

Evaluation of the Reliability of Hamular Notch-Incise Papilla Plane (HIP) in Establishing Occlusal Plane

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ABSTRACT

Introduction: There are various recommendations, using both soft tissue and hard tissue landmarks, for the determination of occlusal plane in dentistry. However, their reliability and accuracy has always been questioned. Hamular notch-Incise papilla Plane (HIP) is one of such landmarks which is stated to be parallel to occlusal plane; however its reliability needs to be evaluated.

Objective: To find the relationship between hamular notch-incise papilla plane and occlusal plane in dentulous subjects.

Materials & Method: 48 dentate subjects with normal Class I occlusion participated in the study. Their maxillary impressions were made and casts were poured. Each cast was then mounted in the surveyor and HIP plane made parallel to the floor by tripod method. With the cast in this relation, the vertical distance between HIP and various reference points of occlusal planes were measured using digital Vernier Caliper. Wilcoxon test was used to find the statistical difference ($p < 0.05$).

Result: During evaluation of data, none of the cast showed absolute parallelism between occlusal plane and HIP plane. The mean vertical distance between HIP and incisal edge (INC) was 6.44 mm, whereas between HIP-6RMP and HIP-6LMP were 6.41 mm and 6.12 mm respectively. About 81% cases showed parallelism within the range of 2 mm. 2-related sample statistic test showed no statistically difference ($p < 0.05$) between HIP-INC and HIP-6RMP; and HIP-INC and HIP-6LMP.

Conclusion: HIP plane tends to be parallel to occlusal plane and can be used as a clinical guideline in the determination of inclination of the occlusal plane.

Key words: hamular notch-incise papilla plane, occlusal plane, surveyor

INTRODUCTION

According to The Glossary of Prosthodontic Terms, occlusal plane is the average plane established by the incisal and occlusal surfaces of the teeth.¹ Actually it is not the plane but represents the planar mean of the curvature of these surfaces.

Occlusal plane has great importance in dentistry. Changes in the plane of occlusion will modify the physical and functional relationship of the oral musculature leading to an alteration in function, comfort and the esthetic value.²⁻⁴

Numerous authors have proposed several landmarks to help define the level of occlusion plane. Camper plane and inter pupillary line are the usual morphologic guides used with the Fox plane in Complete Denture Prosthodontics. Other landmarks are the height of retro-molar pad, lateral borders of the tongue, position of the parotid papilla, commissures of the lips and buccinators grooves.⁵⁻⁸

Cooperman indicated that one could locate the anatomical landmarks of hamular notch and incise papilla to orientate the hamular notch-incise papilla (HIP) occlusal plane.⁹ Sugaya *et al* suggested that, by using HIP plane one could quite predictably reproduce occlusal plane.¹⁰ So the purpose of this study was to identify the relation between these two planes using surveyor and thus assess the reliability of HIP in establishing the occlusal plane.

MATERIALS AND METHOD

A total of 48 dentate subjects were selected for this study. Most of them were dental students and some were patients who visited Department of Prosthodontics, Kantipur Dental College & Hospital. Thorough clinical examination was done to ensure following inclusion criteria: complete permanent and healthy dentition, including the second molars with bilateral Angle Class I molar and canine relations; horizontal overlap and vertical overlap ranging from 2-4 mm; no temporomandibular

joint disorder; absence of extensive restorations or cuspal coverage; no previous or current orthodontic treatment; absence of anterior or posterior cross bite; and absence or minimal dental crowding.

Alginate impressions were made for each subjects and the casts were pour with Type III dental stone. The deepest point of the hamular notch and the center of the incisive papilla were marked with the color pencil. Each cast was mounted in the Marathon Surveyor and hamular notch-incisive papilla plane was made parallel to the floor by tripoding method; that is all three marked points were brought to same level and in contact with the fixed vertical arm.

At this point, the upper part of the surveying arm, where the spring is loaded, was measured using Vernier caliper and this was recorded under heading HIP (Figure 1). Then the surveying arm, not the horizontal arm, was moved up ward at the level of right central incisal edge (INC) and again the same area was measured. The same was done in relation to tip of mesio-palatal cusp of right first (6RMP) and left first maxillary molars (6LMP). These measurements were recorded under heading INC, 6RMP and 6LMP. Now by subtracting HIP from INC, 6RMP and 6LMP, the vertical distance between the HIP and incisal edge, HIP and mesio-palatal cusp of right first molar and HIP and mesio-palatal cusp of left first molar were calculated. If these measurements were equal at all three points, it meant that HIP and occlusal plane are absolutely parallel.

The data collected were statistically analyzed to test the equality of the mean differences using Wilcoxon non-parametric 2-related sample test, the significance level was set at $p < 0.05$ for each analysis.



Figure 1: Surveyor with dental cast mounted and digital Vernier Caliper

RESULT

In the present study, none of the cases showed absolute parallelism between HIP plane and occlusal plane. However 81.25% of the cases showed parallelism within the range of 2 mm. The mean vertical distance between HIP plane and incisal edge (INC) was 6.44 mm, whereas between HIP and 6RMP, and HIP and 6LMP was 6.41 mm and 6.12 mm respectively (Table 1). Keeping mean vertical distance HIP-INC as standard, the mean difference between HIP-6RMP and HIP-6LMP were 0.03 mm and 0.32 mm.

Statistical analysis showed no statistically significant difference ($p > 0.05$) between HIP-INC and HIP-6RMP (Pair 1), and HIP-INC and HIP-6LMP (Pair 2). But when the same test was done between HIP-6RMP and HIP-6LMP (Pair 3), statistically significant difference ($p < 0.05$) result was obtained (Table 2).

Table 1: Distance between HIP and Occlusal plane in incisal, right first molar and left first molar region.

Groups	Mean	SD	Min	Max
HIP- INC	6.44	1.54	4.01	8.90
HIP-6RMP	6.41	0.98	4.85	8.27
HIP-6LMP	6.12	0.76	4.90	8.17

Table 2: Wilcoxon test statistics for difference between the pairs

	N	Mean	SD	SEM	p-value
Pair 1					
HIP-INC	48	6.445	1.544	0.222	0.712
HIP-6RMP	48	6.413	0.983	0.141	
Pair 2					
HIP-INC	48	6.445	1.544	0.222	0.214
HIP-6LMP	48	6.125	0.764	0.110	
Pair 3					
HIP-6RMP	48	6.413	0.983	0.141	0.034*
HIP-6LMP	48	6.125	0.764	0.110	

*statistically significant at $p < 0.05$

DISCUSSION

It is evident from the literature that there are controversies regarding the location and orientation of the occlusal plane.⁴ Reliable landmarks that can better guide the clinician in establishing occlusal plane are very necessary. HIP was reported in the literature to be used in establishing the occlusal plane.^{11,12} As these landmarks appeared to be least affected by residual ridge resorption and are easily visible, it could be of great help if they could be used to orient the occlusal plane.

Rich, Karkaziz and Polyzois^{11,12} observed parallel relation between HIP and the occlusal plane; however they insisted on further evaluation considering the discrepancies in their methodology. Karkaziz and Polyzois applied cephalometry to investigate the relationship between occlusal plane and HIP plane.

Fu *et al*⁴ found $2.61^\circ \pm 0.81$ angle between the occlusal plane and HIP in Taiwanese subjects. Similar result of $1.60^\circ \pm 2.2$ was noted by Sugaya *et al*¹⁰ in Japanese. Both studies used three-dimensional precise measuring devices to measure the angle between occlusal plane and HIP, and concluded that HIP tends to be more parallel to occlusal plane and can be used as a clinical guide.

In this study, dental surveyor was used and the HIP was kept parallel to the floor by tripodding method. Then the vertical height was measured at three points: INC, 6RMP and 6LMP. The statistical result obtained was little different from other researchers. The posterior part of the occlusal plane was parallel with the HIP but the anterior part was not. At the same time more than 80% subjects had HIP parallel to occlusal plane within the range of 2 mm. This suggests that HIP tends to be parallel to the occlusal plane; however further investigations with larger sample are required to establish this concept.

CONCLUSION

Hamular notch-incisive papilla plane (HIP) tends to be parallel to occlusal plane and can be used as a clinical guideline in the determination of inclination of occlusal plane.

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