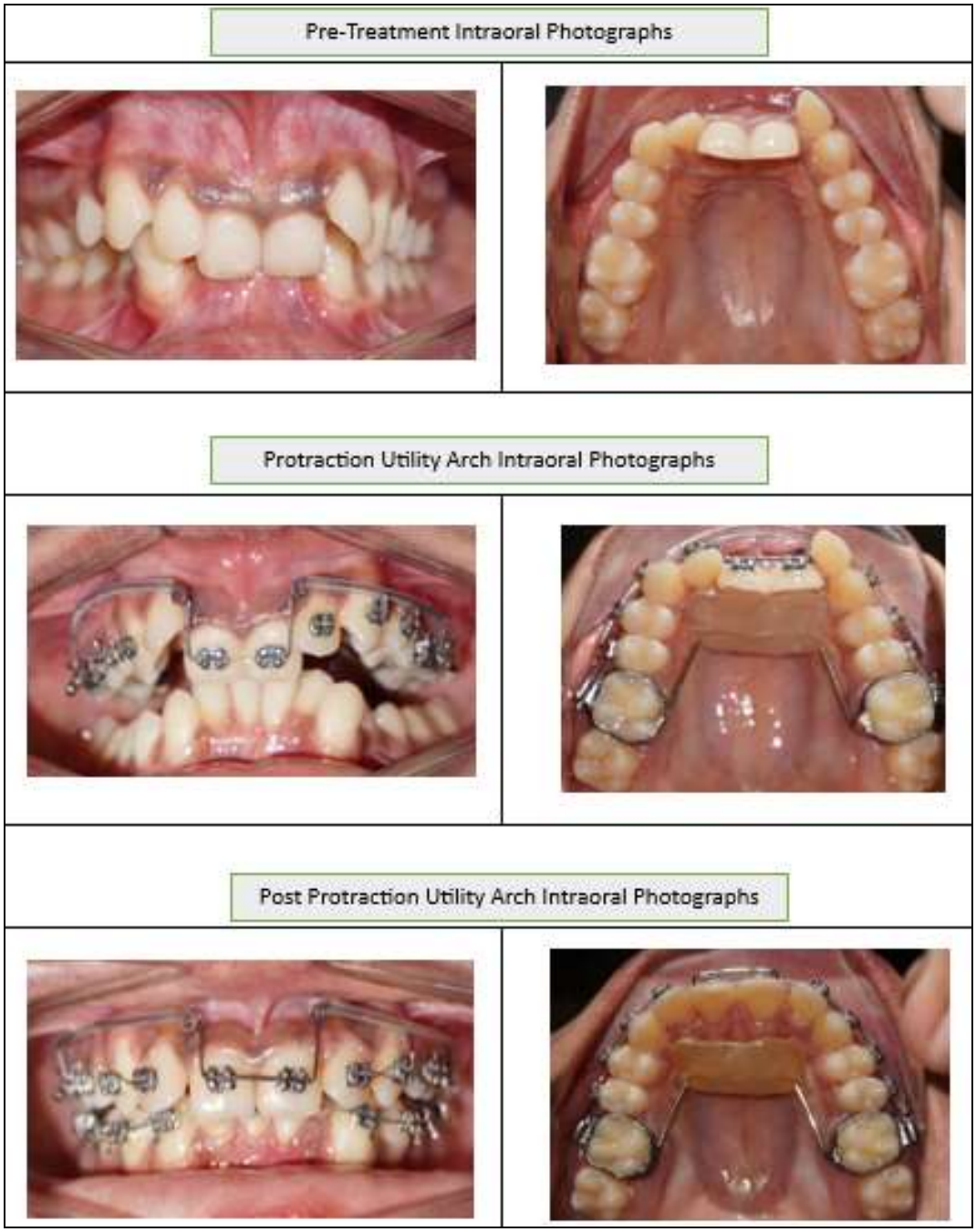

Fig 3: Case 2 Intraoral clinical photographs

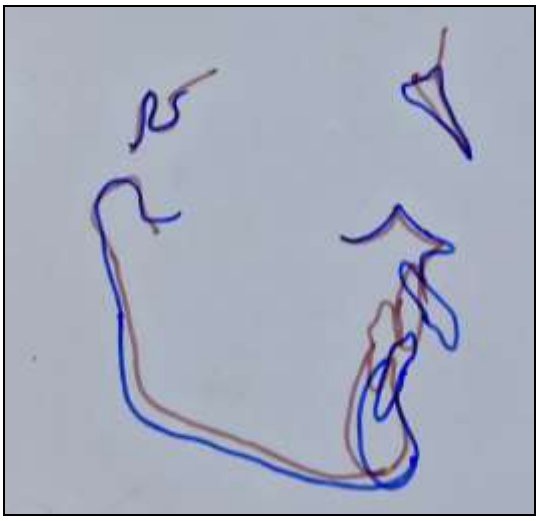

Fig 4: Case 2 Cephalometric superimposition

Table 2: Case 2 Cephalometric values

	Normal Value	Pre-treatment	Post Utility arch
U1-SN	102^0	76^0	105^0
U1-NA	22^0	4^0	24^0
U1- NA (linear)	4 mm	-4 mm	5 mm
Interincisal angle	131^0	176^0	131^0

Case 3: A patient, 15-year-old female, reported to the department with a complaint of irregularly placed upper and lower teeth. On intraoral clinical examination, patient has a Class II molar and cupid relationship. Severe crowding was seen in the maxillary and mandibular arch with palatally placed upper second premolars. Class II type 2 incisor relationship was seen in the upper arch.

The orthodontic treatment started with placing a 2 x 2 protraction utility arch (0.017x0.025 TMA) in the upper arch. Simultaneously, leveling and alignment was started in the maxillary arch using round and rectangular NiTi archwires by compassing the retroclined central incisors. Palatal buttons

were bonded on palatal surfaces of 14 and 24 to align 15 and 25. After 3 months, a rigid stainless steel archwire was placed with the open coil spring between 12 and 22 to make space for protracting the retroclined upper central incisors.

After 6 months of placement of protraction utility arch retroclined 11, 21 got proclined significantly. An increase in overjet was seen with a comparative reduction in overbite. [Figure 5, Figure 6, Table 3]

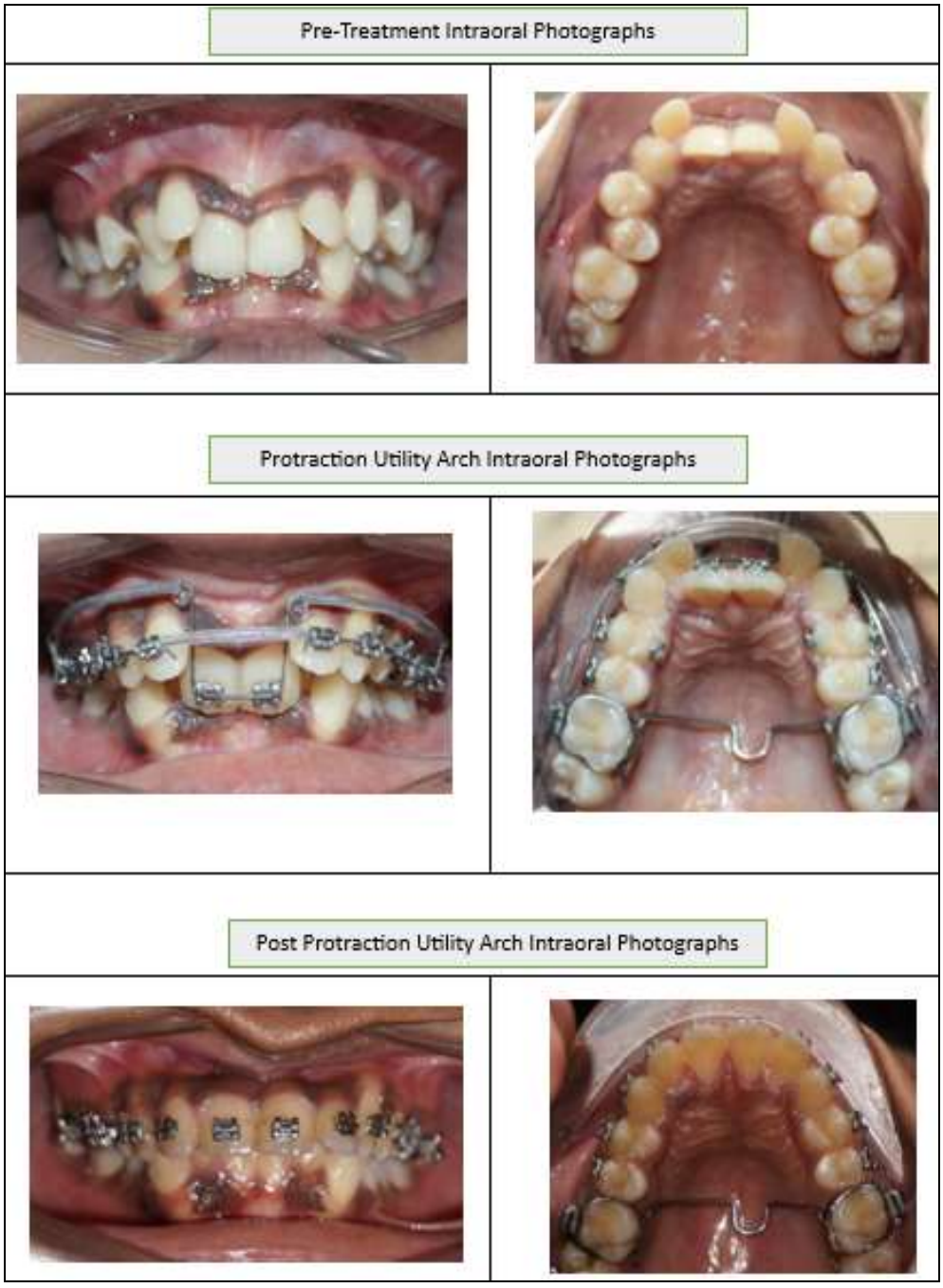

Fig 5: Case 3 Intraoral clinical photographs

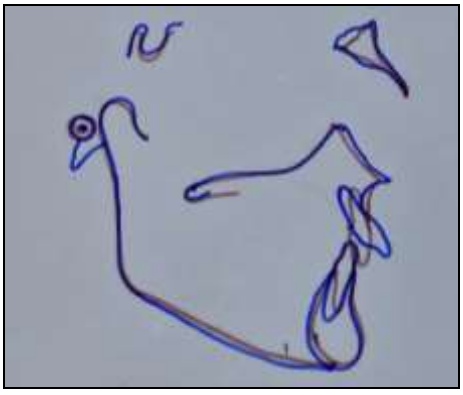

Fig 6: Case 3 Cephalometric superimposition

Table 3: Case 3 Cephalometric values

	Normal value	Pre-treatment	Post Utility arch
U1-SN	102^0	92^0	112^0
U1-NA	22^0	10^0	30^0
U1- NA (linear)	4 mm	1 mm	5 mm
Interincisal angle	131^0	167^0	128^0

Case 4

A female patient, aged 22 years reported to the department with chief complaint of irregularly placed upper front teeth. On Intraoral clinical examination it was observed that the patient's maxillary central incisors were retroclined. This patient had Class II molar relationship. The overjet was significantly reduced and deep overbite was evident. The

patient had over retained deciduous canine in right quadrant and palatally placed 13.

The 2x2 Protraction utility arch constructed using 0.019 x 0.025 TMA wire, was placed in maxillary arch. Simultaneously, bonding was done in maxillary teeth to level and align the arch using round and rectangular NiTi archwires without including 11,21. The deciduous canine was extracted after achieving proper alignment of 11,21. The alignment of 13 will be carried out using overlay technique on a rigid stainless steel archwire.

In this patient, the retroclined central incisors were corrected using protraction utility arch in 2 months. A increased overjet and reduced overbite was seen post protraction utility arch. [Figure 7, Figure 8, Table 4]

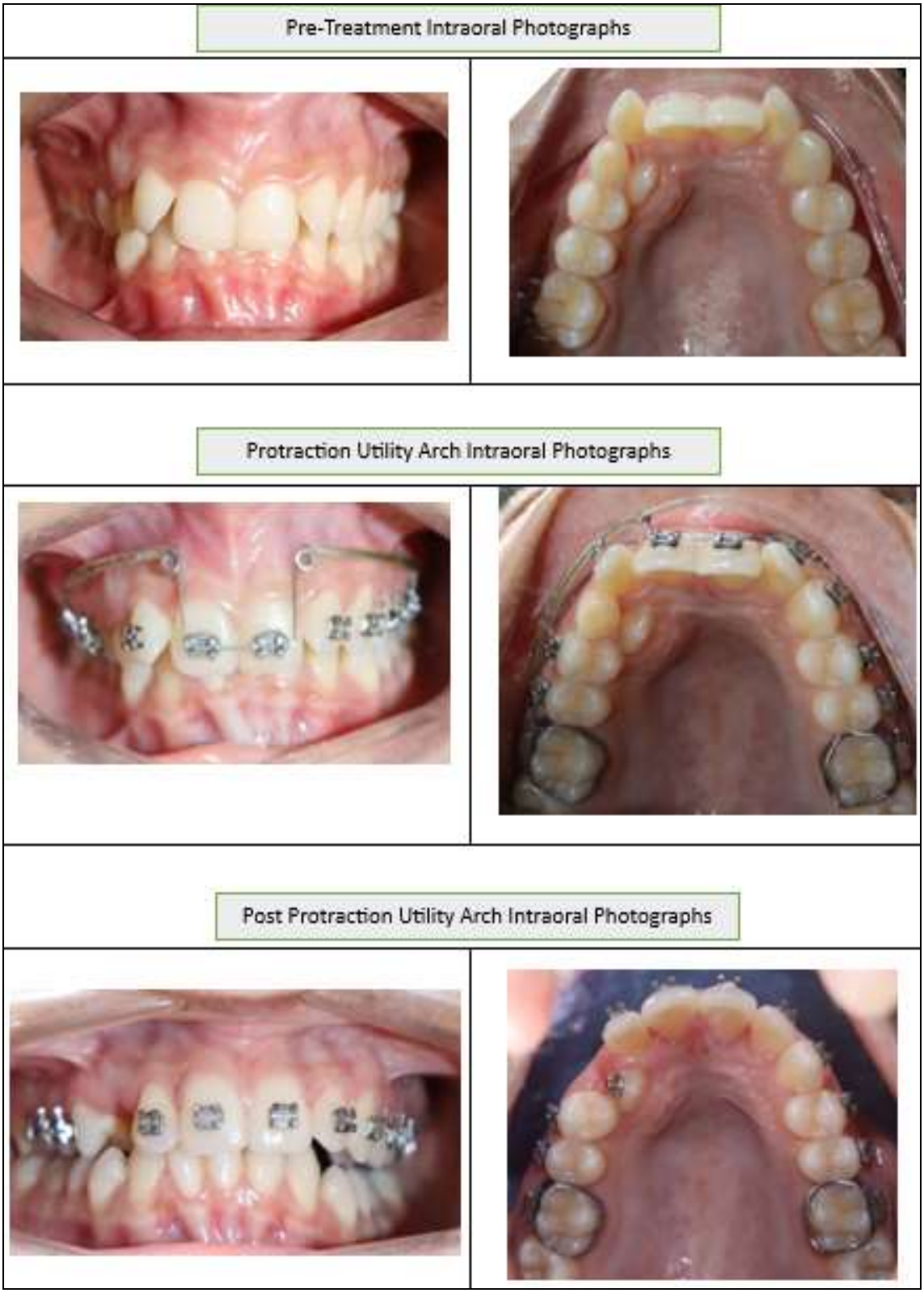

Fig 7: Case 4 Intraoral clinical photographs

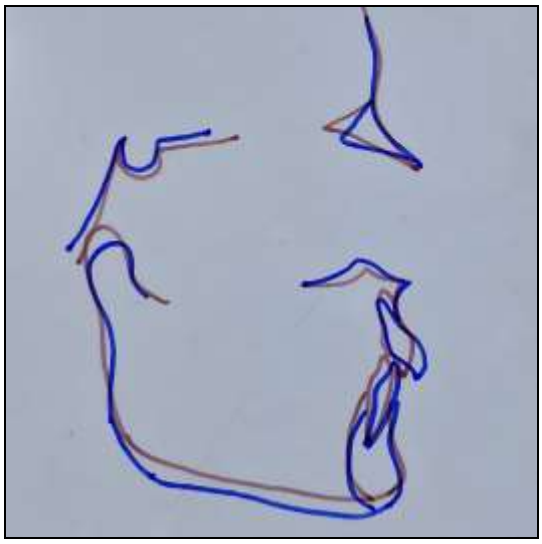

Fig 8: Case 4 Cephalometric superimposition

Table 4: Case 4 Cephalometric values

	Normal value	Pre-treatment	Post Utility arch
U1-SN	102^0	86^0	107^0
U1-NA	22^0	5^0	25^0
U1- NA (linear)	4 mm	3 mm	5 mm
Interincisal angle	131^0	159^0	130^0

Discussion

Class II division 2 malocclusion, while often linked to a mild Class II skeletal pattern, can also present with Class I or even Class III skeletal relationships. A more pronounced Class II skeletal pattern usually leads to a Class II division 1 malocclusion because the upper incisors are positioned beyond the influence of the lower lip. However, a high lower lip line relative to the upper incisors can result in a Class II division 2 malocclusion. Furthermore, a reduced vertical dimension is a typical characteristic and contributing factor in the development of Class II division 2 malocclusions [3, 4].

Individuals with Class II Division 2 malocclusion often exhibit distinct facial features, including a concave lower facial third, a prominent nose and chin, and retruded lips. A protrusion-type utility arch can be an effective treatment option for these patients, as it helps to move both upper and lower incisors forward. This appliance is frequently used to flare and intrude the upper incisors in Class II Division 2 cases [4]. A key characteristic of Class II Division 2 malocclusion is the retroclination of the upper incisors, and correcting this is a major objective in orthodontic treatment [2]. Therefore, a protraction utility arch was chosen for these patients to proclinate the upper central incisors, aligning them with the rest of the maxillary dentition. This approach can shorten treatment time and offer stable outcomes, as it avoids the need for arch expansion and minimizes changes to the intercanine width.

Conclusion

These case reports demonstrate Protraction utility arches' clinical effectiveness in correcting retroclined upper central incisors in a group of patients. The results showed significant improvement in incisor inclination, overjet, and overbite following the Protraction utility arch treatment.

The findings suggest that Protraction utility arches can be a valuable treatment option for patients with retroclined upper central incisors, particularly in cases where more complex orthodontic appliances are not indicated.

Conflict of Interest
Not available

Financial Support
Not available

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