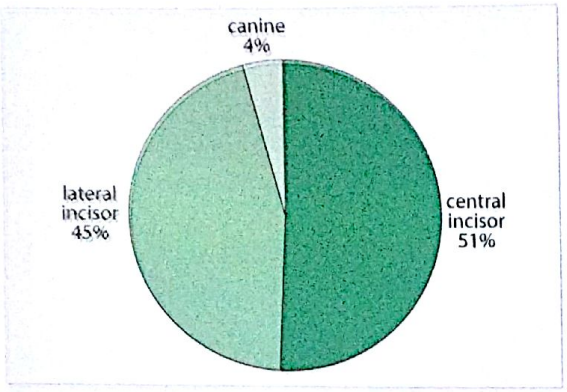

Fig 13 Distribution of pathologic migration in maxillary anterior teeth.

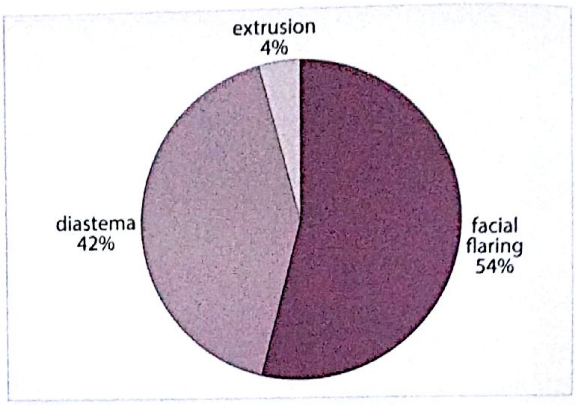

Fig 14 Percentage of different types of pathologic migration.

45.09% in lateral incisors, and 3.90% in canines (Fig 13). The most frequent type of pathologic migration was facial flaring (53.84%) followed by diastema (42.30%) and extrusion 3.84% (Fig 14). An average of 2.1 sites was obtained on a subject (minimum 1 and maximum 4).

The clinical parameters used in the study were GI, PI, PD, and CAL. Prior to periodontal treatment, PDs at the diastema sites ranged from 5 to 7 mm. After treatment, they were all reduced to 4 mm or less. CAL ranged from 6 to 9 mm before treatment, and from 5 to 7 mm after treatment.

Frequency of repositioning of pathologically migrated teeth

Evaluation on cast

- Mesiodistal repositioning: 88.46% of all sites (46 of 52 sites) demonstrated various degrees of repositioning (both partial closure and complete closure) after periodontal therapy 6 months after baseline. Of these 46 sites, all exhibited improvement after surgical therapy.
- Complete repositioning occurred in 34.61% and partial closure was seen in 53.80%.

Hence it can be concluded that a statistically significant number of pathologically migrated teeth repositioned in a period of 6 months.

- Labiopalatal repositioning was seen in 32 out of 51 teeth (62.74%).

Evaluation on radiographs

- Mesiodistal repositioning: 77.27% of all sites (34 of 44 sites) demonstrated various degrees of repositioning (both partial closure and complete closure) after periodontal therapy 6 months after baseline. Of these 34 sites, all exhibited improvement after surgical therapy.

Relation between severity of migration and degree of repositioning

For convenience, the scoring for evaluating the relation between severity of migration and degree of repositioning was as follows:

- score 1 = ≤ 1 mm
- score 2 = 1.1 to 2 mm
- score 3 = ≥ 2 mm.

Of those pathologically migrated teeth scoring 1, 100.00% and 86.95% were repositioned on casts and radiographs respectively; for score 2, this was 81.25% and 80.00%; and for score 3, 75.00% and 54.54% of teeth were repositioned (Fig 15 and Table 1). Complete repositioning was seen in 75.00% and 52.17% of score 1 on casts and radiographs respectively. The greatest repositioning was seen in score 1. Hence it can be concluded that the lower the severity of the score, the greater is the percentage of repositioning.

Figure 16 and Table 2 show the comparison between the cast and radiographic MDD measurements. Figure 17 shows a comparison of cast LPD measurements.

DISCUSSION

The present study was undertaken to analyze spontaneous repositioning of pathologically migrated teeth in periodontitis patients.

It showed that the most frequent types of migration are facial flaring (53.84%), followed by diastema (42.30%) and extrusion (3.84%). Prior to periodontal treatment, PDs, CAL, PI, and GI at the pathologically migrated teeth were evaluated. After treatment there was considerable overall reduction in these values.

It was observed that the prevalence of PTM was 50.98% in central incisors, 45.09% in lateral incisors, and 3.90% in canines. The obvious reason for the low incidence in canines is the resistance offered by their long root against PTM. As a result of the anterior controlling factor (ACF) of force being greatest on the central incisor, the effect of all the etiologic factors acting on the central incisor is magnified and this predisposes the central incisor to migrate pathologically. Since central incisors fall in the direct esthetic zone, these patients may be more motivated to seek periodontal care, resulting in greater numbers of patients reported. Further studies are needed to address this issue.

The present results demonstrate that a substantial proportion of pathologically migrated teeth spontaneously repositioned after periodontal therapy. This repositioning was stable 6 months from baseline. The repositioning was not seen after basic therapy (SRP and occlusal correction), in contrast with results of Gaumet et al,[9] who showed a few cases of repositioning after basic therapy. The reason may be that the authors had carried out soft tissue curettage during basic therapy, which may have led to removal of granulation tissue, clot formation, and wound contraction, and the present study included only SRP. All repositioning that took place in the present study occurred after the surgical phase, similar to the results obtained by Manor et al.[6]

In the present study, the repositioning was measured in two planes: the mesiodistal plane (cast and radiograph) and the anteroposterior plane on casts. The reason for incorporating anteroposterior plane measurements was the prevalence of facial flaring and labial tipping types of PTM. Radiographic measurement was incorporated in order to assess whether evaluation of repositioned of teeth on radiographs was comparable to cast measurements, in case the tedious procedure of preparation of diagnostic casts could be avoided. Only mesiodistal plane measurements were considered for radiographic evaluation as anteroposterior plane measurements on conventional radiographs was not possible.

On casts and radiographs when small to moderate migrations only were considered, the frequency of successful closure was higher.

From the results obtained, it was concluded that the lower the score of MDD on casts, the greater is the percentage of repositioning. The probable reason for this is the combined effect of removal of etiologic factors, periodontal wound contraction, and reestablishment of periodontal health.

The outcome of healing will be increased tensile forces exerted centrifugally on the root in the area with the greatest PD at baseline. The result of those forces exerted on the entire root at one time will, therefore, act as a motive power bringing back the tooth to where it was before the disease process began.[9] In contrast, in the present study higher scores did not reposition, indicating that the contracting periodontal wound had a limited range of action.

The literature has consistently demonstrated that, in the process of pathologic migration caused by advanced loss of periodontal support, the tooth drifts in a direction diametrically opposite to the site exhibiting the most severe destruction.[5-7,12-16] Forces from within the pathologic granulation tissue were thought to be responsible.[3] Since spontaneously repositioning teeth were always observed to move straight in the direction of the site that had exhibited the greatest initial probing depth, it was concluded that the cause of this movement was the eradication of pathologic forces secondary to periodontal treatment. However, no scientific evidence demonstrating the production of such forces by the diseased tissue is available.

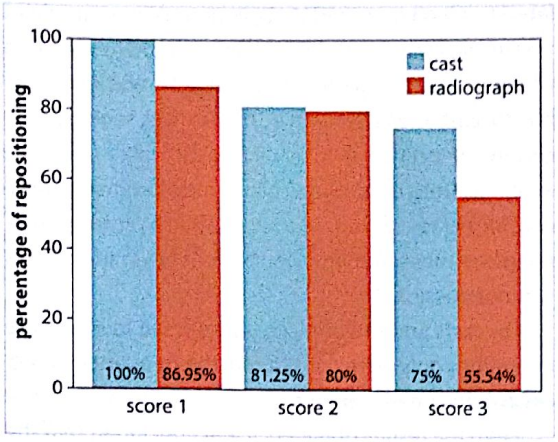

Fig 15 Relation between severity of pathologic migration and percentage of repositioning on casts and radiographs.

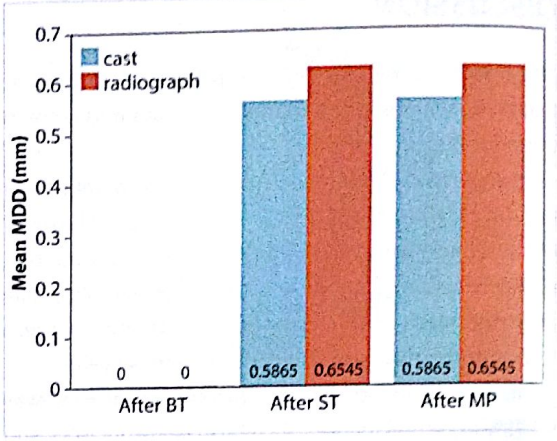

Fig 16 Comparison of difference in decrease in mean values of MDD measurements on cast and radiographs after different stages of therapy (BT, basic therapy; MP, maintenance phase; ST surgical therapy).

Table 1 Comparison of MDD measurements by casts and radiographs after different stages of therapy (paired *t* test)

		Mean	SD	*t* statistic	*P* value
Pair 1	C_0	1.73	0.9178	−0.2212	.8260
	I_0	1.75	1.0810		
Pair 2	C_1	1.73	0.9179	−0.2212	.8260
	I_1	1.75	1.0810		
Pair 3	C_2	1.14	1.0660	0.8219	.4157
	I_2	1.07	1.0357		
Pair 4	C_3	1.14	1.0660	0.8219	.4157
	I_3	1.07	1.0357		

C_0, MDD on casts at baseline; C_1, MDD on casts 1 month after SRP; C_2, MDD on casts 3 months after surgery; C_3, MDD on casts 6 months from baseline; I_0, MDD on radiographs at baseline; I_1, MDD on radiographs 1 month after SRP; I_2, MDD on radiographs 3 months after surgery; I_3, MDD on radiographs 6 months from baseline; SD, standard deviation.

Table 2 Comparison of degree of repositioning in MDD plane after different stages of therapy obtained by cast and radiographs (paired *t* test)

		Mean	SD	*t* statistic	*P* value
Pair 1	RC_{BT}	0	0	0	0
	RI_{BT}	0	0		
Pair 2	RC_{ST}	0.5795	0.3181	−1.138	.2616
	RI_{ST}	0.6545	0.4939		
Pair 3	RC_{MP}	0.5795	0.3181	−1.138	.2616
	RI_{MP}	0.6545	0.4939		

RC_{BT}, Degree of repositioning after basic therapy obtained on casts; RC_{MP}, Degree of repositioning after maintenance phase obtained on casts; RC_{ST}, Degree of repositioning after surgical therapy obtained on casts; RI_{BT}, Degree of repositioning after basic therapy obtained on radiographs; RI_{MP}, Degree of repositioning after maintenance phase obtained on radiographs; RI_{ST}, Degree of repositioning after surgical therapy obtained on radiographs.

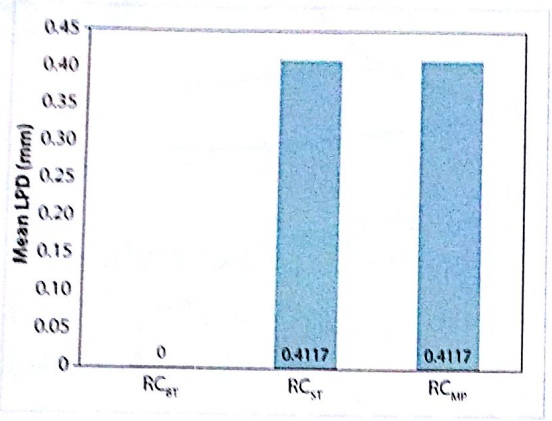

Fig 17 Differences in decrease of mean LPD measurements on casts after different stages of therapy (RC_{BT}, Degree of repositioning after basic therapy obtained on casts; RC_{ST}, Degree of repositioning after surgical therapy obtained on casts; RC_{MP}, Degree of repositioning after maintenance phase obtained on casts).

CONCLUSION

Within the confines of this study it can be concluded that orthodontic intervention may be required in pathologic migration with scores ≥ 1 mm of MDD. Based on the LPD values it can be concluded that the tooth can move in the labiopalatal direction by 1 mm. Further studies are needed to test this hypothesis. The movement of teeth following periodontal therapy has not been systematically studied. It is possible that teeth other than those affected by pathologic migrations may also move small amounts during the healing phase of treatment. The design of this study did not allow an answer to this question.

Lastly, patient factors should be considered in the decision for the treatment of PTM. These include patient compliance and cooperation, motivation to keep the natural teeth, skeletal factors, economic factors, availability for treatment, systemic health, and acceptance of surgical periodontal treatment, if necessary. At the end of this discussion, it is hoped that the results inferred from this study will act as a guide to clinicians treating pathologic migrations.

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